EXTENT OF ADOPTION OF SCIENTIFIC PRACTICES IN PRAWN FARMING

BY

SASIKUMAR P. K.

THESIS

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Department of Management Studies

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&

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DEDICATED

TO MY BELOVED MOTHER

DECLARATION

I hereby declare that this thesis entitled EXTENT OF ADOPTION OF SCIENTIFIC PRACTICES IN PRAWN FARMING is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship, or other similar title of any other University or Society.

Panangad,
24th May, 1990.

SASIKUMAR, P.K.

CERTIFICATE

Certified that this thesis, entitled EXTENT OF ADOPTION OF SCIENTIFIC PRACTICES IN PRAWN FARMING is a record of research work done independently by Sri. Sasikumar, P.K. under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship, or associateship to him.

Mannuthy,
24th May, 1990

Dr.P.S. PUSHKARAN,
(Chairman, Advisory Board)
Professor & Head,
Department of Extension,
College of Veterinary and
Animal Sciences, Mannuthy.

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INTRODUCTION

Aquaculture - the rearing of aquatic beings in captivity has gained great significance in recent years. It is a means for producing quality protein at low cost which can meet the protein requirements of the country's vast population. Further, aquaculture can act as an efficient tool for rural development by creating employment and income to the unemployed and under-employed rural lot. Among the various aquaculture practices, prawn farming has drawn the attention of all owing to the high price prawn fetches and its unwholesome demand, in Indian and foreign markets.

Prawn is primarily viewed as a product for export, more as a commodity for domestic consumption. Prawn exports contribute over three-fourth of Indian seafood export earnings every year. In 1988-89 India's marine products export touched a new peak of performance, by exporting a total of 99,777 tonnes, worth 597.85 crores of rupees. Of this total, frozen shrimps alone accounted for 56,835 tonnes (56.96 per cent) in volume and Rs 470.33 crores (78.67 per cent) in value (MPEDA, 1989).

Presently, the prawn export industry is largely dependent on the production from marine sector. Marine prawn production in India during the year 1986 was 1,89,042 tonnes (Srinath, 1987). Major part of this production comes from the west coast and the substantial portion is contributed by Kerala Coastal Waters (Srinath, 1987). Since late 1950's, in order to meet the insatiable demand for shrimps, all possible measures are being explored for the maximum exploitation of shrimp resources in the coastal waters. Mechanization of the fishery through the introduction of shrimp trawlers was the major improvement made for achieving this goal. Shrimp trawling has, no doubt, contributed to substantial increase in production over a decade. However, in recent years, the indications are that a stage has reached where the total production shows no more increase. This stagnation was due to the limited resources, indiscriminate fishing, variation in the environmental factors etc.

At the same time the number of processing units is on an increase. Eventually this resulted in the under-utilization of the processing plants. The future growth and survival of the prawn export industry depend on uninterrupted supply of raw material to run the processing plants. Hence to save the industry it is imperative to keep up production. Therefore, any step taken to augment production of prawn would be of national importance.

Deep sea shrimping is a costly operation. Besides, the desirable mix of penaeid prawns do not occur in the deep sea waters. In this situation farming of commercially important sspecies of prawns in captivity becomes the best alternative. Prawn farming could, to a very large extent, augment the prawn production in the country. This could help in stabilizing the raw material supply to the industry. It could also provide employment opportunities to a major section of the coastal fisherfolk.

The country's resources for prawn farming are plenty. India has an estimated area of 17,00,000 hectares of cultivable brackish water areas in the coastal sector. Out of this only 30,000 ha. lying in the coastal belt of Kerala, Karnataka and West Bengal are presently utilised for prawn and fish farming (Silas et al.,1983). Besides this water resource, seeds of cultivable species of prawns are available in plenty in our natural waters. In addition there are a few prawn hatcheries producing prawn seeds on commercial scale.

In Kerala, the total brackish water resource including the lower reaches of rivers, the brackish water lakes, the backwaters and the adjacent low lying fields and mangroove swamps is estimated at about 2,43,000 ha. It is estimated that about 1,21,600 ha. distributed in various regions of the state could be utilised for culture (Department of Fisheries, Kerala, 1987).

Past few years had witnessed tremendous improvements in the technology of prawn farming. As a result the prawn production had increased from a few hundred kilogrammes/ha/year in traditional culture systems to a level as high as 40 tonnes/ha/year in modern high-tech culture systems. However, in India shrimp farming is being carried out mostly in a traditional way as could be seen in the Bheries of West Bengal, Pokkali fields of Kerala, Gazani lands of Karnataka and Khazan lands of Goa.

In Kerala, the traditional system of prawn farming in paddy fields, popularly known as 'prawn filtration' is prevalent in low lying areas extending to over 6000 ha. (Sathiadas et al., 1987). These fields, varying in size from less than 0.5 ha. to more than 10 ha. (George and Suseelan, 1983) and lying along the coastal villages of Trichur, Ernakulam, Alleppey and Kottayam districts, are confluent with the Vembanad lake through canals and are subjected to tidal influence. The farming system involves entrapment of juvenile prawns brought in by the tidal water in the fields and catching them by filtration at regular intervals.

Traditional prawn filtration is mainly a seasonal practice done during the pre-monsoon periods (November-April). During the southwest monsoon period (June-September) water in the fields become almost fresh making it unsuitable for farming of marine prawns. During this period a special system of paddy cultivation called 'Pokkali' is practised in these fields. The average yield of paddy per hectare obtained is 2,000 kg (Unnithan, 1985).

Soon after paddy harvest, the fields are leased out to prawn farmers for a period of five months, ie. mid November to mid April. The lease value varies depending on the productivity of the field. The average lease amount per hectare in Ernakulam district was Rs 4,030/- (Sathiadas et al., 1987). The leasee prepares the field by repairing bunds and fixing sluice gate for regulating the flow of tidal water. The paddy stumps and straw left out in the field are not removed but allowed to decay there to form a good organic manure.

Stocking is done by letting in tidal water into the fields during high tide. Along with tidal water juvenile prawns from the adjoining brackish water areas enter the field. When tidal water starts receding during low tide, a bamboo or arecanut screen is inserted across the sluice, trapping the juvenile prawns that have entered the field. This process is continued throughout the period of operation.

Harvesting starts from mid December. This is done during low tide by operating a conical net fixed at the sluice gate. The harvesting operations are carried out for five to eight days around every full moon period and new moon period (locally called as thakkom). Final harvest called 'Kalakkipiduthamı' or 'Ketukalakkal' is done at the end of culture period.

In addition to the pokkali fields, there are relatively deeper brackish water impoundments which are not suitable for growing paddy. The culture operations are similar to that in seasonal fields, but conducted year round.

The prawn production is very low in this conventional practice, estimated as 510 kg/ha. (Sathiadas et al.,1987) and is composed of many undesirable species. The low prawn production from filtration fields is mainly because of the lack of selectivity exercised in stocking, insufficient time allotted for the growth of prawns, the entry of predatory and competing organisms along with prawn seeds causing destruction to the stock and the dependence on nature for stocking material which is highly fluctuating.

The scientific prawn farming technology developed by the research institutes viz. Central Marine Fisheries Research Institute (CMFRI), Central Institute of Brackish-water Aquaculture (CIBA) and College of Fisheries of Kerala Agricultural University delineates the defects of traditional system and offer better prawn production.

Commendable work has been done by various extension agencies and developmental organisations for the dissemination and wider adoption of the technology. The Central Marine Fisheries Research Institute (CMFRI) was the pioneering agency in the dissemination of scientific prawn farming technology in the State. A systematic approach to the diffusion of the technology was first attempted through the Krishi Vigyan Kendra (KVK) of CMFRI at Narakal in 1977. Thereafter realising the significance of this practice various state and central agencies took part in these activities. The Marine Products Export Development Authority (MPEDA) under the Ministry of Commerce started a separate section called Prawn farming section at Ernakulam with the objective of popularisation of scientific prawn farming to support the export industry through the supply of raw material. The state agency responsible for disseminating scientific prawn farming technology was the state department of Fisheries. Recently the topic of prawn farming extension was handed over to the newly constituted Brackish Water Fish Farmers Development Agency (BFFDA). This agency started working in the year 1988 with its office at Ernakulam. Besides the above mentioned agencies, the Economics and Extension Division of CMFRI, Central Institute of Brackishwater Aquaculture (CIBA), College of Fisheries, various Fisheries Research Stations and the Directorate of Extension of Kerala Agricultural University (KAU) etc. are also engaged in the dissemination of scientific prawn farming technology.

These agencies conduct training programmes, demonstrations, seminars, discussion meetings, film shows and issue a series of literature benefitting the farmers. They also provide technical, financial and input assistance to the needy farmers and monitor their farming operations.

Significance of the study

Unless farming innovations, generated and standardised through researches reach the hands of its ultimate users, the very purpose of it will remain unfulfilled. The development of prawn farming in the country depend upon the farmers, small and large scattered along the coastal villages adopting the innovation pertaining to this farming. Hence for the promotion of scientific prawn farming appropriate strategies for transfer of scientifically formulated package of practices must be determined. The technology in the form of usable package must be disseminated through effective channels of communication to reach the farmers, helping them to improve their farming operations and thus to provide active support in the economic development of the country.

In Kerala, dissemination of scientific prawn farming practices was started in the mid seventies and thereafter considerable work had been done by various extension agencies and government departments for the promotion of scientific prawn farming. Annoyingly, inspite of all these efforts, the level of adoption of scientific practices has not reached a satisfactory level. This suggest the need for an inquiry into the poor adoption level and to identify the hurdles to be crossed for getting a wider adoption of the technology.

This study aims at an analysis of the adoption behaviour of the selected farmers in prawm farming, which will help to understand the extent of adoption of these practices by farmers. Knowledge about the existing pattern can be utilised for designing proper strategy to enhance the extent of adoption of scientific practices.

The study will also help to identify important reasons for non-adoption and partial adoption of scientific practices. Identification of problems will go a long way to change or modify the present extension planning and can also help in rectifying the system or person defect.

The investigation also covers the extension communication media used for the dissemination of scientific prawn farming practices, and their extent of utilization by farmers. This will help in modelling, and using appropriate communication media for the effective transfer of technology.

The specific objectives of the study are:

1. To assess the extent of adoption of scientific practices in prawn farming.
2. To study the communication media used in the dissemination of the scientific prawn farming practices.
3. To study the extent of utilisation of communication media for the awareness and adoption of prawn farming practices.
4. To study the relationship, if any, between the selected situational, socio-economic, socio-psychological and communication characteristics of the prawn farmers and their adoption behaviour.
5. To identify the reasons for non-adoption or partial adoption of the selected practices.

Limitations of the study

Considering the time and resources available at the disposal of the researcher, the study was confined to a sample of 100 prawn farmers selected from among the prawn farmers in Ernakulam district. Hence the findings of the study cannot be generalised and applied to the state as a whole as here can be variations in the farming conditions, characteristics of the farmers and institutional support available to the farmers.

REVIEW OF LITERATURE

A close review of past studies is imperative in a scientific investigation as, it will help to provide a clear insight into the existing findings thus aiding in developing a sound conceptual frame work for the study.

On reviewing the related literature it became evident that there were no studies pertaining to the adoption behaviour of prawn farmers. Hence review of literature on the adoption of scientific practices in scientific prawn farming could not be done in this chapter. A brief review on the utilisation of communication media by farmers at awareness and adoption stages and the relationship between dependent and independent variables were made from fisheries and allied fields. A brief review is also made on the reasons for non-adoption and partial adoption of scientific practices in prawn farming. They are presented under following sub headings.

1. Utilisation of communication media for awareness of scientific practices.
2. Utilisation of communication media for adoption of scientific practices.

3. Relationship between selected independent variables and adoption of scientific practices.
4. Reasons for non-adoption and partial adoption of scientific practices in prawn farming.

2.1. Utilisation of communication media for awareness of scientific practices

Champawat and Intodia (1970) studied the sources of information consulted by farmers at various stages of adoption of weedicides. They found that at awareness stage College extension worker and Village level worker were the main personal sources of information and that the neighbours were only next to them.

Singh (1970) reported that village level change agent and other farmers combined were the most important sources of awareness.

Rajaguru and Satapathy (1971) reported that University extension service and neighbours of the farmers were the most effective sources disseminating useful information about high yielding varieties of paddy.

Rogers and Shoemaker (1971) suggested five stages in the innovation decision process viz. knowledge, persuasion, decision, implementation and confirmation. He reported that in developed countries mass media channels were important in creating awareness knowledge. In developing countries the role of mass media is partly replaced by cosmopolite interpersonal channels.

Mathur et al. (1974) found that there is a predominent use of interpersonal sources of communication as neighbours, friends and relatives, block personnel and IARI personnel in the process of decision making. by wheat growers. Use of mass media had been much less than that of interpersonal media. The mass media sources like poster, printed media and krishi vigyan mela were used only in the initial stages.

Balasubramanian (1976) revealed that farmers utilised formal sources mostly followed closely by informal sources for getting information about high yielding varieties of paddy.

Bhatnagar (1978) observed that among rural communities of Uttarpradesh, inter personal channels were the most important means through which farmers get information in the first instance, Subhadra (1979) reported that at awareness stage of dairy innovations, the neighbourhood agencies were the most utilised information source followed by Government agencies and mass media. Among mass media sources most important were radio and seminars. Newspaper, posters, demonstrations, film shows and literature played only a very insignificant role.

Singh and Sahay (1982) found that in progressive villages personal cosmopolite sources and mass media provided information about high yielding varieties, while in non-progressive villages only a few personal cosmopolite and more personal localite sources provided the information.

2.2. Utilisation of communication media for adoption of scientific practices

Champawat and Intodia (1970) reported that in the adoption of weedicides College extension worker and village level worker were the main personal sources of information.

Mathur et al. (1974) found that the interpersonal sources of communication as friends and relatives, block personnel and IARI personnel were the most used information sources in the process of decision making by Wheat growers.

Mohammed and Singh (1978) observed that among cotton growers, peer influence was the most important source of information for adoption followed by formal communication. The magazines and bulletins were not at all used by any farmers.

Annamalai (1979) studied the utilisation of farm information sources in the adoption process and concluded that out of 18 sources analysed, only five, namely radio, Deputy Agricultural Officer, field visits, progressive farmers and demonstration were the most utilised sources by paddy farmers in the order of preference.

Subhadra (1979) revealed that at adoption stage Government agencies were the most used information source by dairy farmers. This was followed by neighbourhood agencies and mass media. Among the mass media sources, radio and seminar ranked first. The utilisation of News paper, posters, demonstration and literature were insignificant.

Bhaskaran and Praveena (1982) reported that the communication media and methods which had influenced the adoption behaviour included radio, demonstration, farmer training sessions and field trips. The methods cited least important were extension literature including farm magazines, educational films, posters and exhibits, slide lectures and lecture meetings.

Subbareddy and Channagowda (1982) observed that in the utilisation of green fodder 55 per cent of dairy farmers consulted formal personal sources and 48 per cent consulted formal mass media sources like News paper, radio, exhibition and films. The informal localised sources such as other farmers, village leaders were also consulted by dairy farmers.

Nataraju and Channagowda (1985) revealed that in the adoption of improved dairy practices Veterinary Inspector and cattle rally were the most common source of information utilised by small farmers, marginal farmers and agricultural labourers. Demonstration occupied third place for small farmers. Sources like Secretary of the dairy Co-operative Society and neighbours occupied third position for other two groups.

Das *et al*. (1988) found that among the various items of mass media extension publications showed important contribution to the adoption of composite fish culture, followed by demonstrations, radio, news paper, films, discussion programmes and exhibitions. Of the various cosmopolite sources of information fisheries co-operative society played the most important role followed by scientists, State fisheries officials, input dealers and bank officials. The localite sources, friends, relatives and neighbours were also found to play very important role in motivating for adoption.

Sujathkumar (1988) revealed that the sources of information used for adoption by traditional fishermen were friends and relatives, co-operative societies, Radio, News paper, private dealers and nationalised banks in the order of importance. For the trawler owners also friends and relatives were the most important sources. Private dealers occupied the second place followed by radio, news paper, co-operative societies and nationalised banks.

Vasanthkumar (1988) studied the information seeking behaviour of traditional fishermen. The information seeking behaviour was studied in terms of sources of information, frequency and purpose of contact. The sources of information were development organisations, mass media and private dealers. The results indicated that among fisheries development organisations, co-operative societies were the sources of information for all; State fisheries department and nationalised banks for 91 per cent and 70 per cent respectively. Among mass media radio, news papers and television were used by 100 per cent, 78 per cent and 13 per cent of the fishermen respectively. Based on frequency of contact radio was the most important source followed by private dealers, news paper, co-operative societies, State fisheries department, nationalised banks and television in the order of importance.

Velumani (1988) studied the information source utilisation by cotton growers. The findings pointed out that among institutional sources, Assistant Agricultural Officer was the most used source. This was followed by Agricultural Officer - T & V and Agricultural Officer Seed Certification. Among non institutional sources neighbours were the primary source for 59.16 per cent. Other important sources were friends, pesticide dealers, relatives, contact farmers, progressive farmers and village leaders. Among mass media, 79.16 per cent used radio as their first source, followed by news paper (58.33 per cent) and magazine (25.83 per cent). Films and exhibitions were the least preferred sources.

2.3. Relationship between selected independent variables and adoption behaviour

2.3.1. Socio-economic variables

2.3.1.1. Age

Chandrakandan and Subramanyan (1975) observed that age had no significant relationship with adoption of recommended practices among paddy cultivators.

Oliver *et al.* (1975) reported that young and middle aged farmers were less conservative in adoption.

Sundaraswamy and Doraiswamy (1975) studied the adoption behaviour of sorghum growers and found that age had a significant positive relationship with adoption of recommended practices.

Bhaskaran (1978) stated, among paddy growers no relationship was in evidence between age and adoption of scientific practices.

Subhadra (1979) observed that age had no significant relationship with the adoption of dairy husbandry practices.

Manivannan (1980) revealed that age had a significant inverse relationship with the adoption behaviour among sun flower growers.

Prakash (1980) studied the adoption behaviour of tribes in more developed and less developed areas and found that age had a positive relationship with adoption behaviour in more developed areas.

Sohi and Kherde (1980) stated that age had no contribution to the adoption of dairy practices among small and marginal farmers.

Sushama et al. (1981) found that age was not related with the adoption of modern living practices by selected tribes of Kerala in more and less developed areas.

Ogunfiditimi (1981) noted that age of the farmer had no significant correlation with the adoption of improved farm practices.

Balasubramaniam and Kaul (1982) reported that age had no significant association with adoption of fish curing practices.

Chakravarthy (1982) revealed that no significant relationship existed between age and adoption of indegenous farm practices.

Haque and Ray (1983) stated that there was no relationship between age and adoption of scientific fish culture practices.

Das _et_ _al_. (1982) observed that farmers of age 30 years and below were better adopters of scientific fish culture.

Wilson and Chaturvedi(1985) studied adoption of improved technology of flue cured virginia in three districts of Andhra Pradesh, viz. East Godaveri, West Godaveri and Prakasam. The result indicated that age of the farmers was negatively related with adoption behaviour in east Godaveri district, while it had no association with adoption behaviour in the latter two districts.

Satwant and Surinder (1986) reported that adoption of improved household practices were low among younger housewives.

Prasannan (1987) concluded that age of the farmers had a negative but non-significant association with the extent of adoption of message in T & V system.

Ramkumar (1987) revealed that age had no significant association with the extent of adoption of improved dairy practices.

Ratinasabapathi (1987) found there was no significant relationship between age and the adoption of integrated pest management measures for cotton.

Das et al. (1988) studied the adoption behaviour of fish farmers and found that age was inversely related with the adoption of composite fish culture innovations.

Krishnamoorthy (1988) observed non significant association between age and adoption behaviour of cotton and millet growers.

Subbashchandra (1988) stated that age was not significantly related with the adoption of fish culture innovations.

Venkataprabhu (1988) reported that no significant association existed between age and adoption of water management practices among paddy, sugar cane and turmeric growers.

Rasheed Sulaiman (1989) revealed that age had significant inverse relationship with adoption of fertiliser management practices among paddy growers of Palghat district, while it had no significant association with the adoption behaviour of paddy growers of Calicut district.

2.3.1.2. Education

Singh and Singh (1970) reported that education had significant association with adoption behaviour of paddy farmers.

Choukidar and George (1972) found that education score of farmers was significantly associated with their adoption behaviour.

Ziaulkarim and Mahaboob (1974) stated that the adoption behaviour of rice growers of Bengladesh was positively and significantly correlated with their functional literacy.

Oliver et al. (1975) revealed that education had a positive and significant relationship with the adoption of high yielding varieties among farmers of Tamilnadu.

Pillai (1978) observed that the adopters and non-adopters differed significantly with respect to education in the adoption of soil conservation measure.

Bhaskaran (1978) reported that no relationship was evidenced between education and adoption of high yielding varieties among paddy farmers.

Rajendran (1978) concluded that education had a positive significant relationship with the adoption of selected agricultural practices among small farmers.

Subhadra (1979) stated that no relationship existed between education and adoption of dairy husbandry practices among members of milk co-operatives.

Manivannan (1980) reported that education had positive significant association with the adoption behaviour of sunflower growers.

Sohi and Kherde (1980) observed that the dairy adoption behaviour of small and marginal farmers had positive significant relationship with education.

Ogunfiditimi (1981) found that the level of education had positive significant association with the adoption of improved farm practices among farmers of Nigeria.

Balasubramaniam and Kaul (1982) noted that education had no influence on the adoption behaviour of fish curers.

Chakravarthy (1982) revealed that education had no significant association with the adoption of indegeneous farm practices.

Haraprasad (1982) reported that education was found positively and significantly correlated with the adoption of improved practices of livestock rearing among the beneficiaries of Small Farmers Development Agency.

Haque and Ray (1983) observed that education had no significant contribution to adoption of recommended species of fish in composite fish culture.

Vijayakumar (1982) found that the extent of adoption of improved practices in coconut cultivation was significantly influenced by education among the beneficiary as well as non-beneficiary farmers.

Viju (1985) studied the adoption behaviour of tribal farmers towards improved agriculture practices. The results indicated that education status had a positive significant association with the adoption behaviour.

Satwant and Surinder (1986) reported that adoption of improved household practices among housewives was influenced by their education.

Prasannan (1987) revealed that educational status had a positive and significant association with the adoption of messages by contact farmers in T & V system.

Ramkumar (1987) found that education had no significant association with the adoption behaviour of dairy farmers.

Ratinasabapathi (1987) observed that education had no significcant relationship with adoption of integrated pest management practices among cotton growers.

Das _et al_. (1988) reported that education had a positive association with adoption of practices in composite fish culture.

Krishnamoorthy (1988) stated that no significant association was evidenced between education and adoption behaviour of cotton and millet growers.

Subashchandra (1988) studied the adoption behaviour of fish farmers and found that education had no significant contribution to adoption.

Rasheed Sulaiman (1989) observed positive significant association between education and adoption of fertilizer management practices among paddy growers..

2.3.1.3. Experience

Rajendran (1978) reported that experience had no significant relationship with he adoption of selected agricultural practices.

Subhadra (1979) found that no significant relationship existed between farming experience and adoption of dairy husbandry practices.

Balasubramaniam and Kaul (1982) stated that experience did not have any significant relationship with the adoption of fish curing practices.

Nanjaiyan (1985) reported that farming experience is negatively and significantly associated with adoption behaviour.

Ratinasabapathi (1987) observed that farm experience was not significantly associated with the adoption of integrated pest management measures for cotton.

Das *et al*. (1988) noted that experience in improved fish culture had strong positive relationship with the adoption of composite fish culture innovations.

Krishnamoorthy (1988) reported that no significant relationship existed between experience and adoption of seed treatment practices among cotton and millet growers.

Subhash Chandra (1988) revealed that farm experience had no significant association with adoption of fish culture practices.

2.3.1.4. Occupation

Balasubramaniam and Kaul (1982) observed that occupation had no significant association with adoption of fish curing practices.

Tyagi and Sohal (1984) reported that occupation had a positive substantial influence on the adoption behaviour of dairy farmers.

Singh *et al*. (1985) found that occupation had significant positive relationship with adoption behaviour in non-progressive dairy villages.

Ratinasabapathi (1987) reported that occupation had no significant relationship with adoption of integrated pest management measures for cotton.

Krishnamoorthy (1988) revealed that no association existed between occupation and adoption behaviour of cotton and millet growers.

Venkataprabhu (1988) noted that a significant association existed between occupation and adoption of water management measures for paddy, sugarcane and turmeric.

2.3.1.5. Land possession

Singh and Ray (1985) reported that status of land ownership had positive and significant contribution to the level of fertilizer use of marginal farmers.

Viju (1985) found that the status of land tenancy had no significant association with adoption behaviour of tribal farmers towards improved agricultural practices.

2.3.1.6. Training participation

Pimprikal *et al*. (1974) observed significant association between training and adoption behaviour.

Krishna and Jalihal (1976) found higher adoption of hybrid maize by trained farmers.

Muthia *et al*. (1978) reported that 56 per cent of the participants in training adopted full dose of fertilizers, 30 per cent adopted partially and the non-adopters were only 14 per cent.

Thangaraju (1979) noted that trained farmers were better adopters of all practices.

Joshi and Thorat (1984) revealed that there was significant association between training and adoption index of production aspect of nutritious food.

Sohal and Fulzele (1986) reported that training programme in 'on as well as off' campus was very effective to the extent of adoption of recommended practices.

Sanjeev (1987) found significant difference between trained farmers and untrained farmers in their adoption of improved paddy cultivation practices.

Sudha (1987) observed significant difference in adoption between participants and non-participants in training programmes.

Das *et al*.(1988) brought out that significant positive relationship existed between participation in training programmes and adoption of composite fish culture practices.

2.3.1.7. Institutional credit utilisation

Vijayakumar (1983) reported that credit utilisation behaviour had a significant positive relationship with adoption of improved practices in coconut cultivation.

Singh and Ray (1985) observed that fertilizer use was in general dependent on the farmers credit facilities.

Jayaramiah (1987) revealed significant relationship between credit borrowing and adoption behaviour of groundnut, potato and jowar growers.

Rasheed Sulaiman (1989) noted the existence of a positive and significant relationship between credit utilisation and adoption behaviour.

2.3.1.8. Income

Oliver *et al.* (1975) reported that income had an influence on the adoption of high yielding varieties.

Chandrakandan and Subramanyan (1975) observed that the adoption behaviour of paddy farmers was significantly associated with income.

Pillai (1978) found that there is significant difference between adopters and non-adopters with respect to income in the adoption of soil conservation measures.

Subhadra (1979) revealed that no significant relationship was evidenced between income and adoption of improved dairy practices by members of milk co-operatives.

Balasubramaniam and Kaul (1982) noted that annual income had no significant association with the adoption of fish curing practices.

Vijayakumar (1983) found that income of beneficiary as well as non-beneficiary farmers of special agricultural units had a significant association with the adoption of improved practices in coconut cultivation.

Balasubramaniam and Kaul (1985) reported that total income had positive significant association with adoption behaviour of traditional fishermen.

Satwant and Surinder (1986) observed that the adoption of improved household practices by farm women was associated with their income.

Ramkumar (1987) found that income had no significant association with the adoption behaviour of dairy farmers.

Subhashchandra (1988) studied the adoption behaviour of fish farmers and concluded that annual income had no significant association with adoption of fish culture practices.

Rasheed Sulaiman (1989) reported that annual income had a positive and significant relationship with the adoption of fertilizer management practices among paddy growers.

2.3.2. Situational variables

The situational variables selected for study were total farming area, area under selective stocking, salinity, distance from barmouth, average depth at low tide, average depth at high tide and number of crops raised. As these characteristics pertain mainly to brackish water fish farming and only very few research is done in this area no review could be collected about their relationship with adoption behaviour except for the variable total farming area, which is presented below.

2.3.2.1. Total farming area

Singh and Singh (1970) reported that farm size was the most important variable contributing to the adoption behaviour of farmers.

Sharma and Nair (1974) found that size of holding was positively significantly related with the adoption of high yielding varieties of paddy.

Ziaul Karim and Mahaboob (1974) observed farm size had positive and significant association with the adoption of fertilizers among rice growers.

Chandrakandan and Subramanyan (1975) noted significant association between farm size and adoption of recommended practices of paddy.

Pillai (1978) revealed that significant difference exists among non-adopters and adopters of soil conservation measures with respect to size of holding.

Bhaskaran (1978) stated that extent of holding had no association with the adoption behaviour of farmers.

Rajendran (1978) observed positive significant relationship between size of holding and adoption of selected agricultural practices among farmers.

Subhadra (1979) revealed that no significant association was evidenced between the land holding and adoption of dairy practices.

Manivannan (1980) reported that farm size had a positive significant influence on the adoption behaviour of sun flower growers.

Prakash (1980) found that among the tribes of Kerala in more developed as well as in less developed areas, the farm size had a positive significant relationship with adoption behaviour.

Sohi and Kherde (1980) studied adoption of dairy practices and found positive significant association between farm size and adoption.

Ogunfiditimi (1981) reported that farm size had a negative relationship with adoption of improved farm practices among Nigerian farmers.

Sushama *et al*. (1981) found that among the tribes in more developed areas, farm size had a positive significant relationship with adoption of modern living practices.

Ratinasabapathi (1987) stated that there was no significant relationship between farm size and integrated pest management measures for cotton.

Das *et al.*(1988) observed negative correlation between total area in possession and adoption of practices.

Krishnamoorthy (1988) reported that there was no significant association between farm size and adoption of seed treatment practice among cotton and millet growers.

Subhashchandra (1988) studied the adoption behaviour of fish farmers and observed that there was no significant relationship between farm size and adoption behaviour.

2.3.3. Socio-psychological variables

2.3.3.1. Scientific orientation

Manivannan (1980) reported that scientific orientation had a positive significant association with the adoption behaviour of sun flower growers.

Kamarudeen (1981) observed positive significant relationship between scientific orientation and adoption of the demonstrated cultivation practices.

Thiagarajan (1981) revealed that no significant association existed between scientific orientation of farmers and adoption of summer cropping practices.

Chakravarthy (1982) noted that scientific orientation had no significant influence on the adoption of indegeneous farm practices.

Nanjaiyan (1985) found significant association between scientific orientation and adoption behaviour of small farmers.

Prasannan (1987) revealed that no significant relationship was evidenced between scientific orientation and adoption of messages in T & V system.

Ramkumar (1987) stated that scientific orientation positively influenced the adoption of dairy practices.

Ratinasabapathi (1987) observed significant positive correlation between scientific orientation and integrated pest management measures for cotton.

Krishnamoorthy (1988) reported that, scientific orientation was positively and significantly associated with the adoption of seed treatment practices among irrigated cotton and millet growers.

Subhashchandra (1988) studied the adoption behaviour of fish farmers and found positive significant relationship between scientific orientation and extent of adoption.

Venkataprabhu (1988) revealed that no significant relationship was evidenced between scientific orientation and adoption of water management practices of paddy, sugarcane and turmeric.

Rasheed Sulaiman (1989) reported that adoption of fertilizer management practices was significantly influenced by scientific orientation of farmers in low fertilizer consuming district.

2.3.3.2. Risk preference

Singh and Singh (1970) reported that risk orientation had significant contribution to the adoption behaviour of farmers.

Sharma and Nair (1974) revealed risk orientation had positive and significant association with the adoption behaviour of paddy growers.

Rajendran (1978) observed positive significant relationship between risk orientation and adoption of selected agricultural practices.

