TECHNO-SOCIO-ECONOMIC ASSESSMENT OF FARMERS' PRACTICES IN RICE CULTIVATION IN THIRUVANANTHAPURAM DISTRICT

By

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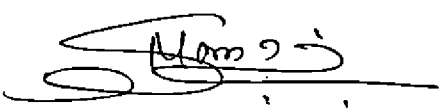
THESIS
SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE
MASTER OF SCIENCE IN AGRICULTURE
FACULTY OF AGRICULTURE
KERALA AGRICULTURAL UNIVERSITY

DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
VELLAYANI
THIRUVANANTHAPURAM

2000

DECLARATION

I hereby declare that this thesis entitled "Techno-socio-economic assessment of farmers' practices in rice cultivation in Thiruvananthapuram district" 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 of any degree, diploma, associateship, fellowship or other similar title, of any other university or society.



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CERTIFICATE

Certified that this thesis entitled "Techno-socio-economic assessment of farmers' practices in rice cultivation in Thiruvananthapuram district" is a record of research work done independently by Mr. Manoj. S. 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.

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ACKNOWLEDGEMENT

It is with great pleasure that I express my sincere gratitude and indebtedness to

Dr. C. Bhaskaran, Associate Professor, Training Service Scheme, Department of Agricultural Extension, College of Agriculture, Vellayani for suggesting the field of investigation, valuable guidance, constructive criticism and constant encouragement throughout the course of the study and research work. In fact, I am fortunate in having him as the Chairman of my advisory committee.

Dr. M. M. Hussain, Professor and Head, Department of Agricultural Extension as the member of advisory committee for his scholarly suggestions, valuable advices and criticisms during the course of the study and preparation of the manuscript.

Dr. G. Balakrishna Pillai, Professor and former Head, Department of Agricultural Extension, for his unfailing support and critical scrutiny of the manuscript.

Dr. V. Muraleedharan Nair, Professor and Head Department of Agronomy for his valuable help for selecting the locale of the study, critical comments, timely and propitious support extended at all stages of the research work.

Dr. R. Prakash, Associate Professor, Department of Agricultural Extension, for his timely help.

Gokulapalan Sir for his parental care, immense help and unfailing support.

Teachers of the Department of Agricultural Extension for their unstinted interest and advice.

Umamaheswaran Sir and Girija Madam for their keen interest and affection.

My dear friends, Rajku, Abhi, Allan, Swami, Pakku, Ajith, Rakhee, Rani, Lakshmy, Sudha, Geetha, Romy, Radhika, Suja, Syam, Sunil, Ullas, Sonia, Ameena, Rekha, Ranjith, Smitha, Thumpi, Sibychayan and Kochajith.

Biju, ARDRA Computers for the patience he shared.

Kerala Agricultural University for awarding me the Junior Research Fellowship.

Above all God Almighty for giving me the strength to do this endeavour successfully.

MANOJ. S.

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INTRODUCTION

1. INTRODUCTION

Rice is the world's only crop planted by emperors and kings, offered to Gods and eaten by both the wealthiest and the poorest (IRRI, 1993). It is the most important crop as far as Kerala is concerned, since it is the staple food of Keralites. But unfortunately, only 30 per cent of the area under rice is brought under high yielding varieties (FIB, 1998). Of late, the farmers are not willing to cultivate paddy because of the increase in cost of cultivation, lack of appropriate technology and a host of other reasons.

In places like Kerala, existing research systems are not always able to generate the technologies needed to solve the problems of resource poor farmers, due to constraints of manpower and funds. Such farmers are forced to develop their own technologies to suit their particular conditions. Thus farmer experimentations and farmers' practices have gained growing significance now-a-days. In the specific context of Kerala, it is worth to point out that though most of the latest agricultural technologies have not yet reached farmers' fields on a massive scale, seventy per cent of the farmers are reported to have adopted thirteen out of twenty farmer developed practices (Manju, 1996). Thus the knowledge of farmers' practices is very important for the planning of research and extension projects, since such knowledge enables researchers and extension workers to directly focus on the refinement of these practices for wider and efficient use. Understanding and assessing farmers' practices in rice cultivation is therefore a prerequisite for technology assessment, appropriation and refinement.

Each of the farmers' practices are having three aspects in it. These three aspects form the basis for its persistence in the field. The first one among the three is the technical aspect. The technical aspect include the dimensions like relative advantage, compatibility, complexity, trialability and observability. The second one is its social aspects. This include a variety of components like, sustainability, simplicity, family labour utilisation etc. Economic aspect is the third one and it includes dimensions like profitability and input availability.

Since the social and economic aspects vary from place to place, farmers were forced to develop their own technologies suited for their own farms. This created variation in cultivation practices and formed the basis for locally developed technologies or indigenous technologies. One such example is the 'Chakram' developed by Kuttanad farmers for dewatering their fields.

Farmers are continuously conducting their own experiments, partially or fully adopting the technologies they find out and results may be spread through their own networks. Their own analysis of farming systems offer important insights different from that of the scientists. Only if we consider such innovations, we will be able to develop for the future.

The present study titled 'techno-socio-economic assessment of farmers' practices in rice cultivation in Thiruvananthapuram district' aims at generating comprehensive feed back regarding the practices followed by the farmers in rice cultivation with a view to facilitating the research system in Kerala in

planning and implementing research projects to generate client-driven technology.

The main objectives of the study are

1. To identify and document the farmers' practices followed in rice cultivation
2. To assess the efficiency of the farmers' practices on the basis of their techno-socio-economic aspects.
3. To assess the knowledge of rice farmers in the recommended practices of rice cultivation.
4. To find out the extent of adoption of farmers' practices and its relationship with selected characteristics of the farmers.
5. To assess the ecofriendliness of the farmers' practices as perceived by farmers
6. To list out the constraints faced by rice farmers in rice cultivation .

This study, constrained by limited time and resources unable to operate in all parts of the state. Rice cultivation varies according to the type of land, availability of water and climate. So a variety of farmers' practices could be obtained. This study was confined to a single 'Padasekharam' alone. These limitations have perhaps narrowed down the scope of generalising the results. Inspite of these, every effort is taken to conduct the study as systematic as possible.

THEORETICAL ORIENTATION

2. THEORETICAL ORIENTATION

A theoretical framework would help to form a clear concept about farmers' practices and its allied aspects. They are described under the following heads.

2.1 Concept of farmers' practices

2.2 Importance of farmers' practices

2.3 Studies on farmers' practices

2.4 Knowledge of farmers about recommended practices

2.5 Extent of adoption of farmers' practices

2.6 Relationship between knowledge and selected profile characteristics of farmers

2.7 Relationship between adoption and selected profile characteristics of farmers

2.8 Techno-socio-economic assessment of farmers' practices.

2.9 Efficiency of farmers' practices

2.10 Constraints in rice cultivation

2.11 Conceptual model of the study

2.1 Concept of farmers' practices

In this study farmers' practices are defined as those practices which are actually followed by farmers including indigenous practices and recommended practices.

Haskel *et al.* (1981) defined indigenous knowledge as a system finely tuned and adapted both biologically and socially, to counter the process of

what are often harsh and inimical environments. This represents hundreds or thousands of years of adaptive evolution in which the vagaries of climate, the availability of land and water, the basic needs of the people and their animals for food, shelter and health have been amalgamated in a system which has allowed society to exist and develop in the face of tremendous odds.

Alcorn (1984) opined that farmers' practical knowledge about the local ecosystem is reflected in their farming techniques and in their skill in using the natural resources to gain their livelihood which may reveal ideas that contain seeds of adaptive value.

Carter (1988) said that indigenous knowledge is highly localised and restricted. Local environmental factors and cultural conditions govern the evolution of indigenous knowledge. These vary between countries, regions and farms.

Wang (1988) defined indigenous knowledge as the sum total of knowledge and practices which are based on people's accumulated experience in dealing with situations and problems in various aspects of life and such knowledge and practices are special to a particular culture.

Ploeg (1989) reported farmers' understanding of agricultural processes as a complex of personal, metaphorical and contextual knowledge which becomes almost impenetrable when subjected to scientific scrutiny and reaching a common understanding may be extremely difficult.

Warren (1989) suggested that indigenous knowledge is unique to a given culture of a society, which forms an information base for a society. According to him, indigenous knowledge is dynamic, it changes through indigenous creativity and innovativeness as well as through contact with other knowledge systems.

Thurstone (1990) reported that some of the operations with which traditional knowledge associated are alteration of plant and crop architecture, biological control, cutting and burning, adjusting crop density or depth or time of planting, planting diverse crops, allowing, flooding, mulching, multiple cropping, planting without tillage, using organic amendments, planting in raised beds, rotation, sanitation and manipulating shade and tillage most of which are sustainable.

According to a number of authors traditional agricultural systems which basically rely on indigenous knowledge are considered for productivity, sustainability, stability and equitability. Documentation of all the traditional beliefs assumes greater importance to understand the scientific rationale, to accelerate technical change, to enable better understanding of technology development and to increase awareness among youth and pride among farmers.

Verma and Dhukia (1991) said that indigenous knowledge was mainly inherited through socio-cultural system and was minimised and developed through the oral conditions, folk tales and proverbs. It is proved that the system of farming presented this way was based on wisdom and solid logic which now finds support from scientific studies too.

Bebbington (1992) discussed the nature of indigenous knowledge. According to him, rural people's knowledge was not only technical but also included the range of aspirations, values and preferences that rural people have. He added that this knowledge was constructed through the socio-economic and cultural histories of the regions within which people live.

According to Duhaylungsod (1992), in most countries of the third world, rural people have an enormous body of agricultural knowledge. Ironically, however it has remained as an underutilised national resource. Such situations came about largely because the production of knowledge has been historically dominated by a form generally called modern and scientific.

Reijntjes *et al.* (1992) opined that the knowledge of a farming population living in a specified area is devised from the local people's past experience, both that are handed down from previous generation and that of the present generation.

Berkes *et al.* (1993) reported that traditional people who depend on their local ecosystems for their essential needs, have accumulated by trial and error a rich body of local environmental knowledge and in several cases elaborated resource management systems and developmental institutions appropriate for implementing these systems. Biodiversity conservation appears to be the most integral part of many traditional management systems from tropical forests to coastal fisheries.

According to Vasu (1994) indigenous know-how has two connotations. One is concerned with the traditional technologies and the other is with respect to the modern technologies, either developed indigenously or imported and adapted to indigenous conditions.

2.2 Importance of farmers' practices

Chitambar (1961) said that it was important in planning and implementing new programmes for the extension worker, to understand the economics of traditional practices followed by the farmers.

Rudramoorthy (1964) pointed out that a judicious combination of folk knowledge and scientific knowledge will help to speed up the adoption of improved practices by the farmers.

Rogers and Shoemaker (1971) stated that imminent change occurs when members of a social system with little or no external influence create and develop a new idea which then spreads within the system.

Faniram and Areola (1976) reported that in the field of crop production and the management of the soil, the knowledge and experience of local farmers are unrivaled and no alternative system of food production is found as competent as farmers' knowledge.

Nand and Kumar (1980) concluded that it becomes necessary that the scientists investigate the rationality of each one of the technical beliefs held by farmers so that they can clearly accept or reject a technical belief.

Narasimham (1981) opined that before considering the problems arising from the modernization of agricultural technology, the status of folk knowledge and practices must be evaluated, only then it can be comprehensively updated.

Figueroa and Bolliger (1985) identified the positive effect of formal education on productivity in rural areas, precisely because it helped to develop skills of abstraction and numeracy required to handle markets.

Norman (1985) in an overview of research on African farmers' practices and potential for change, opined that an understanding of the farmers' practices can help in designing relevant improved technologies for limited resource farmers.

Altieri and Liebman (1986) stated that in this new emerging conception of agricultural development, rural people's knowledge about plants, soils and animals gains unprecedented significance. He continued that scientists involved in small farm development must quickly systematize and incorporate farmers' knowledge, before the wealth of practical knowledge, is lost forever, given that most traditional farming systems are rapidly disappearing in the face of major social, economical and political changes occurring in developing countries.

Barrow (1988) emphasized the importance of traditional knowledge as a tool in development and discussed in broad terms, its relevance to the change process and as to why it has not been fully utilised in the past. The basis for change and improvement lies with making the people of the area they focus, making them responsible for their environment through the use of traditional knowledge base as a foundation stone for sustainable real development as if people matter.

Cashman (1988) examined the value and practicality of incorporating indigenous knowledge components in agricultural research to augment sustainable development that benefits women, as well as men and all rural people equally.

Davis (1988) reviewed the current international debate on native populations, provided examples of how indigenous knowledge in the Americans has contributed to environmentally sound development approaches and sets forth additional principles about how best to incorporate native groups in to the local developmental process.

Brokensha (1989) in his study, critically examined the advantages and associated problems of trying to incorporate local management systems in attaining sustainability in rural households and implementing such development from below.

Essers *et al.* (1989) reported that locally available resources has been especially apparent in the area of sustainable agriculture. Professionals in the field feel the need to systematize and document their methodologies. Their study concluded with remarks about the power and flexibility of locally produced knowledge.

Nitsch (1991) opined that the management of a farm requires the ability to handle a multitude of biological, technical, economical and social factors in a changing and largely unpredictable environment. He explained that such co-ordination skills were not so much based on the formal rationality employed by scientists as an adaptive rationality where adaptive rationality was seen as a continuous interaction among visions, experiences and experimentation. These co-ordination and adaptive rationality were made up of tacit knowledge ; knowledge that could not be reduced to facts and rules and thus cannot be formalised.

Waters (1991) observed that the agricultural knowledge of the cultivators was sufficient to support sustainable agriculture and urged the private or voluntary organisations as well as government to tune their policies that way.

According to Sandoval (1992) there is a pressing need for the systematic documentation-or "memory banking"-of local farmers' indigenous practices with traditional varieties and supplementary crops. While

germplasm encodes genetic information that has evolved through time as a response to selection pressures, the minds of local farmers who have considerable experience in growing these crops, repositories of cultural information.

Bentely (1993) suggested that scientists can learn most from farmers about factors in the farmers' lives that are important and easy to observe.