Manivannan (1980) noted positive significant relationship between risk orientation and extent of adoption of sun flower growers.

Kamarudeen (1981) found risk preference of the farmers was positively and significantly correlated to the extent of adoption of demonstrated cultivation practices.

Balasubramaniam and Kaul (1984) reported that the farmers with high risk capital are better adopters of improved practices in trawling.

Nanjaiyan (1985) noted that significant positive correlation existed between the risk preference and adoption behaviour of small farmers.

Viju (1985) observed positive and highly significant association between risk orientation and adoption behaviour of tribal farmers.

Prasannan (1987) revealed that no significant association existed between risk preference and adoption of messages in T & V system.

Ramkumar (1987) found that risk orientation and adoption behaviour of dairy farmers had positive and highly significant association.

Ratinasabapathi (1987) reported that risk preference had positive and highly significant relationship with adoption of pest management measures for cotton.

Krishnamoorthy (1988) noted that risk preference had positive and highly significant association with adoption of seed treatment practices.

2.3.3.3. Economic motivation

Sharma and Nair (1974) reported that economic motivation had a positive significant association with the adoption behaviour of rice growers.

Rajendran (1978) observed positive significant association between economic motivation and adoption behaviour of small farmers.

Manivannan (1980) found that economic motivation was significantly related with extent of adoption among sun flower growers.

Thiagarajan (1981) revealed that economic motivation had no significant influence on the adoption of summer cropping practices.

Chakravarthy (1982) reported that no significant association had existed between economic motivation and adoption of indegeneous farm practices.

Haque and Ray (1983) noted positive significant association between adoption of composite fish culture practices and economic motivation.

Tyagi and Sohal (1984) observed significant relationship between economic motivation and extent of adoption of dairy practices.

Nanjaiyan (1985) found that no significant association existed between economic motivation and adoption behaviour of small farmers.

Viju (1985) reported positive significant relationship between economic motivation and adoption behaviour of tribal farmers.

Ponnappan (1988) revealed that no significant relationship existed between economic motivation and adoption of practices among fish farmers.

Ramkumar (1987) noted that economic motivation was positively significantly associated with adoption behaviour of dairy farmers.

Ratinasabapathi (1987) reported that a positive significant relationship existed between economic motivation and adoption of integrated pest management measures.

Krishnamoorthy (1988) found positive and significant association between economic motivation and adoption behaviour among cotton and millet growers.

Subhashchandra (1988) stated that economic motivation had significant and positive contribution to the extent of adoption among fish farmers.

Rasheed Sulaiman (1989) revealed positive significant relationship between economic motivation and adoption of various fertilizer management practices.

2.3.3.4. Marketing orientation

Singh and Singh (1970) found that market orientation was positively and significantly associated with adoption behaviour of farmers.

Singh and Ray (1985) observed that marketing orientation had no significant relationship with the level of fertilizer use among marginal, small and medium farmers.

2.3.3.5. Rationality in decision making

Sawant and Thorat (1977) concluded that rationality does not bring about a critical difference in decision making in adopters of various categories except those who are the earliest to adopt and those who are the last to adopt an improved farm practice.

Singh and Singh (1982) studied rationality in decision making and adoption of two innovations namely, adoption of high yielding varieties and family planning programmes among farming couples. The findings were indicative of a positive and significant association between the two variables.

Nanjaiyan (1985) observed that extent of adoption had significant association but with negative trend with rational behaviour.

Syamala (1988) revealed that rationality in decision making had no significant association with adoption of demonstrated culture practices for farmer demonstrators, whereas it showed positive significant association in case of neighbouring farmers.

2.3.4. Communication variables

2.3.4.1. Utilisation of personal localite sources.

Singh and Singh (1970) reported that utilisation of personal localite sources had a negative and highly significant association with adoption behaviour of farmers.

Supe (1971) found that the informal sources were ineffective in motivating the farmer to adopt innovations.

Sharma and Nair (1974) revealed that the use of inter-personal localite sources had positive and significant association with the adoption behaviour of paddy growers.

Mohammed and Singh (1978) noted that the farmers using friends, neighbours and relatives as sources of information obtained the lowest mean adoption score.

Balasubramaniam and Kaul (1984) observed that friends and relatives were the main source of information for low adopters among traditional fishermen.

Das et al. (1988) stated that use of personal localite source had no significant association with the adoption of practiices among fish farmers.

2.3.4.2. Utilisation of personal-cosmopolite sources

Supe (1971) observed that the farmers using formal sources of information were rational and consequently their adoption rate was high.

Sharma and Nair (1974) revealed that the use of inter-personal cosmopolite sources had positive and significant association with adoption behaviour.

Sundaraswamy and Doraiswamy (1975) reported that contact with extension agency positively influenced the adoption of recommended practices of sorghum cultivation.

Mohammed and Singh (1978) stated that the farmers using extension workers as source of information had better adoption score.

Prakash (1980) reported the existence of a positive association between information source utilisation and adoption behaviour among tribes.

Sohi and Kherdo (1980) found extension contact had positive and significant relationship with dairy adoption behaviour.

Sushama *et al*. (1981) observed that among tribes in more developed areas, use of information sources had positive and significant relationship with adoption behaviour.

Haque and Ray (1983) revealed a significant association between utilisation of personal cosmopolite source and adoption of practices in composite fish culture.

Balasubramaniam and Kaul (1984) found that among trawler owners the highest mean adoption index was for those who got the information through research personnel.

Ratinasabapathi (1987) reported that extension agency contact had positive significant influence on the adoption behaviour of cotton growers.

Krishnamoorthy (1988) noted that among cotton and millet growers contact with extension agency was positively and significantly associated with the adoption of seed treatment practices among cotton and millet growers.

Subhashchandra (1988) studied the adoption behaviour of fish farmers and concluded that adoption behaviour was positively significantly related with extension agency contact.

Venkataprabhu (1988) observed that contact with extension agency had no significant association with adoption of water management measures for paddy, sugarcane and turmeric.

2.3.4.3. Utilisation of mass media sources

Singh and Singh (1970) reported that, communication variable mass media were having significant contribution to adoption behaviour of farmers.

Choukidar and George (1972) stated that mass media participation did not show any significant difference between adopters and non-adopters.

Sharma and Nair (1974) observed significant direct relationship between use of mass media and adoption behaviour.

Chandrakandan and Subramanyan (1975) found significant association between media participation and adoption of recommended practices among paddy growers.

Manivannan (1980) noted the existence of positive significant association between mass media exposure and extent of adoption of sun flower growers.

Ray and Haque(1980) reported that the utilisation of six sources of information, viz. radio, demonstration, publication, newspaper, Krishi mela/exhibition and educational films in the order were positively related to the adoption of composite fish culture practices.

Sohi and Kherde (1980) revealed the existence of a positive and significant relationship between utilisation of mass media and adoption behaviour of dairy farmers.

Thiagarajan (1981) concluded that mass media exposure had no significant influence on the adoption behaviour of farmers.

Haraprasad (1982) found that mass media participation had positive and highly significant correlation with the adoption behaviour.

Tyagi and Sohal (1984) stated that media exposure was an important variable influencing the adoption of dairy technology.

Nanjaiyan (1985) reported that mass media had no significant influence on the adoption behaviour of small farmers.

Ratinasabapathi (1987) observed that mass media had no significant contribution to the extent of adoption of integrated pest management measures for cotton.

Das *et al*. (1988) pointed out that the use of mass media had significant direct relationship with adoption of composite fish culture innovations.

Krishnamoorthy (1988) reported that mass media exposure had no significant association with adoption behaviour of cotton growers.

Venkataprabhu (1988) observed non-significant relationship between media participation and adoption of management practices for paddy, sugarcane and turmeric.

2.4. Reasons for non-adoption and partial adoption of scientific practice in prawn farming practices.

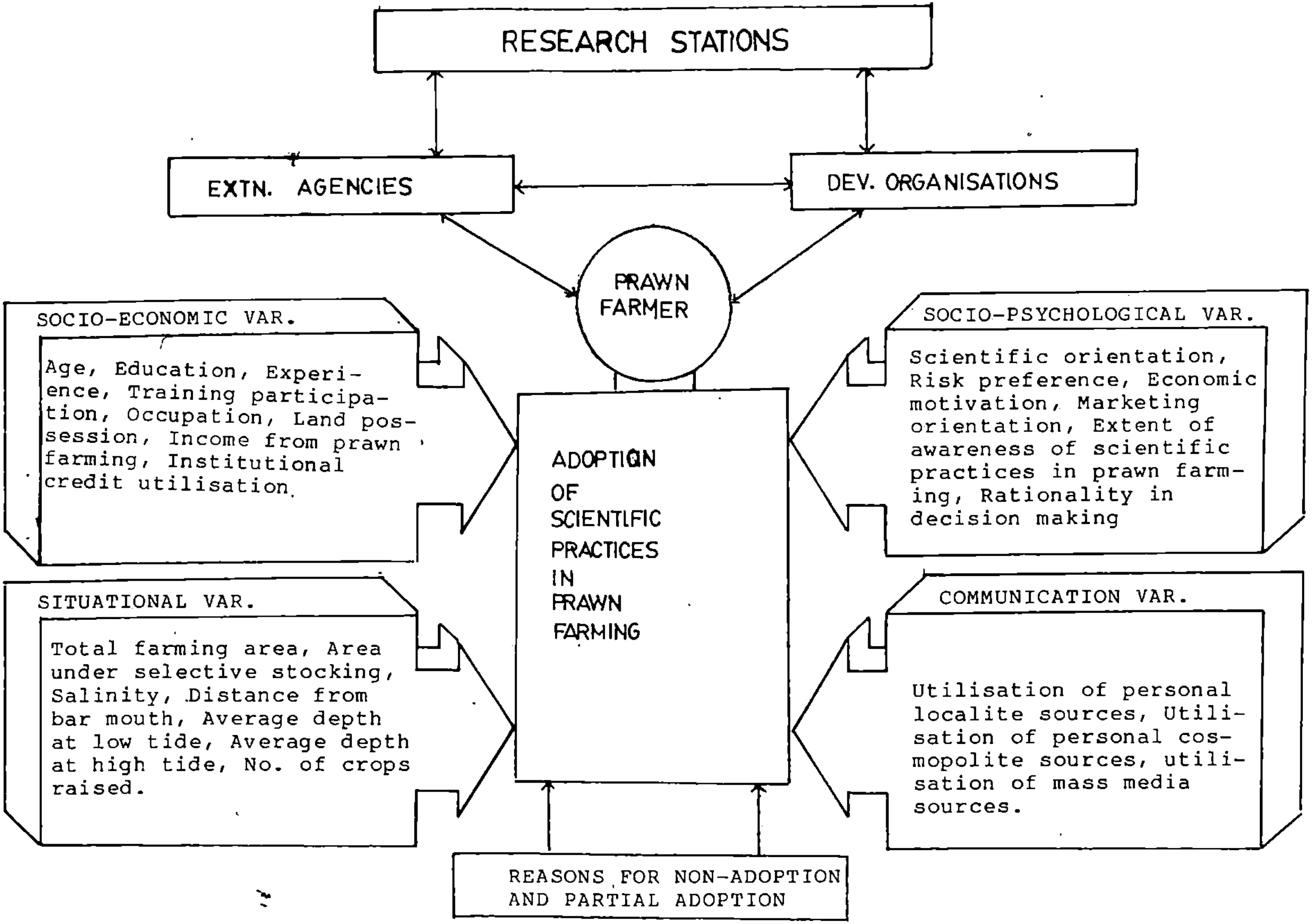
Anon. (1986) reported that the problems in adoption of scientific prawn farming practices were in respect of finance technology, insurance cover, feed and seed supply.

Krishna Srinath (1986) observed that the major constraints in adoption of scientific prawn farming practices were lack of availability of quality prawn seeds, perception of lack of periodical harvest and income and confusion among farmers about the right source of information.

The technical committee on inland fisheries, as reported by Singh and Sampath (1988) pointed out the practice of annual lease as the major bottleneck in transfer of intensive fish farming technology to the beneficiaries. Other constraints were lack of availability of quality seed at right time, non-availability of a cadre of trained fish farmers, absence of free flow of credit through institutional finance, lack of motivation to interested farmers and lack of proper extension/technical support in fish farm management, post harvest practices and marketing of the produce.

Theoretical frame work of the study is presented in fig. 1.

FIG.1 THEORETICAL FRAMEWORK OF THE STUDY



III MATERIALS AND METHODS

MATERIALS AND METHODS

The materials and methods employed in this study are described in this chapter, under the following headings.

1. Area of study.
2. Selection of respondents.
3. Selection of practices.
4. Selection of variables.
5. Definition of variables and their measurement.
6. Methods of data collection.
7. Statistical tools employed.

1. Area of study

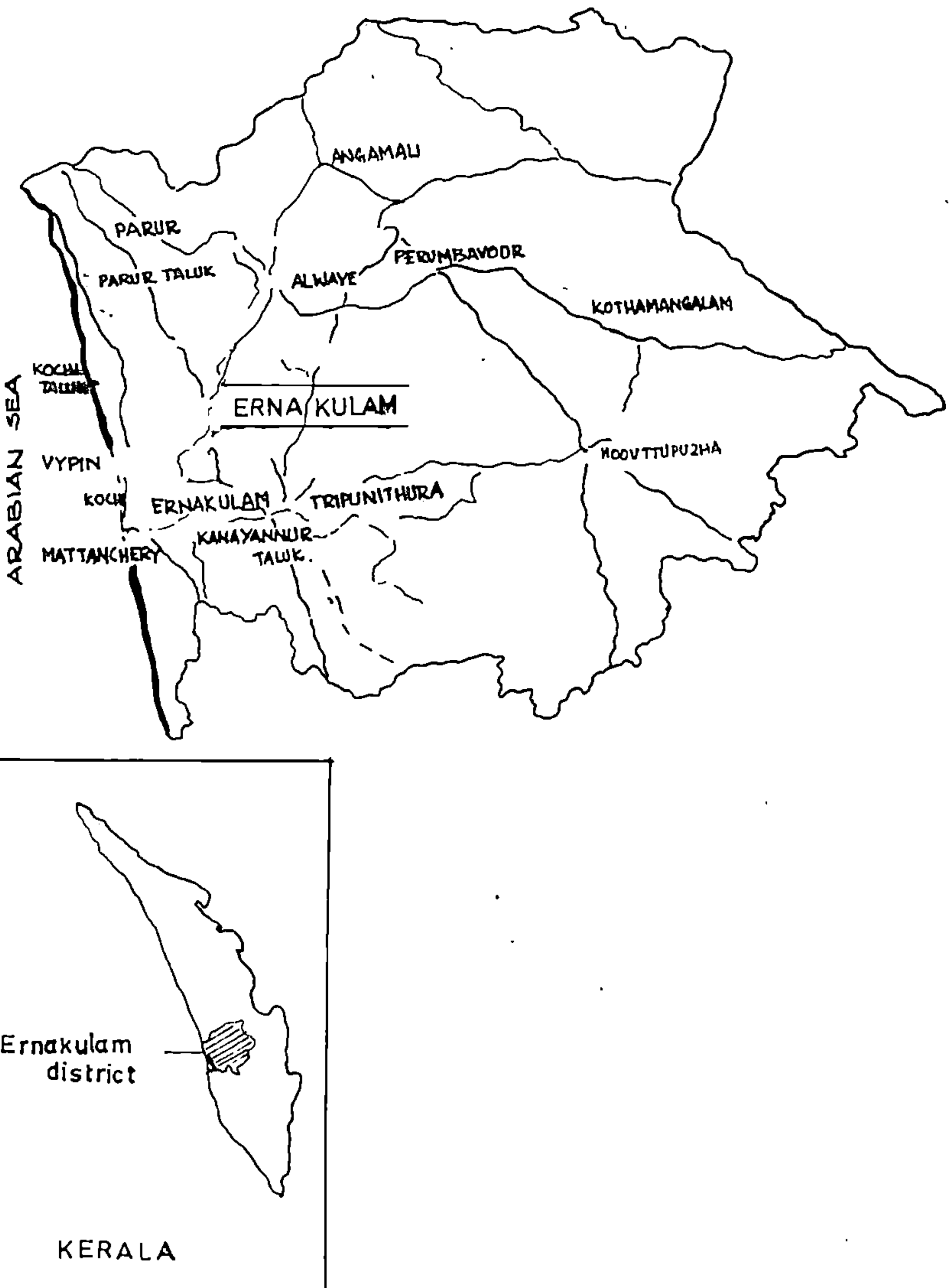
Ernakulam district was selected purposively for the study, as it covers the largest extent of area under prawn farming in the state.

In addition, Cochin occupying a strategic position in the fisheries map of India, is one of the pilot centres where commendable work has been done for the development and dissemination of technology related to the fields of culture, capture and processing of fish. There are seven Central fisheries institutes and three state government organisations operating in the district. Besides these organisations, the Fisheries College of Kerala Agricultural University and the School of Marine Sciences of Cochin University are also working in the district. Among these institutions researches relating to the development and standardisation of prawn farming technology are mainly done by the College of Fisheries, Central Institute of Brackish Water Aquaculture (CIBA) and Central Marine Fisheries Research Institute (CMFRI). Transfer of prawn farming technology in the district is done mainly by the extension units of these organisations, Krishi Vigyan Kendra of CMFRI, Marine Products Export Development Authority (MPEDA) and Brackish Water Fish Farmers Development Agency (BFFDA).

Above all, Cochin being the major port of seafood exports from the country, the infrastructure facilities available in Cochin are excellent as far as the pre-processing, processing, storage and marketing of the produce are concerned. This may also have a conducive role in the popularisation and wider adoption of the technology.

The area under prawn farming in the district is estimated as 4920 ha. (Sathiadas et al., 1987). These brackish water areas lying on the banks of Vembanad lake and its connecting channels are distributed in and around three taluks viz. Cochin, Kanayannur and Parur (Fig. 2.).

Fig.2. STUDY AREA



3.2. Selection of respondents

3.2.1. Sampling frame

A sampling frame was constructed by collecting the addresses of all prawn farmers in the district. To make a complete list, the addresses of all farmers who got licence from State Fisheries Department for prawn filtration and of those farmers registered for scientific prawn farming with the prawn farming section of MPEDA and BFFDA were collected. Since there is possibility of a farmer registering under more than one agency at the time of investigation, all the addresses collected were thoroughly scrutinised to avoid duplications.

The final list of prawn farmers which formed the population of study constituted the following.

Agency of Registration	Number of prawn farmers
State Fisheries Department	804
BFFDA, Ernakulam	105
Prawn Farming Section of MPEDA	106
Total	1015

3.2.2. Sampling

The prawn farmers were grouped into two strata based on their registration for obtaining a better representative sample of the universe. The first stratum comprised the 804 farmers licenced from State Fisheries Department. The second stratum comprised a total of 211 farmers, 105 farmers registered under prawn farming section of MPEDA and 106 farmers registered under BFFDA.

For the present study, a sample consisting of 100 farmers, 80 from the first stratum and 20 from the second stratum was drawn at random based on probability proportion to size.

3.3. Selection of Practices

Since a package of practices for prawn farming has not been prepared and published by any institute or agency at the time of investigation the same was constructed for the study.

To develop a package, a comprehensive list of important practices in prawn farming was prepared after referring various literature related to the subject and detailed discussions with experts. The initial list thus prepared comprised of 23 practices (Annexure I).

This was presented in the form of a closed questionnaire (Annexure II) to 40 scientists working in the field of aquaculture. The judges were asked to rate the relevance of each practice on a three-point continuum as under

Degree of relevancy	Score
Most relevant	3
Relevant	2
Least relevant	1

The final selection of practices was done based on the relevancy index (RI) obtained for each practice. For the calculation of relevancy index, the total score obtained for each practice was found out by multiplying the frequency of responses under each category of the continuum with the corresponding weight.

The relevancy index was worked out as

$$RI = \frac{\text{total score obtained for a practice}}{\text{total number of judgements} \times 3} \times 100$$

The criterion applied for the selection of practices was that, a practice selected must be ranked as relevant or most relevant by majority of the judges. Hence the practices with RI more than 66.66 were selected to form the final package. Thus 19 practices from the first list were selected to constitute the final package (Annexure III).

3.4. Selection of variables

Based on the objectives of study, review of relevant literature and discussion with experts in the field of aquaculture and extension, the following variables were selected.

1. Communication media used for the dissemination of scientific prawn farming practices.

2. Extent of utilization of communication media for awareness and adoption of scientific practices in prawn farming.

3. Dependent variables

   Extent of adoption of scientific practices in prawn farming.

4. Independent variables.

   I. Socio-economic variables

      1. Age
      2. Education
      3. Experience
      4. Occupation

5. Land possession
6. Training participation
7. Institutional credit utilization
8. Income from prawn farming.

II. Situational variables

1. Total farming area
2. Area under selective stocking
3. Salinity
4. Distance from bar mouth
5. Average depth at low tide
6. Average depth at high tide
7. Number of crops raised.

III. Socio-psychological variables

1. Scientific orientation
2. Risk preference
3. Economic motivation
4. Marketing orientation
5. Extent of awareness of scientific practices in prawn farming
6. Rationality in decision making

IV. Communication variables

1. Utilization of personal localite sources
2. Utilization of personal cosmopolite sources
3. Utilization of mass media sources.

5. Reasons for non-adoption or partial adoption of scientific practices in prawn farming.

3.5. Definition of variables and their measurement

3.5.1. Communication media used for the dissemination of scientific practices

The communication media employed in the dissemination of scientific prawn farming practices include both media and methods used by various extension agencies engaged in popularisation of scientific prawn farming.

To study the communication media, a questionnaire was prepared after going through related literature and discussion with experts. The questionnaire (Annexure IV) was served to the institutes and agencies presently engaged in popularisation of scientific prawn farming. They were asked to indicate the methods/media employed by them, frequency of use and purpose for which media was employed.

Since, there are only four agencies actively engaged in extension activities related to prawn farming, the data were not compiled. The activities of different agencies were dealt with separately.

3.5.2. Extent of utilization of communication media for awareness and adoption of scientific prawn farming practices

As conceptualised by various authors communication behaviour is a broader concept including information source utilization in its field. A brief review of past studies by Singh (1970), Singh (1971), Ramachandran (1974), Ramachandran *et al.*(1979), Sujathkumar (1988) and Velumani (1988) revealed that communication behaviour which explains information source utilization can be expressed as one or more of the following components.

1. Awareness of the communication source
2. Actual use of source
3. Frequency of use of source
4. Use of technology competent source
5. Attention to the content of message
6. Comprehension of the message
7. Acceptance or adoption of message

Subhadra (1979) studied the extent of utilization of communication media at awareness and adoption stages as the percentage of use of a media to the total number of times various media was consulted by all farmers.

Ramachandran *et al.* (1979) measured information source utilisation by using an index called information source utilization index applying the weightage of different sources and frequency of use of the source.

Sujathkumar (1988) studied information consultancy pattern by giving a score of one for each source once consulted by the respondent. Such a total was pooled up and considered as information source score.

Velumani (1988) studied the information source utilization on three dimensions of communication behaviour viz. use of communication source, frequency of use and credibility of sources. The pooled score on these three categories of information sources namely institutional, non-institutional and mass media were taken as the score of information source utilisation.

In the present study the extent of utilization of communication media is defined as the degree to which various communication sources were consulted by the farmers.

The extent of utilization of communication media at awareness and adoption stages was measured using the procedure followed by Subhadra (1979). To assess the extent of utilization of various communication media employed, the farmers were asked to indicate the media which they consulted for awareness and adoption of each practice. A score of one was given for a source once consulted by a farmer. In case the farmer indicated more than one source, only the first and most important one was given score. The total score thus obtained for each media was found out. The extent of utilization of communication media was worked out as follows:

$$\text{Extent of utilisation of communication media} = \frac{\text{Total score obtained for the media}}{\text{Sum total of all media utilisation scores}} \times 100$$

3.5.3. Extent of adoption of scientific practices

Various methods have been developed by research workers to measure the adoption behaviour.

Wilkening (1952) used an index for measuring the adoption of improved farm practices. The index of adoption used was the percentage of practices adopted to the total number of practices applicable to that farmer.

Marsh and Coleman (1955) used practice adoption scores as the percentage of applicable practices adopted.

Chattopadhyaya (1963) used adoption quotient for measuring adoption which is a ratio scale that measures a farmers behaviour on dimensions of applicability, potentiality, extent, time, consistency and different nature of innovations.

Supe (1969) developed a scale viz. Cotton practices adoption scale. He selected ten practices of cotton and for each practice a score of six was assigned for complete adoption. The practices which were divisible were assigned partial score for partial adoption.

Singh and Singh (1974) measured the extent of adoption which was a modification of Chatopadhyaya (1963) method.

In the present study extent of adoption of scientific practices in prawn farming is operationalised as the degree to which various scientific practices are put into use by the prawn farmers.

In the present study the extent of adoption was measured using the scale developed by Chatopadhyaya (1963) with slight modifications.

The extent of adoption of each individual practice was scored as under

Full adoption of scientific practice	2
Partial adoption of scientific practice	1
Non-adoption	0

The adoption quotient for each respondent was worked out as

$$AQ = \sum_{i=1}^{N} \frac{e/p}{N} \times 100$$

where e - Extent of adoption of each practice

p - Potentiality of adoption of a practice (two for all practices in this study)

N - Number of practices applicable to the respondent

The extent of adoption of individual practice by the farmers was worked out as the percent of respondents who adopt fully, partially or nil for each practice.

3.5.4. Independent variables

3.5.4.1. Socio-economic variables

1. Age

Age of the respondent is operationally defined as the number of years completed by the respondent at the time of interview since birth.

Quantification was done by assigning a score of one to each year which was rounded off to the nearest number.

2. Education

This indicates the level of formal education of the respondent.

Trivedi (1963) developed a socio-economic status scale in which based on education the respondents were categorised as follows with respective scores.

Category	Score
Illiterate	0
Can read only	1
Can read and write	2
Primary school	3
Middle school	4
High school	5
College	6

In the present study the categorisation of respondents were done following Trivedi (1963). The scores were computed using the procedure developed by Rangacharyulu (1988).

For the computation of weights, only four categories viz. primary school, middle school, high school and college were considered since, the respondents interviewed were found belonging to these four categories only.

Conditions to be met for application of procedure

Rangacharyulu (1988) method is applicable only to those variables which have ordered categories and which follow normality.

Table 1. Computation of weight of different categories of education.

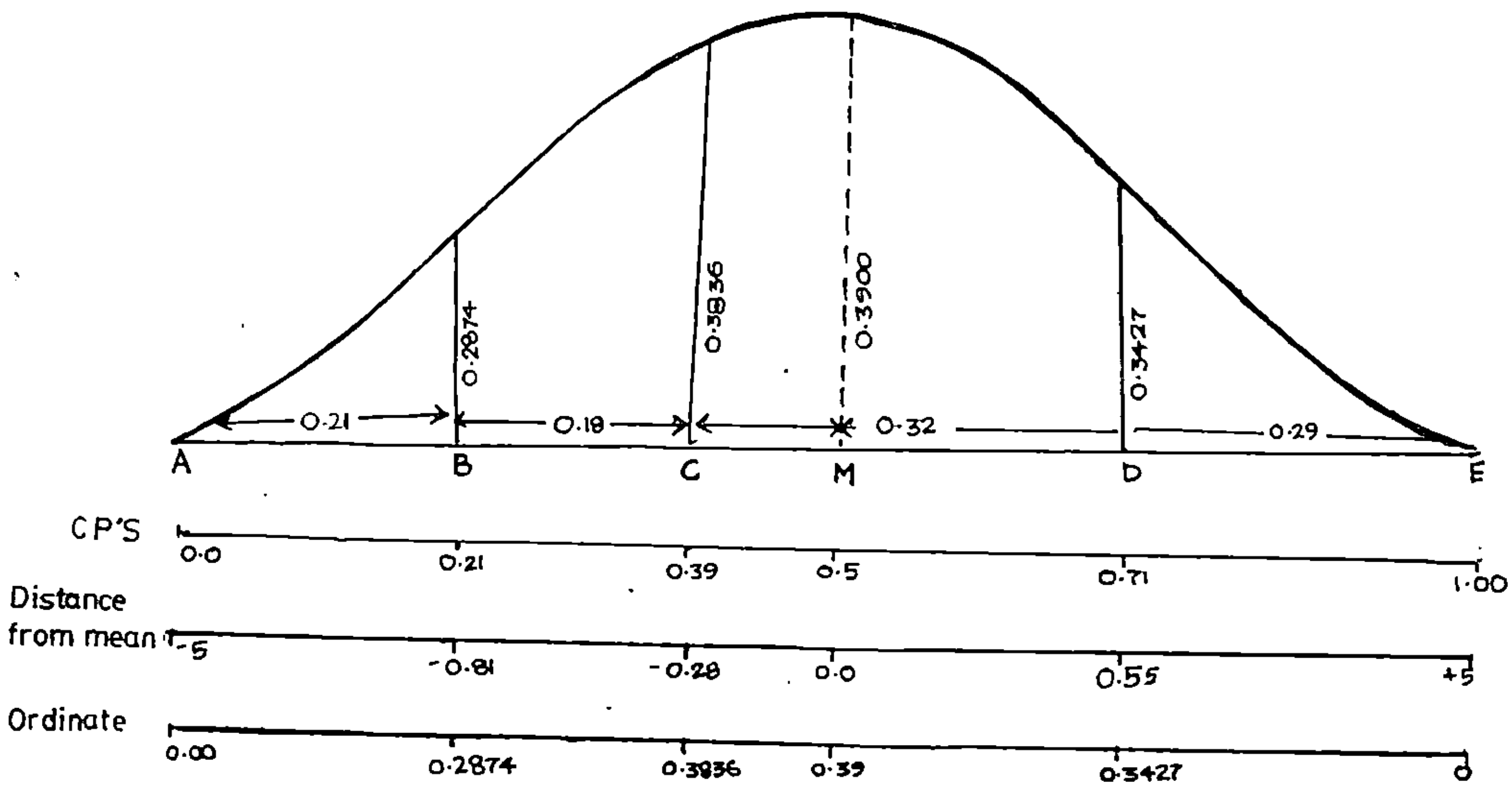
Category	f	p	cp=q	Distance from Mean	Ordinate z	Weight	Final weight
A	0	0	0	-5.00	-	-	-
Primary (B)	21	0.21	0.21	-0.81	-0.2874	-1.3859	0
Middle school (C)	18	0.18	0.39	-0.28	-0.3836	-0.5340	0.8346
High School (D)	32	0.32	0.71	0.55	0.3429	0.1272	1.4958
College (E)	29	0.29	1.00	5.00	0.0000	1.1824	2.5510
Total	100	1.00	-	-	-	-	-

Computation of weight

For the computation of weight of each category, the number of respondents falling under each category was found out. Based on the frequencies proportions were worked out (Table 1).

The areas corresponding to proportions of the categories is demarcated in the figure (Fig.3). The position point 'B' represents primary school, 'C' middle school and so on. The position point 'A' corresponds to

FIG. 3 EDUCATION CATEGORIES ON STANDARD NORMAL CURVE



an imaginary or dummy category. The areas occupied on the normal curve by the four categories corresponding to points B, C, D and E are 0.21, 0.18, 0.32 and 0.29 respectively. The corresponding cumulative areas at five position points are 0, 0.21, 0.39, 0.71 and 1.00 respectively. Distances of the position points from the mean 'M' (which is zero on the standard normal curve) are taken for determining their ordinate values (Table 1).

The weight of the categories were found out using the formula

$$\text{The weight of category B (middle school)} = \frac{z(A) - z(B)}{q(B) - q(A)}$$

where z(A) and z(B) are ordinate values at the position point A and B respectively.

q(A) and q(B) are the cumulative proportions for the categories A and B respectively.

Similarly the weight of all the categories were worked out. In order to avoid negative sign for the weights, a positive constant was added to all weights.

3. Experience

It is operationalised as the number of years since the farmer is directly engaged in prawn farming.

Quantification was done by assigning a score of one to each year which was rounded off to the nearest number.

4. Occupation

Occupation is operationally defined as the vocation on which major share of the time is spent.

In this study quantification was done by assigning a score of two to those who take prawn farming as main occupation and a score of one for those who take it as subsidiary or ancillary occupation.

5. Land possession

Based on land possession the farmers are grouped under two classes viz. owner farmers and leasee farmers.

Owner farmer is operationally defined as a farmer possessing legal ownership on the farm land, including such right as for the renovations in the field and to lease it out or othewise.

Leasee farmer is a farmer who obtains right for the use of land for a specified period as stated in the agreement, without having the right to make any renovations and on payment of a rental to the owner.

The quantification was done by assigning a score of two to a farmer having ownership of the farm land a score of one to a leasee farmer.

6. Training participation

In this study training participation is operationalised as the involvement of a farmer in the learning situations related to prawn farming organised by any of the state or central institution or agency.

Quantification was done by assigning a score of one to those farmers who have participated in training programme or programmes and a score of zero to those who have not participated in any training programme.

7. Institutional credit utilization

It is defined as the utilization of credit facilities for prawn farming from government sources, viz. Nationalised banks, land development banks, co-operative banks/society or any financial institutions other than private agencies and money lenders.

Quantification was done by assigning a score of one to a farmer utilizing institutional credit and zero to those who have not.

8. Income from prawn farming

It is defined as the gross income per hectare of the farm per crop.

The income expressed in Rupees was taken as such for analysis.

3.5.4.2. Situational variables

1. Total farming area

Is operationally defined as the area in hectares operated by the farmers for raising prawns either for a short period of the year or throughout the year with or without having ownership of the land.

The area expressed in hectares was taken as such for analysis.

2. Area under selective stocking

The area under selective stocking is operationalised as the possession of pond/farm area by the farmers for selective stocking and rearing commercially important varieties of prawns either for a short period of the year or throughout the year with or without having the ownership of the land.

The quantification was done by assigning a score of one to a farmer who has allotted whole or part of the farm for selective stocking and zero score to those who have not.

3. Salinity

In this study salinity is operationally defined as the relative level of salt content of water during the period of first culture operations in the year (late November to March-April).

For the purpose of quantification, salinity was classified into three categories viz. high, medium and low in comparison with the average maximum salinity available in Cochin backwater. The scores for the categories were found out using the technique developed by Rangacharyulu (1988).

While applying the Rangacharyulu (1988) technique, for satisfying the assumption of normality logarithmic transformation of the data were done. The weights thus arrived at are presented in table 2.

Table 2. Computation of weight of different categories of salinity.

Category	f	log f	p	cp=q	Distance from mean	Ordi- nate z	Weight	Final weight
A	0	-	0	-	-5.00	-	-	-
Low(B)	12	1.0792	0.2530	0.2530	-0.67	0.3187	-1.2597	0
Medium(C)	24	1.3802	0.3236	0.5766	0.19	0.3918	0.2259	1.0338
High(D)	64	1.8062	0.4234	1.0000	5.00	0	0.9254	2.1851
Total	100	-	-	-	-	-	-	

4. Distance from bar mouth

It is operationally defined as the distance in kilometers to be travelled by a particle of water from the bar mouth to reach the farm.

The distance in kilometers rounded to the nearest integer as expressed by the farmers was taken as such for analysis.

5.Average depth at low tide

It is operationally defined as the average depth of water column during normal low tide.

The depth of water column indicated by the farmer in centimeeters was applied as such for analysis.

6. Average depth at high tide

It is operationally defined as the average depth of water column during the normal high tide.

Depth of water column expressed by the farmer in centimeters was taken as such for analysis.

7. Number of crops raised

In the present study the number of crops raised is operationally defined as the number of times during a year prawn farming practices is repeated in the farm.

It was scored by assigning a score of one for each crop during a year.

3.5.4.3. Socio-psychological variables

1. Scientific orientation

It is defined as the degree to which a farmer is oriented to the use of scientific methods in farming and decision making.

Supe (1969) developed a scale for measuring scientific orientation. The scale consisted of six statements of which one was negative. To measure the scientific orientation, the respondents were asked to indicate their agreement or disagreement towards the statement on a five point continuum ranging from strongly agree to strongly disagree. The responses thus obtained were scored as

Response category	Score
Strongly agree	7
Agree	5
Undecided	4
Disagree	3
Strongly disagree	1

The scoring pattern was reversed for negative statements. The sum of scores obtained by an individual was taken as his score for scientific orientation.

In the present study the scoring pattern used by Pushkaran (1975) is followed.

Response category	Score
Strongly agree	5
Agree	4
Undecided	3
Disagree	2
Strongly disagree	1

2. Risk preference

It is defined as the degree to which a farmer is oriented towards uncertainty and has the courage to face the problems in farming.

Risk preference was measured using the scale developed by Supe (1969). The scale consisted of six statements of which two were negative. The scoring pattern followed was same as that of scientific orientation.

3. Economic motivation

It is defined as the occupational success in terms of profit maximisation and the relative value placed by a farmer on economic ends.

Economic motivation was measured using the scale developed by Supe (1969). The scale consisted of six statements of which two were negative. The scoring pattern followed was same as that of scientific orientation.

4. Marketing orientation

It is defined as the degree to which a farmer is oriented towards market information and manipulations in marketing strategies as to achieve maximum price for the produce.

It was measured using the scale developed by Samantha (1977). The original scale of Samantha for management orientation has three dimensions viz., planning orientation, production orientation and marketing orientation.

In the present study marketing orientation was measured using Samantha (1977) scale with slight modifications to suit the present study. The scale consisted of six statements of which three were negative and three were positive. In the case of positive statement, score one was given for agreement and zero for disagreement. For a negative statement the scoring pattern was reversed. The sum of scores obtained for all statements was taken as the score of marketing orientation.

5. Extent of awareness of scientific practices in prawn farming.

Awareness of scientific practices in prawn farming is defined as the first stage in the innovation decision process wherein the individual gets exposed to the existence of the scientific practice.

At the awareness stage the individual is exposed to the innovation but lacks complete information about it (Rogers, 1962).

In the present study extent of awareness is measured as the percentage of practices an individual is aware to the total number of practices selected for study, which is expressed as awareness index (AI).

$$\text{Awareness Index (AI)} = \frac{\text{Number of practices the individual is aware of}}{\text{Total number of practices selected for study}} \times 100$$

The awareness about individual practices among prawn farmers was worked out as the percentage of respondents aware of that practice to the total number of respondents.

6. Rationality in decision making

Supe (1969) defined rationality as the efforts directed towards an evaluation of behaviour on the basis of a criterion of rationality.

In the present study rationality in decision making has been operationally defined as the ability of an individual to select those 'means' which are justified of bearing rationality from the various means available at his disposal to reach an end.

A scale was developed by Supe (1969) to measure rationality. The components of the scale were categorised into two groups. The first component is applicability of decisions to the farmers situation. The other group of components is concerned with individual decisions and include potentiality, extent and complexity of decisions.

Applicability

In this study the rationality in decision making is applicable only to those practices which the farmer has adopted.

Potentiality

It can be defined as the maximum degree to which a farmer can be rational in his decision making. In this study it is assumed that the farmer can be rational to the fullest extent in their choice of means.

Extent

Extent of rationality can be defined as the degree to which a farmer has taken a rational decision depending on the category of logical justification he has offered while taking a decision for adoption of the practice. When the extent of rationality equals the potential for being rational the rationality level of the individual is maximum. In the present study three positions viz. highly rational, moderately rational and least rational are considered with respective scores three, two and one.

Complexity

The decision with which the farmer is confronted while adopting recommended farm practices differ in their complexity level. Therefore every decision taken by the farmer can be placed at some point on a continuum of most simple to most complex, depending upon the level of complexity. In the present study this is considered as unity for all practices.

The rationality is measured using Rationality quotient developed by Supe (1969) with slight modification to suit the study.

In adopting a practice, farmers use various means to arrive at decisions as how to follow the practice reflecting varying levels of rationality. To assess rationality, for all the 19 practices selected, six possible ways, having different levels of rationality ranging from most rational to least rational were given. The scores for each decision was as follows:

	Score
On the basis of scientific evaluation of the situation	3
On the basis of recommendations of extension personnel or scientist	3
Based on general recommendations	2

	Score
Based on experience/advice of progressive farmers	2
On the basis of opinion of friends and relatives	1
Without proper direction/reasoning	1

The respondents were asked to indicate any of the given alternative which is true in their case. Then the rationality in decision making of the farmer is worked out as

$$\text{Rationality quotient (R.Q)} = \frac{\sum_{i=1}^{N} \frac{ei}{P_i} \times w_i}{N} \times 100$$

$\sum_{i=1}^{N}$ = Summation of the N decisions of which any one is the i^{th} decision

e_i = Extent of rationality of i^{th} decision which can be less rational (1) Moderately rational (2) and highly ratoinal (3)

P_i = Potentiality for being rational in the i^{th} decision (considered as 3 for all the practices adopted)

w_i = Weight to be given to i^{th} decision based on differential complexity weights for decision (considered as one for all practices).

N = Number of decisions

3.5.4.4. Communication variables

1. Utilisation of personal localite sources

It is operationally defined as consulting those information sources within the social system of the respondent like friends, relatives and neighbours for getting information about scientific practices in prawn farming.

It was measured as the number of times the farmer had consulted various personal localite sources for the adoption of scientific practices in prawn farming.

A score of one was assigned to a respondent consulting any personal localite source for the adoption of a single scientific practice and zero score was assigned to those who have not consulted any personal localite source. The scores obtained for all the 19 practices were summed up to arrive at the personal localite media utilisation score of the respondent. In case, the farmer indicated more than one source for a single practice, only the most important one was accounted.

2. Utilisation of personal cosmopolite sources

It is operationally defined as consulting those information sources outside the social system of respondents, like scientists, extension workers, input dealears and attending training programmes, discussion meetings and demonstrations etc. for getting information about scientific practices in prawn farming, which can influence the farmer to adopt the practices.

Utilisation of personal cosmopolite sources was measured as the number of times the farmer had consulted various personal localite sources for adopting scientific practices in prawm farming.

The scoring pattern followed was same as that used for measuring utilisation of personal localite sources.

3. Utilisation of mass media sources

Utilisation of mass media was operationalised as consulting those media/methods like Radio, Television, newspaper, extension literature for getting information and thereby the media/method influencing the farmer to adopt the practices.

It was measured as the number of times the farmer had consulted various mass media sources for the adoption of scientific practices in prawn farming.

The scoring pattern used was same as that used for measuring utilisation of personal localite sources.

3.6. Methods of data collection

Based on the objectives of the present study, an interview schedule was prepared. This was pre-tested for suitability among a group of prawn farmers outside the sample selected for study. Suitable modifications were made in the schedule based on the pre-test results.

The data were collected through personal interview with the respondent. The questions were asked in the mother tongue (Malayalam) of the respondent, at their level of understanding. All possible efforts and precautions were taken to obtain reliable and objective pieces of information. The interview schedule used for the study is presented in Annexure V.

3.7. Statistical tools employed

1. Simple correlation analysis

The associations between independent and dependent variables and those among the independent variables were analysed by computing correlation coefficients (r).

The formula used was

$$r = \frac{\Sigma xy - \frac{(\Sigma x)\ (\Sigma y)}{N}}{\sqrt{\left(\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right)\left(\Sigma y^2 - \frac{(\Sigma y)^2}{n}\right)}}$$

where r = correlation coefficient

x = independent variable

y = dependent variable

n = Number of observations.

The significance of 'r' was verified using 't' test

2. Multiple regression analysis

Multiple regression model was fitted to determine the net contribution of selected independent variables to the dependent variable. This gives the percentage of variations in the dependent variable that a set of independent variables can jointly explain in the dependent variable. For the computation the procedure as given by Snedecor and Cochran (1967) was followed.

The regression equation employed in the study was:

$$y = a + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

where y = dependent variable

x_1 ..., x_n = independent variables

b_1, ..., b_n = regression coefficients

a = y- intercept

The significance of fitted model was tested using Analysis of Variance technique. The significance of regression coefficient (b's) was tested using 't' test.

3. Step-wise regression analysis

This was done to know the relative effect of the independent variables in predicting the dependent variables and for elimination of unimportant variables. The step-wise regression analysis select the best subset of variables as suggested by Draper and Smith (1966).

4. Path analysis

Path analysis was carried out to determine the direct and indirect influence of independent variables on dependent variable. The analysis was done following the matrix method as given by Singh and Choudhari (1979), which gives the path coefficients of the independent variables. Path coefficient can be defined as the ratio of the standard deviation of the effect due to a given cause to the total standard deviation of the effect, ie. if y is the effect and x_1 is the cause. The path coefficient for the path from cause x_1 to the effect y is $\sigma x_1 / \sigma y$.

IV RESULTS

RESULTS

The results of the study are presented in this chapter. In this study the variable, extent of awareness of scientific practices in prawn farming was taken as an independent variable. It will be more appropriate to present the findings of this variable before explaining extent of adoption of scientific practices in prawm farming. Hence the results pertaining to the independent variable, extent of awareness of scientific practices is presented prior to that of the dependent variable, extent of adoption of scientific practices in prawn farming. The results are presented under the following heads.

4.1. Communication media used for the dissemination of scientific prawn farming practices.

4.2. Extent of utilization of communication media at awareness and adoption stages.

4.3. Extent of awareness of scientific practices in prawn farming.

4.4. Extent of adoption of scientific practices in prawn farming.

4.5. Profile analysis of prawn farmers selected for study.

4.6. Relationship between the independent variables and the dependent variable - extent of adoption of scientific practices in prawn farming.

4.7. Reasons for non-adoption and partial adoption of scientific practices in prawn farming.

4.1. Communication media used for the dissemination of scientific prawn farming practices.

Dissemination of scientific prawn farming practices was started in the year 1977, for the first time in the State by Krishi Vigyan Kendra of Central Marine Fisheries Research Institute at Narakal. Presently there are a number of agencies in the State engaged in extension activities to disseminate and popularise scientific prawn farming practices for its wider adoption. The important agencies among them and the extension efforts made by them in prawn farming are dealt below.

4.1.1. Central Marine Fisheries Research Institute (CMFRI)

The extension activities of the Institute are primarily done through its Krishi Vigyan Kendra at Narakal. The Economics and Extension division at head quarters is also engaged in the implementation of extension programmes in prawn farming.

4.1.1.1. Krishi Vigyan Kendra (KVK), Narakal

The Narakal Krishi Vigyan Kendra was established in the year 1976. The operational area of the agency is Ernakulam District. Activities of KVK include conducting benchmark surveys to identify resources and needs, organisation of training programmes in fisheries and allied subjects, followup services and release of extension literature.

There are eleven technical assistants working under the agency, out of them eight are working in prawn farming extension. The KVK was the first agency to disseminate scientific prawn farming in the district. The extension efforts so far made by the agency for the popularisation of scientific prawn farming is presented in table 3.

Table 3. Methods and Media employed for the dissemination of Scientific prawn farming practices by KVK Narakal, till July 1989.

Sl. No.	Media/Method	No.of items released/ Programmes conducted
I.	Mass methods	
	1. Radio	29
	2. Television	1
	3. Film shows	380
	4. Exhibitions	24
	5. Farmers day	7
	6. Displays	24
	7. Posters	24
	8. News articles and News Stories	5
	9. Magazines and News letters	5
	10. Leaflets	4

Contd......

Sl. No.	Media/Method	No.of items released/ Programmes conducted
	11. Book lets	11
	12. Bit notices	6
	13. Books	1
II.	Group methods	
	1. Lectures	380
	2. Group discussions	225
	3. Tours and visists	120
	4. Training programmes	225
	5. Demonstrations	177
III.	Individual methods	
	1. Farm and Home visits	1900

4.1.1.2. Economics and Extension Division of CMFRI, Cochin

The Economics and Extension division of CMFRI is engaged in researches in the field of fisheries economics and extension. They also undertake extension programmes related to various aspects of fisheries.

There are three scientists and two technical assistants working in extension of which none is specifically designated for extension activities in prawn farming. The extension activities done by the division in prawn farming is presented in table 4.

Table 4. Methods and Media employed for dissemination of Scientific prawn farming practices by the Economics and Extension Divisions of CMFRI,Cochin till July 1989

Sl. No.	Media/method	No.of items released/ Programmes conducted
I.	Mass methods	
	1. Television	1
	2. Farmers day	2
	3. Posters	1
	4. Magazines and News letters	3
II.	Group methods	
	1. Seminars	2
	2. Group discussions	5
	3. Training programmes	2
	4. Demonstration	1
III.	Individual methods	
	1. Farm and home visists	25

4.1.2. Marine Products Export Development Authority (MPEDA)

The prawn farming section of MPEDA conduct micro and macro level surveys of the brackish water areas, provide technical, financial and input assistance to farmers, monitor the farming operations and organise training programmes in prawn farming.

The operational area of prawn farming section of MPEDA, Ernakulam is the coastal districts of Kerala. The extension staff strength of the unit includes three extension officers and three technical assistants. The extension activities done by the section since its establishment is presented in table 5.

Table 5. Methods and Media employed for the dissemination of scientific prawn farming practices by prawn farming section of MPEDA, Ernakulam till July 1989.

Sl. No.	Methods/media	No.of items released/ Programmes conducted
I.	Mass methods	
	1. Radio	31
	2. Farmers day	26
	3. Leaflet	1
	4. Booklet	1
II.	Group methods	
	1. Seminars	5
	2. Group discussions	30
	3. Tours and visits	5
	4. Training programmes	20
III.	Individual methods	
	1. Circular letters	250
	2. Farm and Home visits	150

4.1.3. Brackish water Fish Farmers Development Agency (BFFDA)

The activities of the agency include identification of brackish water areas and beneficiary farmers, providing technical financial and input assistance to farmers, providing market information and arrangement for the marketing of the produce. The operational area of the agency extends to three districts viz. Ernakulam, Trichur and Alleppey. There is only one Extension Officer working under the agency. The extension activities so far done by the Agency is presented in table 6.

Table 6. Methods and Media employed for the dissemination of Scientific prawn farming practices by Brackish water Fish Farmers Development Agency, Ernakulam till July 1989.

Sl. No.	Media/Method	No.of items released/ Programmes conducted
I.	Mass media	
	1. Film shows	4
	2. News articles and News stories	4
	3. Radio	3
	4. Leaf lets	2
II.	Group methods	
	1. Training programmes	4
III.	Individual methods	
	1. Farm and Home visits	60
	2. Office calls	160

4.2. Extent of utilisation of extension communication media at awareness and adoption stages

4.2.1. Awareness stage

Extent of utilisation of various extension communication media at awareness stage is presented in table 7. A perusal of the table clearly indicates that personal localite channels were the most widely used communication media by prawn farmers at awareness stage, followed by personal cosmopolite and mass media. The extent of utilisation scores were 63.61, 31.93 and 4.45 respectively.

Among the personal localite sources, friends, relatives and neighbours were found to be the most important with a score of 47.44 followed by progressive farmers with a score of 16.17

A cross section analysis of various personal cosmopolite sources revealed that scientists were the most used source by the respondents at the awareness stage. The extent of utilisation score was 8.5 for scientists. It was followed by field supervisors of MPEDA, training programmes, discusssion meetings, State department officers, Technical Assistants of KVK and BFFDA extension officer. The extent

Table 7. Extent of utilisation of extension communication media at awareness and adoption stages

Media	Awareness		Adoption	
	Frequency of use	Extent of utilisation score	Frequency of use	Extent of utilisation score
I. Personal localite				
1. Friends, Relatives and neighbours	575	47.44	371	63.31
2. Progressive farmers	196	16.17	60	10.24
Total	771	63.61	431	73.55
II. Personal cosmopolite				
3. Scientists	103	8.5	38	6.50
4. Technical Assistant	29	2.39	12	2.50
5. Field Supervisor	69	5.69	29	4.95
6. State Dept.Officers	36	2.97	17	2.90
7. Extension Officers	19	1.57	16	2.73
8. Bank Agrl.Officer	6	0.50	5	0.85
9. Seed sellers	6	0.50	7	1.19
10. Demonstrations	7	0.58	3	0.51
11. Discussion meetings	43	3.55	9	1.54
12. Training programmes	69	5.70	16	2.76
Total	387	31.93	152	25.93
III. Mass media				
13. Radio	3	0.25	-	-
14. Film shows	3	0.25	-	-
15. News paper	26	2.15	-	-
16. Pamphlets, Booklets, and leaf lets	22	1.82	3	0.51
Total	54	4.45	3	0.51
Grand total	1212	100.00	586	100.00

of utilisation scores of these sources were 5.69, 5.7, 3.55, 2.97, 2.39 and 1.57 respectively. Among the personal cosmopolite sources least utilised were Bank Agricultural Officers and Seed sellers.

Newspapers were the most utilised mass communication method at awareness stage followed by extension literature, radio and film shows. The extent of utilisation scores of aforesaid sources were 2.15, 1.82, 0.25 and 0.25 respectively. The least utilised mass media sources at awareness stage were radio and film shows.

4.2.2. Adoption stage

Extent of utilisation of extension communication media for adoption of scientific practices in prawn farming is presented in table 7. The table indicates that, personal localite sources were the most utilised followed by personal cosmopolite and mass media. The extent of utilisation scores were 73.55, 26.76 and 0.51 respectively.

Among the personal localite sources, friends, relatives and neighbours were found to be the most important with a score of 63.31. This was followed by progressive farmers with a score of 10.24.

Among personal cosmopolite sources utilised for the adoption of scientific practices in prawn farming scientists were ranked first based on extent of utilisation followed by field supervisors of MPEDA, State department officers, Training programmes, BFFDA extension officer, technical assistants of KVK and discussion meetings. The extent of utilisation scores were 6.50, 4.95, 2.90, 2.73, 2.73, 2.50 and 1.54 respectively. Seed sellers, Bank agricultural officers and demonstrations were the least utilised sources.

Only a few mass media sources were found utilised for adoption of scientific practices in prawn farming. The mass media sources utilised were extension publications like pamphlets, booklets and leaflets. The extent of utilisation score for these extension publications was 0.51.

4.3. Extent of awareness of scientific practices in prawn farming

The computed mean for extent of awareness of the respondents about selected scientific practices in prawn farming was 64.00 with standard deviation 15.71. The distribution of respondents based on their extent of awareness is presented in Table 8.

Table 8. Distribution of prawn farmers based on their extent of awareness of scientific practices in prawn farming.

n = 100

Category	Frequency	Percentage
Low (below $\overline{X}$-SD, below 48.29)	20	20
Medium (between $\overline{X}$±SD, between 48.29 and 79.71)	66	66
High (above $\overline{X}$+SD; above 79.71)	14	14

Mean = 64.00 S.D. = 15.71

Based on extent of awareness, about two-thirds of the farmers were in the medium category. Only 14 per cent of the farmers were having high level of awareness about scientific practices in prawn farming. Twenty per cent of the farmers were under the category of low awareness. The diagramatic presentation of the data is made in fig.4.

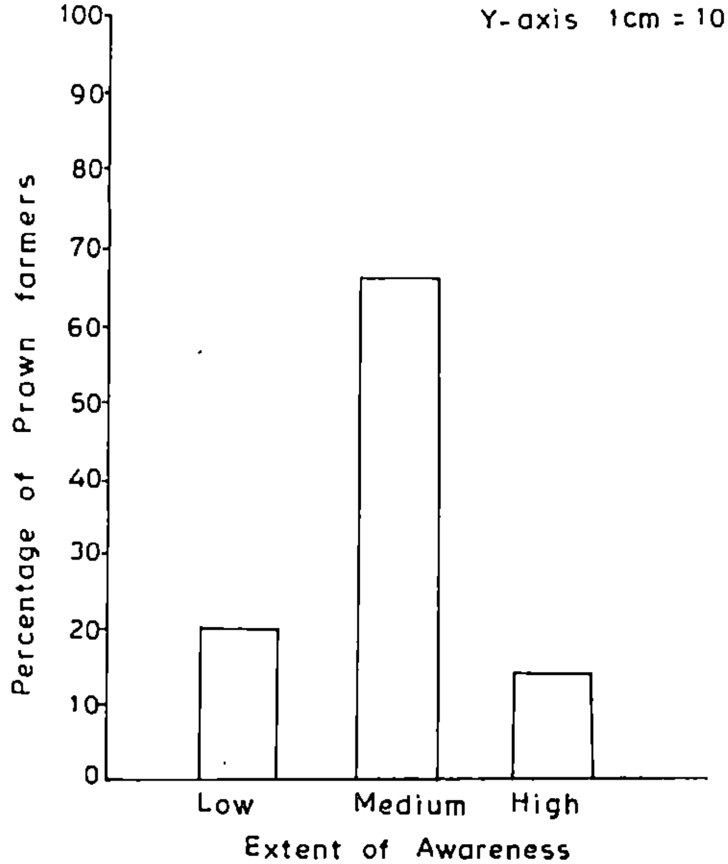


Fig. 4. Distribution of Prawn farmers based on extent of awareness.

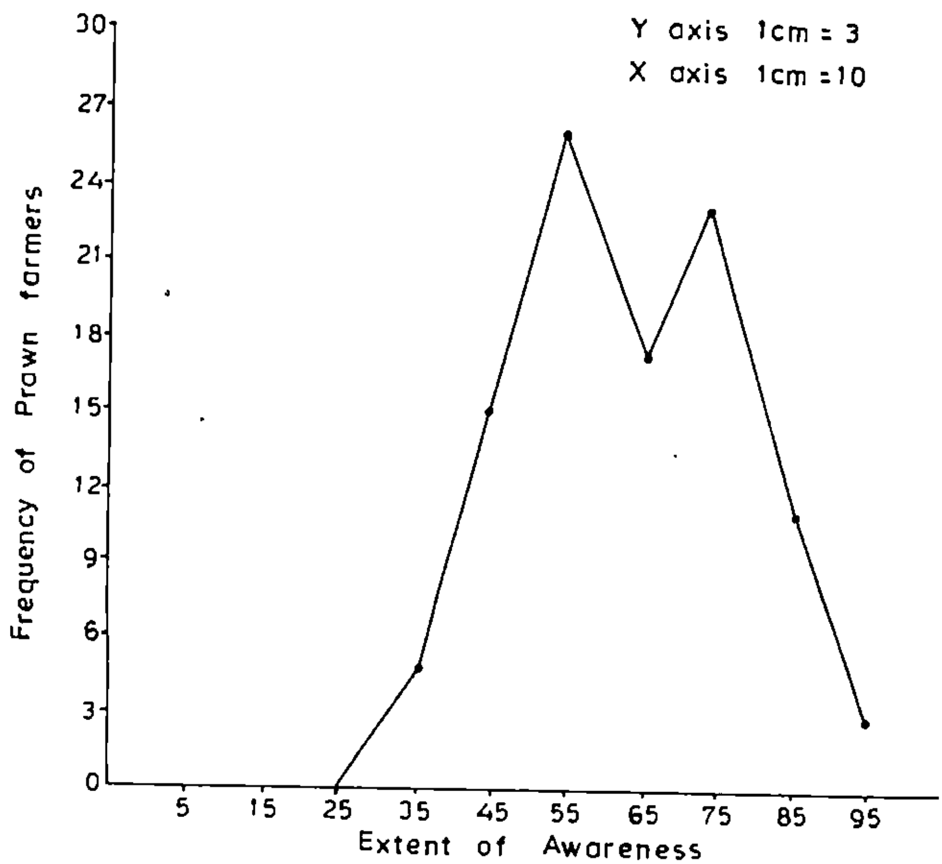


Fig. 5. Frequency distribution of Prawn farmers classified according to extent of awareness.

Table 9. Frequency distribution of farmers classified according to the extent of awareness

n= 100

Class interval	Frequency	Percentage
0-10	-	-
11-20	-	-
21-30	-	-
31-40	5	5
41-50	15	15
51-60	26	26
61-70	17	17
71-80	23	23
81-90	11	11
91-100	3	3
Total	100	100

The frequency distribution of farmers classified according to the extent of awareness is shown in table 9. A perusal of the table reveals that over a quarter (26 per cent) of the respondents were having awareness index ranging between 51 and 60. Twenty three per cent of the farmers came under the class 71-80 and 17 per cent under the class 61-70. All the respondents were having awareness index above 30 and only three per cent of the respondents were having awareness index between 91-100.

The frequency curve showing the distribution of farmers under different classes of awareness is presented in fig.5.

Awareness of individual practices

The percentage of respondents aware of each individual practice selected for study is given in table 10.