Bharara and Seeland (1993) emphasized the importance of the consideration of indigenous knowledge in the development process of areas with precarious environmental conditions. In their contribution, they highlighted the immense value of autochthonomous perceptions of particularly rural surroundings to take future challenges and to safeguard the sustainable, physical, social and cultural persistence of the semi-arid area of Rajasthan.

Vijayalekshmi (1993) suggested that knowing about and enriching tradition in Indian agricultural practices will help in finding ways of continuing with high yield farming without poisoning the soil, water and air with pesticides and fertilizers.

Ahmed (1994) pointed out the need for a blend between indigenous knowledge and modern technology.

Berkes and Folke (1994) argued that in order to ensure a more socially and ecologically sound approach to development, it was necessary to understand, respect and utilize the local knowledge systems.

Salas (1994) opined that one of the main reasons why conventional developmental approaches had failed was that they had tended to ignore the local knowledge systems and practices.

Lupanga *et al.* (1995) conducted a study which examined ways of linking research, extension and farmers through a two way exchange of both Indigenous Technical Knowledge (ITK) and scientific knowledge in order to increase food production in Tanzania.

Vel (1995) pointed out that farmers' indigenous technical knowledge plays an important role in deciding about agricultural innovations.

Altieri (1996) stated that, in this new emerging conception of agricultural development, rural people's knowledge about plants, soils and animals gains unprecedented significance. He continued that scientists involved in small farm development must quickly systematize and incorporate farmers' knowledge before the wealth of practical knowledge is lost forever.

2.3 Studies on farmers' practices

Navarez *et al.* (1985) conducted a study on weed control by farmers' practices. They found that the weed growth can be effectively checked by these practices than the recommended practices.

Brosius *et al.* (1986) found out a new approach to understand traditional knowledge - Ethnoecology. This forms the basis for structuring traditional agroecosystems which is modified in the form of knowledge passed from generation to generation.

Box (1987) revealed the existence of local networks of farmers who regularly discuss among themselves and form concepts, adopt ideas, integrate knowledge and determine acceptable action. The importance of farmer to farmer communication will differ according to social organisation and infrastructure.

Farrington and Martin (1987) observed that in problem identification scientists usually gave emphasis on the answer of the farmers to their own questions, which might be relevant to a given crop or technology.

Gupta (1987) opined that in order to derive scientific value out of the indigenous practices, crucial observation was essential. They had to be put into proper scientific testing thereby the very frontiers of science could be extended.

ETC foundation (1988) formulated a project aimed at the generation and documentation of relevant information on practices and methods of low external input and sustainable agriculture.

A survey conducted at NARP, Southern Region (1989) revealed some of the innovative agricultural practices followed by farmers in the southern region with the rationale. Most of these practices have been existing for the past several years, being followed traditionally.

Deshpande and Potdar (1990) revealed that an organic farmer from Dharwad district used Agnihotra ash to protect seeds from seed-borne fungal and bacterial pathogens.

Gupta (1990) listed the reasons for documentation of indigenous knowledge as to understand scientific rationale, to accelerate technological change, to enable better understanding of technology development, development of newer concept to increase awareness among the young generation, to develop appreciation for the traditional system and receive and restore pride among the farmers themselves.

Titilosa (1990) proposed a method to evaluate the incorporation of indigenous/traditional knowledge in agriculture to development projects in less developed countries, so that the benefits of traditional farmers resource

management techniques, as dictated by the environment and other social conditions can be harnessed and improved upon.

Bharara (1991) identified certain traditional practices namely using crop residues, leaves, manures and mulch, growing legumes and fodder crops to control erosion, mixed cropping of cereals with legumes etc. He also described many farmers' practices based on local evidences and empirical data regarding traditional knowledge of rainfed farming practices and soil water conservation in arid zones of Rajasthan.

According to Gnanadeepa (1991) who has identified and categorized some traditional beliefs, some may be rational and some of them have been scientifically proved by the scientists.

After conducting a case study on traditional practices in dry land agriculture in Tamil Nadu, Kanagasabhapathi (1991) identified many indigenous practices of high use particularly in plant protection. He also tried to collect the possible scientific explanation and some valuable suggestion for further development of these practices.

Reddy *et al.* (1991) made an attempt to collect the information regarding the rationale and wisdom behind traditional rainfed agricultural practices followed by experienced farmers of Andhra Pradesh. It was also suggested that the practices thus identified were to be tested by all concerned with agricultural development.

Sanghi (1991) documented a number of farm management practices evolved by farmers in order to face the harmful effects of natural calamities, after conducting a comprehensive study about the traditional farming practices for risk management in rainfed agriculture.

Clarkson *et al.* (1992) presents indigenous people's views on sustainable development and other issues that affect their societies. It details indigenous people's relationship with environment.

Kishorekumar (1993) documented some of the traditional practices in major farming systems in Kerala and highlighted that indigenous knowledge system always took care of the local ecosystem and resources leading to sustainability in agriculture.

Anantharaman *et al.* (1995) stated that farmers have their own reason for practices followed. It was noted that they are not bound by economic or social factors but largely by scientific reasoning.

Abraham and Thomas (1997) reported that aphids in paddy are controlled with a mixture of asaphoetida and cattle urine or spraying a mixture of garlic, chilli and asaphoetida in water, pasting ginger and yam seed material with cowdung, sun dried, smoked and kept so that the seeds can retain the moisture for an year.

In an in-depth study on the agricultural practices in the hills of Nepal, Subedi (1997) revealed that in most cases, farmers' local knowledge concurred with formal experimental results.

Abay *et al.* (1998) opined that farmers' experiments will be complemented by studies and where necessary, on station research which will help, explain or show how farmers' practices can be improved and generate the information innovative farmers and communities need to continue development activities.

2.4 Knowledge of farmers about recommended practices

Faniran and Areola (1976) reported that in the field of crop production and the management of the soil, the knowledge and experience of local farmers are unrivaled and no alternative system of food production is found as competent as farmers' knowledge.

Samad (1979) found that in areas where pepper and coconut package programmes were implemented, knowledge of farmers about improved scientific practices was more compared to other areas.

Jayakrishnan (1984) observed that paddy growers had medium level of knowledge of low cost technology.

Studies conducted by Juma (1987) in East Africa showed that women usually possess remarkable knowledge about the qualities and uses of indigenous tree spices and that many of those insights are unknown to men.

Waghmare *et al.* (1988) observed that 19.33 per cent of the fruit and vegetable growers were found to be in the low knowledge category. Sixty per cent were located in medium knowledge category and one fifth of the respondents possessed adequate knowledge about the horticultural development programmes.

Sagar (1989) reported that majority of the respondents had medium knowledge about recommended practices of paddy cultivation.

Bonny (1991) found that majority of vegetable growers had medium level of knowledge on improved vegetable cultivation.

Reijntjes *et al.* (1992) stated that indigenous knowledge is not uniformly spread throughout a community and the individual aptitudes for

storing traditional knowledge and generating new knowledge differ. They observed that each individual possess only a part of communities indigenous Knowledge.

Gangadharan (1993) found that majority of pepper growers have medium level of knowledge towards improved agricultural practices.

Sivaprasad (1997) employed teacher made test to find out the extent of knowledge and found out that majority of the respondents had high level of knowledge.

2.5 Extent of adoption of farmers' practices

Sharma and Nair (1974) indicated that the adoption of recommended practices of high yielding variety was far below the recommended level and only nine per cent of the participants adopted three practices i.e., seed treatment, fertilizers and plant protection in combination.

Sawant and Thorat (1977) observed that rationality does not bring about critical differences in decision-making in adoption of various categories, except those who are the last to adopt an improved farm practice. Differential adoption of farm innovations by farmers was generally observed and it attributed to some of the personal, social and economic characters of farmers.

Manivannan (1980) reported that about three-fourth of the farmers (72.50 per cent) had adopted half of the recommended dose of plant protection measures.

Asaithambi (1981) pointed out that one fourth of the big farmers and negligible percentage (2.5 per cent) of small farmers had adopted the plant protection measures.

A study conducted by Chakravarthy (1982) revealed that majority of farmers falling in small and medium category possessed low level adoption whereas, majority of big farmers possessed medium level adoption of indigenous practices.

Reddy (1983) opined that there was uneven or differential pattern of adoption of the recommended practices by farmers.

Godhandapani (1985) showed that the extent of adoption of nutrient recommendation was found to be medium to high for irrigated groundnut cultivation.

Rahman *et al.* (1986) reported that seed rates used by vegetable growers were quite high compared to the package of practices recommendations. They also identified that in contrast to the package of practices recommendations of specific chemicals for protecting vegetable crops from insect pests, the growers applied chemicals of their own choice.

Chenniappan (1987) revealed that extent of adoption of improved practices for irrigated cotton was medium.

Nehru *et al.* (1988) stated that 64 per cent of the lab to land beneficiary farmers adopted the recommended dose of nitrogen and 72 per cent adopted the recommended dose of potash for vegetable cultivation.

Theodore (1988) reported that there was significant difference in the extent of adoption of farming practices among contact and other farmers.

Vijayan (1989) pointed out that all of the recommended practices in the cultivation of Banana var. Nendran except four practices viz., adoption of fertilizers, desuckering, mulching and plant protection measures all the other recommended practices were adopted by almost all the farmers.

Saxena *et al.* (1990) reported that 17.6 per cent of farmers adopted the recommended package of practices on full, while 49.6 per cent adopted partially and 32.8 per cent followed the recommendations to the minimum level on their fields. They also reported that the plant protection measures had been adopted by less per cent of farmers.

Balasubramaniam (1992) has presented the adoption level of each of the identified indigenous practices in percentage.

Jaleel (1992) reported that majority of Kanikar tribes (69 per cent) had only lower level of adoption of modern techniques of cultivation.

Ramachandran (1992) opined that the extent of adoption means the degree to which the respondent has actually adopted the selected practices. When the extent of adoption equals potentiality adoption, it is full and when it is nil, it is considered as non adoption.

Jananadevan (1993) reported that in the practice-wise adoption of recommended practices of coconut, the adoption of high yielding hybrid varieties for new planting was the least, while spacing and filling the pits with top soil at planting time were well adopted by the beneficiary farmers. He also reported that, none of the farmers applied fertilizers according to the recommended doses.

Parvathi (1995) reported more than half of the farm women (56.88 per cent) had medium level of adoption of traditional and modern technologies.

Syamkumar (1999) opined that potentiality is the maximum degree to which the respondent can extend his adoption depending up on the maximum utilization of the resources he commands or can command. A score of 'one' was given for full adoption, 'two' for partial or improper adoption and 'zero'

for non adoption. The adoption score of the respondent was obtained by summing the scores.

2.6 Relationship between knowledge and selected profile characteristics of farmers

Studies explaining the relationship between the farmers' characteristics and their knowledge about recommended practices and adoption of farmers' practices are have to come by and hence those studies pertaining to farmers' characteristics *vis-a-vis* their knowledge and adoption of improved practices are reviewed in this section.

Fifteen variables were selected for the study by reviewing the past literature, experience of the researchers, discussion with subject matter specialists and opinion from extension personnels. Their relationship with knowledge are given in tabulated form as follows.

2.6.1 Relationship of age with knowledge

Sl. No.	Author	Year	Relationship
01	Kamarudeen	1981	Non significant
02	Selvanayagam	1986	Negative non significant
03	Krishnamoorthy	1988	Significant
04	Thampan	1990	Negative non significant
05	Gnanadeepa	1991	Positive significant
06	Manju	1996	Non significant
07	Preetha	1997	Non significant

2.6.2 Relationship of education with knowledge

Sl. No.	Author	Year	Relationship
01	Krishnamoorthy	1988	Positive
02	Thampan	1990	Positive significant
03	Gnanadeepa	1991	Negative significant
04	Gangadharan	1993	Positive
05	Sumathi and Annamalai	1993	Significant
06	Babu	1995	Positive significant
07	Jayasubramanian	1996	Positive significant
08	Manju	1997	Negative significant
09	Preetha	1997	Negative significant

2.6.3 Relationship of occupation with knowledge

Sl. No.	Author	Year	Relationship
01	Manju	1996	Non significant
02	Preetha	1997	Positive significant
03	Jose	1998	Non significant

2.6.4 Farming experience with knowledge

Sl. No.	Author	Year	Relationship
01	Gnanadeepa	1991	Positive significant
02	Ahiah	1993	Non significant
03	Philip	1995	Non significant
04	Jeyasubramanian	1996	Positive significant
05	Manju	1997	Positive significant
06	Preetha	1997	Positive significant
07	Jose	1998	Negative significant

2.6.5 Relationship of annual income with knowledge

Sl. No.	Author	Year	Relationship
01	Kamarudeen	1981	Non significant
02	Badagaonkar	1987	Positive significant
03	Jeyasubramanian	1996	Non significant
04	Manju	1996	Non significant
05	Preetha	1997	Negative non significant
06	Jose	1998	Non significant

2.6.6 Relationship of area with knowledge

Sl. No.	Author	Year	Relationship
01	Godhandapani	1984	Non significant
02	Satheesh	1990	Positive significant
03	Manju	1996	Non significant
04	Manju	1997	Negative significant
05	Preetha	1997	Negative non significant
06	Jose	1998	Non significant

2.6.7 Relationship of information source utilization with knowledge

Sl. No.	Author	Year	Relationship
01	Selvanayagam	1986	Positive non significant
02	Gananadeepa	1991	Negative significant
03	Gangadharan	1993	Significant
04	Manju	1996	Non significant
05	Preetha	1997	Positive significant

2.6.8 Relationship of social participation with knowledge

Sl. No.	Author	Year	Relationship
01	Kamarudeen	1981	Positive significant
02	Haraprasad	1982	Positive significant
03	Ramadas	1987	Positive significant
04	Thampan	1990	Positive
05	Gnanadeepa	1991	Positive non significant
06	Gangadharan	1993	Positive
07	Manju	1996	Negative non significant
08	Preetha	1997	Negative non significant
09	Jose	1998	Positive significant

2.6.9 Relationship of extension orientation with knowledge

Sl. No.	Author	Year	Relationship
01	Gananadeepa	1991	Negative non significant
02	Gangadharan	1993	Significant
03	Manju	1996	Non significant
04	Manju	1997	Positive significant
05	Preetha	1997	Negative non significant
06	Jose	1998	Non significant

2.6.10 Relationship of economic motivation with knowledge

Sl. No.	Author	Year	Relationship
01	Gopala	1991	Non significant
02	Chaudhari and Makode	1992	Positive significant
03	Gangadharan	1993	Positive significant
04	Manju	1996	Non significant
05	Manju	1997	Negative significant
06	Preetha	1997	Negative non significant
07	Jose	1998	Positive significant

2.6.11 Relationship of innovativeness with knowledge

Sl. No.	Author	Year	Relationship
01	Gangadharan	1993	Positive significant
02	Nirmala	1993	Positive significant
03	Manju	1996	Non significant
04	Manju	1997	Negative significant
05	Preetha	1997	Negative non significant
06	Jose	1998	Significant

2.6.12 Relationship of cosmopoliteness with knowledge

Sl. No.	Author	Year	Relationship
01	Selvanayagam	1986	Positive and non significant
02	Gnanadeepa	1991	Negative significant
03	Gangadharan	1993	Positive
04	Manju	1996	Non significant
05	Preetha	1997	Negative non significant
06	Jose	1998	Positive significant

2.6.13 Relationship of risk preference with knowledge

Sl. No.	Author	Year	Relationship
01	Viju	1985	Positive significant
02	Selvanayagam	1986	Negative non significant
03	Ratnabai	1990	Non significant
04	Gnanadeepa	1991	Negative non significant
05	Gangadharan	1993	Positive
06	Suresh	1993	Positive significant
07	Manju	1996	Negative non significant
08	Preetha	1997	Positive significant
09	Jose	1998	Positive significant

2.6.14 Relationship of Participatory Technology Development (PTD) with knowledge

No related study could be located in this context.