It could be seen from the table that, all the prawn farmers studied were aware of the practices, 'strengthening of bunds and deepening of channels' and 'fixing or repairing of sluice gate'. The practices, 'draining and raking of the pond bottom', 'pond drying' and 'removal of aquatic weeds' were known to 27 per cent, 56 per cent and 86 per cent of the farmers respectively. Almost all the prawn farmers were aware of the practice, 'eradication of existing fishes, crustaceans and other unwanted organisms'. Sixty one per cent of the respondents were aware of the practice, 'liming' and eighty one per cent of the farmers were aware of the practice, 'basal application of organic fertilizers'. All the respondents were aware of the practice of 'stocking the ponds with selected prawn seeds'. The practices, 'acclimation of seeds', 'nursery rearing of seeds' and 'supplementary feeding based on biomass' were heard by 26 per cent, 81 per cent and 98 per cent of the

Table 10. Awareness about individual practices in prawn farming

n=100

Sl. No.	Practice	Percentage of respondents aware of the practice
1.	Strengthening of bunds and deepening of channels	100
2.	Fixing or repairing of the sluice gate	100
3.	Draining and raking of the pond bottom	27
4.	Pond drying	56
5.	Removal of aquatic weeds	86
6.	Eradication of existing fishes, crustaceans and other unwanted organisms	97
7.	Liming	61
8.	Basal application of organic fertilizers	81
9.	Stocking of the ponds with selected prawn seeds	100
10.	Acclimation of seeds	26
11.	Nursery rearing of seeds	81
12.	Supplementary feeding based on biomass	98
13.	Maintenance of dissolved oxygen in water	26
14.	Monitoring and control of pH	15
15.	Control of algal blooms	21
16.	Need based water exchange	99
17.	Need based control of disease and parasites	12
18.	Periodic assessment of growth and biomass	57
19.	Harvesting the crop at most economic size	72

Sl. No.	Practices
1.	Strengthening of bunds and deepening of channels
2.	Fixing or repairing of sluice gate
3.	Draining and raking of pond bottom
4.	Pond drying
5.	Removal of aquatic weeds
6.	Eradication of existing fishes, crustaceans and other unwanted organisms
7.	Liming
8.	Basal application of organic fertilizers
9.	Stocking of the ponds with selected prawn seeds
10.	Acclimation of seeds
11.	Nursery rearing of seeds
12.	Supplementary feeding based on biomass
13.	Maintenance of Dissolved Oxygen level in water
14.	Monitoring and control of pH
15.	Control of algal blooms
16.	Need based water exchange
17.	Need based control of disease and parasites
18.	Periodic assessment of growth and biomass
19.	Harvesting the crop at most economic size

Y - axis 1·5 cm = 10

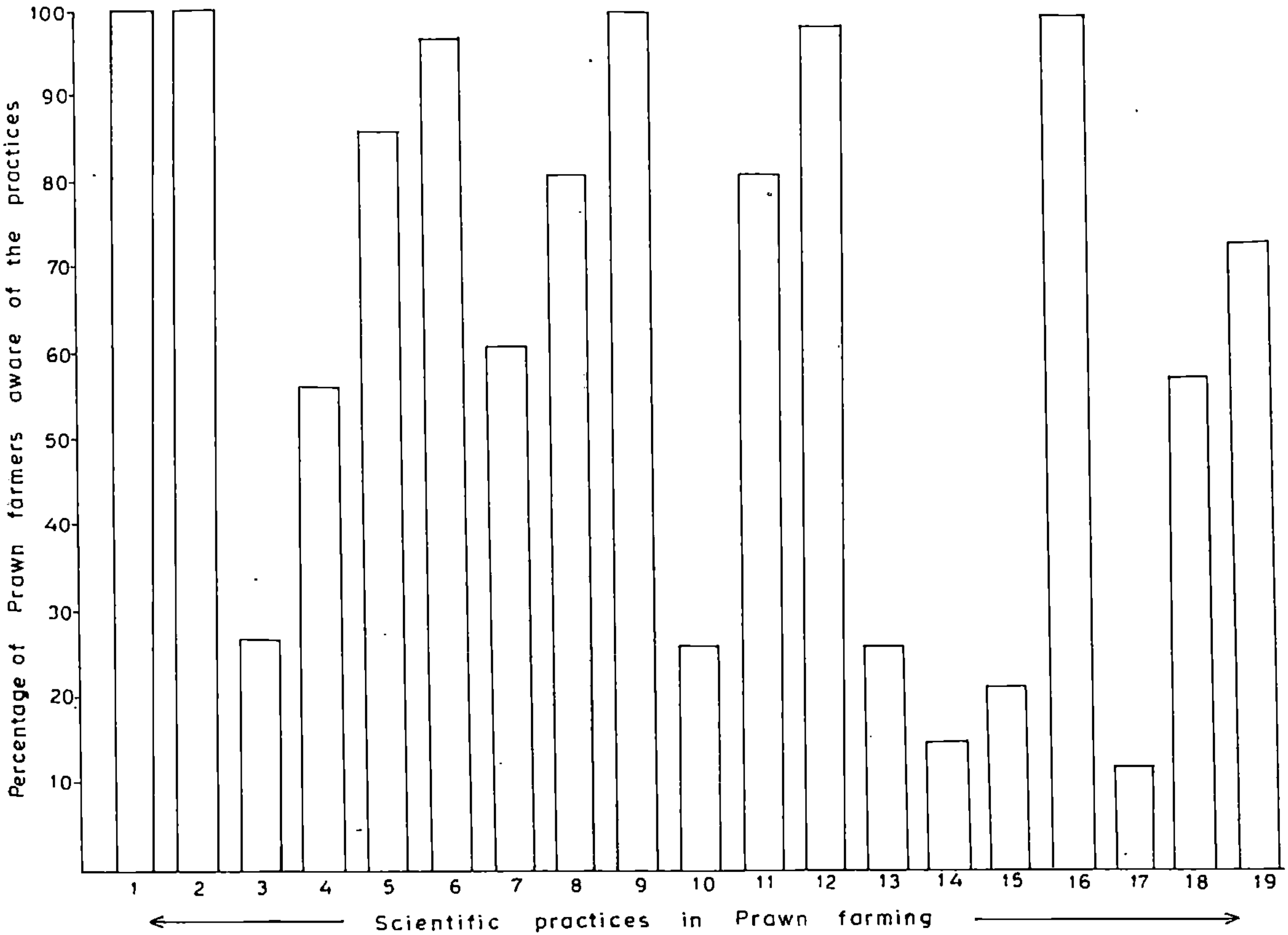


Fig. 6. Awareness of individual practices in Prawn farming.

farmers respectively. Maintenance of dissolved oxygen level in water was known to only 26 per cent of the farmers. As only 15 per cent of the farmers aware of the practice, 'monitoring and control of pH' it was recorded as one of the less popular practice. The practice, 'control over algal blooms' was heard by only a very small section (21 per cent) of the respondents. Almost all the farmers studied were aware of the practice, 'need based water exchange'. The practice of 'need based control of disease and parasites' was the least heard practice among prawn farmers. Only 12 per cent of the farmers were aware of that practice. The practices, 'periodic assessment of growth and biomass' and 'harvesting the crop at most economic size' were heard by 57 per cent and 72 per cent of the respondents respectively.

Figure 6 condenses these findings in a more easy understandable bargraph.

4.4. Extent of adoption of scientific practices in prawn farming

The mean adoption-quotient of the prawn farmers was 24.42 with standard deviation 12.50. Table 11 presents the distribution of respondents based on their adoption quotient.

Table 11. Distribution of prawn farmers based on their extent of adoption

n=100

Category	Frequency	Percentage
Low (Below $\overline{X}$-SD, Below 11.92)	3	3
Medium (Between $\overline{X}\pm$SD, between 11.92 and 36.92)	83	83
High (Above $\overline{X}$+SD, Above 36.92)	14	14

Mean = 24.42 S.D. = 12.50

The table reveals that majority of the prawn farmers (83 per cent) were having medium extent of adoption. Fourteen per cent had high adoption, while only three per cent were under low adoption category. The diagramatic presentation of the data is made in fig.7.

Frequency distribution of respondent farmers classified according to the extent of adoption is presented in table 12. It could be seen from the table that highest percentage of farmers (46 per cent) were in the class 11-20, followed by 34 per cent in the class 21-30. These two classes together constitute 80 per cent of the farmers. Nine per cent were in the class 31-40, four per cent in the class 41-50, three

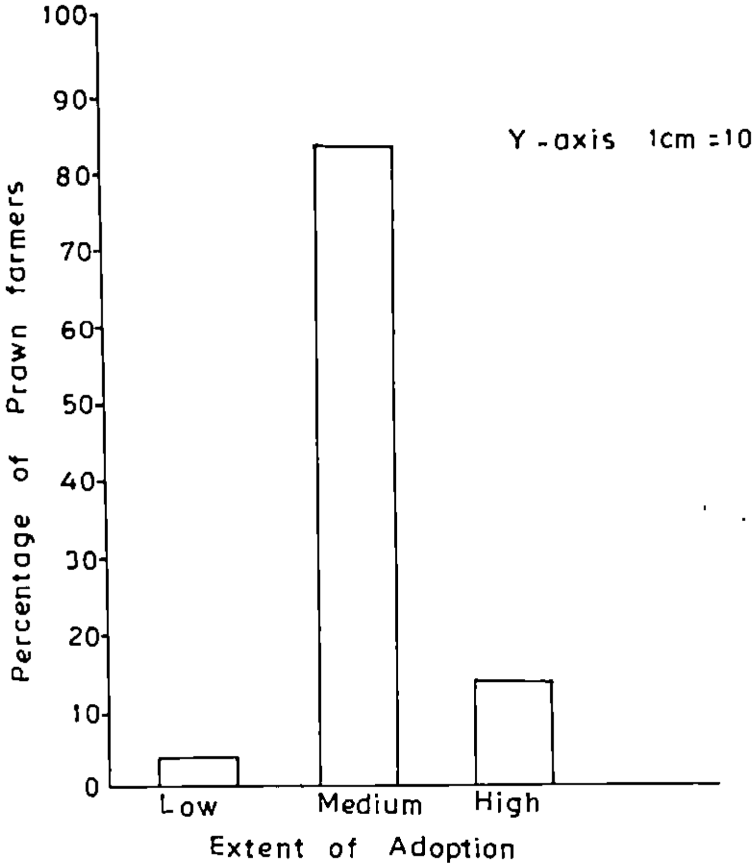


Fig. 7. Distribution of Prawn farmers based on extent of adoption.

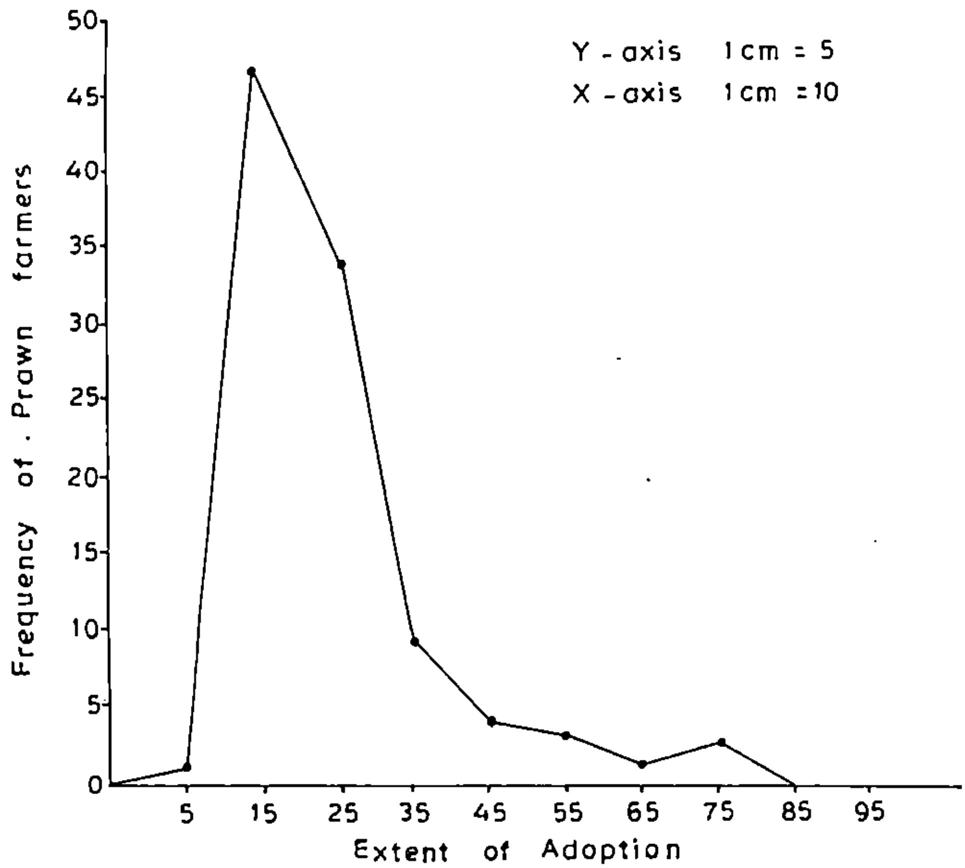


Fig. 8. Frequency distribution of Prawn farmers classified according to extent of adoption.

Table 12. Frequency distribution of respondent farmers classified according to the extent of adoption.

n=100

Class interval	Frequency	Percentage
0-10	1	1
11-20	46	46
21-30	34	34
31-40	9	9
41-50	4	4
51-60	3	3
61-70	1	1
71-80	2	2
81-90	-	-
91-100	-	-
Total	100	100

per cent in the class 51-60, one per cent in the class 61-70 and two per cent in the class 71-80. None of the farmers had an adoption-quotient over 80.

Figure 8 presents the frequency distribution of farmers under different classes based on extent of adoption.

Extent of adoption of individual practices

Extent of adoption of each selected practice is presented in table 13. The table shows the percentage of respondents who have (1) fully adopted (2) partially adopted and (3) not adopted the practices concerned.

Table 13. Extent of adoption of individual practices in prawn farming

n=100

Sl. No.	Practice	Percentage of respondents		
		fully adopted	partially adopted	not adopted
1.	Strengthening of bunds and deepening of channels	50	49	1
2.	Fixing or repairing of sluice gate	96	3	1
3.	Draining and raking of pond bottom	2	5	93
4.	Pond drying	9	4	87
5.	Removal of aquatic weeds	14	72	14
6.	Eradication of existing fishes crustaceans and other unwanted organisms	10	11	79
7.	Liming	5	11	84
8.	Basal application of organic fertilizers	1	29	70

Contd... ..

9.	Stocking of the ponds with selected prawn seeds	10	34	56
10.	Acclimation of seeds	20.45	9.10	70.45
11.	Nursery rearing of seeds	34.10	36.36	29.54
12.	Supplementary feeding based on biomass	3	57	40
13.	Maintenance of dissolved oxygen level in pond	0	1	99
14.	Monitoring and control of pH	1	1	98
15.	Control of algal blooms	2	5	93
16.	Need based water exchange	0	99	1
17.	Need based control of disease and parasites	0	1	99
18.	Periodic assessment of growth and biomass	3	6	91
19.	Harvesting the crop at most economic size	9	2	89

The practice, 'strengthening of bunds and deepening of channels' was adopted to the full extent by 50 per cent of the farmers. Forty nine per cent adopted it partially, while only one per cent did not adopt it.

Almost all the prawn farmers studied (96 per cent) were found to have adopted the practice,'fixing or repairing the sluice gate fully. Partial adopters and non-adopters of this practice were three per cent and one per cent respectively.

Adoption of the practice, 'draining and raking of the pond bottom' was very low as only two per cent of the farmers fully adopted this practice. Five per cent of the farmers adopted it to a less extent while majority were non-adopters.

Majority of the prawn farmers (87 per cent) were found not drying their ponds before they start the prawn culture. Only nine per cent have adopted this practice fully. The partial adopters were four per cent.

The practice, 'removal of aquatic weeds' was found partially adopted by nearly three-fourth (72 per cent) of the prawn farmers studied. Fourteen per cent of the respondents were full adopters while 14 per cent were non-adopters of the practice.

Only less than a quarter of the respondents were found eradicating all existing fishes, crustaceans and other unwanted organisms before the introduction of prawn seeds. The percentage of respondents who fully adopted this practice was only 10; another 11 per cent adopted it partially. Seventy nine per cent of the respondents were non-adopters.

The practice, 'liming' was not adopted by majority (84 per cent) of the farmers. Only five per cent of the farmers had adopted the practice to the required extent. Eleven per cent of the farmers studied were found applying lime at rates less than the actual requirements.

Application of organic fertilizers based on fertility status of the pond was found adopted fully by only one per cent of the farmers. Twenty nine per cent of the farmers applied some quantity of organic fertilizers, but not according to actual requirements, while 70 per cent of the prawn farmers applied no organic fertilizers in their pond.

Majority of the farmers (56 per cent) have not stocked the ponds with selected prawn seeds. Only 10 per cent of the farmers stocked the ponds to the required stocking density. Thirty four per cent adopted lesser stocking densities.

The practice, 'acclimation of the seeds' was applicable only to 44 per cent of the farmers, who adopted the practice, 'stocking the pond with selected prawn seeds'. This practice was found fully adopted by only 20.45 per cent of the respondents. Partial adopters of this practice were 9.1 per cent while majority (70.45 per cent) did not adopt the practice.

The practice, 'nursery rearing of the seeds' was applicable only to 44 per cent of the farmers who stocked the ponds with selected prawn seeds. The nursery rearing practice was fully adopted by 34.1 per cent of the farmers to whom it was applicable. Partial adopters and non-adopters were 36.36 per cent and 29.54 per cent respectively.

Majority of the prawn farmers (57 per cent) were partial adopters of the practice, 'supplementary feeding based on biomass'. Only three per cent of the respondents adopted the practice to its full extent. Non-adopters of the practice were 40 per cent of the total prawn farmers studied.

Maintenance of dissolved oxygen level in the pond was one among the least adopted practices. There was no farmer who fully adopted the practice. Only one per cent of the farmers had adopted it partially while great majority (99 per cent) were non-adopters.

Almost all the respondents were non-adopters of the practice,'monitoring and control of pH'. Only two per cent of the farmers were found adopting the practice of which one per cent was partial adopters.

Sl. No.	Practices
1.	Strengthening of bunds and deepening of channels
2.	Fixing or repairing of sluice gate
3.	Draining and raking of pond bottom
4.	Pond drying
5.	Removal of aquatic weeds
6.	Eradication of existing fishes, crustaceans and other unwanted organisms
7.	Liming
8.	Basal application of organic fertilizers
9.	Stocking of the ponds with selected prawn seeds
10.	Acclimation of seeds
11.	Nursery rearing of seeds
12.	Supplementary feeding based on biomass
13.	Maintenance of Dissolved Oxygen level in water
14.	Monitoring and control of pH
15.	Control of algal blooms
16.	Need based water exchange
17.	Need based control of disease and parasites
18.	Periodic assessment of growth and biomass
19.	Harvesting the crop at most economic size

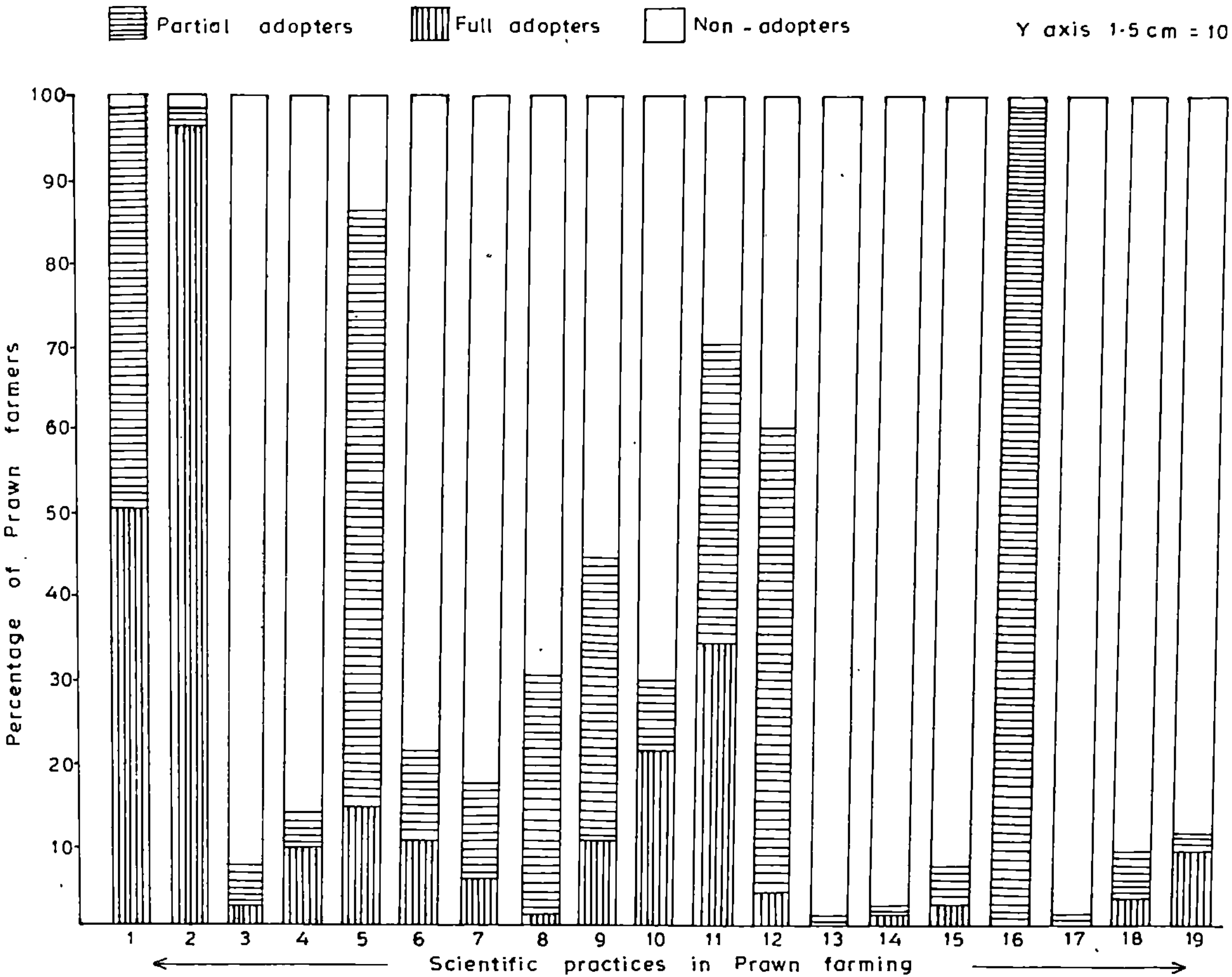


Fig. 9... Extent of adoption of individual practices in Prawn farming.

'Control of algal blooms' was exercised by only two per cent of respondents. Another five per cent adopted it to a lesser extent, while 93 per cent did not adopt it.

There was no full adoption for the practice, 'need based water exchange'. But 99 per cent of the farmers were partial adopters of the practice. Only one per cent came under the category of non-adopters.

None of the respondents were found fully adopting the practice need based control of disease and parasites. Almost all the farmers were non-adopters while only one per cent adopted the practice partially.

Majority of the prawn farmers (91 per cent) were non-adopters of the practice, 'periodic assessment of growth and biomass'. Only three and six per cent of the respondent farmers were found adopting the practice fully and partially respectively.

Only nine per cent of the respondents were found having fully adopted the practice, 'harvesting the crop at most economic size'. Another two per cent adopted it partially while majority (89 per cent) were non-adopters.

Figure 9 presents a condensed diagrammatic presentation of the data.

4.5. Profile analysis of prawn farmers selected for study

4.5.1. Socio-economic characteristics

4.5.1.1. Age

Mean age of the respondents was 44.84 years with standard deviation of 13.17 years. The distribution of respondents based on age is given in table 14.

Table 14. Distribution of prawn farmers based on age

n=100

Category	Frequency	Percentage
Young (below $\bar{X}$-SD; Below 31.67)	23	23
Middle (Between $\bar{X}\pm$SD; between 31.67 and 57.01)	64	64
Old (Above $\bar{X}$+SD; above 57.01)	23	23

Mean = 44.84 S.D. = 13.17

Majority of the respondents (64 per cent) belonged to middle age group, while remaining 46 per cent were equally distributed under young and old categories.

4.5.1.2. Education

All the prawn farmers responded were literate, having received formal education at or above primary level. Based on level of education the respondents were classified as shown in table 15.

Table 15. Distribution of prawn farmers on the basis of education

n=100

Category	Frequency	Percentage
Primary	21	21
Middle school	18	18
High school	32	32
College	29	29

The table 15 illustrates that majority of the prawn farmers were educated at high school level. However, twenty nine per cent had collegiate education, eighteen per cent had middle school level of education and remaining 21 per cent had only primary level of education.

4.5.1.3. Experience

The respondents' mean experience in prawn farming was 15.21 years with standard deviation 11.48 years. Table 16 reveals the distribution of respondents based on their experience..

Table 16. Distribution of prawn farmers based on their experience

n=100

Category	Frequency	Percentage
Low (Below $\bar{X}$-SD; below 3.73)	16	16
Medium (Between $\bar{X}\pm$SD, between 3.73 and 26.39)	76	76
High (Above $\bar{X}$+SD, Above 26.39)	8	8

Mean = 15.21 S.D. = 11.48

Based on experience majority (76 per cent) of the prawn farmers were in the medium category, sixteen per cent were less experienced and only eight per cent had high level of experience.

4.5.1.4. Training participation

Only 12 per cent of the respondents were found to have participated in training programmes. The remaining 88 per cent did not participate in any training programme.

4.5.1.5. Occupation

Majority of the prawn farmers studied (71 per cent) took prawn farming as their major occupation and for the remaining 29 per cent it was only a subsidiary occupation.

4.5.1.6. Land possession

About two-third (67 per cent) of the farmers possessed own land for farming, while the remaining one-third had to lease lands.

4.5.1.7. Income from prawn farming

Mean gross income of the respondents per hectare for a single crop was Rs 11,586.27 with a standard deviation of Rs 5,381.05. The categories of respondents based on income are presented in table 17.

Table 17. Distribution of prawn farmers on the basis of income

n=100

Category	Frequency	Percentage
Low (Below $\bar{X}$-SD, Below 6,025)	23	23
Medium (Between $\bar{X}\pm$SD, Between 6,025 and 16,967)	63	63
High (Above $\bar{X}$+SD, Above 16,967)	14	14

Mean = 11,586.27 S.D. = 5,381.05

The table illustrates that 63 per cent of the prawn farmers studied belong to the medium category, 23 per cent to low and 14 per cent to high categories as far as their income from prawn farming was concerned.

4.5.1.8. Institutional credit utilisation

Majority of the prawn farmers studied (62 per cent) were not enjoying any credit from institutional sources. Only 38 per cent resorted to the financial assistance from credit institutions.

4.5.2. Situational characteristics

4.5.2.1. Total farming area

The mean extent of area operated by the prawn farmers was 6.23 hectares with standard deviation 7.26. Further only 27 per cent of the farmers were found having an operational area of more than 6.23 hectares. Majority of the farmers (72 per cent) operated areas smaller than the mean extent of area.

4.5.2.2. Area under selective stocking

Only 20 per cent of the prawn farmers studied possessed area under selective stocking, while the remaining 80 per cent were not holding any area under selective stocking.

4.5.2.3. Salinity

Nearly two-thirds (64 per cent) of the farms were found having relatively high salinity, while 24 per cent and 12 per cent of the farms were found having medium and low salinity respectively.

4.5.2.4. Distance from bar-mouth

The mean distance of the farms from bar mouth was 12.41 kilometers with standard deviation 3.09. Fifty six per cent of the farms were at a distance above the mean while the remaining 44 per cent were at a distance below the mean.

4.5.2.5. Average depth at low tide

The computed mean of the average depth of the farms at low tide was 47.73 with standard deviation 21.92 cm. About two-thirds (66 per cent) of the farms had average depth above mean, and the remaining one-third had depth lesser than the mean.

4.5.2.6. Average depth at high tide

The mean of the average depth of the farms at high tide was 115.30 centimeters with standard deviation 21.61 cm. Fifty five per cent had higher depths at high tide than the mean. Forty five per cent of the farms had depth less than the average.

4.5.2.7. Number of crops raised

When only in 22 per cent of. the farms more than one crop of prawn was raised, in the other 78 per cent of the farms only a single crop of prawn was raised annually.

4.5.3. Socio-psychological profile

4.5.3.1. Scientific orientation

The mean scientific orientation score of the respondents was 24.49 with standard deviation 4.82. The categorised distribution of respondents based on scientific orientation score is shown in table 18.

Table 18. Distribution of prawn farmers based on their scientific orientation score

n=100

Category	Frequency	Percentage
Low (6-14)	4	4
Medium (15-22)	18	18
High (23-30)	78	78

Mean = 24.49 S.D.= 4.82

The table reveals that more than three-fourth of the respondents were having high scientific orientation. Eighteen per cent were in medium category and only four per cent of the respondents were found with low scientific orientation.

4.5.3.2. Risk preference

The prawn farmers studied had a mean risk preference score of 23.11 with standard deviation 6.01. The respondents and the respective levels of risk preference are presented in table 19.

Table 19. Distribution of prawn farmers based on their Risk preference score

n=100

Category	Frequency	Percentage
Low (6-14)	5	5
Medium (15-22)	39	39
High (23-30)	56	56

Mean = 23.11 S.D. = 6.01

The table shows that more than half of the total farmers studied had high risk preference, thirty nine per cent had medium risk preference and only five per cent were in the low category.

4.5.3.3. Economic motivation

Mean economic motivation score of the respondents was 25.39 with standard deviation 3.32. Table 20 presents the distribution of respondents based on their economic motivation score.

Table 20. Distribution of prawn farmers based on economic motivation

n=100

Category	Frequency	Percentage
Low (6-14)	0	0
Medium (15-22)	19	19
High (23-30)	81	81

Mean = 25.39 S.D. = 3.32

The table reveals that a great majority of the respondents were having high economic motivation. Nineteen per cent of the farmers were in the medium category while none of the farmers were found with low economic motivation score.

4.5.3.4. Marketing orientation

Mean marketing orientation score of the respondents was 5.38 with standard deviation 6.87. The distribution of respondents on their marketing orientation score is presented in table 21.

Table 21. Distribution of prawn farmers based on their marketing orientation score

n=100

Category	Frequency	Percentage
Low (1-2)	1	1
Medium (3-4)	14	14
High (5-6)	85	85

Mean = 5.38 S.D. = 6.87

It is evident from the table that great majority of the respondents were having high marketing orientation. Only one per cent of the respondents were having low marketing orientation while those under medium marketing orientation was 14 per cent.

4.5.3.5. Rationality in decision making

The prawn farmers studied were found having a mean rationality quotient of 63.91 with a standard deviation of 10.1. The distribution of respondents based on their rationality quotient is presented in table 22.

Table 22. Distribution of prawn farmers based on their Rationality Quotient

n=100

Category	Frequency	Percentage
Low (Below $\bar{X}$-SD, Below 53.81)	18	18
Medium (Between $\bar{X}\pm$SD, Between 53.81 and 74.01)	68	68
High (Above $\bar{X}$+SD, Above 74.01)	14	14

Mean = 63.91 S.D. = 10.1

Based on rationality, over two-thirds of the prawn farmers, were in the medium category, followed by 18 per cent in the low category and 14 per cent in the high category.

4.5.4. Communication variables

4.5.4.1. Utilisation of personal localite sources

The mean personal localite media utilisation score of the prawn farmers studied was 4.33 with standard deviation of 1.54. Based on mean score nearly half (46 per cent) of the respondents were having high personal localite media utilisation while the remaining 54 per cent had low personal localite media utilisation.

4.5.4.2. Utilisation of personal cosmopolite sources

Utilisation of personal cosmopolite sources had a mean score of 1.35 with standard deviation 2.77. Among the prawn farmers studied only 22 per cent scored above mean while majority had a personal cosmopolite media utilisation score below mean.

4.5.4.3. Utilisation of mass media sources

Mean mass media utilisation score of the respondents was 6.21 with standard deviation 0.79. A great majority (90 per cent) of the respondents had mass media utilisation score below mean while only 10 per cent had score above mean.

4.6. Relationship between independent variables and dependent variable - extent of adoption of scientific practices in prawn farming

The correlation coefficients computed between each of the independent variable and the dependent variable, extent of adoption of scientific practices in prawn farming revealed that out of the 24 independent variables studied, only nine were significantly influencing the extent of

Table 23. Value of correlation coefficients between selected independent variables and the extent of adoption of scientific practices in prawn farming

Variable No.	Independent variables	Correlation coefficient(r)
x_1.	Age	0.0454
x_2.	Education	0.1936
x_3.	Experience	-0.0979
x_4.	Training participation	0.2812**
x_5.	Occupation	-0.0242
x_6.	Land possession	0.2090*
x_7.	Income from prawn farming	0.0105
x_8.	Institutional Credit utilisation	0.3154**
x_9.	Total area	-0.1040
x_{10}.	Area under selective stocking	0.5864**
x_{11}.	Salinity	0.0636
x_{12}.	Distance from bar mouth	0.0711
x_{13}.	Average depth at low tide	0.0235
x_{14}.	Average depth at high tide	-0.0437
x_{15}.	Number of crops raised	0.3683**
x_{16}.	Scientific orientation	0.1744
x_{17}.	Risk preference	0.1213
x_{18}.	Economic motivation	-0.0415
x_{19}.	Marketing orientation	0.1096
x_{20}.	Extent of awareness of scientific practices in prawn farming	0.5466**
x_{21}.	Rationality in decision making	0.4636**
x_{22}.	Utilisation of personal localite sources	-0.1601
x_{23}.	Utilisation of personal cosmopolite sources	0.8801**
x_{24}.	Utilisation of mass media sources	0.2091*

** Significant at one per cent level

* Significant at five per cent level

adoption. The values of correlation coefficients of independent variables with dependent variable are presented in table 23.