2.7 Relationship between adoption and selected profile characteristics of farmers

2.7.1 Relationship between age and adoption

Sl. No.	Author	Year	Relationship
01	Manivannan	1980	Negative
02	Prakash	1980	Negative
03	Vijayakumar	1983	Negative
04	Swaminathan	1986	Negative
05	Prasannan	1987	Negative
06	Adhiguru	1991	Non significant
07	Lekshmi	1995	Non significant

2.7.2 Relationship between education and adoption

Sl. No.	Author	Year	Relationship
01	Kamarudeen	1981	Positive
02	Vijayakumar	1983	Positive
03	Swaminathan	1986	Positive
04	Prasannan	1987	Positive
05	Anithakumari	1989	Positive

2.7.3 Relationship between occupation and adoption

Sl. No.	Author	Year	Relationship
01	Das and Sarkar	1979	Positive significant
02	Somasundaram and Singh	1979	Non significant
03	Jayakrishnan	1984	Positive significant
04	Manju	1996	Non significant
05	Preetha	1997	Non significant

2.7.4 Relationship between farming experience and adoption

Sl. No.	Author	Year	Relationship
01	Kumbar	1983	Positive
02	Jayakrishnan	1984	Positive
03	Jayapalan	1985	Positive
04	Adhiguru	1991	Non significant
05	Suthe *et al.*	1991	Non significant
06	Rajkumar	1992	Non significant

2.7.5 Relationship between annual income and adoption

Sl. No.	Author	Year	Relationship
01	Viju	1985	Positive
02	Badagaonkar	1987	Positive
03	Aziz	1988	Positive
4	Sivaprasad	1997	Non significant

2.7.6 Relationship between farm size and adoption

Sl. No.	Author	Year	Relationship
01	Prakash	1980	Positive
02	Kamarudeen	1981	Positive
03	Vijayakumar	1983	Positive
04	Anithakumari	1989	Positive

2.7.7 Relationship between exposure to information sources and adoption

Sl. No.	Author	Year	Relationship
01	Godhandapani	1985	Positive significant
02	Jayapalan	1985	Positive significant
03	Wilson and Chaturvedi	1985	Positive significant
04	Prasannan	1987	Positive significant
05	Anithakumari	1989	Positive significant
06	Sajeevachandran	1989	Positive significant
07	Manju	1996	Positive significant
08	Preetha	1997	Positive significant

2.7.8 Relationship between social participation and adoption

Sl. No.	Author	Year	Relationship
01	Manivannan	1980	Non significant
02	Alagarraja	1982	Non significant
03	Sanoria and Sharma	1983	Positive
04	Bhaskaran and Thampi	1986	Non significant
05	Victor	1987	Non significant
06	Gangadharan	1993	Positive

2.7.9 Relationship between extension orientation and adoption

Sl. No.	Author	Year	Relationship
01	Nanjayan	1985	Positive significant
02	Somasekharappa and Manimegalan	1987	Non significant
03	Govind	1992	Positive
04	Gangadharan	1993	Significant
05	Manju	1996	Non significant
06	Preetha	1997	Negative significant
07	Sivaprasad	1997	Non significant

2.7.10 Relationship between economic motivation and adoption

Sl. No.	Author	Year	Relationship
01	Shukla	1980	Positive
02	Ramaswamy	1987	Non significant
03	Krishnamoorthy	1988	Non significant
04	Sajeevchandran	1989	Positive
05	Suthe *et al.*	1991	Positive
06	Rajkumar	1992	Non significant
07	Jnanadevan	1993	Non significant
08	Gangadharan	1993	Positive
09	Meera	1995	Positive

2.7.11 Relationship between cosmopoliteness and adoption

Sl. No.	Author	Year	Relationship
01	Kamarudeen	1981	Positive
02	Ferreira *et al.*	1983	Positive
03	Viju	1985	Positive
04	Mahadevaraiah	1987	Positive
05	Olowu *et al*	1988	Positive
06	Syamala	1988	Non significant
07	Jaleel	1992	Positive

2.7.12 Relationship between risk preference and adoption

Sl. No.	Author	Year	Relationship
01	Babu	1980	Non significant
02	Pillai	1983	Positive
03	Prasannan	1987	Positive and non significant
04	Manju	1996	Negative and non significant
05	Preetha	1997	Positive significant

2.7.13 Relationship between PTD and adoption

No closely related study could be reviewed in this context.

2.8. Techno- socio- economic assessment of farmers' practices

Tamil Nadu Agricultural University (TNAU) (1984) conducted a techno-socio-economic survey for the development of horticulture and

examined the agroclimatic factors like soil, topography, rainfall and irrigation, economic factors such as market conditions, infrastructure facilities like power, transport, storage and communication and political factors such as Government policies and laws on horticultural crops.

Since 1980, the Brazilian National Sugarcane Improvement Programme (PLANAL SUCAR) has been examining the technical and socio-economic aspects of cultivating food crops in conjunction with sugarcane. Some 180 experiments were conducted in various states to demonstrate the practicability and profitability of these farming systems. This was reported by Kombardi (1985).

In the present study technical aspects included the dimensions such as relative advantage, compatibility, complexity, trialability and observability. Social aspects included the components like family labour utilisation and simplicity. Economic aspects consisted of profitability and input availability.

All the five attributes of innovation viz., relative advantage, compatibility, complexity, trialability and observability were found to be significantly related to rate of adoption in a study conducted by Holloway (1977).

Arulraj (1984) in his study found that complexity and compatibility were found to be significantly related with adoption.

Anantharaman *et al.*, (1985) stated that farmers have their own reason for practices followed. It was noted that they were not bound by economic or social factors but largely by scientific reasoning.

Ramagowda and Siddaramaiah (1987) stated that compatibility, trialability and observability with rate of adoption.

Preetha (1997) reported that farmers are more inclined towards modern technology at the cost of sustainability. In her study she also found out that there was no significant difference in the evaluative perception of simplicity, profitability, sustainability, input availability and flexibility attributes of indigenous knowledge.

2.9. Efficiency of farmers' practices

According to Amey (1969) efficiency is a loose term and a host of different concepts of efficiency come really to mind. He said that efficiency was an elusive concept.

Koontz *et al.* (1986) viewed efficiency as achievement of ends with least amount of resources.

Ghosh *et al.* (1988) gave the meaning of efficiency as maximum output with minimum input of labour.

In this study efficiency was operationalised as the ability of a practice to produce right results as it was measured in terms of the perception of farmers, researchers and extension personnel on the basis of its techno socio-economic aspects.

2.10. Constraints in rice farming

According to Pandya and Trivedi (1988) constraints are those items of difficulties or problems faced by individuals in adoption of technology. Constraints in farming as identified by different researchers were reviewed and presented in a tabular form as follows.

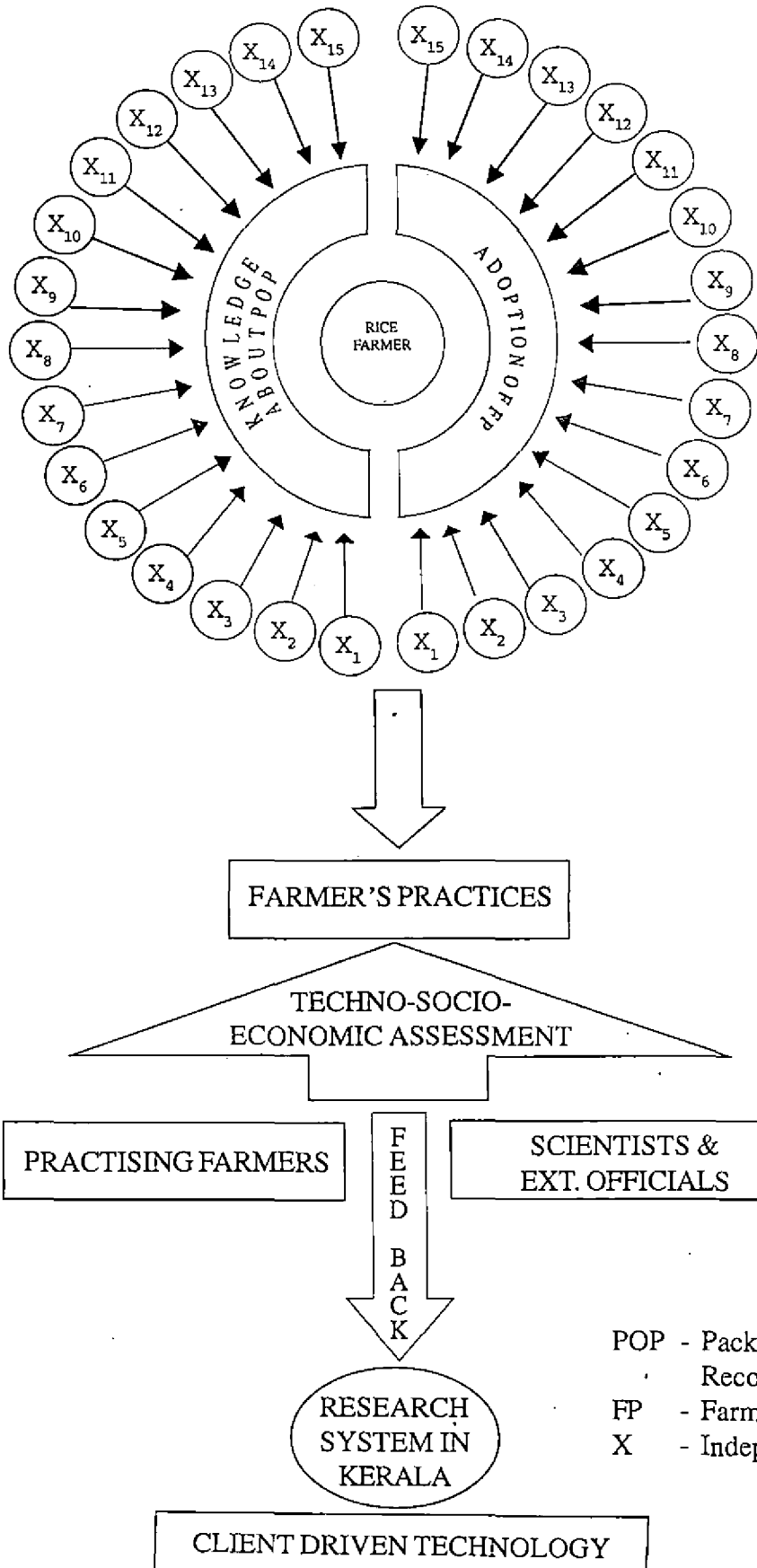
Sl. No.	Researcher	Year	Area of study	Constraints identified
01.	Khaleel	1978	Rice	Lack of HYV seeds, financial assistance, low straw yield, lack of irrigation facilities.
02.	Jaiswal & Arya	1981	Transfer of technology	Relative advantage of the innovation, its compatibility, simplicity divisibility and communicability.
03.	Sivaramakrishnan	1981	Rice	Lack of irrigation facilities
04.	KAU	1983	Rice	Inadequate coverage of high yielding varieties. Shortage of quality seeds, inadequacy of agricultural implements
05.	Menon	1984	Rice	High cost of labour, decreasing productivity.
06.	Suseelan	1988	Rice	High cost of labour, its unavailability, nonavailability of sprayers and other equipment's and skilled workers.
07.	Prakash	1989	Rice	High wage rate, small holdings, lack of co-operation among farmers.
08.	Nair	1990	Rice	Unavailability and high cost of manures, problems of rodents lack of credit, unavailability of agricultural labourers.
09.	Meera	1995	Plant protection technology	Untimely supply and high cost of inputs, difficulty in the selection of alternate chemicals.
10.	Manju	1996	Rice	Unavailability and high cost of labour, low efficiency of certain practices (*'Chakram'* to dewater the lands) and inadequate infra structural facilities.

2.11. Conceptual model of the study

A conceptual model is developed and presented in Fig.1. This will facilitate to generate a comprehensive idea regarding the present study. It also helps to analyse the study theoretically and empirically.

In the top portion of the diagram rice farmer is depicted with the dependent variables such as knowledge about the recommended practices and adoption of farmers' practices. Surrounding this are the independent variables. Their influence has been shown in the figure as arrows pointing towards the dependent variables of the rice farmers. All practices followed in rice cultivation come under 'farmers' practices' and these will be assessed scientifically by the evaluative perception of practising farmers, scientists and extension officials. Their feed back regarding the techno-socio-economic assessment is given to the research systems in Kerala to develop client driven or demand driven technology.