The socio-economic variables tested for finding their association with adoption behaviour were age, education, experience, training participation, occupation, land possession, income from prawn farming and institutional credit utilisation. Of these eight variables only three namely, training participation, land possession and institutional credit utilisation were showing significant correlation with extent of adoption. The correlation coefficients were 0.2812, 0.2090 and 0.3154 respectively. The correlation values are indicative of a positive association between independent and dependent variables.

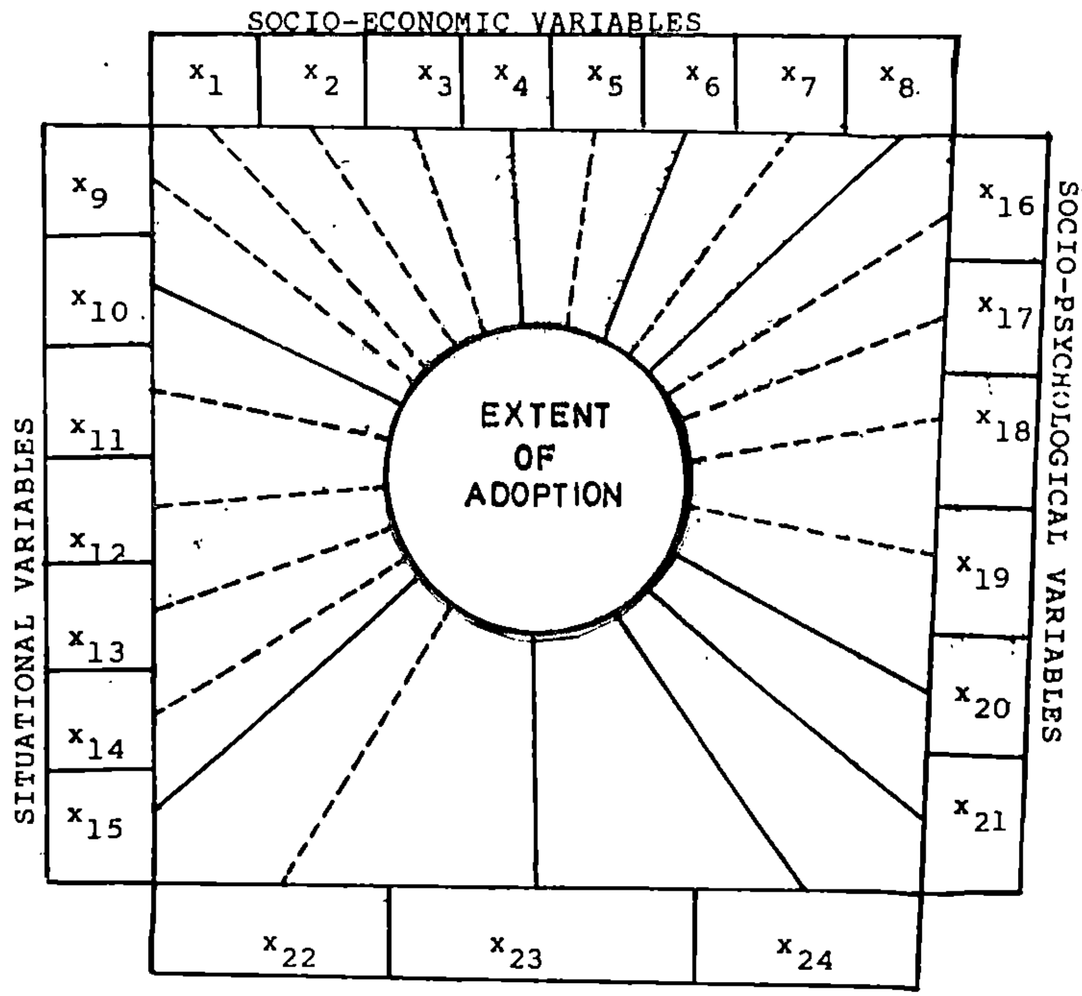
Among the seven situational variables selected for study viz. total area, area under selective stocking, salinity, distance from barmouth, average depth at low tide, average depth at high tide and number of crops raised, only two variables were having significant association with adoption behaviour. Situational variables significantly influencing extent of adoptiion of scientific practices in prawn farming were area under selective stocking and number of crops raised. The correlation coefficients were 0.5864 and 0.3683 respectively indicating a positive and highly significant association.

The socio-psychological variables correlated with dependent variable were scientific orientation. Risk preference, economic motivation, marketing orientation, rationality in decision making and awareness of scientific practices in prawn farming. Of these only two variables had significant association with extent of adoption. The correlation coefficients for extent of awareness of scientific practices in prawn farming and rationality in decision making were 0.5466 and 0.4636 respectively. The correlation values prove a positive association between these independent and dependent variables.

The relationship between three communication variables namely, utilisation of personal localite sources, utilisation of personal cosmopolite sources and utilisation of mass media sources were also studied, the correlation coefficients being -0.1601, 0.8801 and 0.2091 respectively. The utilisation of personal cosmopolite sources was found to have positive and highly significant association with extent of adoption. Utilisation of mass media sources also proved a positive and significant relationship with the extent of adoption.

The relationship between dependent and independent variables is presented in fig. 10.

Fig. 10. Correlation between independent variables and extent of adoption of scientific practices in prawn farming



- - - Non-significant correlation

——— Significant correlation

x_1 Age, x_2 Education, x_3 - Experience, x_4 - Training participation, x_5 - Occupation, x_6 - Land possession, x_7 - Income from prawn farming, x_8 - Institutional credit utilisation, x_9 - total area, x_{10} - Area under selective stocking, x_{11} - Salinity, x_{12} - Distance from bar mouth, x_{13} - Average depth at low tide, x_{14} - Average depth at high tide, x_{15} - Number of crops raised, x_{16} - Scientific orientation, x_{17} - Risk preference, x_{18} - Economic motivation, x_{19} - Marketing orientation, x_{20} - Extent of awareness of scientific practices in prawn farming, x_{21} - Rationality in decision making, x_{22} - Utilisation of personal localite sources, x_{23} - utilisation of personal cosmopolite sources, x_{24} - Utisation of mass media services.

Table 24. Inter correlations between selected independent variables

	x_4	x_6	x_8	x_{10}	x_{15}	x_{20}	x_{21}	x_{23}	x_{24}
x_4	1.000	0.259**	0.218*	0.200*	0.027	0.393**	0.063	0.264**	0.096
x_6		1.000	0.287**	0.298**	0.038	0.251*	0.074	0.127	0.106
x_8			1.000	0.433**	0.231*	0.200*	0.057	0.221*	0.157
x_{10}				1.000	0.459**	0.417**	0.424**	0.406**	0.341**
x_{15}					1.000	0.222*	0.279**	0.255**	0.225*
x_{20}						1.000	0.125	0.536**	0.176
x_{21}							1.000	0.482**	0.016
x_{23}								1.000	-0.047
x_{24}									1.000

* Significant at five per cent level ** Significant at one per cent level

x_4 - Training participation x_6 - Land possession, x_8 - institutional credit utilisation, x_{10} - Area under selective stocking, x_{15} - Number of crops raised, x_{20} - Extent of awareness of scientific practices in prawn farming, x_{21} - Rationality in decision making, x_{23} - utilisation of personal cosmopolite sources, x_{24} - utilisation of mass media sources.

4.6.2. Inter relationship among selected independent variables

Inter correlations between each of the independent variables showing significant association with dependent variable were worked out to study their inter dependence. The results obtained are presented in table 24.

A perusal of the table indicates that most of the variables tested were correlated among one another. Variable x_{10}, area under selective stocking was found significantly related with all other independent variables. The variables, number of crops raised (x_{15}), utilisation of personal cosmopolite sourcees (x_{23}) and extent of awareness of scientific practices in prawn farming (x_{20}) were found significantly related with six other variables. The variable, training participation (x_4) was found influenced by five other independent variables, land possession (x_6) by four variables, and rationality in decision making (x_{21}) by three other variables. The variable, utilisation of mass media sources (x_{24}) was the most independent, which was found influenced by only two other variables.

4.6.3. Multivariate analysis

Since only nine out of the twenty four independent variables were giving significant correlation with the dependent variable, extent of adoption of scientific practices in prawn farming, these nine variables were selected and an attempt was made to study the combined effect of them on the dependent variable. The selected variables are reproduced from table 23 and presented in table 25.

Table 25. Independent variables selected for multivariate analysis

Sl. No.	Variable No.	Independent variables	Correlation coefficient 'r'
1.	x_4	Training participation	0.2812**
2.	x_6	Land possession	0.2090*
3.	x_8	Institutional credit utilisation	0.3154**
4.	x_{10}	Area under selective stocking	0.5864**
5.	x_{15}	Number of crops raised	0.3683**
6.	x_{20}	Extent of awareness about scientific practices in prawn farming	0.5466**
7.	x_{21}	Rationality in decision making	0.4636**
8.	x_{23}	Utilisation of personal cosmopolite sources	0.8801**
9.	x_{24}	Utilisation of mass media sources	0.2091*

* Significant at five per cent level of probability

** Significant at one per cent level of probability

4.6.3.1. Multiple regression analysis

A multiple linear model was fitted for the regression of dependent variable, extent of adoption on the selected independent variables. The variance explained by the model was analysed using Analysis of Variance technique. The results are presented in table 26.

The regression analysis revealed that, the nine independent variables together explained 86.82 per cent of variation in the extent of adoption of scientific practices in prawn farming. The F-ratio computed was significant at one per cent level of probability.

The regression equation obtained was

$$y = 16.351 + 0.320\, x_4 + 1.002\, x_6 + 0.401 x_8 + 5.249\, x_{10} + 1.524 x_{15} - 0.012 x_{20} - 0.023\, x_{21} + 3.669\, x_{23} + 2.757 x_{24}$$

Table 26. Analysis of Variance table giving the significance of multiple regression model

Source	Degree of freedom	Sum of squares	Mean sum of squares	F
Due to regression	9	13562.78	1506.98	65.859**
Error	90	2059.36	22.88	
Total	99	15622.14		

** Significant at one per cent level

Multiple correlation coefficient R^2 = 0.8682

The significance of partial regression coefficient (b) of independent variables was tested using students' t statistic. The results are presented in table 27.

Table 27. Partial regression coefficients of independent variables and their significance

Sl. No.	Variable No.	Variable	Partial regression coefficient (b)	Standard error (SR)	t-value
1.	x_4	Training participation	0.3203	1.649	0.194 NS
2.	x_6	Land possession	1.0019	1.138	0.881 NS
3.	x_8	Institutional credit utilisation	0.4010	1.150	0.349 NS
4.	x_{10}	Area under selective stocking	5.2489	1.762	2.978**
5.	x_{15}	Number of crops raised	1.5244	1.356	1.124 NS
6.	x_{20}	Extent of awareness of scientific practices in prawn farming	-0.0118	0.041	-0.286 NS
7.	x_{21}	Rationality in decision making	-0.0231	0.060	-0.385 NS
8.	x_{23}	Utilisation of personal cosmopolite sources	3.6685	0.245	14.984**
9.	x_{24}	Utilisation of mass media sources	2.7572	0.672	4.104**

** Significant at one per cent level

NS-Non significant

The results show that only three variables viz. area under selective stocking, utilisation of personal cosmopolite sources and utilisation of mass media sources are having significant 'b' coefficients.

4.6.3.2. Step-wise regression analysis

Step-wise regression analysis was done to select the best subset of independent variabless in predicting the dependent variable, extent of adoption of scientific practices in prawn farming. The results of the analysis are presented in table 28.

Table 28. Step-wise regression analysis

Step No.	Variable entering regression	Regression coefficient 'b'	Standard error of 'b'	t-value	Percent of variation explained
I.	Utilisation of personal cosmopolite sources	3.9673	0.2262	17.5387	77.43
II.	Utilisation of personal cosmopolite sources	4.0208	0.1847	21.7694	83.75
	Utilisation of mass media sources	3.9689	0.6473	6.1315	
III.	Utilisation of personal cosmopolite sources	3.6456	0.1896	19.2278	86.48
	Utilisation of mass media sources	2.8456	0.6460	4.4050	
	Area under selective stocking	6.1502	1.3963	4.4046	

A review of the table reveals that the best subset of variables for predicting the dependent variable in the order of importance are utilisation of personal cosmopolite sources, utilisation of mass media sources and area under selective stocking. The variable, utilisation of personal cosmopolite sources alone explained 77.45 per cent of variation in the dependent variable. The variable utilisation of personal cosmopolite sources along with utilisation of mass media sources explained 83.75 per cent of variations in the dependent variable. All the three variables selected in step-wise regression analysis together explained 86.48 per cent of variations in extent of adoption of scientific practices in prawn farming.

4.6.3.4. Path analysis

Path analysis was done to get a clear picture of direct and indirect influence of selected independent variables on extent of adoption. The results of analysis are furnished in table 29.

A perusal of the table reveals that the variable which exercised highest direct influence on adoption behaviour was utilisation of personal cosmopolite sources, with a path coefficient (PC) 0.8138, followed by utilisation of mass media sources (PC = 0.1745), area under selective

Table 29. Path analysis showing direct and indirect effects of the selected independent variables on extent of adoption

	x_4	x_6	x_8	x_{10}	x_{15}	x_{20}	x_{21}	x_{23}	x_{24}	Total
x_4	0.008	0.010	0.003	0.034	0.001	-0.006	-0.001	0.215	0.017	0.281
x_6	0.002	0.038	0.004	0.050	-0.002	-0.004	-0.001	0.103	0.018	0.209
x_8	0.002	0.011	0.016	0.073	0.012	-0.003	-0.001	0.180	0.027	0.315
x_{10}	0.002	0.011	0.007	0.168	0.023	-0.006	-0.008	0.330	0.060	0.586
x_{15}	0.000	-0.001	0.004	0.077	0.051	-0.003	-0.005	0.208	0.039	0.368
x_{20}	0.003	0.009	0.003	0.070	0.011	-0.015	-0.002	0.436	0.031	0.547
x_{21}	0.002	0.003	0.001	0.071	0.014	-0.002	-0.019	0.392	0.003	0.646
x_{23}	0.001	0.005	0.003	0.068	0.013	-0.008	-0.009	0.814	-0.008	0.880
x_{24}	0.001	0.004	0.002	0.057	0.011	-0.003	0.000	-0.038	0.175	0.209
Path coefficients	0.0083	0.0377	0.156	0.1680	0.0505	-0.0148	-0.0187	0.8138	0.1745	

Residual effect R-square 0.132

x_4 - Training participation, x_6 - Land possession, x_8 - institutional credit utilisation
x_{10} - Area under selective stocking, x_{15} - Number of crops raised, x_{20} - Extent of awareness of scientific practices in prawn farming, x_{21} - Rationality in decision making,
x_{23} - utilisation of personal cosmopolite sources, x_{24} - utilisation of mass media sources.

stocking (PC = 0.1680) and Institutional credit utilisation (PC = 0.156). Variable training participation, land possession and number of crops raised had positive, but comparatively less direct influence. The path coefficients were of the order of 0.0083, 0.0377 and 0.0505 respectively. The two socio-psychological variables namely extent of awareness of scientific practices in prawn farming and rationality in decision making showed negative direct influence on adoption behaviour. The path coefficients were -0.0148 and -0.0187 respectively. The analysis indicated a residual effect (R) of 0.132.

The direct effects and substantial indirect effects of selected independent variables on adoption behaviour are presented in table 30. Diagramatic presentation of the data is given in fig.11.

Table 30. Direct and indirect effects of selected socio-economic, situational, socio-psychological and communication variables on the extent of adoption of scientific practices in prawn farming

Sl. No.	Variable No.	Variable	Total direct effect	Substantial indirect effect	
1	x_4	Training participation	0.008	0.034	through area under selective stocking
				0.010	through land possession
				0.215	through utilisation of personal cosmopolite sources
				0.017	through utilisation of mass media

contd....

2. x_6	Land possession	0.038	0.103	through utilisation of personal cosmopolite sources
			0.050	through area under selective stocking
			0.018	through utilisation of mass media
3. x_8	Institutional credit utilisation	0.016	0.180	through utilisation of personal cosmopolite sources
			0.073	through area under selective stocking
			0.027	through utilisation of mass media
			0.011	through land possession.
4. x_{10}	Area under selective stocking	0.168	0.330	through utilisation of personal cosmopolite sources
			0.023	through number of crops raised
			0.011	through land possession
			0.060	through utilisation of mass media
5. x_{15}	Number of crops raised	0.051	0.208	through utilisation of personal cosmopolite sources
			0.077	through area under selective stocking
			0.039	through utilisation of mass media

Contd.........

6. x_{20}	Extent of awareness of scientific practices in prawn farming	-0.015	0.436	through utilisation of personal cosmopolite sources
			0.070	through area under selective stocking
			0.031	through utilisation of mass media
			0.011	through number of crops raised
7. x_{21}	Rationality in decision making	-0.019	0.392	through utilisation of personal cosmopolite sources
			0.071	through area under selective stocking
			0.014	through number of crops raised
8. x_{23}	Utilisation of personal cosmopolite sources	0.814	0.068	through area under selective stocking
			0.013	through number of crops raised
			-0.009	through rationality in decision making
			-0.008	through utilisation of mass media
9. x_{24}	Utilisation of mass media sources	0.175	0.057	through area under selective stocking
			0.011	through number of crops raised
			-0.038	through utilisation of personal cosmopolite sources

The table indicates that, the indirect influence of independent variable, training participation was mainly channelled through the variable utilisation of personal cosmopolite sources. The indirect influence through this variable was 0.215. Substantial indirect effects through other variables were 0.034 through area under selective stocking, 0.017 through utilisation of mass media sources and 0.010 through land possession.

Land possession had substantial indirect effect of 0.103 through utilisation of personal cosmopolite sources, 0.050 through area under selective stocking, and 0.018 through utilisation of mass media sources.

Institutional credit utilisation had substantial indirect effect 0.180 through utilisation of personal cosmopolite sources, 0.073 through area under selective stocking, 0.027 through utilisation of mass media sources, 0.027 through number of crops raised and 0.011 through land possession.

Variables through which substantial indirect effects of independent variable area under selective stocking channelled were utilisation of personal cosmopolite sources (0.330) number of crops raised (0.023), utilisation of mass media sources (0.060) and land possession (0.011).

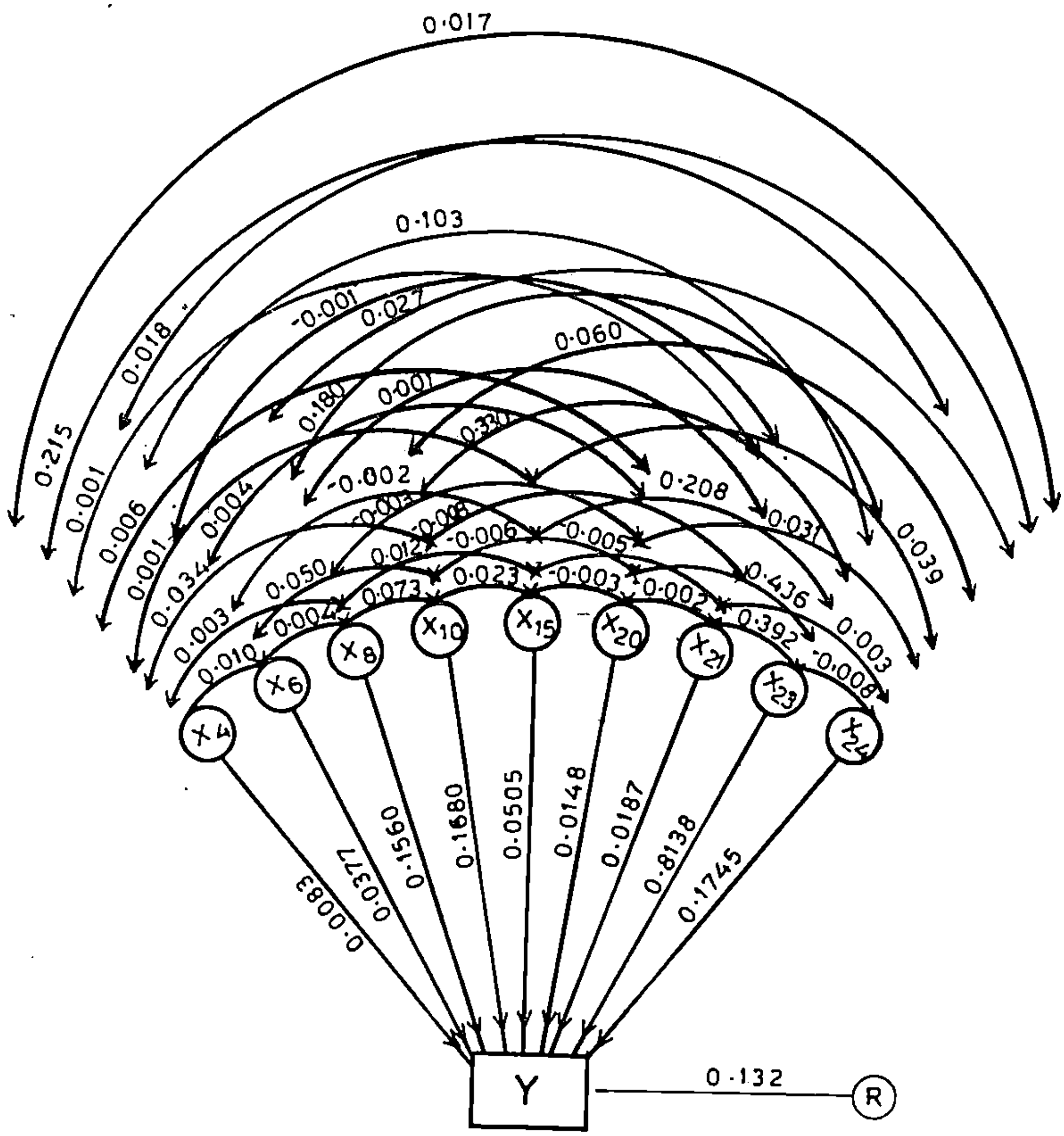
The indirect influence of the independent variable, number of crops raised was mainly channelled through utilisation of personal cosmopolite sources. The indirect effect through this variable was 0.208. Other variables through which substantial indirect effects was channelled were area under selective stocking and utilisation of mass media sources with indirect effects 0.077 aand 0.039 respectively.

Substantial indirect effect of the variable, extent of awareness of scientific practices in prawn farming were 0.436 through utilisation of personal cosmopolite sources, 0.070 through area under selective stocking, 0.031 through utilisation of mass media sources and 0.011 through number of crops raised.

Rationality in decision making showed indirect effects on adoption behaviour as 0.392 through utilisation of personal cosmopolite sources, 0.071 through area under selective stocking and 0.014 through number of crops raised.

Substantial indirect effects of the independent variable utilisation of personal cosmopolite sources were 0.068 through area under selective stocking, 0.013 through number of crops raised, -0.009 through rationality in decision making and -0.008 through utilisation of mass media sources.

Indirect influence of the variable, utilisation of mass media sources was mainly channelled through the variable, area under selective stocking. The indirect influence through this variable was 0.057. Other variables through which substantial indirect influence exercised were utilisation of personal cosmopolite sources and number of crops raised. The indirect effects through these variables were -0.038 and 0.011 respectively.



x_4 - Training particiation, x_6 - Land possession, x_8 - Institutional credit utilisation, x_{10} - Area under selective stocking, x_{15} - Number of crops raised, x_{20} - Extent of awareness of scientific practices in prawn farming, x_{21} - Rationality in decision making, x_{23} - Utilisation of personal cosmopolite sources, x_{24} - Utilisation of mass media sources, Y - Extent of adoption of scientific practices in prawn farming, R - Residual effect.

Fig. 11. Pathdiagram showing direct and indirect influences of independent variables on dependent variable

4.7. Reasons for non-adoption and partial adoption of scientific practices in prawn farming

The reasons for non-adoption and partial adoption of each scientific practice in prawn farming were studied. The findings are presented hereunder.

The practice, 'strengthening of bunds and deepening of channels' was found adopted by fifty per cent of the respondents to its full extent. Table 31 presents the reasons for non-adoption and partial adoption of the practice.

Table 31. Reasons for non-adoption and partial adoption of practice of 'strengthening of bunds and deepening of channels'

Sl. No.	Reasons	Frequency	Percentage to total respondents
1.	Lack of knowledge	20	20
2.	High cost of labour	10	10
3.	Lack of right for renovations in the field	7	7
4.	Since it will cause the reduction of paddy area	5	5
5.	No reason	8	8

A perusal of the table reveals that the most important reason was lack of knowledge, expressed by 20 per cent of the prawn farmers. Other reasons were high cost of labour, lack of right for renovations in the field, indicated by ten per cent and seven per cent of the farmers respectively. Another five per cent of the farmers indicated the reason as the adoption of this practice will cause reduction in the paddy area. Eight per cent of the farmers could not attribute any reason to their partial and non-adoption of the practice.

Majority (96 per cent) of the prawn farmers were full adopters of the practice, 'fixing or repairing of sluice gate'. Table 32 presents the reasons for non-adoption or partial adoption of the practice.

Table 32. Reasons for non-adoption and partial adoption of the practice of 'fixing or repairing of sluice gate'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	High cost of sluice	3	3
2.	Very extensive area	1	1

The table indicates that the reasons for not fully adopting or not adopting the practice were: high cost for three per cent and larger extent of area of farm for another one per cent of the farmers.

Only two per cent of the prawn farmers were found adopting the practice, 'draining and raking of the pond bottom' to full extent. The reasons for non-adoption and partial adoption of the practice are furnished in table 33.

Table 33. Reasons for non-adoption and partial adoption of the practice of 'draining and raking of the pond bottom'

Sl. No.	Response	Frequency	Percentage to total respondents
1.	Lack of awareness	73	73
2.	Lack of drainability of ponds	10	10
3.	No other scientific practices are adopted	10	10
4.	No separate bunds	2	2
5.	No reason	3	3

A review of the table reveals that, the most important reason was lack of awareness,expressed by 73 per cent of the respondents. Ten per cent of the respondents pointed out the reason as lack of drainability of ponds and another ten per cent, non-adoption of other scientific practices of prawn farming for not adopting and partially adopting the practice. A small section of the farmers, comprising two per cent expressed the reason as 'their farms had no seperate bunds'. Three per cent of the farmers did not give any reason for their non-adoption and partial adoption.

The practice, 'pond drying' was adopted to full extent only by nine per cent of the respondents. Table 34 presents the reasons for non-adoption or partial adoption of the practice.

Table 34. Reasons for non-adoption and partial adoption of the practice, 'pond drying'

Sl. No.	Reasons	Frequency	Percentage to total respondents
1.	Lack of awareness	44	44
2.	Lack of drainability	27	27
3.	No other scientific practices are adopted	13	13
4.	Fear of destruction of already trapped prawns	4	4
5.	Lack of knowledge	2	2
6.	No reason	1	1

It is evident from the table that, the non-adoption or partial adoption of this practice was mainly due to lack of awareness (44 per cent), lack of drainability of the pond (27 per cent) and non-adoption of other scientific practices (13 per cent). Four per cent of the farmers feared that the prawns already trapped would be destroyed. Another two per cent of the farmers expressed the reason as lack of knowledge, while one per cent did not indicate any reason for their non-adoption and partial adoption.

Majority of the prawn farmers (86 per cent) contacted were partial adopters or non-adopters of the practice, 'removal of aquatic weeds'. The reasons attributed by them to this are given in table 35.

Table 35. Reasons for non-adoption and partial adoption of the practice, 'removal of aquatic weeds'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Non-adoption of the practice of stocking the ponds with selected prawn seeds	27	27
2.	Lack of knowledge	23	23
3.	Lack of awareness	14	14
4.	High cost of labour	2	2
5.	Short period of licence	2	2
6.	No reason	18	18

The table reveals that, non-adoption of the practice of stocking the pond with selected prawn seeds was the most important reason, as expressed by 27 per cent of non-adopters and partial adopters, Twenty three per cent expressed lack of knowledge and 14 per cent lack of awareness as the reason for not fully adopting or partially adopting the practice. Other reasons pointed out were: high cost of labour and short periodicity of licence. Among the non-adopters and partial adopters 10 per cent could not attribute any reason.

Among the prawn farmers contacted for study, only 10 per cent was found adopting the practice, 'eradication of all existing fishes, crustaceans and other unwanted organisms'. Various reasons were given for non-adoption or partial adoption as could be seen from table 36.

Table 36. Reasons for non-adoption and partial adoption of the practice, 'eradication of all existing fishes, crustaceans and other unwanted organisms'

Sl. No.	Reasons	Frequency	Percentage to total respondents
1.	Non-adoption of the practice, selective stocking	72	72
2.	Lack of knowledge	12	12
3.	Lack of awareness	3	3
4.	Fear of destruction of prawns already trapped	2	2
5.	High cost of toxicants	1	1

It could be seen from the table that the most important reason for non-adoption and partial adoption of this practice was 'non-adoption of the practice, 'stocking the pond with selected prawn seeds' indicated by 72 per cent of the respondents. Lack of knowledge was the reason for 12 per cent of the farmers, followed by lack of awareness for three per cent, fear of destruction of already trapped prawns for two per cent and high cost of toxicants for one per cent of prawn farmers for not adopting or partially adopting the practice.

The practice, 'liming' was found fully adopted by only five per cent of the prawn farmers studied. The reasons for non-adoption or partial adoption of the practice by others are given in table 37.

Table 37. Reasons for non-adoption and partial adoption of the practice, 'liming'.

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of awareness	39	39
2.	Lack of knowledge	32	32
3.	Non-adoption of the practice, stocking the ponds with selected prawn seeds	12	12
4.	Fear of destruction of already trapped prawns	3	3
5.	Short period of licence	2	2
6.	No reason	7	7

A perusal of the table reveals that lack of awareness and lack of knowledge were the reasons for non-adoption and partial adoption of the practice for 39 and 32 per cent of the prawn farmers respectively. Other reasons noted were, non-adoption of the practice, stocking the pond with selected prawn seeds, fear of destruction of already trapped prawns and short period of licence, for twelve per cent, three per cent and two per cent respondents respectively.

Only one per cent of the farmers adopted the practice, 'basal application of organic fertilizers' to its fuller extent. The reasons for non-adoption and partial adoption of the practice is furnished in table 38.

Table 38. Reasons for non-adoption and partial adoption of the practice, 'basal application of organic fertilizers'.

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of knowledge	52	52
2.	Lack of awareness	19	19
3.	Non-adoption of the practice, 'selective stocking'	13	13
4.	Lack of availability	10	10
5.	High cost	1	1
6.	No reason	4	4

The table reveals that the important reasons for non-adoption or partial adoption of the practice were 'lack of knowledge, lack of awareness, non-adoption of the practice, ''stocking the pond with selected prawn seeds' and lack of availability for 52 per cent, 19 per cent, 13 per cent, and 10 per cent of the respondents respectively. Another one per cent of the prawn farmers expressed the reason high cost of organic fertilizers as the reason for non-adoption or partial adoption. Farmers who expressed no reason for non-adoption or partial adoption were four per cent.

Great majority (90 per cent) of the prawn farmers were non-adopters or partial adopters of the practice, 'stocking the pond with selected prawn seeds'. Table 39 presents the reason for non-adoption or partial adoption of the practice.

The table indicates that lack of conviction about the relative advantage of the practice was the most important reason pointed out by 31 per cent of the farmers, followed by lack of availability of quality prawn seeds, failure in the previous attempts, lack of ownership of the land, and high cost of seeds which were expressed by 11 per cent, 10 per cent, 10 per cent and eight per cent of the prawn farmers respectively. Other reasons found were high capital investment for scientific farming, lack of knowledge, poaching, pollution, short period of licence and labour problems in the order of importance.