FIG. 1 CONCEPTUAL FRAMEWORK OF THE STUDY



METHODOLOGY

3. METHODOLOGY

The methodology followed in the study is presented under the following heads.

3.1. Research design

3.2. Locale of the study

3.3. Selection of the sample

3.4. Operationalization and measurement of variables

3.5. Methods used for data collection

3.6. Statistical tools used for the study

3.1 Research design

This study was conducted adopting an ex-post-facto research design. Inferences about relations among variables are made without direct intervention, or from concomitant variation of independent and dependent variables. In this research study, since the manifestation of the independent variables had already occurred and had no scope for manipulation of any variable, ex-post-facto research design was resorted to.

3.2 Locale of the study

The study was conducted in Thiruvananthapuram district of Kerala. This district was selected because conversion of paddy lands is very high in this district compared to other districts in Kerala (FIB, 1998). Even though land conversion and cost of cultivation is very high, farmers are still practising rice cultivation in some traditional rice growing belts of this district. One such area is the 'Andoorkonam Ela' in Andoorkonam village

panchayat. This 'Padasekharam' was selected as the locale of study because of the following reasons.

(1) This was the area where the 'Group farming' practice by the Govt. of Kerala was started first (Government of Kerala, 1995).

(2) This 'Padasekharam' showed no considerable shrinkage in area under cultivation for the past 20 years. It showed only a shrinkage area of 1.3 per cent (Government of Kerala, 1995).

(3) More number of farmers adopted high yielding varieties (Kanchana, Athira etc.).

(4) Homogenous area of about 175 ha of land under paddy cultivation was available with this 'Padasekharam'.

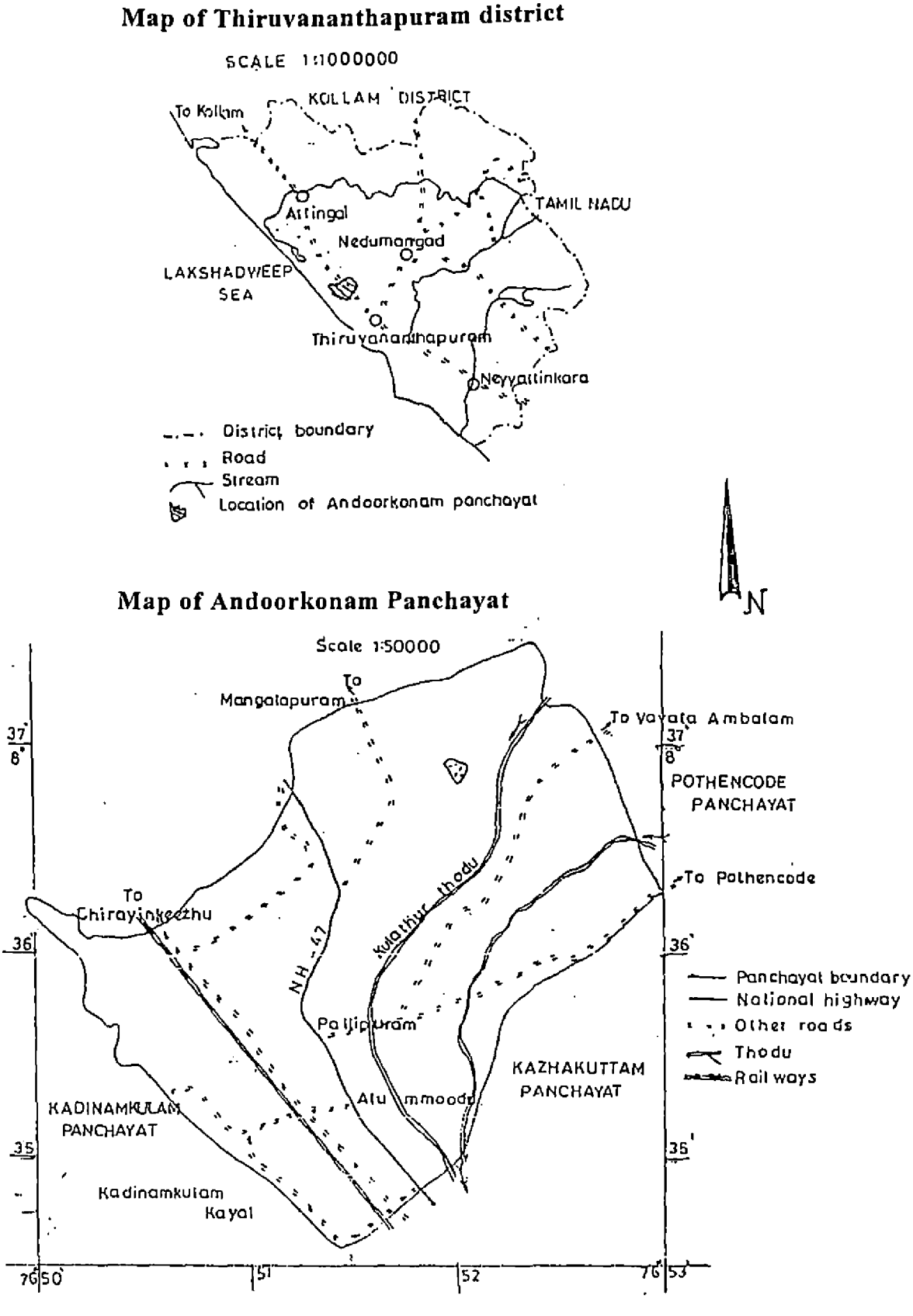
(5) More and more farmers were turning into paddy cultivation avoiding vegetables and banana and this was a characteristic feature of this 'Ela' as told by farmers. According to them this was a unique feature of this 'Padasekharam' alone.

(6) All the farmers were having an opinion that even though paddy was not profitable in other parts of the state it was profitable in 'Andoorkonam Ela'.

(7) Might be because of the above said reasons a panel of researchers, extension personnel and people's representatives from the district rated Andoorkonam Ela' as an area which is significant as far as rice cultivation is concerned and opined that it was worth studying about the cultivation practices which were prevalent there.

Generally two crops of paddy were raised in a year. First crop or viripu sown during April-May and second crop (Mundakan) sown during September-October (Government of Kerala, 1995). Map showing the study area is given in Fig. 2.

Fig. 2 Location map of the study area



3.3 Selection of sample

Two sets of respondents were selected for the study.

1. Practising farmers

2. Extension workers and scientists working on rice crop

Since the research programme was of exploratory and exhaustive in nature involving non-participant observation for data collection, only a modest sample size could be selected. The list of farmers who were practising rice crop continuously for the past 15 years was obtained from Andoorkonam Krishi Bhavan. It included 85 farmers. From the list 35 farmers were selected using the simple random sampling methodology. Since the area selected was homogenous with respect to the cultivation practices and other physical factors such as topography availability of irrigation water, other micro climatic parameters etc., only 35 farmers were included in the first category of respondents.

Second category consisted of a total of 30 respondents. It included 15 scientists from the College of Agriculture, Vellayani, 10 scientists from the College of Horticulture, Vellanikkara and 5 Agricultural Officers working in the near vicinity of College of Agriculture, Vellayani.

Scientists from College of Agriculture and College of Horticulture were selected based on their research experience with rice crop and the Agricultural Officers were selected on the basis of their extension activities in the respective Panchayats which were having significant paddy cultivation.

The 15 scientists from College of Agriculture, Vellayani included ten scientists from the Department of Agronomy and five scientists from the

Department of Agricultural Extension. From the College of Horticulture, Vellanikkara five scientists each from the Department of Agronomy and Department of Agricultural Extension were selected.

Thus a total of 15 extension officials and 15 agricultural scientists working with sufficient experience in extension / research related to the cultivation of paddy crop were selected as the second category of respondents.

3. 4 Operationalisation and measurement of variables included in the study

3.4.1 Identification of farmers' practices

Non participant observation technique was used for the identification of farmers' practices. The list of rice cultivators, who were practicing rice farming for the past fifteen years continuously was obtained from Krishibhavan of Andoorkonam panchayat. As the non participant observation technique was laborious and very time consuming only a modest sample of 35 farmers was selected from that list. Frequent and timely visits to the fields of these farmers were made and observations regarding all the practices were done. Observations from all the fields were pooled and categorized under main cultivation practices.

3.4.2 Operationalisation of dependent variables

3.4.2.1 Knowledge about recommended practices

This variable was operationalised as the extent of informations possessed by the rice farmers about recommended practices for rice cultivation by the Kerala Agricultural University.

This variable was measured using a simple test developed for the study.

Ten items (recommended practices) which were suggested by a panel of experts were included in the interview schedule for measuring the knowledge. Each respondent was given a score of one for the practices which were known to him and zero for the practices which were unknown to him. The final score was calculated by cumulating the scores. Thus one could get a maximum score of ten and minimum of zero.

3.4.2.2 Extent of adoption of farmers' practices

Extent of adoption is the degree to which a farmer has actually adopted the farmers' practices in rice cultivation.

The index developed by Manju (1996) was used in this study with slight modifications. The selection of practices for calculating the adoption index was done by a panel of scientists who are working on rice crop.

The list of farmers' practices was administered to a group of scientists working on rice crop and they were requested to suggest the practices which they thought as important or worth studying. Thus the practices were ranked in the order of their preferences and 25 practices were selected to be included in the final interview schedule for measuring the adoption index. These practices were ranked and given weightages within subheadings of each cultivation practices. Adoption index was calculated as given below.

$$AI = \frac{I}{S} \times \frac{\sum_{i=1}^{k} Wi}{\sum_{i=1}^{n} wi} \times Li \times Ai \times 100$$

AI = Adoption index

S = Number of subheadings

$\sum_{i=1}^{k} Wi$ = Sum of weightages of the selected practices where k is the number of selected practices

$\sum_{i=1}^{n} wi$ = Total weightages of all the practices where n is the number of total practices

Li = Proportion of years since when the respondent is following the i th practices (values from 0 to 15 years as the limits)

Ai = Proportion of area in which the respondent is following the practice (0 - 1)

3.4.3 Operationalisation and measurement of independent variables

3.4.3.1 Age

Age was operationalised as the number of years the respondent had completed at the time of investigation since his or her birth.

3.4.3.2 Education

It was operationalised as the extent of informal and formal learning acquired by the farmer. The different educational levels of the respondents were scored as follows.

Level of education	Score
illiterate	0
primary	1
secondary	2
collegiate	3

3.4.3. 3 Main occupation

This was operationalised as the main vocation from which the farmer derives his major share of income. Scoring procedure is as follows.

Agriculture as primary occupation : 2

Agriculture as secondary occupation :1

3.4.3.4 Farming experience

It was operationally defined as the experience of the farmer in rice cultivation. This variable was measured by asking the respondents to indicate the number of years he has been doing the rice culture.

3.4.3.5 Annual income

This variable was operationalised as the total earning of the rice farmer and the earning members of his family in an year from his farm and all other resources. It was measured in rupees per year.

3.4.3.6 Area under rice cultivation

It was measured as the area under rice cultivation in cents.

3.4.3.7 Exposure to information sources

This refers to the individuals' contact with various sources of information i.e., his/her exposure to various sources and not influencing an internalization of the messages from these sources. Scores of 0, 1 and 2 were given for responses never, occasionally and regularly respectively for each information source.

3.4.3.8 Irrigation index

The extent to which the rice crop is being irrigated was measured by this variable.

The scoring procedure developed by Geethakutty (1993) was adopted here with a slight modification. Two dimensions, *viz* availability of irrigation water and area covered under irrigation were considered for this purpose. The scores were given as follows.

1. Availability of irrigation water.

Throughout the year	2
Partial availability	1
Never	0

2. Area irrigated.

75 per cent and above	4
Between 74.99 and 50.00	3
Between 49.99 and 25.00	2
Below 25 per cent	1

The scores obtained by a farmer for the availability of irrigation water and area under irrigation were multiplied to get the irrigation index.

3.4.3.9 Social Participation

It was operationally defined as the degree of involvement of respondent in formal and informal social organisations either as member or as office bearer which also includes their degree of participation in organisational activities.

The scale used by Subramoniam (1986) was followed with necessary modification to suit the present study.

The scoring procedure is as follows :

1. Membership

No membership	0
Membership in each organisation	1
Office bearer in each organisation	2

2. Frequency of attending meetings

Never attending any meeting	0
Occasionally attending a few meetings	1
Regularly attending all meetings	2

To obtain final score of the respondent, the scores given as the member or office bearer were multiplied with scores given for attendance in the activities and added up for all the organisations.

3.4.3.10 Extension Orientation

Extension orientation referred to the extent of contact a farmer had with different extension agencies and also his participation in union activities or programmes like meetings, seminars etc. organised by these agencies and personnel.

Here the response for contact of a farmer with different extension personnel were measured as followings.

Response	Score
Regular	2
Occasional	1
Never	0

The total score was obtained by adding up all the scores for different extension activities.

The extension participation was measured by summing up the scores obtained by a farmer for his participation in various extension activities. The scores were assigned to the respondents as follows

Response	Score
Whenever conducted	2
Sometimes	1
Never	0

The total score was obtained by adding up the scores for all extension activities. The scores for extension orientation for a respondent was arrived at by adding up the scores for extension contact and extension participation.

3.4.3.11 Economic motivation

It was operationalized as the drive of the respondent for occupational sources in terms of profit making and the relative value placed on economic ends.

This was measured using Supe's scale (1969) with modification in the scoring procedure. Instead of a five point continuum of response as developed by Supe, a dichotomy of yes or no response pattern was used as done by Prasad (1983). The scale consisted of six statements of which five statements were positive, while the last one was negative. A score of one was assigned to agree response and zero score for disagree response in the case of positive statements. The scoring pattern was reversed for negative statement. The score obtained on each statement were added to get the total score of a respondent on this variable. The maximum score that could be obtained by a respondent is six and minimum was zero.