Table 39. Reasons for non-adoption and partial adoption of the practice, 'stocking the pond with selected prawn seeds'.

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of conviction about the relative advantage of the practice	31	31
2.	Lack of availability of quality prawn seeds	11	11
3.	Failure in the previous attempts	10	10
4.	Lack of ownership of land	10	10
5.	High cost of seeds	8	8
6.	High capital investment for scientific farming	5	5
7.	Lack of knowledge	5	5
8.	Poaching	5	5
9.	Pollution	3	3
10.	Short period of licence	2	2
11.	Labour problems	1	1

The practice, 'acclimation of seeds' was applicable only for 14 per cent of farmers. Among them only 20.45 per cent adopted the practice fully. The reasons for non-adoption and partial adoption of the practice is given in table 40.

Table 40. Reasons for non-adoption and partial adoption of the practice'acclimation of prawn seeds'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of awareness	27	61.36
2.	Lack of knowledge	7	15.90
3.	Lack of facilities	1	3.40

A review of the table indicates that the most important reason for non-adoption was lack of awareness for 61.36 per cent of the respondents followed by lack of knowledge (15.90 per cent) and lack of facilities (2.30 per cent).

Potential adopters of the practice, 'nursery rearing of prawn seeds' was only 44 per cent. Among them only about one third of the farmers adopted the practice to its full extent. The reasons for non-adoption and partial adption of the practice is presented in table 41.

Table 41. Reasons for non-adoption and partial adoption of the practice, 'nursery rearing of the seeds'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of knowledge	19	43.18
2.	Lack of awareness	7	15.91
3.	Lack of sufficient nursery ponds	3	6.82

A perusal of the table indicates that lack of knowledge was the major reason for non-adoption and partial adoption as indicated by 43.18 per cent of potential farmers, followed by lack of awareness and lack of sufficient nursery ponds by 15.91 per cent and 6.82 per cent of potential adopters respectively.

Only three per cent of the respondents were found adopting the practice, 'supplementary feeding based on biomass' to its full extent. The reasons for non-adoption and partial adoption of the practice is furnished in table 42.

Table 42. Reasons for non-adoption and partial adoption of the practice, 'supplementary feeding based on biomass'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of knowledge	53	53
2.	Non-adoption of the practice, 'stocking of the ponds with selected prawn seeds'	25	25
3.	High cost	8	8
4.	Lack of awareness	2	2
5.	Lack of availability of compounded feed	2	2
6.	No reason	7	7

A review of the table indicates that the reasons for non-adoption and partial adoption of the practice were lack of knowledge, non-adoption of the practice, 'stocking of the pond with selected prawn seeds', 'high cost', 'lack of awareness' and 'lack of availability of compounded feed' in the order of importance pointed out by 53 per cent, 25 per cent, eight per cent, two per cent and two per cent respectively. Another seven per cent of farmers did not indicate any reason for their non-adoption or partial adoption of the practice.

None of the prawn farmers studied were found fully adopting the practice,'maintenance of dissolved oxygen level in the pond'. Table 43 presents the reasons for non-adoption and partial adoption of the practice.

Table 43. Reasons for non-adoption and partial adoption of the practice,'maintenance of dissolved oxygen level in the pond'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of awareness	74	74
2.	No other scientific practices are adopted	10	10
3.	Lack of knowledge	7	7
4.	High cost of mechanical aeration	4	4
5.	No reason	5	5

An examination of the table indicates that lack of awareness was the most important reason, expressed by 74 per cent of the respondents, followed by non-adoption of other scientific practices, lack of knowledge and high cost of mechanical aeration, by 10 per cent, seven per cent and four per cent respectively. The farmers who did not attribute any reason to non-adoption or partial adoption formed five per cent of the total.

Only one per cent of the farmers were found adopting the practice, 'monitoring and control of pH' to its full extent. The reasons expressed by the farmers for not adopting or partially adopting the practice is given in table 44.

Table 44. Reasons for non-adoption and partial adoption of the practice, 'monitoring and control of pH'

Sl.	Reason	Frequency	Percentage to total respondents
1.	Lack of awareness	85	85
2.	Lack of knowledge	9	9
3.	No other scientific practices are adopted	5	5

It can be seen from the table that, lack of awareness was the most important reason pointed out by 85 per cent of the respondents. Other reasons were lack of knowledge by nine per cent and non adoption of other scientific practices in prawn farming by five per cent of the respondents.

The practice, 'control of algal blooms' was found fully adopted by only two per cent of the prawn farmers under study. Table 45 presents the reasons for non-adoption or partial adoption of the practice.

Table 45. Reasons for non-adoption and partial adoption of the practice, 'control of algal blooms'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of awareness	79	79
2.	Lack of knowledge	9	9
3.	No other scientific practices are adopted	6	6
4.	No reason	3	3

A perusal of the table reveals that most important reason for non-adoption or partial adoption was lack of awareness. Seventy nine per cent of the respondents expressed this reason. Other important reasons were lack of knowledge and non-adoption of other scientific practices indicated by nine per cent and six per cent respectively. Another three per cent of the farmers could not give any reason for their non-adoption or partial adoption of the practice.

None of the prawn farmers studied were found adopting the practice, 'need based water exchange' to its full extent. The reasons for non-adoption or partial adoption of the practice is furnished in table 46.

Table 46. Reasons for non-adoption and partial adoption of the practice, 'need based water exchange'

Sl. No.	Reasons	Frequency	Percentage to total respondents
1.	Lack of pumping facilities	14	14
2.	Non-adoption of the practice, stocking of the ponds with selected prawn seeds	13	13
3.	Lack of knowledge	7	7
4.	Lack of awareness	1	1
5.	No reason	65	65

The table illustrates that the most important reasons were lack of pumping facilities, non-adoption of the practice, 'stocking the ponds with selected prawn seeds' and lack of knowledge, by 14 per cent, 13 per cent and seven per cent of the farmers respectively. The reason lack of awareness was expressed by another one per cent of the respondents. Majority of the farmers studied did not express any reason for the partial or non-adoption of this practice.

All the prawn farmers studied were found to be non-adopters or partial adopters of the practice, 'need based control of disease and parasites'. Table 47 presents the reasons for non-adoption or partial adoption of the practice.

Table 47. Reasons for non-adoption and partial adoption of the practice, 'need based control of disease and parasites'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Lack of awareness	88	88
2.	Lack of knowledge	5	5
3.	Non-adoption of the practice, stocking of the ponds with selected prawn seeds	4	4
4.	No reason	3	3

It can be concluded from the table that lack of awareness was the most important reason for non-adoption and partial adoption of the practice. Eighty eight per cent of the respondents indicated the reason lack of awareness. Other important reasons expressed were lack of knowledge by five per cent and non-adoption of the practice, 'stocking the pond with selected prawn seeds' by four per cent of the respondents. Among the prawn farmers studied three per cent could not attribute any reason to the non adoption or partial adoption of this practice.

The practice, 'periodic assessment of growth and biomass' was adopted by only three per cent of the respondents to the full extent. The reasons for non-adoption and partial adoption of the practice is presented in table 48.

Table 48. Reasons for non-adoption and partial adoption of the practice, 'periodic assessment of growth and biomass'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Non-adoption of the practice, stocking of the ponds with selected prawn seeds	46	46
2.	Lack of awareness	43	43
3.	Lack of knowledge	8	8

It can be seen from the table that the most important reason was non-adoption of the practice, 'stocking the pond with selected prawn seeds' expressed by 46 per cent of the respondents. Forty three per cent of the respondents expressed the reason as lack of awareness and another eight per cent expressed lack of knowledge as the reason for non-adoption and partial adoption of the practice.

Only nine per cent of the respondents were found to have fully adopted the practice, 'harvesting the crop at the most economic size'. Table 49 presents the reasons for non-adoption or partial adoption of the practice.

Table 49. Reasons for non-adoption and partial adoption of the practice, 'harvesting the crop at most economic size'

Sl. No.	Reason	Frequency	Percentage to total respondents
1.	Non-adoption of the practice, stocking of the pond with selected prawn seeds	62	62
2.	Lack of awareness	28	28
3.	Lack of knowledge	1	1

The table indicates that non-adoption of the practice, stocking of the pond with selected prawn seeds' was the most important reason, followed by lack of awareness and lack of knowledge expressed by 62 per cent, 28 per cent and one per cent of farmers respectively.

V . DISCUSSION

DISCUSSION

The study was mainly concentrated in finding out the extent of adoption of scientific practices in prawn farming and the correlates of adoption behaviour. The reasons for non-adoption and partial adoption of scientific practices were also probed into. Besides this, the communication media used for dissemination of scientific prawn farming practices and their extent of utilisation at awareness and adoption stages were also analysed. The results of the study are discussed in this chapter.

It is evident that the media coverage on scientific prawn farming was very extensive. Of the various agencies engaged in prawn farming extension, commendable work was done by the Krishi Vigyan Kendra, prawn farming section of MPEDA and BFFDA. Among the various media and methods employed for disseminating scientific prawn farming practices, farm and home visits was the most frequently used individual method. Lectures, film shows, group discussions, training programmes and demonstrations were the other important techniques employed for disseminating information to the prawn farmers. Besides the above a series of extension literature, including a few books, leaflets and pamphlets on this topic were also published.

Personal localite sources were the most extensively used source of information for awareness about scientific practices. This was followed by personal cosmopolite and mass media sources. This finding is in agreement with those of Bhatnagar (1978) and Subhadra (1979), but at variance with that of Champawat and Intodia (1970), Singh (1970) and Rogers and Shoemaker (1971). The same pattern of utilisation as in the awareness stage was observed in the adoption stage also. In the adoption stage, the reliance on personal localite sources had shown an increase, whereas the extent of utilisation of personal cosmopolite and mass media sources registered a decline. The increased reliance on personal localite sources at adoption stage may be due to the reason that for adopting the innovation farmers seeked more information about the consequences of adopting the innovation, which they received from the neer peers. This finding is in discordance with the findings of Champawat and Intodia (1970), Annamalai (1979),. Subhadra (1979), Bhaskaran and Praveena (1982)

Singh and Sahay (1982) and Subbareddy and Channagowda (1982) but in consonance with the findings of Mathur *et al*. (1974) and Velumani (1988).

Friends, relatives and neighbours were found to be the important personal localite sources at awareness and adoption stages. The fairly appreciable role of scientists, extension workers and training programmes among personal cosmopolite sources and newspapers and extension publications among mass media sources at awareness and adoption stages is worth mentioning.

In the present study it was observed that, inspite of the various efforts made by extension agencies, the extent of utilisation of personal cosmopolite sources decreased at adoption stage than at awareness stage. The decline in the utilisation of cosmopolite sources may be due to the low credibility attached to the personal cosmopolite and mass media sources by the farmers. The reasons for this trend has to be explored and delineated. Methods have to be adopted for enhancing the credibility of institutional sources among farmers, to ensure a better adoption level.

The mean awareness index of the prawn farmers for scientific practices was 64.00. Majority of the farmers were in the medium category based on awareness index. Only 14 per cent of the farmers possessed high level of awareness. Further it was found that over 75 per cent of the respondents contacted had awareness index above 50.

This relatively higher level of awareness is indicative of the role played by communication media in popularisation of the innovation. Traditional prawn farming is an age old practice in Kerala, but attempts to modernise the sector through scientific innovations were started only a decade back. Thereafter considerable work has been done by various extension agencies and Government Departments for the popularisation and wider adoption of the technology. The success of any extension effort depends on creating awareness among the farmers about the existence of the innovation and then leading through subsequent stages of innovation decision process.

Though the present level of awareness is high above the average, it remains unsatisfactory when compared to the efforts made by various State and Central

Government agencies for the transfer of technology. This suggest the need for a revaluation of the present extension techniques, and devising a sound extension strategy.

The computed mean adoption quotient of the prawn farmers was 24.42. More than three-fourth of the farmers were in the medium category with regard to the extent of adoption. Only six per cent of the farmers were found having adoption quotient above fifty.

The adoption level appears lower than what could be expected after a decades extension efforts. A larger section of the prawn farmers are still continuing the traditional methods of cultivation, which is far less productive and unscientific. In this context, it is of special mention that a sizable portion of the prawn farmers in the district had registered for scientific prawn farming and availed of technical, financial and input assistance from Government agencies. They formed twenty per cent of the sample selected for study. But distressingly, over eighty per cent of the farmers studied had adoption quotients less than thirty. None of the farmers had adoption quotient above eighty and only a marginal number had adoption quotient above fifty.

This very low level of adoption and the wide gap between the extent of awareness and extent of adoption points out the failure of the extension system in making the farmers adopt the innovation.

This warrants the need for a concerted effort by various agencies presently engaged in extension of scientific prawn farming technology. The agencies must jointly act in the delineation of bottle necks hindering the adoption of technology, which are discussed later in this chapter. A sound extension strategy has to be evolved through joint action, eliminating the pitfalls. As Krishna Srinath (1986) suggested, the confusion among the farmers about the right source of information has to be weeded out. The territory of operation of each agency has to be determined and proper liaison has to be established between the research and extension agencies for effective operation.

A cross sectional analysis of individual practices gives a further insight into the present situation and will provide valuable information about the problems to be tackled for getting a wider adoption.

The practice, 'strengthening of bunds and deepening of channels' is an improvement over the age old practice and all the farmers contacted were aware of this practice. Fifty per cent of them adopted the practice fully while the other half, except one per cent were partial adopters. The non-adopters and partial adopters expressed the reasons 'lack of knowledge', 'high cost of labour', and 'lack of right for modifications in the field'. This indicates that the level of adoption of this practice can be enhanced through teaching the farmer 'what and how' of the practice. Further it points to the need for initiation of decisions at policy level to increase lease period.

The practice of 'fixing or repairing of sluice gate' is an age old one, which was followed in traditional filtration. Not much improvements were made in this practice. The farmers through tradition and long experience had gained knowledge about the optimum size and position of sluice to be fixed for regulating the flow of water. All the farmers contacted were aware of this practice and a great majority of them adopted it fully. The partial adopters were three per cent and only one per cent of the farmers hadn't adopted the practice.

The important reasons expressed by non-adopters and partial adopters were 'high cost of sluice' and 'larger extent of farm'. Hence in this connection efforts has to be made for designing cheap and durable sluice gates.

'Draining and raking of the pond bottom' before the start of culture was heard by only a little over a quarter of the farmers. Majority, over ninety per cent were non-adopters of this practice. The low awareness and adoption of this practice raise the doubt that the extension agencies hadn't given due importance to the dissemination of this practice. However, this being most relevant, as noted by majority of the scientists contacted for composing the package, cann't be undermined. The most important reason indicated by non-adopters and partial adopters was 'lack of awareness'. This is supportive to the above argument. Other reasons found were 'lack of drainability of ponds' and 'non-adoption of other scientific practices'.

Only 56 per cent of the prawn farmers were aware of the practice pond drying. This practice is aimed at the destruction of unwanted organisms and for activating soil reactions. The full adopters of this practice were only nine per cent and partial adopters formed another four per cent. Non-adopters of the practice were over 75 per cent. The fact suggests that the farmers could not realise the importance of this practice. 'Lack of awareness', 'lack of drainability of ponds' and 'non-adoption of other scientific practices' were found to be the important reasons for non-adoption and partial adoption. A very high per cent of farmers indicating the reason 'lack of awareness' once again points out the failure of extension system.

Over three-fourth of the farmers were aware of the practice, 'removal of aquatic weeds'. While only fourteen per cent of the farmers adopted the practice to its full extent a great majority were partial adopters. Partial removal of aquatic weeds, mainly floating aquatic weeds was practiced from very early periods, even in the traditional system. Many of the farmers who are still following the traditional filtration practice opined that the submerged weeds especially the paddy stubbles will serve as an excellent food and shelter for the prawns. This argument cannot be over ruled, but in scientific farming, where higher stocking densities and better management techniques are employed, this is not permissible. The major reason expressed was they have not adopted the practice, 'selective stocking'. Other reasons were 'lack of knowledge' and 'lack of awareness'. The reaasons for non-adoption found and the low level of adoption suggest the necessity of more concentrated efforts to convince the farmers about the importance of this practice.

Almost all the farmers were aware of the practice, 'eradication of all existing fishes, crustaceans and other unwanted organisms'. But only about ten per cent of them adopted it fully. The partial adopters of this practice were eleven per cent. Unwanted organisms, if not completely eradicated from fish ponds will cause destruction of the stock by preying on or by competing with stocked prawns. The major reasons for non-adoption and partial adoption expressed were the 'non-adoption of the practice selective stocking' and 'lack of knowledge'. However the non-adoption of the said practice does not make this practice unimportant. Hence the result indicates that the farmers could not realise the importance of this practice. This necessitates the task of extension in convincing the farmers about the utility of adopting the practice.

Over sixty per cent of the respondents were aware of the practice, 'liming'. The partial adopters and full adopters of this practice comprised only 16 per cent of the sample selected for study. The practice, liming of ponds before introduction of prawn seeds, aims at neutralising the acidity of soil and water. In addition, it serves the role of destruction of parasites and pathogens to a great extent. Kerala soils being acidic in most of the places, necessitate the application of lime as a precaution and for correcting the pH of water. The important reasons for non-adoption and partial adoption observed were 'lack of awareness' and 'lack of knowledge'. Over 10 per cent of the farmers opined that the 'non-adoption was due to the non-adoption of the practice, selective stocking'. Unlike many other scientific practices in prawn farming adoption of this practice does not incur much of a financial burden over the farmers. Hence proper education of the farmers would have created a better adoption level. This suggests that the future strategies must provide sufficiently for educating the farmers.

In semi-intensive prawn farming which is being popularised in the country, the application of organic fertilizers is recommended for improving the nutritional status of pond. This practice was known to over eighty per cent of the farmers contacted. Only one per cent of the farmers adopted the practice fully while 29 per cent adopted partially. Probably the low level of adoption of this practice may be the reason for the declining productivity from prawn fields year after year as reported by Sathiadas _et al_.(1987). The most important reasons for non-adoption and partial adoption were 'lack of knowledge' and 'lack of awareness'. Some farmers also indicated the reason'non-adoption of the practice, selective stocking'. Once again, the reasons for non-adoption observed are indicative of the failure of extension system in proper transfer of information to the farmers. Hence future programmes should concentrate in educating the farmers about all the practices in scientific prawn farming.

The practice, 'stocking the ponds with selected prawn seeds' is considered as the most important step towards scientific prawn farming. The farmers viewed that the adoption of most of the other practices of scientific farming is complementary to the adoption of this practice. Hence they registered the non-adoption of this practice as the reason for not adopting other scientific practices. The practice was known to all farmers but over fifty per cent of the farmers were non-adopters. Only ten per cent of them adopted correct stocking densities.

Interestingly, the most cited reason for non-adoption of the practice was 'lack of conviction about the relative advantage of the practice'. Yet another group comprising of about 10 per cent of the respondents expressed the reason, 'failure in previous attempts'. This situation, that a sizable segment of the population expressing lack of conviction and another group disenchantment has to be viewed very seriously. This warrants an immediate reconsideration of the technology and analysing the package presently communicated to the farmers to identify the loop holes if any and to make necessary corrections. The technology if only presented fool proof and the farmers are convinced of its relative advantage a higher level of adoption can be ensured. Other reasons expressed were 'lack of availability of quality seeds', 'lack of ownership of land', 'high cost of seeds', 'lack of knowledge', 'pollution', 'poaching' and 'short period of licence'. In this regard the extension agencies should initiate necessary steps to ensure timely supply of quality prawn seeds. In addition action must be initiated for extending the period of lease, preventing pollution etc.

Only about a quarter of the prawn farmers studied had knowledge about the existence of the practice,'acclimation of seeds'. Adoption of this pratice was dependent on the adoption of the practice, 'stocking the pond with selected prawn seeds'. Hence this practice was applicable only to forty four per cent of the farmers who has adopted selective stocking. Among them only about twenty per cent adopted it to fuller extent, another nine per cent adopted partially. The non-adoption of this practice may result in heavy mortalities to the stocked prawn seeds. This practice being complementary to the previous practice, those who adopt the former practice must adopt this practice too, for getting fuller advantage. The important reasons for non-adoption and partial adoption of the practice were 'lack of awareness' and 'lack of knowledge'. This indicates that the extension agencies could not bring about a desirable change in the behaviour of farmers.

More than three-fourth of the farmers contacted were aware of the practice nursery rearing of seeds. Like the previous practice this was applicable only to 44 per cent of the farmers who adopted the practice 'selective stocking'. Among them about one-third of the farmers adopted the practice fully and another one-third adopted partially. As in the case of previous practice, this is also complementary to the practice of stocking the ponds with selected prawn seeds. The non-adoption of this practice may result in heavy mortality of the stocked seeds. Here also the important reasons for non-adoption and partial adoption were 'lack of knowledge' and 'lack of awareness', which suggest the need of concerted efforts by the agencies to make the farmers aware and knowledgeable.

In semi-intensive farming good production can be ensured only if sufficient feed is given to supplement the natural food available in the pond. Almost all the farmers were aware of the practice supplementary feeding based on biomass. Only a few farmers adopted the practice fully. Over 50 per cent applied supplementary feeds to some extent, but not according to the requirement. Though it was found that about ten per cent of the prawn farmers contacted applied correct stocking densities yet only a few of them adopted correct feeding practices. Hence a good production cannot be expected from such farms. The most important reason for non-adoption and partial adoption found was 'lack of knowledge'. One-fourth of the farmers expressed the reason that they had not stocked the ponds with selected prawn seeds. Other reasons were 'high cost' and 'lack of availability of prawn feeds'. The reasons for non-adoption and partial adoption clearly indicate that the farmers could not realise the importance of supplementary feeding and further more, supplementary feed was unavailable and costly. This situation points out the need for creating learning experience to the farmers and also the extension and developmental agencies should make available compounded feed at lower cost for enhancing adoption level of this practice.

The practice, 'maintaining dissolved oxygen level in the pond' was less popular among the prawn farmers. All the farmers except one per cent of the farmers who adopted the practice partially, were non adopters of this practice. In semi-intensive prawn farming, resorting to artificial means of aeration is not recommended. Still the importance of maintaining dissolved oxygen level cannot be undermined. At times of stress due to depletion of oxygen, corrective measures have to be taken for preventing mortalities. The important reasons for non-adoption found were 'lack of awareness' and 'non-adoption of other scientific practices'. The reasons for non-adoption observed stress the need for educating the farmers about the importance of maintaining the dissolved oxygen level in the pond.

The practice of 'monitoring and control of pH' was not much popular among the prawn farmers. Over 80 per cent of the farmers were unaware of such a practice. The level of adoption was too low with only one per cent of the farmers adopting the practice fully and another one per cent adopting partially. In prawn farming monitoring and control of pH is very important as there is possibility of sudden changes in pH which can lead to heavy mortalities. The most important reasons for non-adoption and partial adoption were 'lack of awareness' and 'lack of knowledge'. This is indicative of the failure of the technology transfer system. Hence, the future strategies must concentrate in creating awareness and knowledge of the practice for getting a wider adoption.

Over three-fourth of the farmers were unaware of the practice, 'control of algal blooms'. Only a few farmers adopted the practice either to the fuller extent or to some extent. The algal blooms which may develop in the ponds cause oxygen depletion and become a threat to the fauna. Hence it is important to prevent the outbreak of blooms in culture ponds. Major reasons for non-adoption and partial adoption observed were 'lack of awareness' and 'lack of knowledge'. This once again reiterates the necessity of educating the farmers about the importance and utility of the practice.

Almost all the farmers contacted were aware of the practice 'need based water exchange', but none of the farmers adopted the practice fully. Ninety nine per cent of the farmers were partial adopters of this practice. This high partial adoption is mainly because that majority of the farmers resorted to prawn filtration, where prawn seeds are allowed to enter the field with tidal water. In scientific farming water exchange is made to oxygenate water, and to improve the nutritional status of pond. Exploring the reasons for non adoption and partial adoption, it was found that majority of the farmers could not find out any reason for not fully adopting the practice. Others expressed the reasons, 'lack of pumping facilities', 'non-adoption of the practice, selective stocking' and 'lack of knowledge'. Scientists are of the view that in Kerala conditions, as the tidal amplitude is less than what is required, a high production can be ensured only if good water exchange facilities are made. Pumping facilities becomes a must in conditions where the tidal range is low and good stocking densities are employed. This suggests the need for properly educating the farmers through extension teaching so as to obtain a higher level of adoption.

Among the various scientific practices selected for study, the practice of 'need based control of disease and parasites' was found to be the least popular among the farmers. Only slightly more than 10 per cent of the farmers were aware of this practice. Adoption of this practice was also the poorest among the scientific practices. Only one per cent of the farmers were found adopting it to a certain extent. Disease out-breaks resulting in mass mortalities were not uncommon in prawn farming. Many a time crop failure due to disease outbreaks had been reported from Cochin areas. Though with the present level of technology, treatment of disease is hardly possible, yet precautionary measures can be taken to prevent onset of diseases and attack of parasites. The very low level of awareness and adoption points out the failure of the extension system in the promotion of this practice. The reasons for non-adoption and partial adoption of this practice were found to be the 'lack of awareness' and 'lack of knowledge'. Hence efforts have to be made for a proper transfer of information to the farmers for bettering the level of adoption.

The practice of 'periodic assessment of growth and biomass' is aimed at assessing the success of culture operations and taking remedial action, if the expected results are not on the way. Over fifty per cent of the farmers were aware of this practice, but only nine per cent of the farmers adopted it. Among the adopters majority were partial adopters. The important reason attributed to the low level of adoption was 'non-adoption of the practice selective sstocking'. Other important reasons were 'lack of awareness' and 'lack of knowledge'. The reasons for non-adoption suggest the need of further efforts to enhance the adoption level.

Economising the production is highly important in any farming operations. The prawns must be harvested when they reach the most economic size ie. when it reaches the stage where additional input does not give an equal increase in growth. Nearly three-fourth of the prawn farmers contacted were aware of this practice, but only about 11 per cent of the farmers were found adopting the practice and among them two per cent were partial adopters. The important reasons for non-adoption and partial adoption were the 'non-adoption of the practice selective stocking' and 'lack of awareness'. Hence attempts have to be made to create awareness to the farmers.

The study revealed that out of the 24 characteristics of prawn farmers studied, comprising eight socio-economic , seven situational, six socio-psychological and three communication variables, only nine had a significant influence on adoption behaviour. The characteristics, which had significant influence were, training participation, land possession, Institutional credit utilisation, area under selective stocking, number of crops raised, extent of awareness of scientific practices in prawn farming, rationality in decision making, utilisation of personal cosmopolite sources and utilisation of mass media sources. The inter correlation analysis of these nine variables revealed that none of them were independent of each other. Further their dependence was established by path analysis. Multiple regression model fitted with the above variables revealed that these variables together accounted for 86.82 per cent of variations in extent of adoption. The regression coefficients of only three variables viz., area under selective stocking, utilisation of personal cosmopolite sources and utilisation of mass media sources proved significant. The step-wise regression analysis done to select the best subset of variables brought out that the variable, utilisation of personal cosmopolite sources was the most important contributor to the adoption behaviour. This alone explained 77.43 per cent of variations in adoption. The second important variable was the utilisation of mass media sources, which along with the variable utilisation of personal cosmopolite sources explained 83.75 per cent of variations in the dependent variable. The situational variable, area under selective stocking stood third based on its degree of influence upon adoption behaviour. This variable together with the previous variables explained 86.48 per cent of variations in adoption. The analysis therefore revealed consistently the vital role of these three variables in influencing adoption behaviour.

Of the significant attributes influencing adoption behaviour of prawn farmers, utilisation of personal cosmopolite sources demonstrated the highest degree of influence on adoption behaviour. This had a very highly significant and positive influence on adoption behaviour. This finding agrees well with those of Sharma and Nair (1974), Haque and Ray (1983), Balasubramaniam and Kaul (1984, 1985) Ratinasabapathi(1987), Krishnamoorthy (1988) and Subhashchandra (1988), but does not agree with the finding of Venkataprabhu (1988).

This variable had a direct influence of the order of 0.814. Though this variable was significantly related with all other variables tested for interdependence except the variable land possession, it did not show much of an indiret influence through other variables on adoption behaviour.

This finding points out the potential of personal cosmopolite sources like scientists and extension workers in motivating farmers to adopt the innovation. Though it was observed that the farmers themselves did not show any inclination for the use of technically competent sources at adoption stage, perhaps due to the conflicting messages about the success of innovation and other problems thereof, this variable proved to be the most important predictor of adoption behaviour. Hence, while formulating the future strategies for transfer of technology sufficient room must be provided for the use of perrsonal cosmopolite source for obtaining better results.

Though the variable, utilisation of mass media sources had no highly significant association with extent of adoption. The step-wise regression analysis revealed this as the second important variable influencing adoption behaviour. This had a direct influence of the order of 0.175 on the extent of adoption. Maximum substantial indirect influence was through the variable, area under selective stocking. This finding of positive significant association between utilisation of mass media sources and extent of adoption is in line with the findings of Singh and Singh (1970), Sharma and Nair (1974), Manivannan (1980), Ray and Haque (1980), Sohi and Kherdo (1980), Thiagarajan (1981) and Das et al. (1988) but in discordance with the findings of Choukidar and George (1972), Nanjaiyan (1985), Ratinasabapati (1987) and Krishnamoorthy (1988) reporting a non-significant association.

In spite of the fact that the mass media sources were utilised by prawn farmers to a very limited extent, it exerted a strong influence on the adoption behaviour of farmers. Its indirect influence through the variable area under selective stocking suggests that those farmers who had put some or whole of the farm under selective stocking must be provided with sufficient exposure to mass sources. They must be trained in scientific prawn farming and supplied with extension literature sufficiently so as to ensure better adoption of scientific practices.

Only twenty per cent of the farmers possessed area under selective farming. This variable was found having highly significant association with the adoption of scientific practices. It had a direct influence of the order of 0.168 and showed an indirect influence of 0.330

through utilisation of personal cosmopolite sources. This was found to be the third important variable in predicting adoption behaviour as revealed by step-wise regression analysis. Further the adoption of the practice selective stocking emerged as the key step towards scientific prawn farming, which influenced the adoption of most of the other scientific practices. Prawn farmers often cited the reason, non-adoption of the practice of selective stocking as the reason for not following other scientific practices. This points out the decisive role of this variable in determining the adoption behaviour of farmers. The relatively high indirect influence of this variable through utilisation of personal cosmopolite sources and the highly significant inter-correlation between these two suggest that the adoption level of the farmers, who have put some or whole of the farm under selective stocking can be sufficiently enhanced if they are provided with adequate information through personal cosmopolite sources.

Eventhough only a little more than 10 per cent of the prawn farmers received formal training in scientific prawn farming, training participation showed a highly significant association with adoption behaviour. This may be due to the reason that the training could bring about a better understanding and knowledge to the farmers about the use of innovation and a desire on the part of the farmer to increase production through adoption of the innovation. The studies conducted by Pimprikal _et al_. (1974), Muthia _et al_. (1978), Thangaraju (1979) and Joshy and Thorat (1984) also reported a significant association between training and adoption behaviour. The findings of Sanjeev (1987), Sudha (1987) and Das _et al_. (1988) also confirmed this result.

However, the multiple regression model fitted showed a non-significannt 'b' coefficient for this variable. Training participation had significant association with almost all the variables studied. The direct influence of this variable on adoption was found to be only 0.008, while it had substantial indirect influence through the variables utilisation of personal cosmopolite sources, area under selective stocking and utilisation of mass media sources. This illustrates that the farmers who participate in training programmes tend to seek more information through personal cosmopolite as well as mass media sources, which result in a higher adoption level.

As the technology of aquaculture is changing so fast training of the farmers is of atmost importance to keep them abreast with the latest technology. Though over 250 training programmes were conducted in prawn farming in the district, only a little above 10 per cent of the farmers participated in training programmes. This has to be considered seriously. This state of affairs point out that the extension agencies could not successfully identify the potential farmers to participate in the training programmes. Hence proper attention should be given in the selection of beneficiaries to the training programmes as to ensure that only potential farmers are selected for training programmes. To make the training effective, as Sanders (1967) emphasised, 'the training must go to the farmers they are, it must be directed specifically to farmers' present interests and needs, it must be fitted into times when farmers are not too busy and must be accompanied by immediate opportunities for farmers to try the new things they have learnt'.

Only a little over two third of the prawn farmers had their own farms to cultivate, while the remaining one third were leasee farmers. The variable, land possession showed positive and significant influence on extent of adoption. This may be due to the fact that, adoption of scientific prawn farming technology involves some permanent modifications in the field, which require additional investment and hence may be readily adopted by a land owner than a leasee farmer. This result of positive significant relationship between adoption behaviour and land possession agreed with the findings of Singh and Ray (1985), while it disagreed with the findings of Viju (1985). The regression analysis did not yield a significant 'b' coefficient for this variable. However the role of this variable in predicting the adoption behviour cannot be undermined. The direct influence of this variable was of the order of 0.038 and substantial indirect influence was channelled mainly through the variables, utilisation of personal cosmopolite sources, area under selective stocking, and utilisation of mass media sources.

Hence for obtaining a better adoption of scientific practices in prawn farming the farmers having their own land have to be concentrated and they must be provided with sufficient information through personal cosmopolite sources and mass media sources.

It was found that among the prawn farmers only 38 per cent availed financial assistance from institutional sources. However, institutional credit utilisation was found having a highly significant positive association with the extent of adoption. This positive significant association between credit utilisation and extent of adoption may be due to the reason that the credit institutions offered credit mainly for scientific farming. This observation is in consonance with the findings of Singh and Ray (1985), Jayaramiah (1987), and Rasheed Sulaiman (1989) who reported a positive significant association between credit utilisation and adoption behaviour.

However, the 'b' coefficient of this variable obtained in the multiple regression analysis was found non-significant. Path analysis revealed that this variable had a direct effect of the order of 0.016 on adoption behaviour. The indirect influence was practically channelled through all the other variables. Of these, the utilisation of personal cosmopolite sources, area under selective stocking, utilisation of mass media sources and land possession were important.

This finding reveals that, the farmers who have availed credit facilities are more oriented towards the adoption of scientific practices and hence they must be provided with competent information through personal cosmopolite and mass media sources.

Only less than a quarter of the farmers were found raising more than a single crop of prawn. The correlation analysis revealed that this variable had a positive and highly significant influence on the adoption behaviour of the farmers. This may be due to the reason that in scientific prawn farming the culture period is short when compared to traditional method. But the linear multiple regression model fitted showed an insignificant 'b' coefficient for this variable. The direct influence of this variable on extent of adoption was of the order of 0.051. Maximum substantial indirect influence was through utilisation of personal cosmopolite sources followed by area under selective stocking and utilisation of mass media sources. This finding highlights the significance of the variable utilisation of personal cosmopolite sources in the prediction of adoption behaviour. The finding suggests that the farmers must be motivated to rear more than one crop with selected prawn seeds, which could yield higher economic returns. The influence of personal cosmopolite and mass media sources could be exploited for this purpose.

As discussed earlier the prawn farmers had a high level of awareness about scientific practices in prawn farming. The awareness showed a positive and highly significant association on the adoption behaviour. This variable was found influenced by almost all the other variables. Interestingly, multiple regression model fitted showed a negative 'b' coefficient, which suggested that the farmers who were more aware of the scientific practices in prawn farming were more reluctant to adopt the practices. This may be due to the uncertainty in the technology or the influence of the conflicting messages about the relative advantage of the technology. The path analysis further illustrates this trend. This variable yielded a direct effect of -0.015 on the dependent variable. However the substantial indirect influences were positive and were channelled mainly through the variables utilisation of personal cosmopolite sources, area under selective stocking and the number of crops raised.

The findings suggest that the farmers must be approached with competent and credible sources of information for making them adopt the innovation. Creating awareness alone is not enough. Further they have to be supplied with convincing evidences which could prove the relative advantage of the technology.

The prawn farmers had a relatively higher level of rationality and based on rationality, majority of the farmers were in the medium category. Rationality in decision making showed a positive and highly significant association with adoption behaviour. This finding is in general agreement with the results of Singh and Singh (1982), but disagreed with the findings of Sawant and Thorat (1977), Nanjaiyan (1985) and Syamala (1988).

The multiple regression analysis revealed a non significant but negative 'b' coefficient for this variable. This finding was further strengthened by the results of path analysis which revealed a negative direct influence of this variable on adoption behaviour. However, it showed positive substantial indirect influence through utilisation of personal cosmopolite sources, area under selective stocking and number of crops raised. This negative direct influence may be due to the lack of conviction about the relative advantage of the technology and the uncertainty about the expected outcomes of the technology.

This illustrates that prawn farmers, unless provided with messages through personal cosmopolite sources and are motivated to adopt the practice of selective stocking the rationality will have a negative influence on their adoption behaviour. This once again reiterates the paramount importance of personal cosmopolite sources in influencing the extent of adoption of scientific practices in prawn farming.

Majority of the farmers were in the medium category based on age (31 years to 57 years). Age of the prawn farmers was found having no influence on their adoption behaviour. This finding was in consonance with the findings of Chandrakandan and Subramaniam (1975), Bhaskaran (1978), Subhadra (1979), Ogunfiditimi (1981), Chakravarthy (1982), Haque and Ray (1983), Ratinasabapathi (1987), Ramkumar (1987), Krishnamoorthy (1988), Subhashchandra (1988) and Venkataprabhu (1988), but disagreed with the results of Sundaraswamy and Doraiswamy (1975), Prakash (1980), Satwant and Surinder

(1986), who reported a positive association and with those of Oliver *et al.* (1975), Manivannan (1980), Prasannan (1987), Das *et al.* (1988) and Rasheed Sulaiman (1989) reporting negative relationship.

All the prawn farmers were literates having formal education at or above primary level. Education showed a positive influence on the adoption behaviour. But the correlation coefficient proved non-significant. This may be due to that all the farmers having undergone formal education were capable of understanding and perceiving scientific prawn farming practices. This finding suggests that, since all the farmers were literates, the print media can be extensively used for effective dissemination of scientific prawn farming practices. The result was in agreement with the findings of Bhaskaran (1978), Subhadra (1979), Balasubramaniam and Kaul (1982), Chakravarthy (1982), Haque and Ray (1983), Ramkumar (1987), Ratinasabapathi (1987) and Subashchandra (1988). But the findings of Singh and Singh (1970), Choukidar and George (1972), Ziaul Karim and Mahaboob (1974), Oliver *et al.* (1975), Pillai (1978), Rajendran (1978), Manivannan (1980), Sohi and Kherdo (1980), Ogunfiditimi (1981), Haraprasad (1982), Vijayakumar (1983), Viju (1985), Satwant and Surinder (1986), Prasannan (1987), Das *et al.* (1988), Krishnamoorthy (1988) and Rasheed Sulaiman (1989) did not hold good with the result of the study.

The prawn farmers were having a good deal of experience in farming operations, and based on experience majority were in the medium category. The correlation analysis revealed that experience had no significant influence on the adoption behaviour of prawn farmers. This trend may be due to the fact that all the farmers had a good deal of experience in farming, hence it did not act as a differentiating factor. This finding agreed well with the results obtained by Rajendran (1978), Subhadra (1979), Balasubramaniam and Kaul (1982), Ratinasabapati (1987), Krishnamoorthy (1988) and Subhaschandra (1988), but disapproved the conclusions drawn by Nanjaiyan (1985) and Das *et al.* (1988).

Majority of the prawn farmers took prawn farming as their major occupation, but this variable did not prove any significant influence on extent of adoption. The finding is well supported by the works of Balasubramaniam and Kaul (1982), Ratinasabapathy (1987), Krishnamoorthy (1988), Subashchandra (1988) and Venkataprabhu (1988), which revealed that no significant association existed between occupation and adoption behaviour of farmers. But this result was in discordance with the findings of Tyagi and Sohal (1984) and Singh et al. (1985). In the present study the lack of any association between the extent of adoption and occupation may be due to the lack of conviction about the relative advantage of the technology among the farmers.

The average gross income per hectare per crop of the prawn farmers was found at about Rs 11,600/- and based on income majority of the farmers were in the medium category. Correlation analysis revealed that this was not a determinent variable of adoption behaviour. This finding points out that the adoption of scientific practices in prawn farming could not bring about much of an economic advantage to the farmers. This may be due to the partial adoption of the practice or faulty implementation of the technology. Subhadra (1979), Balasubramaniam and Kaul (1982), Ramkumar (1987) and Subashchandra (1988) revealed that income had no significant influence on adoption behaviour. The present findings also agree well with it. But this finding did not agree with the findings of Oliver et al. (1975), Chandrakandan and Subramanian (1975), Pillai (1978), Vijayakumar (1983), Balasubramaniam and Kaul (1985), Satwant and Surinder (1986) and Rasheed Sulaiman (1989).

The mean extent of area operated by prawn farmers was over six ha. But majority of the farmers had operational area less than the mean. This high mean value is due to the presence of a few very large farms in the sample selected for study. Interestingly, this variable had a negative but non-significant influence on extent of adoption. In this context, it is important to mention that the possession of the land emerged as an important predictor of adoption behaviour rather than the extent of area. This finding was in consonance with the results of Bhaskaran (1978), Subhadra (1979), Ratinasabapathi (1987), Krishnamoorthy (1988) and Subhaschandra (1988), who reported the existence of a non-significant association between the extent of farm and adoption behaviour. But the above result contradicted the findings of Sharma and Nair (1974), Chandrakandan and Subramanian (1975), Oliver *et al*. (1975), Rajendran (1978), Ziaul Karim and Mahaboob (1974), Manivannan (1980), Prakash (1980), Ogunfiditimi (1981), Sushama *et al*. (1981), Das *et al*. (1988) and Rasheed Sulaiman (1989).

About two-thirds of the farms studied were found having relatively high levels of salinity. This would help the farmers to raise at least two crops of prawn a year. However, only less than one-third of the farmers were found raising more than one crop of prawn per annum. This is due to the fact that majority of the farmers opted traditional filtration practice, with some improvements in management.

The average distance of farms from bar mouth was less than 15 kilometers, which permitted a reasonably good tidal amplitude in the farm.

The average depth of water at low tide was found less than 50 centimetres and average depth at high tide was about 115 centimeters. This low tide depth is very low when compared to the recommended average depth of 90 cm. . Majority of the farmers kept the depth of water column so low, since great majority of them resorted to prawn filtration.

These situational variables did not show any significant influence on adoption behaviour. This might be due to the poor knowledge and lack of conviction of the scientific practices in prawn farming so that the farmers could not utilise the actual potential available at their disposal.

The prawn farmers had very high scientific orientation, but this attribute could not register any significant influence on their adoption behaviour. Similar results were also reported by Thiagarajan (1981), Chakravarthy (1982), Prasannan (1987) and Venkataprabhu (1988). But this result was in discordance with the findings of Manivannan (1980), Kamarudeen (1981), Nanjaiyan (1985), Ramkumar (1987), Ratinasabapati (1987), Krishnamoorthy (1988), Subhash Chandra (1988) and Rasheed Sulaiman (1989).

All the prawn farmers were rated very high based on their risk preference scores. Singh and Singh (1970), Sharma and Nair (1974), Rajendran (1978), Kamarudeen (1981), Balasubramaniam and Kaul (1984), Nanjaiyan (1985), Viju (1985), Ramkumar (1987), Ratinasabapathi (1987) and Krishnamoorthy (1988) noted that a positive and significant association existed between risk preference and adoption behaviour. In contradiction to the above results, in this study it was found that the risk preference of prawn farmers had no significant contribution to the extent of adoption of scientific practices. This result agreed well with the findings of Prasannan (1987).

Majority of the prawn farmers had high level of economic motivation, but the correlation analysis revealed that this variable did not have any significant influence on the adoption behaviour. This finding agreed well with those of Sohi and Kherdo (1980), Thiagarajan (1981), Chakravarthy (1982), Prasannan (1987) and Ponnappan (1988). But this result opposed the observations of Sharma and Nair (1974), Rajendran (1978), Manivannan (1980), Haque and Ray (1983), Tyagi and Sohal (1984), Ratinasabapathi (1987) and Krishnamoorthy (1988), who revealed a positive significant association between economic motivation and adoption behaviour.

Though the majority of the prawn farmers contacted had relatively high levels of marketing orientation, this could not show any remarkable influence on their adoption behaviour. This result was in general agreement with the results of Singh and Ray (1985) whereas in discordance with the findings of Singh and Singh (1970).

The observation that out of the six socio-psychological variables selected for study four of them viz. scientific orientation, risk preference, economic motivation and marketing orientation could not register any significant influence on adoption behaviour is worth mentioning. This may be due to the fact that, as majority of the farmers rated high based on these variables, a differentiation based on these variables could not be sorted out.

The personal localite sources were the most widely and frequently consulted media by majority of the farmers at awareness and adoption stages. Interestingly, this variable showed a negative relationship with the adoption behaviour. But the correlation coefficient proved non-significant. This non-significant influence of the personal localite sources on adoption behaviour may be due to the lack of conviction of the farmers about the relative advantage of the technology. This non-significant association of the variables with adoption behaviour is supported by the findings of Das et al.(1988); but against the finding of Sharma and Nair (1974) who reported a positive significant relationship between the variable and adoption behaviour, and that the land for a period of six months or a year will not prefer to go for a high investment. This warrants the need for amendments in the leasing policies and land utilisation rules. In this regard it is essential to raise the period of lease from six months to a still longer period. But while considering an action for enhancing the lease period the major hindrance will be the government regulations regarding the utilisation of agricultural lands.

Presently prawn farming is largely carried out in the pokkali lands during summer months. The government regulations prevent converting agricultural lands for any purpose other than agriculture. Strong protest is also being raised by agricultural labourers against converting paddy fields into prawn farms. But the pokkali cultivation has been proved as uneconomic in most of the areas. In such areas adoption of scientific prawn/fish farming is the best alternative for optimising the production. Hence amendments have to be made in the present land utilisation regulations which are highly detrimental to the development of aquaculture. The areas where more than one crop of prawn could be cultivated have to be identified and exempted from the cover of this regulation. The argument of agricultural labourers that of Singh and Singh (1970) who observed a negative and highly significant association between the utilisation of personal localite sources and adoption behaviour.

A summary of the results of the present study suggests the need of a planned perspective and concerted attempt to make a breakthrough in the adoption of scientific prawn farming.

While discussing the diffusion and adoption of scientific prawn farming technology, the fruitfulness of the technology also warrant mention. Intensive prawn farming, though well developed in the South East Asian and Oriental countries, is still in the juvenile stage of development in India. Desired results could be achieved only if the technology is made fool proof and diffused through competent channels to reach the farmers.

In this study it was observed that, the farmers lacked conviction about the relative advantage of the practice of stocking the ponds with selected prawn seeds.

Disenchantment resulting from failure in past attempts also emerged as an important reason for non-adoption of the practice, 'stocking the ponds with selected prawn seeds'. The prawn farmers viewed the adoption of this practice as synonymous to adopting scientific prawn farming. They believed that all other practices were contingent to this. Of course, the lack of conviction and disenchantment can also be resulted due to lack of adequate knowledge. In this context, it is to be remembered that great many of the farmers who had higher adoption levels operated their farms under close supervision and technical assistance of government agencies. This raises the doubt that, was the technology presented as a fool proof package to the farmers and presented in such a way to escape from any faulty implementation which could result in disenchantment.

Prawn farming being a developing field in Kerala, and the farming conditions varying greatly from field to field, a universal package could not serve the purpose. What is good in one field need not necessarily be good in other fields. Hence the technology has to be evolved, which could permit for the variations from field to field and recommendations have to be made for their application in different agro-climatic conditions.

Hence in the popularisation of scientific prawn farming, the first and foremost step is to ensure the viability of the technology for the given agro-climatic conditions. The technology, which is being developed and standardised at research stations need to be tested for viability through adaptive trials in farmers holdings. Only this could serve in convincing the farmers and help in identifying the appropriateness of the area for prawn farming. This will contribute to the remedial measures which have to be chalked out to harvest best results.

The scientifically proven technology has to be made in the form of a usable package understandable to the farmers and diffused through competent and credible channels. In the diffusion of the technology all the practices must be rightly emphasised since, non-adoption or partial adoption of one or few of the practices of the package may result in total failure of the crop.

The prawn farmers who operate their own farms were found better adopters of the technology. Hence in diffusing the technology farmers having possession of the farms have to be concentrated. But all the farmers who own the farms adopting the technology alone will not suffice to hit the target, since a sizeable segment of the prawn farmers are leasee farmers. As scientific prawn farming is a capital intensive programme and require sufficient modifications in the field, a leasee who hires the land for a period of six months or a year will not prefer to go for a high investment. This warrants the need for amendments in the leasing policies and land utilisation rules. In this regard it is essential to raise the period of lease from six months to a still longer period. But while considering an action for enhancing the lease period the major hindrance will be the government regulations regarding the utilisation of agricultural lands.

Presently prawn farming is largely carried out in the pokkali lands during summer months. The government regulations prevent converting agricultural lands for any purpose other than agriculture. Strong protest is also being raised by agricultural labourers against converting paddy fields into prawn farms. But the pokkali cultivation has been proved as uneconomic in most of the areas. In such areas adoption of scientific prawn/fish farming is the best alternative for optimising the production. Hence amendments have to be made in the present land utilisation regulations which are highly detrimental to the development of aquaculture. The areas where more than one crop of prawn could be cultivated have to be identified and exempted from the cover of this regulation. The argument of agricultural labourers that the man days will be lost if scientific farming is introduced is baseless. If properly developed it could provide an equal or higher number of mandays. Further, this problem could be tackled by setting up farms in co-operative ownership and leasing out public water bodies to the co-operative units of landless labourers.

A sudden leap from the traditional to fully scientific farming is not practicable as the practice is capital intensive and highly technology oriented. In the first stage the farmers have to be motivated to conduct trials in their holdings, so that they will get experience and conviction about the relative advantage of the technology. In all operations active extension support must be provided through a well planned approach. Instead of diffusing general messages, advices to the farmers are to be given only after conducting sufficient study on the needs and requirements of farmers holding. For the implementation of programmes, only competent personnel selected and properly trained should be employed. For this trainers and extension workers of all organisations must be given rigorous training in various aspects of scientific prawn farming and extension teaching. The trainers training centres must keep immediate liaison with the research stations and development organisations for enabling a speedy transfer of information.

As Krishna Srinath (1986) emphasised the confusion among the farmers about the right source of information also need to be weeded out. For this various agencies engaged in prawn farming extension must work joint hand and their territory of operation must be well defined to prevent duplication of effort and confusion among farmers.

For getting a good start, in the first phase, the potential farmers having a favourable attitude towards prawn farming are to be concentrated. These selected farmers must be given all organisational support. As scientific prawn farming is highly technology oriented, training programmes in this practice are imperative. The training programmes have to be organised at selected centres convenient to the farmers and they are to be motivated to attend the training.

A free flow of credit also need to be ensured in this sector for bettering the level of adoption.

Above all service units, with essential laboratory facilities are to be established at selected centres. The concept of inland fisheries societies has to be brought into existence at the earliest. As the utilisation of personal cosmopolite sources have a strong influence on adoption behaviour, the role of service personnel is of paramount importance. The extension personnel at field level units must assist the farmers in all the farming operations. The mass media channels also need to be explored for promoting the level of adoption. Relevant informations and supporting messages are to be communicated through the various communication channels so as to reinforce the adoption.

The problems faced by the farmers have to be identified by the field level extension workers and immediately supplied to the research stations and the solutions formulated are communicated to the farmers without much delay.

Emperical model evolved from the study is presented in fig.12. Also a model for transfer of technology in prawn farming based on the findings of the present study is presented in fig.13.

FIG.12 EMPIRICAL MODEL OF THE STUDY

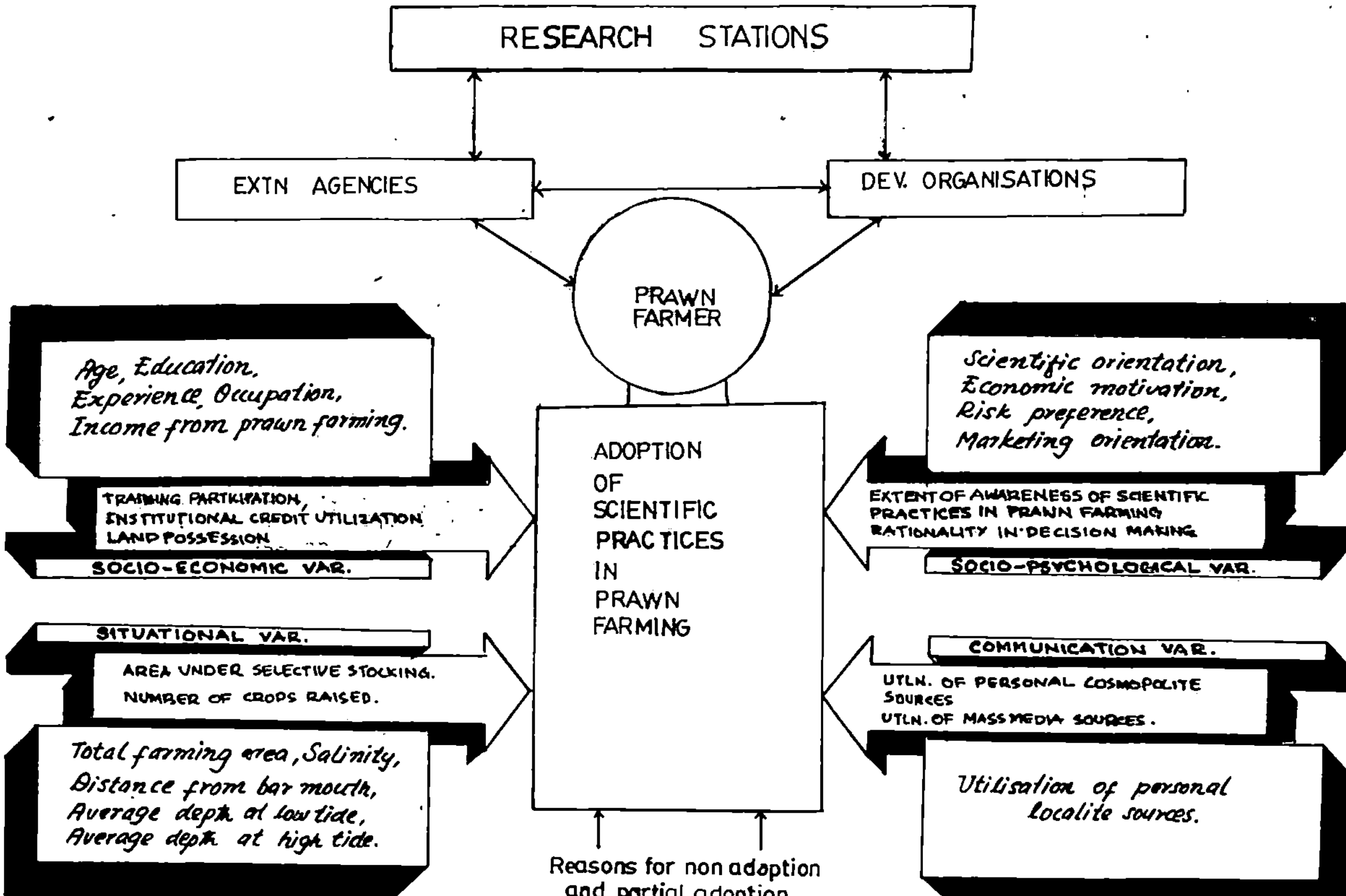
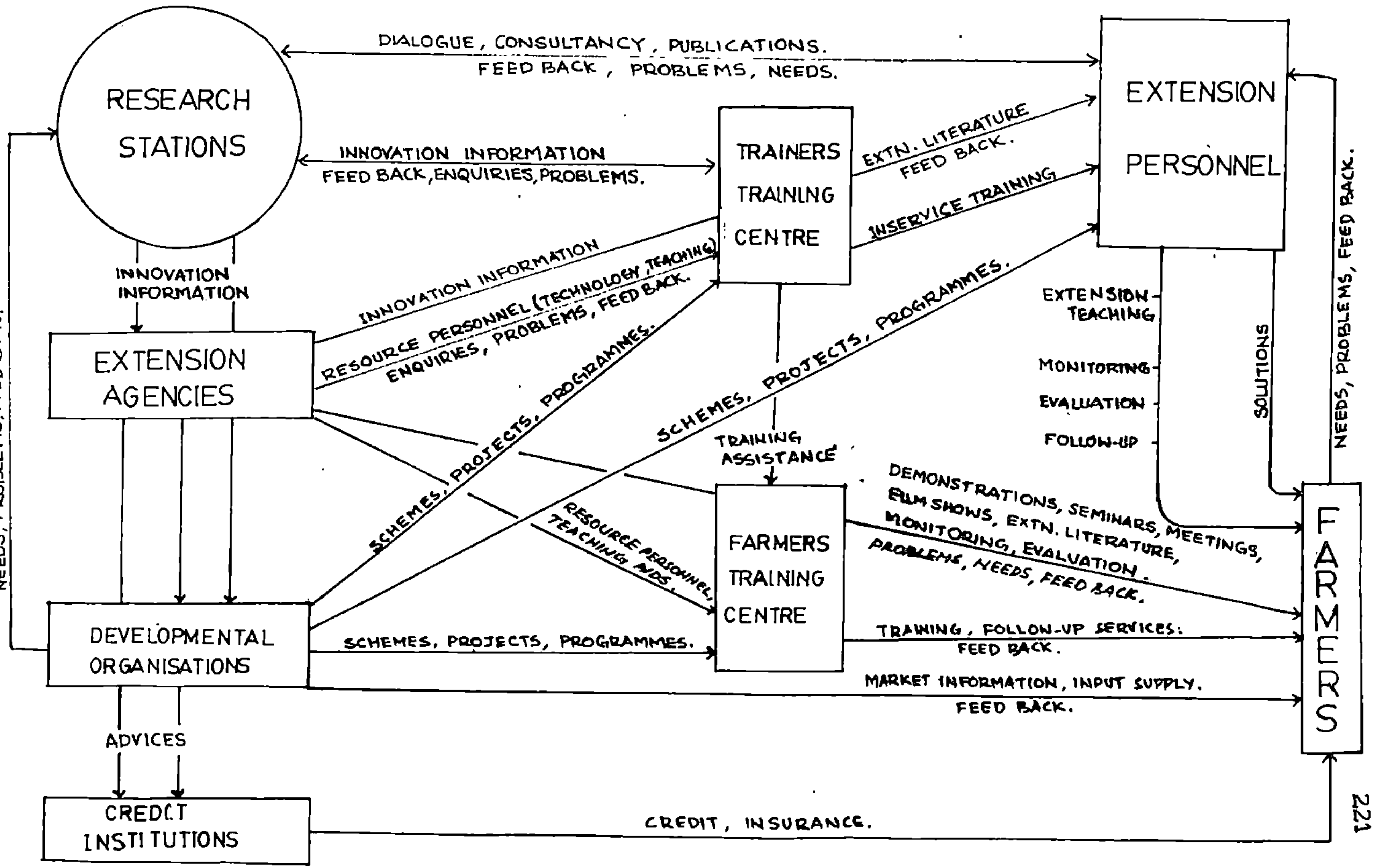


FIG. 13. A MODEL FOR TRANSFER OF TECHNOLOGY IN PRAWN FARMING



VI SUMMARY

SUMMARY

Prawn farming is a promising aquaculture enterprise, which has gained considerable momentum in recent years. The very high demand for prawns in foreign as well as in domestic markets and the uncertainty in prawn production from marine sector gave an impetus to the development of this enterprise.

In Kerala, prawn farming is an age old practice and attempts to modernise the sector through the introduction of scientific management practices were started a decade back. Even at present, despite the efforts made by various state and central government agencies for the popularisation and wider adoption of the technology, the farming operations are carried out mostly in a traditional way.

This study was aimed at exploring the adoption behaviour of prawn farmers and to identify and remedy the problems in getting a wider adoption of the technology.

The study had the following specific objectives:

1. To study the communication media used in the dissemination of scientific prawn farming practices.
2. To study the extent of utilisation of communication

media for awareness and adoption of prawn farming practices.

3. To assess the extent of adoption of scientific practices in prawn farming.

4. To study the relationship if any, between the selected socio-economic, situational, socio-psychological and communication characteristics of prawn farmers and their adoption behaviour.

5. To identify the reasons for non-adoption and partial adoption of the selected practices.

The results of the study will throw light on the present situation and may help in identifying the pitfalls in implementation of extension programmes. The findings of the study will help the planners in formulating future strategies and in modelling and using extension communication media for effective transfer of technology.

A package of practices in scientific prawn farming was prepared for the purpose of the study based on the relevancy rating of a group of judges.

To study the communication media used for the dissemination of scientific prawn farming practices, data were collected from the institutions and agencies engaged in the diffusion of scientific prawn farming.

Extent of awareness of scientific practices in prawn farming was measured using an awareness index.

The extent of utilisation of communication media was measured using extent of media utilisation score.

The extent of adoption of scientific practices in prawn farming was measured using the adoption quotient.

The socio-economic variables tested to find out their influence on adoption behaviour were age, education, experience, occupation, land possession, training participation, institutional credit utilisation and Income from prawn farming.

The situational variables studied were total farming area, area under selective stocking, salinity, distance from bar mouth, average depth at high tide, average depth at low tide and number of crops raised.

Socio-psychological variables tested to find out their influence on adoption behaviour were scientific orientation, risk preference, economic motivation, marketing orientation, extent of awareness of scientific practices in prawn farming and rationality in decision making.

Utilisation of personal localite sources, utilisation of personal cosmopolite sources and utilisation of mass media sources were the three communication variables studied in relation to adoption behaviour.

The categorisation of respondents into high, medium and low with respect to different variables was done based on the mean ($\bar{X}$) and standard deviation (S.D) of the respective variable.

Simple analyses were done using percentages. Correlation analysis was done to find the relationship between the dependent and independent variables and those among independent variables. Multiple regression model was fitted with independent variables having significant correlation with the dependent variable. Step-wise regression analysis was done to select the best subset of variables in predicting the dependent variable. Path analysis was done to find out the direct and indirect influence of independent variables on the extent of adoption.

The salient findings of the study are summarised and presented below.

1. The important agencies engaged in the dissemination of scientific prawn farming were Central Marine Fisheries Research Institute (CMFRI), Krishi Vigyan Kendra (KVK) of

CMFRI, prawn farming section of Marine Products Export Development Authority (MPEDA) and Brackish water Fish Farmers Development Agency (BFFDA). Among the various media and methods employed in the dissemination of scientific prawn farming practices, farm and home visits was the most frequently used individual method. Lectures film shows, group discussions , training programmes and demonstrations were the other important techniques employed.

2. The mean awareness index of the prawn farmers for scientific practices was 64.00. Based on awareness, majority of the farmers were in the medium category. Over 75 per cent of the respondents had awareness index above 50.