3.4.3.12 Innovativeness

This is operationalised as the degree to which the respondent was relatively earlier in adopting new ideas. The procedure followed by Singh and Choudhary (1977) and adopted by Selvanayagam (1986) was used to measure the innovativeness of the rice farmer. In this procedure a question was asked as to when the farmer would like to adopt an improved practice in farming. The response from him was scored as follows:

Response	Score
1. As soon as it is brought to my knowledge	3
2. After I have seen other farmers tried successfully in the farm	2
3. I prefer to wait and take my own time	1

3.4.3.13 Cosmopoliteness

Rogers (1962) defined cosmopoliteness as the degree to which an individual's orientation is external to a particular social system.

In this study cosmopoliteness is operationally defined as the tendency of the rice farmers to be in contact with outside world based on the believes that all the needs of an individual cannot be satisfied within his own community. The variable was measured by using the scale developed by Desai (1981).

The two dimensions of the variable are

(a) frequency of visits to the nearest town in a month

(b) the purpose of visits

The scoring pattern was as follows

(a) frequency of visits	
(i) twice or more a week	5
(ii) once a week	4
(iii) Once a fortnight	3
(iv) once a month	2
(v) very rarely	1
(vi) Never	0

(b) purpose of visit

(i) All visits relating to agriculture	5
(ii) Some relating to agriculture	4
(iii) Personal / or domestic matter	3
(iv) Entertainment	2
(v) Any other purpose	1
(vi) No response	0

The total score of each respondent was found out by adding the scores of the above two dimensions of cosmopoliteness.

3.4.3.14 Risk preference

This was operationalised as the positive or negative effects, feelings or effects towards risk held by a farmer towards farming in general.

The scale developed by Supe (1969) was used to measure risk preference of the respondents. The scale consisted of six statements of which two were negative statements. The responses were collected in a five point continuum and the scoring pattern for positive statements as follows.

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

In the case of negative statements the scoring pattern was reversed. The scores obtained on each statement were cumulated to obtain total score of a respondent on this variable.

3.4.3.15 Participatory Technology Development (P.T.D)

It was operationalised as the process of combining the indigenous knowledge and research capacities of the local farming communities with that of research and development institutions in an interactive way in order to identify, generate, test and apply new techniques and practices and to strengthen the existing experimental and technology management capacities of the farmers. It was also referred to as 'people centered technology development'. This variable has two parts.

(a) Participation in PTD

This was operationalized as the involvement of the farmers in the developmental activities carried out through the various package programmes. As little study on this aspect has been carried out so far, there was no criteria for measuring the participation in PTD. So it was necessary to develop a scale for that purpose. The scale consisted of three programmes of PTD on paddy cultivation in that area. A score of one was assigned to response - 'Yes' and Zero to the response - 'No'. The scores obtained on each statement was cumulated to get the score of an individual. The maximum score one could obtain was three and minimum zero.

(b) Perception about P.T.D.

Perception was operationally defined as a dynamic phenomenon which involves not only perceiving stimuli but also interpreting and describing these stimuli in terms of what are meaningful to the individual. This was measured by a scale developed for the study. Thce scale consisted of six statements of

which only one was positive, rest were negative. A score of '1' was assigned for the 'Agree' response and '0' score for 'disagree' response in case of positive statement. The scoring pattern was reversed in the case of negative statements. The scores obtained on each statement were cumulated to obtain the total score of the respondent on this variable.

3.4.4 Operational definition of the techno-socio-economic assessment of the farmers' practices

Techno socio economic assessment was operationally defined as the meaningful sensation of the respondent about the worth or value of the farmers practices in terms of the technical aspects which include relative advantage, compatibility, complexity, trialability and observability, social aspects which include simplicity and labour utilisation and economic aspects which include profitability and input availability. These dimensions were defined as follows.

Relative and advantage : degree to which a practice was perceived as being better than the idea it superceds.

Compatibility : degree to which a practice was perceived as being consistent with the existing values, past experiences and needs of potential adopters.

Complexity : degree to which a practice was difficult to understand and use.

Trialability : degree to which a practice might be experimented on a limited basis.

Observability : degree to which the results of a practice were visible to others.

Simplicity : degree to which a practice was perceived to be easier in adoption.

Labour utilization : degree to which a practice was perceived to employ more family labour than hired labour.

Profitability : degree to which a practice was perceived to give better yield.

Input availability : ease and ready availability of inputs required for a practice.

For assessing the efficiency of farmers' practices-technical, social and economic-indices were developed using matrix ranking methodology as suggested by Chambers (1991) with some modifications suited for the present study. The list of collected farmers' practices were administered to a group of scientists who were working with sufficient experience in the field of rice research and to a group of progressive farmers. The first category included a total of 30 scientists of which 15 from College of Agriculture, Vellayani and 15 from College of Horticulture, Vellanikkara. The second category included 20 respondents from the experimental area.

Efficiency index of each farmers' practices on the basis of the technical, social and economic dimensions were measured in a three point continuum of extremely efficient, efficient and not efficient. Score of 3, 2 and 1 were given respectively for these responses.

The technical index was worked out by adding the mean scores of each farmers' practice on all the dimensions which were included under the technical aspects as mentioned above. Thus a practice could get a maximum index value of 15 and minimum of five. Separate index values were worked out for the two groups of respondents viz., the scientists and the progressive farmers.

The social and economic indices were worked out using the same procedure as described above. In these two cases, the maximum index value a practice could get was six and the minimum value was two.

For getting the efficiency index of farmers' practices on the basis of technical, social and economic aspects, all the three indices were cumulated and techno-socio-economic index was formed. This also was calculated separately for the two respondent groups. Thus a practice could get a maximum techno-socio-economic index value of 27 and a minimum value of nine.

The techno-socio-economic index value thus obtained are arranged in the form of a matrix as shown below.

Respondents / Farmers' practices	Techno-socio-economic index		Efficiency index (Cumulated index)	Rank
	Scientists	Progressive farmers		
P_1				
P_2				
P_3				
P_n				

P_1, P_2, P_3 and P_n - 'n' number of farmers' practices.

The index values of each practice calculated for the two respondent groups were added to get the efficiency index (cumulated index) and ranked. A practice could get a maximum value of 54 and a minimum value of 18.

3.4.5 Ecofriendliness as perceived by farmers

It was the degree to which a practice was perceived as profitable, conserve natural resource base and provide healthy and safe environment in the long run. The list of the collected farmers' practice was administered to a group of 20 progressive farmers and were asked to indicate their response on a four point continuum. Scores of 1, 2, 3 and 4 were given to the responses

extremely not ecofriendly, not ecofriendly, ecofriendly and extremely ecofriendly respectively. The mean score for each practice was worked out and multiplied with the weightages for each practice given by the scientists. Thus index value for ecofriendliness was found out and ranked.

3.5 Constraints faced by rice farmers

Here the methodology developed by Meera (1995) was used. A list of constraints was prepared based on review of literature, and discussions with subject matter specialists and extension officials. Then the farmers were asked to indicate, whether they were experiencing these constraints or not. The frequency of each constraint was found separately and on the basis the constraints were ranked.

3.6 Methods used for data collection

The study was carried out in three steps. The first step comprised the collection of data regarding the profile characteristics of the farmers. For this purpose a structured and pretested interview schedule was used (Appendix I).

The second step was taking the observations regarding the farmers' practices. Non participant observation technique was used for this data collection. This involved visiting the farmers' fields frequently from the first step of cultivation, that is preparation of the land for nursery to the harvesting and storing the seeds for the next cultivation. Thus data on farmers' practices were collected without asking the farmers. Non participant observation was selected because there may be loss of information while interviewing a farmer. There were a high probability of committing errors in such type of interviews.

Non participant observation technique was very costly and time consuming. So the sample size was reduced to 35 farmers. Eventhough a comprehensive observation of practices was done; a frame of observation schedule was also formed for avoiding the missing of the key operations (Appendix II).

The third step was the techno-socio-economic assessment and assessing the eco friendliness in rice cultivation. For this purpose structured schedules were used (Appendix III).

3.7 Statistical tools used for the study

Correlation analysis was used to workout the relationship between the independent variables and dependent variables. Intercorrelation analysis was also done among the independent variables to find out their interrelationships.

Besides, mean, standard deviation simple percentage analysis etc. were used for the analysis of data.

RESULTS
AND
DISCUSSION

4. RESULTS AND DISCUSSION

This chapter deals with the results obtained in the study and the discussions based on the results. Keeping the objectives in view, the findings as well as the discussion on them are presented under the following headings.

4.1 Identification of farmers' practices in rice cultivation

4.2 Profile characteristics of rice farmers

4.3 Knowledge of the farmers about the recommended practices

4.4 Extent of adoption of farmers' practices

4.5 Ecofriendliness of farmers' practices as perceived by the farmers

4.6 Techno-socio-economic assessment of farmers' practices

4.7 Efficiency index of farmers' practices

4.8 Constraints faced by rice farmers

4.9 Empirical model of the study

4.1 Identification of farmers' practices in rice cultivation

The results obtained are discussed under 17 subheadings. The opinions of scientists about the rationality of these practices are also discussed along with.

4.1.1 Source of seeds

Majority of the farmers were selecting seeds from their previous crop. But a few were getting seeds from the Krishi Bhavan and other progressive farmers of nearby 'Elas'.

4.1.2 Selection of seeds

Farmers who were selecting seeds from their previous crop had their own ways of selection of seeds. Selection of '*Thalakkathir*' was the most common among them. '*Thalakkathir*' refers to the panicles which mature first and bend by virtue of the weight of the grains.

According to scientists this is a rational practice. The grains maturing first will have a viable embryo in it and bend due to weight will have maximum amount of dry matter in it. This will provide food for the fast growing embryo and the seedlings will be more healthier.

4.1.3 Selection of variety

Most of the farmers used the variety 'Aiswarya' for the first crop and PTB-9 (locally known as '*Onpathu*' which means 'nine') for the second crop. However a third crop was discarded by all of them due to heavy attack of BPH (Brown Plant Hopper) during the particular crop season.

A small fraction used 'Athira' and 'Kanchana' for the first crop. But all (100 per cent) of the farmers invariably used PTB-9 for the second crop.

The variety Aiswarya is preferred by the farmers because of the higher yield and red rice. Red rice is more preferred in South Kerala.

Athira and Kanchana were used for cultivation because they were relatively new varieties supplied by the Krishibhavan.

The use of the PTB-9 for the second crop is a recommended practice and farmers do it because it is more resistant to pests, diseases and drought and provide more straw yield than any other variety.

4.1.4 Drying and storage of seeds

The seeds collected from the previous crop were dried under sun for two days and one night. The exact point of drying is found out by breaking open the seed to see a whitish centre. According to farmers drying above and below that point is not desirable since the viability of the seeds will be lost in that case within a few days. Drying below that point will cause entry of pathogen like saprophytic fungi and drying above that point will cause the abortion of embryo.

According to scientists this is a rational practice.

The dried seeds are put in gunny bags and kept inside '*Pathayams*' or placed over wooden platforms.

4.1.5 Nursery practices

4.1.5.1 Ploughing the land

The land for nursery is ploughed using bullocks (Plate 1). This practice was adopted by all the farmers. The land is ploughed five to six times at a rate of one ploughing per day. After three ploughings the land is flooded for one week to decompose all the vegetation that was present at the time of ploughing. After that the land is ploughed two to three times and beds of width about 1.5 m are formed on the last day of ploughing (Plate 2).

4.1.5.2 Seed treatments

The seeds were taken out from the stored places, required quantity was measured using a locally available instrument called '*Pakka*' (Plates 3 and 4).

Plate 1 Land for nursery is ploughed using bullocks

Plate 2 Beds are formed on the final day of ploughing

Plate 3'Pakka' – the seed measuring device

Plate 4 Measuring the seeds using 'Pakka'

The seeds were taken in gunny bags and immersed in the ponds or canals after putting some weight over them. They were thus soaked for about 18-24 hours. After that they were taken out and heaped in dark rooms for about 12-18 hours. By that time all the seeds start germination and the coleoptile portion will be visible as whitish strands coming out of the seeds (Plate 5).

According to farmers the heaped seeds in dark rooms would germinate faster. They said that the heat produced inside the heap caused the seeds to germinate. They adopted another indigenous practice of sprinkling cowdung slurry over the heaped seeds if the germination was not proper.

Scientists opined that this is also a rational practice. As the germinating seeds respire, heat is produced. When the seeds are heaped this heat will not dissipate out. Further it will hasten the metabolic activities and germination will be made faster. Cowdung carries organic matter and decomposing microorganisms. They will act on the husks of seeds and they get softened. By their activity also heat is produced which will improve the seed germination process.

4.1.5.3 Sowing of seeds

1. Seed rate

One '*Para*' of seeds - about 7.5 - 8.0 kg is sufficient for getting seedlings for about 20 cents of land. For sowing this, about 1.5 to 2 cents of land is required. This practice coincided with the recommended practice of sowing seeds at the rate of 85 kg per hectare.

Plate 5 Sprouted seeds after soaking

2. Mode of sowing

Simple broadcasting of sprouted seeds was the most commonly adopted practice (Plate 6). However some farmers mixed the sprouted seeds with fresh cowdung and sown over the nursery beds.

4.1.5.4 Duration of the nursery

Duration of the nursery depended on the variety used for cultivation. For 'Aiswarya' the duration varied from 30 - 45 days while that for PTB - 9 varied from 45 - 61 days. This was against the recommended practice of nursery duration. Wood ash at the rate of 10 tins per 'Para' (14 cents) was also applied in nursery.

Scientists opined that the over-aged seedlings can cause yield reduction due to poor performance. But according to the farmers' opinion they were using over-aged seedlings. They said that they were forced to extend the time for keeping the seedlings in nursery due to the fluctuating rainfall and absence of irrigation water (Plate 7).

4.1.5.5 Bird scaring at the time of sowing

Pigeons and Mynas were the common menace while sowing the seeds. So a variety of practices were developed by farmers for scaring them. The most common one was placing bird scarers (Plate 8). Bird scarers are those structures which resemble human beings in attire, built using straw and torn-clothes. Most of the farmers adopted this technique.

According to scientists this was a rational practice.

Plate 6 Broadcasting the sprouted seeds

Plate 7 Tall and lanky seedlings as a result of extending the nursery duration

Another one was to place plastic bags of different colours tied on to poles over the sown fields (Plate 9).

Some farmers adopted placing coconut leaflets on the beds to prevent the attack of birds.

A few adopted placing black coloured clothes and wings of dead crow over the fields to avoid bird menace. Stretching videotapes over the fields was another way to drive away birds (Plate 8).

The most common one was the manual bird scaring which was adopted by all the farmers.

4.1.5.6 Plucking seedlings from the nursery

Nursery was flooded first and water was allowed to stand there till the plucking was completed (Plate 10). The plucked seedlings were hit against coconut fronds placed on the field and by this the adhering mud was removed. The top portion of the leaves of the plucked seedlings were clipped off.

Farmers' said that this would enhance the regeneration of seedlings. But the scientists rated it as an irrational practice as the wounds can cause the entry of pathogens and insects.

4.1.6 Main field preparation

4.1.6.1 Ploughing the land

The land was ploughed three times using tractor. This practice was followed by all the farmers. After the first ploughing, the land was kept flooded for three days and ducks were allowed to enter the field (Plate 11). This practice was followed by all farmers. This would reduce the pest

Plate 8 Bird-scarer along with stretched audio-video tapes

Plate 9 Coloured plastic bags placed over the field

Plate 10 Plucking seedlings from the flooded nursery

Plate 11 Ducks are allowed to enter the field after the first ploughing

incidence since the exposed pupae and larvae were fed by these birds. Then the second ploughing was carried out. After that the land was kept flooded for a week. Then the final ploughing was carried out along with levelling the land. For levelling manual work force was also engaged.

4.1.6.2 Trimming and plastering bunds

Bund trimming and plastering was carried out manually along with the first ploughing of the land. By the second ploughing this practice was completed.

This also forms a recommended practice.

4.1.7 Planting of seedlings

Two to three seedlings, were planted per hill at a spacing of 10 - 15 cm (Plate 12). The planting depth as described by farmers was about half of a finger. It was around 5 - 7 cm.

4.1.8 Application of manures and fertilizers

Farm Yard Manure (FYM) and wood ash were applied at the time of final ploughing of the main field. Some farmers applied lime at the time of final ploughing of the land. No chemical fertilizers were applied at the time of transplanting.

Five days after transplanting, chemical fertilizers were applied. The most common fertilizers used were Factomphos, urea and ammonium sulphate. The quantity of these fertilizers varied from farmer to farmer.

Plate 12 Planting the seedlings

However, split application of fertilizers was a general practice followed by farmers. Chemical fertilizers were applied in three splits viz., five days after transplanting, 30 days after transplanting (maximum tillering phase) and during the flowering stage.

Application of poultry manure along with FYM was another practice followed by some of the farmers. They said that this would drastically reduce the amount of FYM required for rice cultivation.

4.1.9 Weeding

Two weedings were carried out. One weeding 15 - 20 days after transplanting and other during the flowering stage. Hand weeding was adopted and it was done prior to application of fertilizers.

4.1.10 Plant protection

The first attack observed was of a pest viz., the rice case worm. Almost all the fields were affected by this pest. The farmers used Quinalphos to control this pest. The affected fields were drained for two days and along with that the chemical was sprayed.

Application of Quinalphos against rice case worm and draining the fields are recommended practices.

The next attack was by another pest namely rice stem borer. It was observed during the flowering phase and grain forming stage. For managing this pest Malathion was sprayed.

During the milky stage heavy incidence of rice bug was noticed. Attack of this pest was managed by spraying metacid. This was also a recommended practice.

Some farmers followed a practice of mixing a fungicide-mancozeb-with metacid and sprayed at the time of emergence of the panicles. However this practice needs further investigation as opined by scientists.

4.1.11 Rodent control measures

Rats and squirrels were causing damage to the crop during grain maturation phase.

Squirrels were controlled by an indigenously developed practice which is mentioned below. A plantain fruit was taken and cut open longitudinally and some granules of carbofuran was placed inside (Plate 13). This was then placed over the bunds. Squirrels were having the habit of eating the grains which were bend over the bunds. Thus this practice of putting plantain fruits on the bunds have not only prevented the eating of grains, as plantain fruits were preferred over rice grains but also caused the death of squirrels as well.

Farmers told that this practice also helped to reduce the menace caused by Mynas to a great extent.

Some farmers followed the practice of trapping the squirrels using rat traps. They placed common rat traps with baits such as coconut kernels, peanuts, plantain fruits etc., and trapped some of the squirrels.

A variety of practices were developed which included both indigenous and recommended practices for controlling rats. Most common among them was an indigenously developed practice of putting 'owl perches' (Plate 14). Owl perches were those structures which served as seats for owls. For this farmers placed coconut fronds over the fields. During night hours the owls sat there and caught the rats.

Plate 13 Plantain fruit bait

Plate 14 Owl perches

According to scientists this was a rational practice. Preetha (1997) reported this practice among rice growers in Thrissur district also.

Another indigenous practice was to place zinc phosphide inside jack fruitlets and then they were placed over the bunds.

Some farmers followed the practice of placing cotton along with jaggery near the rat holes. Rats ate this and the cotton present in the bait would clog the intestine and cause death.

There was a practice of placing dead rats along the sides of the bunds with a belief that other rats would be alarmed of it and would run away.

Mixing cement and wastes of dried fish and placing along the corners of the field-bunds was yet another locally developed practice for controlling rats.

In the nursery there was a practice of placing the thorns of a locally available plant - known as '*Thodalimullu*' - over the beds to prevent the entry of rats and squirrels on the nursery beds.

Placing anticoagulant poisons such as Ratol and Roban were also in use among the rice farmers.

Different types of traps were also used by them. Among them placing of earthern pots was the most common and a locally developed one. Fast moving rats would fall into the pots and they could not escape from it. Killing of the rats which were trapped is by filling water in to the earthern pots. According to scientists this was also a rational practice.

Other traps which were in common usage were the '*Elipathayams*' and '*Adivillu*'. '*Elipathayams*' were those traps in which, by the biting of rat on the bait the spring connected with the door released and caused the door to

shut. Thus the rat was trapped inside. '*Adivillu*' were those traps in which the bait when bitten by rat the spring released and a bow like portion hit on the head of the rats. These traps were very common among the rice farmers.

4.1.12 Water management practices

All the farmers followed the practice of keeping a thin film of water over the fields throughout the crop period. However during the attack of pests water level was further narrowed down and maintained at saturation level. At times of fertilizer application also this practice was followed.

4.1.13 Harvesting

Harvesting was done manually using sickles. The cut down plants were tied into bundles and were placed over bunds (Plate 15).

4.1.14 Transportation

The tied bundles were carried manually from fields and transported to the threshing yard by bullock carts (Plates 16 and 17).

4.1.15 Threshing

Threshing of the grains was carried out by beating the bundles on to a hard surface such as wooden logs or stone pieces (Plate 18). After that the left over straw was exposed to sun for a day and threshed under feet.

4.1.16 Winnowing

The grains were dried under sun for two days for the easy separation of chaff and grains. Dropping the grains against wind was the most common

Plate 15 Harvested plants are tied in to bundles and kept over bunds

Plate 16 Manual transportation from the field

Plate 17 Transportation in bullock-carts

Plate 18 Threshing

Plate 19 Formation of '*Vaickol Thuru*'

practice followed by farmers. The chaff was blown away by the wind and the grains were collected at the bottom.

4.1.17 Storage

The grains thus separated were again dried under sun for a day and then put in sacks and placed over wooden platforms. The straw was then dried under sun for two to three days and were placed in a circular fashion to form - the 'Vaickol Thuru' (Plate 19).

4.2 Profile characteristics of rice farmers

4.2.1 Distribution of respondents based on their profile characteristics

A close examination of the Table 1 revealed that agriculture was the main occupation of 82.86 percentage of the farmers. Most of them were in the high category in the case of variables like age (51.43 per cent), annual income (54.29 per cent), irrigation index (82.86), innovativeness (82.86) and risk preference (51.43 per cent). Regarding the rest of the variables less than 50 per cent of the farmers were in high category. Among them 77.14 per cent of the farmers were in low category regarding education. 62.86 per cent farmers were in low category in the case of area under rice and farming experience. 60 per cent of the farmers were in low category when the variable exposure to information source utilization was considered. Similar trend was observed in the case of variables like economic motivation (68.57 per cent), extension orientation (51.43) cosmopoliteness (65.71), participation in PTD (68.57 per cent) and perception about PTD (62.86 per cent).

Table 1 Distribution of respondents based on their profile characteristics

(n = 35)

Sl. No.	Variables	Category	Score	Frequency	Percentage
01	Age	Low	<54.3	17	48.57
		High	≥54.3	18	51.43
02	Education	Low	<1.03	27	77.14
		High	≥1.03	8	22.86
03	Occupation	Low	<1.83	6	17.14
		High	≥1.83	29	82.86
04	Farming experience	Low	<25.57	22	62.86
		High	≥25.57	13	37.14
05	Annual income	Low	<47.77	16	45.71
		High	≥47.77	19	54.29
06	Area under rice	Low	<134.17	22	62.86
		High	≥134.17	13	37.14
07	Exposure to information source	Low	<7.51	21	60.00
		High	≥7.51	14	40.00
08	Irrigation index	Low	<8.00	6	17.14
		High	≥8.00	29	82.86
09	Social participation	Low	<3.66	19	54.29
		High	≥3.66	16	45.71
10	Extension orientation	Low	<6.51	18	51.43
		High	≥6.51	17	48.57
11	Economic motivation	Low	<4.23	24	68.57
		High	≥4.23	11	31.43
12	Innovativeness	Low	<2.00	6	17.14
		High	≥2.00	29	82.86
13	Cosmopoliteness	Low	<16.06	23	65.71
		High	≥16.06	12	34.29
14	Risk preference	Low	<24.29	17	48.57
		High	≥24.29	18	51.43
15 (a)	Participation in PTD	Low	<1.06	24	68.57
		High	≥1.06	11	31.43
15 (b)	Perception about PTD	Low	<3.65	22	62.86
		High	≥3.65	13	37.14

4.2.2 Intercorrelation analysis among the independent variables

The correlation matrix is presented under Table 2. It revealed the following conclusions.

Age was significantly and positively correlated with occupation and farming experience. The correlation coefficient between age and farming experience was significant at one per cent level of significance.

The variable education was positively and significantly correlated with annual income, exposure to information source, social participation, extension orientation and innovativeness.

Annual income was positively and significantly correlated with area under paddy, exposure to information source, social participation, extension orientation, economic motivation, innovativeness and cosmopoliteness.

Area under paddy was positively correlated with exposure to information source, social participation, extension orientation, innovativeness, cosmopoliteness and risk preference.

Exposure to information source was highly correlated with social participation, extension orientation and innovativeness.

Positive and significant correlation was observed between social participation and innovativeness.

Extension orientation was positively correlated with innovativeness and risk preference.

Innovativeness showed a positive and significant correlation with cosmopoliteness and risk preference.

The relations between other variables were non significant.

Table 2 Intercorrelation matrix among the independent variables

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	$X_{15(a)}$	$X_{15(b)}$
X_1	1.0000	-0.0705	0.3900*	0.5680**	0.3099	0.3043	-0.0405	-0.0187	-0.0650	-0.1482	0.0034	0.2527	0.2682	0.2277	0.0972	.01231
X_2		1.0000	-0.0697	-0.1820	0.5960**	0.2518	0.4156*	0.1926	0.4731**	0.4451**	0.2314	0.5302**	0.1231	0.0414	0.0218	0.1389
X_3			1.0000	0.2341	0.0733	0.3008	0.0089	-0.1710	0.2335	0.0826	-0.1507	0.1531	0.3069	0.0471	0.2716	0.0937
X_4				1.0000	0.0954	0.0213	-0.1391	-0.1410	0.1267	-0.2636	0.0037	-0.1158	0.2230	-0.0742	0.3103	.02792
X_5					1.0000	0.5690**	0.4904**	0.0685	0.6974**	0.5878**	0.4040*	0.5302**	0.3736*	0.2717	0.3261	0.0660
X_6						1.0000	0.3660*	-0.0550	0.4730**	0.3744*	0.1279	0.3357*	0.5438**	0.5083**	0.1008	0.1187
X_7							1.0000	0.0589	0.5220**	0.4662**	0.2444	0.4461**	-0.0390	0.2074	0.1268	0.1410
X_8								1.0000	-0.0343	0.1183	0.1009	0.0660	-0.2360	-0.0130	0.1391	0.0089
X_9									1.0000	0.4661**	0.1732	0.4329**	0.3170	0.3106	0.3008	0.1410
X_{10}										1.0000	0.2845	0.6030**	0.1686	0.4774**	0.2341	0.2516
X_{11}											1.0000	0.2546	0.2310	0.2685	0.0068	0.0314
X_{12}												1.0000	0.3787*	0.5064**	0.1537	0.2527
X_{13}													1.0000	0.3049	0.0034	0.1926
X_{14}														1.0000	0.1710	0.0089
$X_{15(a)}$															1.0000	0.0589
$X_{15(b)}$																1.0000

X_1 - Age
X_2 - Education
X_3 - Occupation
X_4 - Farming experience
X_5 - Annual income
X_6 - Area
X_7 - Exposure to informaiton source
X_8 - Irrigation index
X_9 - Social participation
X_{10} - Extension orientation
X_{11} - Economic motivation
X_{12} - Innovativeness
X_{13} - Cosmopoliteness
X_{14} - Risk preference
$X_{15(a)}$ - Participation in PTD
$X_{15(b)}$ - Perception about PTD

Table value 'r' at 5 per cent significant level - 0.330
Table value 'r' at 1 per cent significant level - 0.424

* Significant at 5 per cent level
** Significant at 1 per cent level

4.3 Knowledge of the farmers about the recommended practices

4.3.1 Distribution of respondents based on their knowledge about the recommended practices

On examining the Table 3 and Fig. 3 it revealed that majority of the rice farmers were in the low knowledge group. Most of them are unaware of the recommended practices. From Table 1 we can infer that low levels of education farming experience, exposure to information source utilization, social participation, extension orientation, economic motivation and cosmopoliteness might have contributed to the low knowledge level of the rice farmers in the experimental locality. Majority of the farmers were undertaking rice cultivation just because they received the land as ancestoral property and cultivating traditionally.