3. Personal localite sources were the most extensively used source of information for awareness about scientific practices, followed by personal cosmopolite and mass media sources.

4. In the adoption stage also the same pattern of utilisation of communication media as in the awareness stage was observed. It was found that the farmers contacted more extensively with personal localite sources at adoption stage than at the awareness stage. At the same time the extent of utilisation of personal cosmopolite and mass media sources registered a decline in adoption stage.

5. The mean adoption quotient of the prawn farmers was 24.42. Based on adoption quotient, majority of the farmers were in the medium category. It was found that over 80 per cent of the farmers had adoption quotient less than thirty.

6. All the farmers were aware of the practice, 'strengthening of bunds and deepening of channels'. Fifty per cent of them adopted the practice fully while the remaining fifty per cent except one per cent of the farmers were partial adopters. The important reasons expressed for non-adoption and partial adoption of the practice were high cost ofsluice and 'larger extent of farm'.

7. Only about a quarter of the prawn farmers contacted were aware of the practice, 'draining and raking of the pond bottom'. The adopters of this practice were found to be less than 10 per cent. The important reasons for non-adoption and partial adoption was'lack of awareness'.

8. About fifty per cent of the farmers contacted were aware of the practice, 'pond drying'. Only nine per cent of the respondents adopted the practice fully and partial adopters constituted another four per cent. 'Lack of awareness' 'lack of drainability of ponds' and 'non-adoption of other scientific practices' were the important reasons for non-adoption and partial adoption.

9. Over 85 per cent of the farmers were aware of the practice, 'removal of aquatic weeds'. Only 14 per cent of the farmers studied adopted the practice fully, while 72 per cent of the farmers were partial adopters. Major reason expressed by non-adopters and partial adopters was the 'non-adoption of the practice, 'selective stocking'. Other reasons were 'lack of knowledge' and 'lack of awareness of the practice'.

10. Almost all the farmers contacted were aware of the practice, 'eradication of all existing fishes, crustaceans and other unwanted organisms'. The full adopters of this practice were only 10 per cent. Another 10 per cent adopted it partially. Non-adoption of the practice, 'selective stocking' and 'lack of knowledge' emerged as the important reasons for non-adoption and partial adoption.

11.The practice of 'liming' was heard by over 60 per cent of the respondents. Adopters of this practice, both partial and full together comprised only 16 per cent. The important reasons for non adoption and partial adoption were 'lack of awareness' and 'lack of knowledge'.

12. 'Basal application of organic fertilizers' was heard by over 80 pper cent of the farmers contacted. The

practice was adopted by one per cent and 30 per cent of the farmers fully and partially respectively. 'Lack of knowledge' and 'lack of awareness' were found to be the important reasons for non-adoption and partial adoption.

13. All the prawn farmers studied were aware of the practice, 'stocking the pond with selected prawn seeds'. But over 55 per cent of the farmers were non-adopters of this practice. Only 10 per cent of the farmers adopted the practice to its full extent. 'Lack of conviction about the relative advantage', 'lack of availability of prawn seeds' and 'disenchantment' emerged as the important reasons for non-adoption and partial adoption.

14. Only a little above 25 per cent of the farmers have heard of the practice, 'acclimation of seeds' before stocking. This practice, being complementary to the previous practice was applicable only to 44 per cent of the farmers. Among them only 20 per cent adopted it fully, while another 10 per cent adopted to a lesser extent. The important reasons for non-adoption and partial adoption found were 'lack of awareness' and 'lack of knowledge'.

15. The proportion of prawn farmers aware of the practice, 'nursery rearing' was 81 per cent. The practice was applicable only to 44 per cent of the farmers. Among

them one-third of the farmers adopted the practice fully and another one-third partially. 'Lack of awareness' and 'lack of knowledge' were the important reasons for non-adoption and partial adoption.

16. The practice, 'supplementary feeding based on biomass' was heard by almost all the farmers. Fifty seven per cent of the farmers adopted the practice to a certain extent. The full adopters of the practice were only three per cent. The non-adopters and partial adopters expressed the reasons 'lack of knowledge' and non-adoption of the practice, 'selective stocking'.

17. Maintaining dissolved oxygen level in the pond was a less popular practice among the prawn farmers. Only 26 per cent of the farmers were aware of such a practice. There was no full adoption for this practice. However one per cent of the farmers adopted it to some extent. The important reasons for non-adoption and partial adoption found were 'lack of awareness' and 'non-adoption of other scientific practices'.

18. The farmers aware of the practice, 'monitoring and control of pH' were only 15 per cent. The level of adoption of the practice was too low. Only one per cent of the farmers adopted it fully and another one per cent

adopted partially. The important reasons expressed by non-adopters and partial adopters were 'lack of awareness' and 'lack of knowledge'.

19. The practice,'control of algal blooms' was heard by only 21 per cent of the farmers studied. Only two per cent of the farmers adopted it fully. While another five per cent adopted it partially. Major reasons for non-adoption and partial adoption were 'lack of awareness' and 'lack of knowledge'.

20. The practice, 'need based water exchange' was heard by all the farmers contacted. There was no full adoption for this pactice. All the farmers except one per cent adopted the practice partially. The reasons for non-adoption and partial adoption were 'lack of pumping facilities' and non-adoption of the 'practice selective stocking'.

21. Least popular among the scientific practices in prawn farming was, 'need based control of disease and parasites'. Only 12 per cent of the farmers were aware of this practice. All the farmers contacted except one per cent were non-adopters. 'Lack of awareness' and 'lack of knowledge' were found to be the important reasons for non-adoption and partial adoption.

22. The practice of 'periodic assessment of growth and bio-mass' was heard by over 55 per cent of the farmers contacted. Only about nine per cent of the farmers had adopted this practice and among whom majority were partial adopters. The important reasons attributed to this low level of adoption were 'non-adoption of the practice, selective stocking', 'lack of awareness' and 'lack of knowledge'.

23. About three-fourth of the farmers contacted were aware of the practice, 'harvesting the crop at most economic size'. The adopters of this practice were only 11 per cent, of which two per cent were partial adopters. The important reasons for non-adoption and partial adoption were 'non-adoption of the practice selective stocking' and 'lack of awareness'.

24. Out of the 24 characteristics of prawn farmers, tested to find their relationship with adoption behaviour, it was found that only nine of them had significant influence on adoption behaviour. The characteristics which showed significant influence were training participation, land possession, institutional credit utilisation, area under selective stocking, number of crops raised, extent of awareness of scientific practices in prawn farming,

rationality in decision making, utilisation of personal cosmopolite source and utilisation of mass media sources.

25. Multiple regression model fitted with the above nine variables revealed that these variables, together accounted for 86.84 per cent of variations in extent of adoption.

26. The step-wise regression analysis done to select the best subset of variables in predicting the adoption behaviour revealed that , the variable utilisation of personal cosmopolite sources was the most important contributor to the extent of adoption, which registered for 77.43 per cent of variations in adoption behaviour. The second important variable was the utilisation of mass media sources, which along with the previous variable explained 83.75 per cent of variations in adoption behaviour. Area under selective stocking stood third, which along with the other two variables explained 86.48 per cent of variations in adoption behaviour.

27. Among the characteristics of prawn farmers subjected to path analysis, all the variables except extent of awareness of scientific practices in prawn

farming and rationality in decision making had positive direct influence on extent of adoption. The indirect influence of independent variables was mainly channeled through the utilisation of personal cosmopolite sources and area under selective stocking.

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VIII ANNEXURES

ANNEXURE I

List of scientific practices in prawn farming selected for relevancy rating

Sl.No.	Practices
1.	Strengthening of bunds and deepening of channels
2.	Fixing or repairing of sluice gate
3.	Draining and raking of pond bottom
4.	Pond drying
5.	Removal of aquatic weeds
6.	Eradication of existing fishes, crustaceans and other unwanted organisms.
7.	Liming
8.	Basal application of organic fertilizers
9.	Basal application of inorganic fertilizers
10.	Stocking of the ponds with selected prawn seeds
11.	Providing shelters
12.	Acclimation of seeds
13.	Nursery rearing of seeds
14.	Application of organic fertilizers in split doses
15.	Application of inorganic fertilizers in split doses
16.	Supplementary feeding based on biomass

Contd....

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17. Maintenance of DO level in water
18. Monitoring and control of pH
19. Control of algal blooms
20. Need based water exchange
21. Need based control of disease and parasites
22. Periodic assessment of growth and biomass
23. Harvesting the crop at most economic size

ANNEXURE II

KERALA AGRICULTURAL UNIVERSITY

Dr. P.S. PUSHKARAN
Professor & Head,
Dept. of Extension

College of Veterinary &
Animal Sciences,
Mannuthy,
Dated 5th March, 1989.

To

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Dear Sir,

Mr. Sasikumar, P.K., student in M.F.Sc.Extension is working on his thesis problem entitled "Extent of Adoption of Scientific Practices in Prawn Farming", under my guidance. As a part of his study, to arrive at a criterion for evaluating the practices presently followed by prawn farmers, he would like to identify and list the important practices to be followed in scientific prawn farming.

The scientific practices identified after going through various literature in prawn farming are given hereunder. As a researcher in the field of aquaculture, you may kindly go through the statements critically and rank them as most relevant / relevant/ least relevant accordingly. Based on your ranking a package of practice will be formulated and used for the study.

Thanking you,

Yours faithfully,
Sd/-
Dr.P.S. PUSHKARAN

SCIENTIFIC PRACTICES IN PRAWN FARMING

Kindly go through all the statements before ranking and put a mark against the statements in appropriate column based on your evaluation

Sl. No.	Practices	Most relevant	relevant	Least relevant
1.	Strengthening of bunds and deepening of channels			
2.	Fixing or repairing of sluice gate			
3.	Draining and raking of pond bottom			
4.	Pond drying			
5.	Removal of aquatic weeds			
6.	Eradication of existing fishes, crustaceans and other unwanted organisms			
7.	Liming			
8.	Basal application of organic fertilizers			
9.	Basal application of inorganic fertilizers			
10.	Stocking of the ponds with selected prawn seeds			
11.	Providing shelters			
12.	Acclimation of seeds			
13.	Nursery rearing of seeds			
14.	Application of organic fertilizers in split doses			

P.T.O.

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15. Application of inorganic fertilizers in split doses.

16. Supplementary feeding based on biomass

17. Maintenance of DO level in water

18. Monitoring and control of pH

19. Control of algal blooms

20. Need based water exchange

21. Need based control of disease and parasites

22. Periodic assessment of growth and biomass

23. Harvesting the crop at most economic size

24. Any other practice

    1.

    2.

    3.

Signature:

Name:

Designation:

ANNEXURE III

Relevancy index of scientific practices in prawn farming

Sl. No.	Practices	Relevancy index
1.	Strengthening of bunds and deepening of channels	0.949*
2.	Fixing or repairing of sluice gate	0.966*
3.	Draining and raking of pond bottom	0.778*
4.	Pond drying	0.757*
5.	Removal of aquatic weeds	0.744*
6.	Eradication of existing fishes, crustaceans and other unwanted organisms	0.974*
7.	Liming	0.744*
8.	Basal application of organic fertilizers	0.717*
9.	Basal application of inorganic fertilizers	0.658
10.	Stocking of the ponds with selected prawn seeds	0.974*
11.	Providing shelters	0.615

Contd.....

12.	Acclimation of seeds	0.846*
13.	Nursery rearing of seeds	0.726*
14.	Application of organic fertilizers in split doses	0.658
15.	Application of inorganic fertilizers in split doses	0.615
16.	Supplementary feeding based on biomass	0.872*
17.	Maintenance of Dissolved Oxygen level in water	0.829*
18.	Monitoring and control of pH	0.846*
19.	Control of algal blooms	0.752*
20.	Need based water exchange	0.872*
21.	Need based control of disease and parasites	0.769*
22.	Periodic assessment of growth and biomass	0.812*
23.	Harvesting the crop at most economic size	0.949*

* Practices selected to compose the package

ANNEXURE IV

Dr. P.S. PUSHKARAN
Professor & Head
Dept. of Extension

College of Veterinary &
Animal Sciences.
Mannuthy,
Dated 20th July, 1989.

To

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Dear Sir,

Mr. Sasikumar, P.K., Student in M.F.Sc.Extension is working on his thesis problems entitled "Extent of Adoption of Scientific Practice in Prawn Farming" under my guidance. As a part of his work, he would like to study the extension communication media used by various agencies for dissemination of scientific practices in prawn farming.

Your agency/organisation being actively engaged in the field of prawn farming extension, I request you to kindly help us with the necessary information as called for in the questionnaire attached.

Thanking you,

Yours faithfully,
Sd/-
Dr.P.S. PUSHKARAN

DEPARTMENT OF MANAGEMENT STUDIES, COLLEGE OF FISHERIES
PANANGAD, COCHIN

STUDY OF THE COMMUNICATION MEDIA USED FOR THE DISSEMINATION OF SCIENTIFIC PRAWN FARMING PRACTICES

1. Name of the Organisation

2. Year of establishment

3. Number of Extension personnel working under the organisation

   b. No. of extension personnel working in prawn farming

4. Area of operation of the organisation

5. Important activities of the organisation

   1.

   2.

   3.

   4.

   5.

6. Methods and Media, employed for the dissemination of scientific prawn farming practices

Sl.	Media/Method	No.of programmes conducted or items released	Purpose	No.of farmers benefitted
I.	Mass Methods			
	1. Radio			
	2. Television			
	3. Film shows			

contd...

4. Slide shows & film strips
5. Exhibitions
6. Demonstrations
7. Farmers day
8. Displays
9. Posters
10. News articles & News stories
11. Magazines & News letters
12. Pamphlets
13. Leaflefts
14. Booklets
15. Bit notices

    Any other

II. Group Methods

1. Lectures
2. Workshops
3. Seminars
4. Symposia
5. Group discussions
6. Tours & visits
7. Training Programmes

    Any other

Contd...

III. Individual methods

1. Circular letters
2. Farm and Home visits
3. Office calls

   Any other

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7. Other important informations, if any

Date:

Signature
Name:
Designation

ANNEXURE V

DEPARTMENT OF MANAGEMENT STUDIES, COLLEGE OF FISHERIES, PANANGAD

POST GRADUATE RESEARCH WORK

INTERVIEW SCHEDULE

Respondent No.

Village . . . . .   Taluk . . .

PART A

1. Name
2. Address
3. Age
4. Education :Illiterate/Can read only/Can read and write/ Primary/Middle school/High school/College
5. Occupation   i. Main occupation
    ii. Subsidiary occupation
6. Income from prawn farming: Rs .../crop
7. Experience in Prawn Farming : ... years
8. Total area of the farm .... ha/acre
9. Area under scientific prawn farming ...ha/acre
10. Ownership .... own/Leased
11. Salinity of water : High/Medium/Low

12. Distance of the farm from bar mouth .... kms

13. Average depth of water : at low tide ...... cms
at high tide . ....cms

14. No. of crops raised:

15. Training participation

Have you received any training
in Prawn farming : Yes/No

If yes,

1. Name of the Agency:

2. Type of training:

3. Duration of training:

16. Credit utilisation

i. Have you received credit or
any other financial assistance
for prawn farming : Yes/No

ii. If yes,

1. Name of the organisation
or agency sanctioned the loan

PART B

Adoption of Scientific Practice in Prawn farming

I. STRENGTHENING OF BUNDS AND DEEPENING OF CHANNELS

a. Have you heard of the practice of strengthening of bunds and deepening of channels before the start of the culture operations : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/Partially/Nil

d. If adopted, name the media (if any) which influenced you in the adoption. :

e. How you follow the practice :

1. Based on the analysis of physical characteristics of soil
2. Based on the recommendations of extn. personnel
3. Based on experience/advice of progressive farmers
4. Based on general recommendations
5. Based on the opinion of friends and relatives
6. Without proper direction/reasoning

If not fully adopted,

f. What are the reasons for non adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge

3. Lack of availability of skilled labour

4. Lack of availability of quality wood

5. High cost

6. Any other (please specify)

III. DRAINING AND RAKING OF POND BOTTOM

a. Have you heard of the practice of draining and raking of the pond bottom during pond preparation : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have adopted the practice in your farm : Fully/partially/Nil

d. If adopted, name the media (If any) which influenced you in the adoption :

e. How you follow the practice

1. Based on the nature of bottom sedements

2. Based on recommendations of extn. personnel

3. Based on experience/advice of progressive farmers

4. Based on general recommendations

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not fully adopted, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Lack of availability of labour
4. Fear of release of acid salts
5. Heavy depth of water
6. High cost of labour
7. Any other (please specify)

II. FIXING OR REPAIRING OF SLUICE GATE

a. Have you heard of the practice of fixing or repairing of sluice gate before start of culture operations. : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/Nil

d. If adopted, name the media (if any) which influenced you in the adoption :

e. How you follow the practice

1. Based on the study of water requirement tidal flow etc.
2. Based on recommendations of extn. personnel
3. Based on experience/advice of progressive farmers
4. Based on general recommendations
5. Based on the advice of friends and relatives
6. Without proper direction/reasoning

f. If not fully adopted, what are the reasons for non-adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge

3. Fear of release of acid salts

4. Lack of drainability of ponds

5. Heavy seepage

6. Any other (please specify)

IV. POND DRYING

a. Have you heard of the practice of drying the pond under sun during the pond preparation : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in the adoption :

e. How you follow the practice

1. Based on the time required for stabilization of soil and eradication of predators etc.

2. Based on the recommendations of extn. personnel

3. Based on general recommendations

4. Based on experience or advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Lack of drainability

4. Heavy seepage

5. Lack of pumping facilities

6. Any other (please specify)

V. REMOVAL OF AQUATIC WEEDS

a. Have you heard about the practice of removal of aquatic weeds before stocking of the ponds : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the type of weeds present

2. Based on the recommendations of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on advice of friends and relatives

6. Without proper directions/reasoning

f. If not fully adopted, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Lack of availability of weedicides

4. Inefficiency of suggested methods

5. Fear of residual effects

6. High cost

7. Any other (please specify)

VI. ERADICATION OF EXISTING FISHES, CRUSTACEANS AND OTHER UNWANTED ORGANISMS

a. Have you heard of the practice of eradication of all existing fishes crustaceans and other unwanted organisms before stocking of the pond : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the calculation of volume of water and toxicity of the toxicant

2. Based on the recommendations of the extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge
3. Lack of availability of toxicants
4. Inefficiency of suggested methods
5. Fear of residual effects
6. High cost of toxicants
7. Any other (please specify)

VII. LIMING

a. Have you heard of the practice of liming the pond during preparation: Yes/No

If yes

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on soil test results
2. Based on recommendations of extn. personnel
3. Based on experience/advice of progressive farmers
4. Based on general recommendations
5. Based on the advice of friends and relatives
6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Lack of availability of lime

4. High cost of lime

5. Any other (please specify)

VIII. BASAL APPLICATION OF ORGANIC FERTILIZERS

a. Have you heard of the practice of applying organic fertilizers in prawn farms : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption

e. How you follow the practice

1. Based on the analysis of fertility of water

2. Based on the recommendations of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Fear of pollution and development of algal blooms

4. Fear of reduction of oxygen availability after fertilizer application

5. Lack of availability

6. Fear of transmission of disease

7. Any other (please specify)

IX. STOCKING OF THE POND WITH SELECTED PRAWN SEEDS

a. Have you heard of the practice of stocking the ponds with selected prawn seeds : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the estimation of carrying capacity of the ponds.

2. Based on the recommendation of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption.

1. Lack of awareness

2. Lack of knowledge

3. Lack of availability of quality prawn seeds

4. Heavy mortality during transportation

5. High cost of seeds

6. Any other (please specify)

X. ACCLIMATION OF SEEDS

a. Have you heard of the practice of acclimation of seeds : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your own farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practices

1. Based on the estimation of salinity and temperature differences

2. Based on the recommendations of extn. personnel.

3. Based on general recommendations.

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption

1. Lack of awareness

2. Lack of knowledge

3. Lack of facilities

4. Any other (please specify)

XI. NURSERY REARING OF SEEDS

a. Have you heard of the practice of nursery rearing of prawn seeds before stocking : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have your adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in the adoption :

e. How you follow the practice

1. Based on the size of the seeds brought

2. Based on the recommendations of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Differences in size of seeds brought.

4. Lack of sufficient nursery ponds

5. Since the seeds brought are of larger size

6. Any other (please specify)

XII. SUPPLEMENTARY FEEDING BASED ON THE BIOMASS

a. Have you heard of the practice of supplementary feeding of stocked prawns : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on assessment of biomass/requirement feeding

2. Based on the recommendations of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on advice of friends and relatives

6. Without proper directions/reasoning

f. If not adopted fully, what are the reasons for non-adoption

1. Lack of awareness
2. Lack of knowledge
3. Lack of availability of formulated feeds
4. Lack of availability of feed ingredients
5. Difficulties in the assessment of biomass
6. High cost of formulated feeds
7. Any other (please specify)

XIII. MAINTENANCE OF DO LEVEL IN THE POND

a. Have you heard of the practice of maintaining DO level in the pond : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the estimation of DO level in the pond
2. Based on the recommendations of extn. personnel
3. Based on general recommendations
4. Based on experience/advice of progressive farmers
5. Based on the advice of friends and relatives
6. Without proper direction/reasoning

f. If not fully adopted, what are the reasons for non adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge
3. Lack of availability of pond aerating equipments
4. High cost of mechanical aeration
5. Lack of facilities to estimate the oxygen level in the pond
6. Any other (please specify)

XIV. MONITORING AND CONTROL OF pH

a. Have you heard of the practice of monitoring and control of pH of the pond water : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on analysis of pH of soil and water
2. Based on the recommendations of extn. personnel
3. Based on general recommendations
4. Based on experience/advice of progressive farmers
5. Based on advice of friends and relatives
6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge
3. pH changes are not always noticed
4. Lack of techniques to estimate the pH
5. Any other (please specify)

XV. CONTROL OF ALGAL BLOOMS

a. Are you aware of the practice of controlling algal blooms in culture ponds : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the analysis of type of blooms present
2. Based on the recommendations of extn. personnel
3. Based on general recommendations
4. Based on experience/advice of progressive farmers
5. Based on the advice of friends and relatives
6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge
3. Lack of efficient methods
4. Lack of availability of algicides
5. Fear of residual effects
6. Any other (please specify)

XVI. NEED BASED WATER EXCHANGE

a. Have you heard of the practice of exchanging pond water : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the analysis of water quality
2. Based on the recommendations of extn. personnel
3. Based on general recommendations
4. Based on experience/advice of progressive farmers
5. Based on the advice of friends and relatives
6. Without proper direction/reasoning.

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness

2. Lack of knowledge

3. Insufficient tidal range

4. Lack of pumping facilities

5. Any other (please specify)

XVII. NEED BASED CONTROL OF DISEASE AND PARASITES

a. Have you heard of the practice of control of disease and parasites in culture ponds : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the analysis of water and examination of diseased fishes

2. Based on the recommendation of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption

1. Lack of awareness

2. Lack of knowledge

3. The disease are not always identified

4. Lack of availability of theraputics

5. Difficulty in the application of theraputics

6. Inefficiency of available treatment methods

7. Any other (please specify)

XVIII. PERIODIC ASSESSMENT OF GROWTH AND BIOMASS

a. Have you heard of the practice of periodic assessment of growth of prawns and estimation of biomass : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. By following systematic sampling procedures

2. Based on the recommendations of extn. personnel

3. Based on general recommendations

4. Based on experience/advice of progressive farmers

5. Based on the advice of friends and relatives

6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption or partial adoption

1. Lack of awareness
2. Lack of knowledge
3. Lack of efficiency of methods
4. Lack of availability of skilled labourers
5. Any other (please specify)

XIX. HARVESTING THE CROP AT MOST ECONOMIC SIZE

a. Have you heard of the practice of harvesting the crop at most economic size : Yes/No

If yes,

b. Name the media through which you got the information :

c. Have you adopted the practice in your farm : Fully/partially/nil

d. If adopted, name the media (if any) which influenced you in adoption :

e. How you follow the practice

1. Based on the estimation of growth and observation of demand and price
2. Based on the recommendations of extn. personnel
3. Based on general recommendations
4. Based on experience/opinion of progressive farmers
5. Based on advice of friends and relatives
6. Without proper direction/reasoning

f. If not adopted fully, what are the reasons for non-adoption

1. Lack of awareness
2. Lack of knowledge
3. Heavy fluctuations in market price
4. Drop in salinity of water
5. Fear of out break of disease and infections
6. Expiry of licence period
7. Labour problems
8. Any other (please specify)

Remarks:

PART C

SCIENTIFIC ORIENTATION

Given are a set of statements, you may kindly go through the statements and express your opinion in any of the response category given along with.

Statements	SA	A	U	D	SD
1. New methods of farming gives better results than old methods					
2. The way of farming of our fore-fathers is still the best way to farm today					
3. Even a farmer with lot of farm experience should use new methods of farming					
4. A good farmer experiments with new ideas in farming					
5. Though it takes time for a farmer to learn new methods in farming, it is worth the efforts					
6. Traditional methods of farming have to be changed in order to raise the living of a farmer					

SA - Strongly Agree

A - Agree

U - Undecided

D - Disagree

SD - Strongly Disagree

RISK ORIENTATION

Given are a set of statements, you may kindly go through the statements and express your opinion in any of the response category given along with.

Statements	SA	A	U	D	SD
1. A farmer should grow larger no.of crops to avoid greater risks involved in growing a single crop.					
2. A farmer should take more of chance in making a big profit than to be content with small but less risky profit.					
3. A farmer who is willing to take greater risk than the average farmer usually does better financially.					
4. It is good for a farmer to take risk when he knows his chances of success is fairly high.					
5. It is better for a farmer not try new farming method unless most others in the locality have used it with success.					
6. Trying a new method in farming by a farmer involves risk, but is worth it.					

SA - Strongly Agree
A - Agree
U - Undecided
D - Disagree
SD - Strongly Disagree

ECONOMIC MOTIVATION

Given are a set of statements, you may kindly go through the statements and express your opinion in any of the response category given along with.

Statements	SA	A	U	D	SD
a. A farmer should work towards larger yields and economic profits.					
b. The most successful farmer is one who makes the most profit.					
c. The farmer should try new farming idea which may earn him more money.					
d. A farmer should grow fish crops to increase monetary profits in comparison to growing of paddy crops for home consumption.					
e. It is difficult for the farmers children to make a good start unless provided them with economic assistance.					
f. A farmer must earn his living but the most important thing in life cannot be defined in economic terms.					

SA - Strongly agree
A - Agree
U - Undecided
D - Disagree
SD - Strongly Disagree

MARKETING ORIENTATION

Kindly indicate your opinion, agreement or disagreement with each of the statement given below.

Statement	Agree	Disagree
1. Market news is not so useful to a farmer.		
2. A farmer can get good price by grading his produce		
3. Cold storage facilities can help a farmer to get better price for his produce		
4. One should sell his produce to the nearest market irrespective of the price.		
5. One should purchase inputs from the shops where his relatives purchase .		
6. One should grow those crops which have more market demand.		

EXTENT OF ADOPTION OF SCIENTIFIC PRACTICES IN PRAWN FARMING

BY

SASIKUMAR P. K.

ABSTRACT OF A THESIS

Submitted in partial fulfilment of the requirement for the degree

MASTER OF FISHERIES SCIENCE

Faculty of Fisheries

Kerala Agricultural University

Department of Management Studies

College of Fisheries

PANANGAD - COCHIN

&

Department of Extension

College of Veterinary and Animal Sciences

MANNUTHY - TRICHUR

1990

ABSTRACT

This study was undertaken to probe into the present situation of prawn farming in Kerala. The study aimed at assessing the communication media used for the dissemination of scientific prawn farming practices, the communication media utilised by prawn farmers at awareness and adoption stages, extent of adoption of scientific practices, correlates of adoption behaviour and the reasons for non-adoption or partial adoption of scientific practices.

The study was conducted in Ernakulam district among 100 prawn farmers randomly selected. The data were collected through personal interview using a structured and pre-tested interview schedule. Appropriate standard statistical tools were used for analysis and interpretaion.

The extent of adoption was measured using the adoption quotient formula. Twenty four characteristics of prawn farmers were tested to find their association with adoption behaviour. The socio-economic variables studied were age, education, experience, land possession,

training participation, institutional credit utilisation and income from prawn farming. The situational characteristics included total farming area, area under selective stocking, salinity, distance from bar mouth, average depth at high tide, average depth at low tide and number of crops raised. Scientific orientation, economic motivation risk preference, marketing orientation, extent of awareness of scientific practices in prawn farming and rationality in decision making were the socio-psychological variables tested. The communication variables studied were utilisation of personal localite sources, utilisation of personal cosmopolite sources and utilisation of mass media sources.

The study revealed that the extension communication media were very extensively used for the dissemination of scientific prawn farming technology. The most important individual method employed was farm and home visits. Other methods frequently employed were lectures, film shows, group discussions,. training programmes and demonstrations.

The farmers utilised more of personal localite sources, followed by personal cosmopolite and mass media sources for awareness as well as adoption.

The mean awareness index of prawn farmers was 64.00 with majority of the farmers falling under the category of medium awareness. The mean extent of adoption of scientific practices was worked out as 24.42, and majority of the farmers came in the medium category based on extent of adoption.

Of the 19 scientific practices selected for study, all the practices except 'acclimation of seeds', 'maintenance of dissolved oxygen level in the pond', 'monitoring and control of pH', 'control of algal blooms' and 'need based control of disease and parasites' were heard by over 50 per cent of the respondents. Only three practices viz. strengthening of bunds and deepening of channels, fixing or repairing of sluice gate, and stocking the pond with selected prawn seeds were heard by all the respondents.

Only two practices namely 'strengthening of bunds and deepening of channels' and 'fixing or repairing of sluice gate' were found fully adopted by 50 or above 50 per cent of respondents. Highest full adoption was observed for the practice 'fixing or repairing of sluice gate'. There was no full adopters for the practices 'maintenance of dissolved oxygen level in the pond', 'need based water exchange' and 'need based control of disease and parasites'. Highest partial adoption was observed for the practice 'need based water exchange', followed by 'removal of aquatic weeds', 'supplementary feeding based on biomass', and 'strengthening of bunds' and 'deepening of channels'. The partial adopters of these practices were 99 per cent, 92 per cent, 57 per cent and 49 per cent respectively.

Important reasons for non-adoption and partial adoption of the practices were lack of awareness, lack of knowledge and non-adoption of the practice 'stocking the ponds with selected prawn seeds'.

Among the 24 variables tested to find out association with extent of adoption, only nine showed significant influence on adoption behaviour. The characteristics of prawn farmers which were found significantly contributing to extent of adoption were training participation, land possession, institutional credit utilisation, area under selective stocking, number of crops raised, extent of awareness of scientific practices in prawn farming, rationality in decision making, utilisation of personal cosmopolite sources and utilisation of mass media sources.

Multiple regression model fitted with the above nine variables illustrated that these nine variables together explained 86.82 per cent of variations in extent of adoption.

Further, the step-wise regression analysis revealed that the best subset of variables in predicting the dependent variables were utilisation of personal cosmopolite sources, utilisation of mass media sources and area under selective stocking. These three variables together explained 86.48 per cent of variations in adoption behaviour.

Of the nine variables subjected to path-analysis, all the variables except awareness of scientific practices in prawn farming and rationality in decision making had positive path coefficients. The indirect influence of the variables on extent of adoption were mainly channelled through utilisation of personal cosmopolite sources and area under selective stocking.