4.3.2 Relation between dependent variables and knowledge of rice farmers about the recommended practices

The results of the simple correlation analysis between knowledge and selected independent variables are presented in Table 4. It revealed that the variables education, annual income, exposure to information source, social participation, extension orientation, economic motivation, risk preference and participation in PTD were having a positive and significant relationship with knowledge about recommended practices. The rest of the variables had no effect on the dependent variable. Among the independent variables which were having a positive and significant relationship, education, annual income, social participation and innovativeness were significant at one per cent level.

Table 3 Distribution of respondents based on their knowledge about recommended practices

(n = 35)

Category	Score	Percentage
Low	< 5.23	54.29
High	≥ 5.23	45.71

Fig. 3 Distribution of respondents based on their knowledge about recommended practices

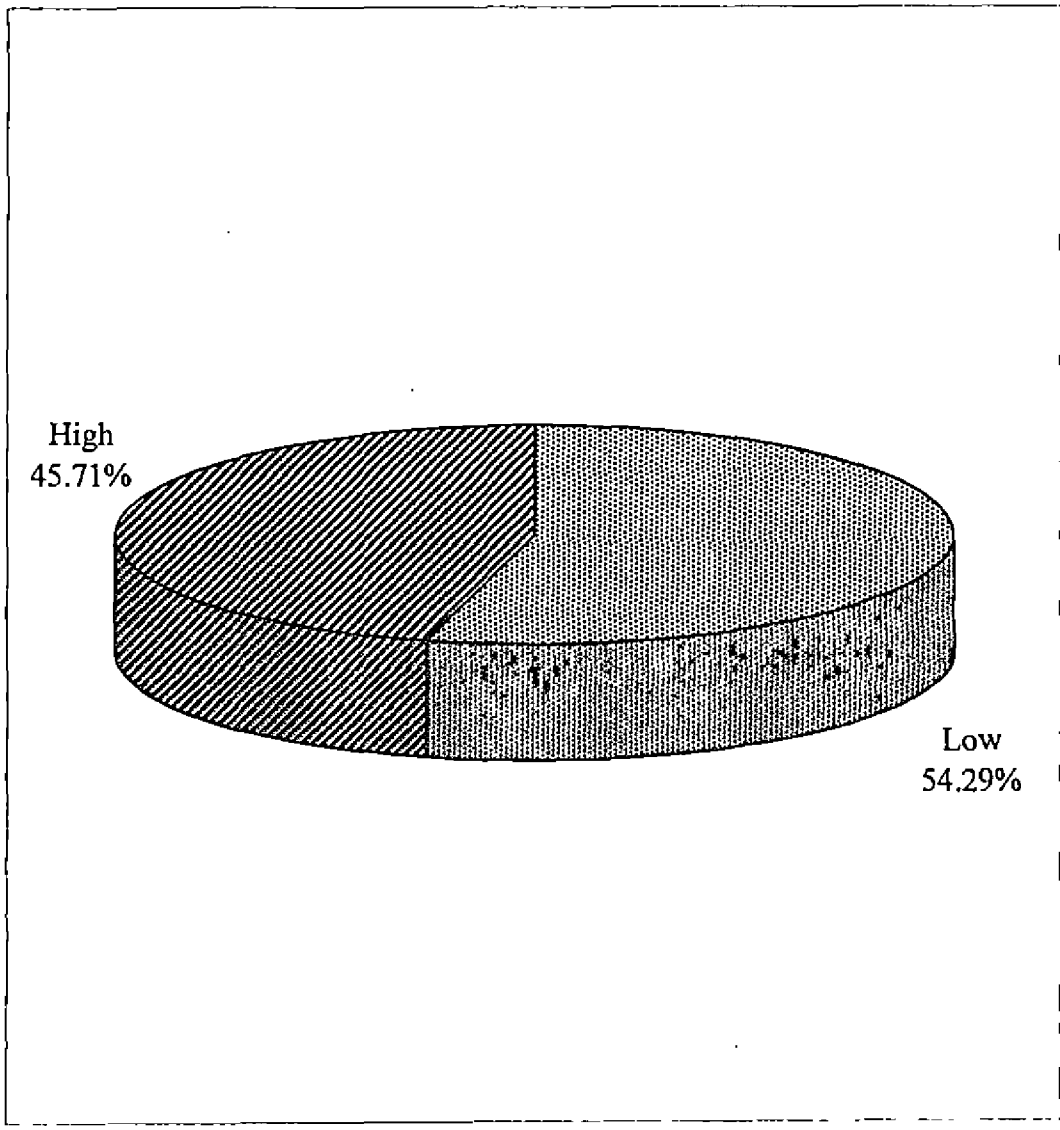


Table 4 Correlation between knowledge about recommended practices and independent variables

(n = 35)

Sl. No.	Variables	Correlation coefficient (r)
01	Age	0.1313
02	Education	0.4921**
03	Occupation	0.1930
04	Farming experience	0.0886
05	Annual income	0.4461**
06	Total area under paddy	0.2592
07	Exposure to information source	0.3388*
08	Irrigation index	0.0976
09	Social participation	0.5428**
10	Extension orientation	0.4194*
11	Economic motivation	0.3452*
12	Innoativeness	0.6252**
13	Cosmopoliteness	0.1839
14	Risk preference	0.3753*
15 (a)	Participation in PTD	0.3512*
15 (b)	Perception about PTD	0.2941

Table value of 'r' at 5 per cent significant level - 0.330
Table value of 'r' at 1 per cent significant level - 0.424
* Significant at 5 per cent level
** Significant at 1 per cent level

Education might have opened the window for getting more knowledge for the rice farmers. Education lays the foundation for all learning processes and it directly influences the knowledge level of rice farmers. This result was in conformity with the studies of Babu (1995) and Jayasubramanian (1996).

Social participation increases the contact between individuals and it enhances communication between them. This might have encouraged the exchange of ideas and contributed to the knowledge of them. Jose (1998) conducted a study and he also found out the same result.

As annual income increases it also increases the opportunities of getting information. In other words it increases the purchasing power of the individuals to have the sources of information such as radio, TV, newspapers and other publications. This might be the reason for increasing the knowledge level as annual income raised. The same trend was observed by Badagaontear (1987).

Innovativeness increases the experience of the farmers and it improves their expertise. This might be the reason for getting a direct relationship between innovativeness and knowledge. The same result was reported by Gangadharan (1993) and Jose (1998) also.

Manju (1997) also reported a direct and significant relationship between extension orientation and knowledge.

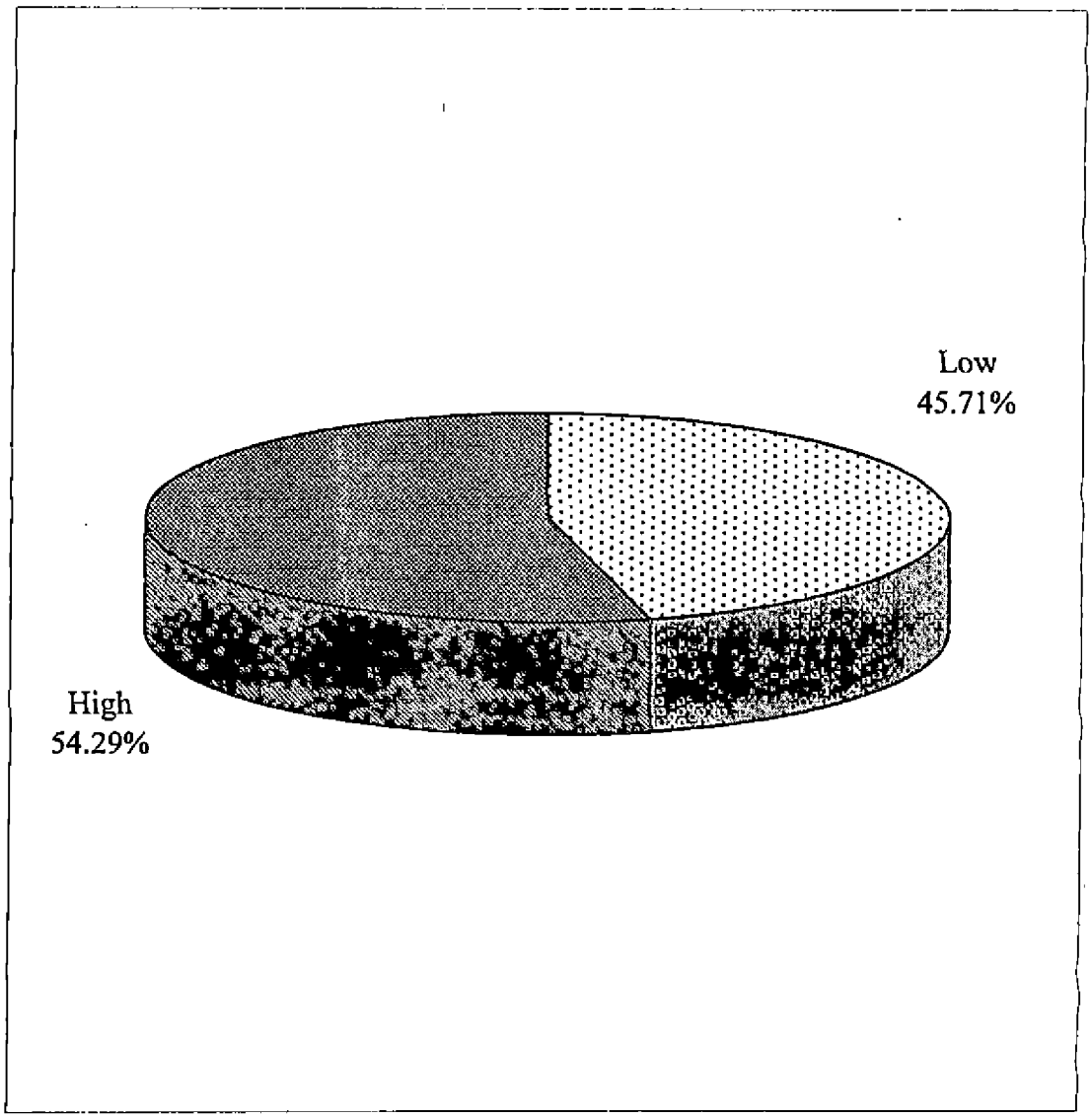
A positive and significant relationship between economic motivation and knowledge was reported by Jose (1998) also.

Table 5 Distribution of farmers with respect to their adoption of selected farmers' practices

(n = 35)

Category	Adoption index	Percentage
Low	< 40.23	45.71
High	≥ 40.23	54.29

Fig. 4 Distribution of farmers with respect to their adoption of selected farmers' practices



4.4 Extent of adoption of farmers' practices

4.4.1 Distribution of rice farmers with respect to their adoption of selected farmers' practices

The distribution of rice farmers based on their adoption of selected farmers' practices is furnished in Table 5 and Fig 4. It showed that majority of them (54.29 per cent) were in the high adopters' category. Eventhough the area and production of rice in our state is dwindling, the persistence of rice crop in this area may be due to these high adopters who develop their own technologies by trial and error and blending recommended and indigenous practices and using them invariably in their field. In a study on the farmers' practices on bittergourd, Manjusha (1999) also found a high adopters' category on the adoption of farmers' practices.

4.4.2 Relationship between independent variables and adoption of selected farmers practices

Correlation analysis was done to establish relationship between independent variables and the dependent variable-adoption. The results of this analysis are given in Table 6. It revealed that the variables; main occupation, total area under paddy and economic motivation were having a positive and significant relationship with adoption. They were significant at 5 per cent level of significance. The variables farming experience, social participation and innovativeness were also having a positive and significant relationship with adoption. They were significant at one per cent level of significance. The rest of the variables had no relationship with the dependent variable.

Table 6 Correlation between independent variables and adoption of selected farmers' practices

(n = 35)

Sl. No.	Variables	Correlation coefficient (r)
01	Age	0.0947
02	Education	0.1928
03	Occupation	0.3920*
04	Farming experience	0.4827**
05	Annual income	0.1834
06	Total area under paddy	0.3393*
07	Exposure to information source	0.2912
08	Irrigation index	0.0173
09	Social participation	0.4428**
10	Extension orientation	0.3241
11	Economic motivation	0.3954*
12	Innoativeness	0.4254**
13	Cosmopoliteness	0.1937
14	Risk preference	0.2934
15 (a)	Participation in PTD	0.1237
15 (b)	Perception about PTD	0.2397

Table value of 'r' at 5 per cent significant level - 0.330
Table value of 'r' at 1 per cent significant level - 0.424
* Significant at 5 per cent level
** Significant at 1 per cent level

As the farming experience increased the farmer got acquainted with more number of cultivation practices and this might be the reason for getting a direct relationship with farming experience and adoption. Jayapalan (1985) also reported the same result.

Social participation might have formed basis for sharing of ideas and experiences between farmers which in turn affected positively the adoption of farmers' practices. Gangadharan (1993) reported the same result in his study.

Innovative farmers experiment themselves with a variety of practices and adopt suitable practices. This might be the reason behind the positive correlation between innovativeness and adoption.

The positive relationship between main occupation and adoption was also reported by Jayakrishnan (1984).

Anithakumari (1989) reported that the relationship of farm size and adoption as positive and significant.

Economic motivation and adoption had a positive and significant relationship as reported by Meera (1995).

4.4.3 Percentage adoption of selected farmers' practices by rice farmers

A perusal of Table 7 revealed the extent of adoption of farmers' practices by the rice farmers. Among the selected practices, PTB-9 for the second crop, soaking seeds in water for 18-24 hours prior to sowing, preparing the main field using tractor and manual harvesting using sickles were the most common practices. They showed an adoption percentage of 100.

PTB-9 was adopted by all the farmers because, by the experience of them, they knew that this variety is suitable for the hardy conditions that

Table 7 Percentage adoption of selected farmers' practices by rice farmers

(n = 35)

Sl. No.	Practices	Percentage adoption
01	Selection of *Thalakkathir*	71.14
02	'Aiswarya' for first crop	62.29
03	PTB-9 for second crop	100.00
04	Nursery ploughed 2-3 times using bullocks	85.70
05	Seeds soaked in water for 18-24 hours	100.00
06	Sprinkling cowdung slurry over soaked seeds	91.42
07	Duration of nursery	
	(a) Aiswarya - 30-45 days	80.00
	(b) PTB-9 45-61 days	94.29
08	Wood ash application	45.34
09	Bird scaring	
	(a) Bird scarers	32.00
	(b) Coconut leaflets	44.38
	(c) Audio-Video tapes	29.34
	(d) Coloured plastic bags	33.48
	(e) Combination of more than two above techniques	39.20
10	Flooding nursery for 24 hours prior to plucking	46.89
11	Mainfield preparation using tractor	100.00
12	Two hand weedings	22.85
13	Quinalphos against caseworm	40.00
14	Metacid against rice bug	77.14
15	Mancozeb + Metacid mixture	34.28
16.	Rat control	65.71
	(a) Plantain fruit bait for squirrels and Mynas	65.71
	(b) Cotton + jaggery bait for rats	51.42
	(c) Owl perches	34.28
	(d) Placing dead rats	14.28
	(e) Cement + dried fish bait for rats	60.00
	(f) Combination of more than two	17.14
17	Poultry manure instead of FYM	51.42
18	Application of chemical fertilizers in splits	65.71
19	Manual harvesting	100.00
20	Threshing by hitting bundles on to wooden logs	91.42
21	Storing grains in gunny bags (not in plastic bags)	71.14

prevailed during the second crop season. It was tolerant to drought and moderately resistant against common pests. It had a good yield of straw also. The straw yielding habit also attracted the farmers to cultivate widely.

As discussed earlier soaking enhanced the germination of seeds.

Tractor ploughing was less labour intensive and less time consuming than ploughing using bullocks so this practice was adopted by all the farmers.

Majority of the farmers raised nurseries before harvesting and this reduced the scope of mechanized harvesting. Non availability of harvesting combines also was another major reason to stick on to manual harvesting.

More than 90 per cent of the farmers followed the practices of sprinkling cowdung slurry over soaked seeds to improve germination, keeping the variety PTB-9 in nursery for 45-61 days and threshing by hitting the bundles on to hard surfaces.

The next common practices were ploughing the nursery area 2-3 times using bullocks and keeping the variety Aiswarya in the nursery for 30-45 days. These practices were followed by more than 80 per cent of the rice farmers.

Selection of '*Thalakkathir*' for seed purpose, spraying metacid against rice bug and storing the grains in gunny bags instead of plastic bags were followed by more than 70 per cent of the rice farmers. Preetha (1997) reported the use of gunny bags for storing rice seeds instead of polythene bags among the rice growers in Thrissur district and opined that this practice needed more research to see whether this was affecting the quality of seeds.

Using the variety 'Aiswarya' for the first crop and application of chemical fertilizers in splits were followed by more than 60 per cent of the farmers.

51.42 per cent of the farmers used poultry manure instead of FYM. The non availability and cost of FYM necessitated the farmers to develop the alternate source as poultry manure.

Among the bird scaring techniques, placing coconut leaf lets was the most common practice. About 40 per cent of the population used the combination of more than two methods.

Plantain fruit bait containing carbofuran granules and cement with dried fish particles were the most common rat control measures adopted by the farmers. Only 17.4 per cent followed the combination of more than two techniques.

The rest of the practices were followed by below 50 per cent of the population.

4.5 Ecofriendliness of the selected farmers' practices as perceived by farmers

On examining Table 8 and Fig. 5 it could be seen that sprinkling cowdung slurry over the soaked seeds was most ecofriendly practice as rated by the farmers.

Soaking seeds in water and placing owl perches got the second rank in ecofriendliness. Owl perches served as nature's way in controlling the rat population.

Selection of '*Thalakkathir*' for seed purpose and use of 'Aiswarya' for the first crop and PTB-9 for the second crop was the third most ecofriendly farmers' practice.

Ploughing the land for nursery using bullocks and placing coconut leaf lets to prevent bird attack got the same rank and they were ranked as the fourth ecofriendly practices. Farmers were aware of the fact that these practices were causing no environmental degradation.

Table 8 Ecofriendliness of selected farmers' practices as perceived by farmers

(n = 20)

Sl. No	Practices	Mean score	Rank
01	Selection of '*Thalakkathir*' for seed purpose	3.55	3
02	Use of Aiswarya for first crop and PTB-9for second crop	3.55	3
03	Soaking seeds in water	3.65	2
04	Sprinkling cowdung slurry over soaked seeds	4.05	1
05	Land for nursery is ploughed using bullocks	3.50	4
06	Placing bird scarers	3.45	5
07	Placing coconut leaf lets	3.50	4
08	Stretching audio video tapes	3.45	5
09	Coloured plastic bags	3.30	7
10	Quinalphos against caseworm	3.25	8
11	Malathion against rise stemborer	3.35	6
12	Metacid against rice buy	3.30	7
13	Metacid + Mancozeb mixture	3.00	9
14	Plantain + carbofuran bait to control squirrels and Mynas	3.45	5
15.	Owl perches	3.65	2
16.	Cotton + jaggery bait for rats	3.50	4
17.	Placing dead rats	2.65	10
18.	Cement + dried fish bait	3.30	7
19.	Application of fertilizers in splits	3.35	6
20.	Application of poultry manure instead of FYM	3.45	5

Fig. 5 Ecofriendliness of farmers' practices as perceived by farmers

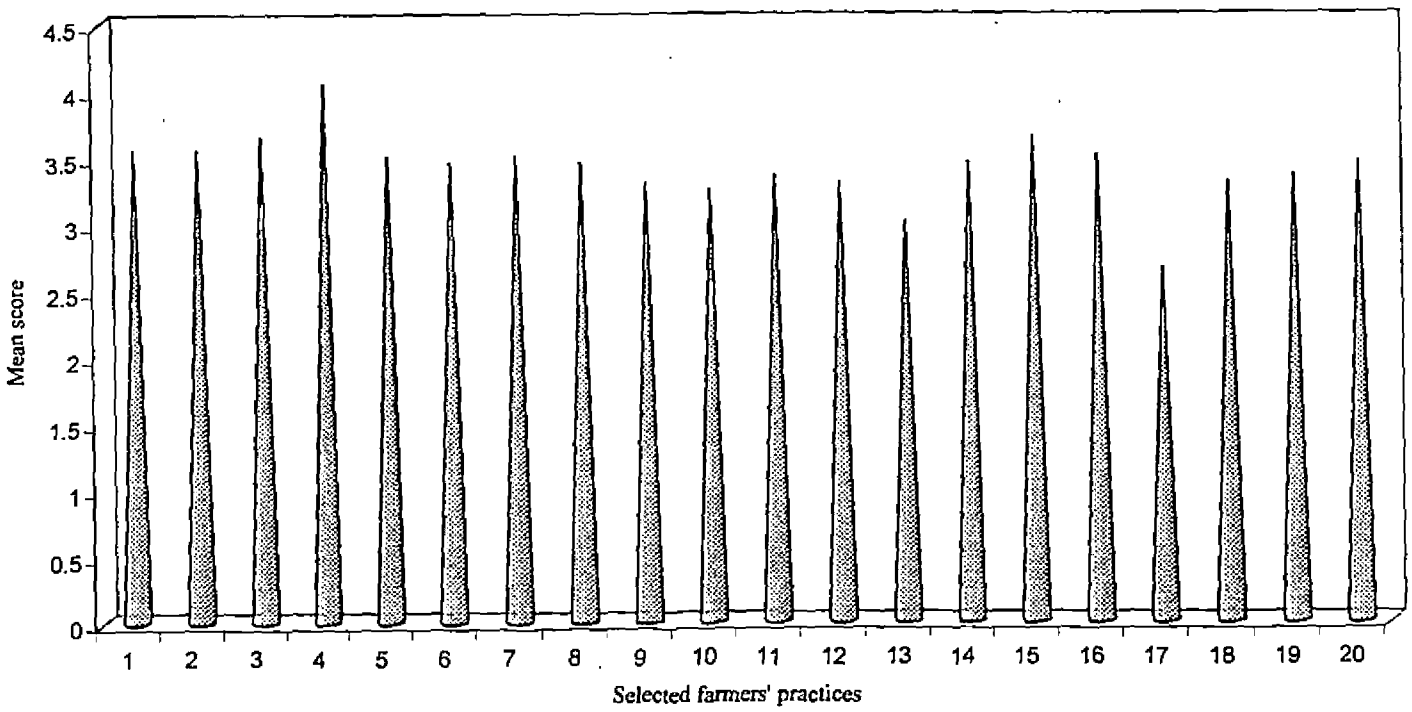


Fig. 5 Continued

01 Selection of '*Thalakkathir*' for seed purpose

02 Use of Aiswarya for first crop and PTB-9for second crop

03 Soaking seeds in water

04 Sprinkling cowdung slurry over soaked seeds

05 Land for nursery is ploughed using bullocks

06 Placing bird scarers

07 Placing coconut leaf lets

08 Stretching audio video tapes

09 Coloured plastic bags

10 Quinalphos against caseworm

11 Malathion against rise stemborer

12 Metacid against rice bug

13 Metacid + Mancozeb mixture

14 Plantain + carbofuran bait to control squirrels and Mynas

15. Owl perches

16. Cotton + jaggery bait for rats

17. Placing dead rats

18. Cement + dried fish bait

19. Application of fertilizers in splits

20. Application of poultry manure instead of FYM

The next ecofriendly practices were placing bird scarers, stretching audio and video tapes to prevent bird menace, plantain fruit containing carbofuran granules to control squirrels and Mynas and application of poultry manure instead of FYM.

Spraying Malathion against rice stem borer and application of fertilizers in splits were the sixth ecofriendly farmers practices. Malathion is known to have less mammalian toxicity. Split application of fertilizers prevented the leaching loss and there by reducing pollution of soil and water bodies.

Placing different coloured plastic bags over the fields to prevent bird attack, spraying metacid against rice bug and using cement with dried fish bait against rats were rated by the farmers with relatively lesser values.

Spraying Quinalphos against case worm and spraying metacid and mancozeb mixture at the time of panicle emergence were ranked as the eighth and ninth ecofriendly practices respectively. The toxicity and persistence of these chemicals in the ecosystem were very much known to the rice farmers and that might be the reason to give low scores to these practices.

The least ecofriendly practice as perceived by farmers was placing dead rats along the bunds toward off rats. The dead rats emitted foul smell and birds like crows might carry them and drop in to the water bodies and might cause health hazards. Might be because of these reasons, this practice got a very low score and a high rank.

4.6 Techno-socio-economic assessment of farmers' practices

4.6.1 By scientists/extension officials

Techno-socio-economic index of farmers' practices which was obtained by cumulating the technological, social and economic indices by the evaluative perception of scientists/extension officials are presented in Table 9. It revealed that the practice of controlling the squirrels and Mynas by placing a plantain bait trap containing carbofuran granules got the highest techno-socio-economic index and ranked first. Squirrels and Mynas are very fond of plantain fruit and the bait will not lose its form even if it contains carbofuran granules. It was very carefully split open and poison was placed inside. This may be the reason for rating it on first by the scientists/extension officials.

Application of poultry manure in place of FYM was the second practice in getting a higher index value. Poultry manure is more concentrated than FYM and thus relatively small amounts are needed. Non availability and higher cost of FYM became the reasons behind the selection of poultry manure as the alternate source.

The next most important practice was the bird scaring techniques. All the techniques adopted by farmers were relatively cheaper, easy to establish and could be made using the locally available materials. So they were also rated as efficient farmers' practices by the scientists.

The fourth practice was sprinkling cowdung slurry over the seeds in order to enhance germination. Cowdung slurry contained several micro organisms. They act on the rice husk and soften it. Their activity also produced heat which hastened the metabolic activities. This might be the reason to enhance germination percentage when cow dung slurry was applied.

Table 9 Techno-socio-economic assessment of farmers' practices by scientists/extension officials

(n = 30)

Practices	Technological index	Social index	Economic index	Techno-socio-economic index	Rank
P_1	10.06	3.97	3.93	17.96	27
P_2	9.33	3.93	3.83	17.09	33
P_3	11.97	4.33	4.86	21.16	7
P_4	11.07	4.46	3.83	19.36	13
P_5	10.34	3.83	4.00	18.17	25
P_6	11.44	4.93	4.66	21.03	8
P_7	12.23	4.90	5.34	22.47	4
P_8	10.20	4.20	3.87	18.27	24
P_9	7.94	3.34	3.66	14.94	35
P_{10}	10.93	4.87	4.23	20.23	11
P_{11}	12.00	5.34	5.17	22.51	3
P_{12}	11.23	4.95	5.03	21.19	6
P_{13}	10.39	3.14	4.10	17.63	30
P_{14}	10.13	3.66	3.87	17.66	29
P_{15}	10.13	3.74	3.70	17.57	31
P_{16}	11.66	4.43	4.00	20.09	12
P_{17}	10.16	4.10	3.74	18.00	26
P_{18}	11.13	3.97	3.70	18.80	19
P_{19}	10.40	8.83	3.66	17.89	28
P_{20}	10.59	3.93	3.87	18.39	23
P_{21}	12.64	5.04	5.34	23.02	1
P_{22}	12.03	5.00	4.93	21.96	5
P_{23}	10.43	4.20	4.33	18.96	18
P_{24}	8.51	4.00	3.50	16.01	34
P_{25}	9.76	4.82	4.00	18.58	20
P_{26}	11.64	4.37	4.63	20.64	10
P_{27}	10.57	4.10	3.87	18.54	21
P_{28}	11.37	4.46	4.43	20.66	9
P_{29}	12.47	4.93	5.17	22.57	2
P_{30}	10.70	4.77	3.87	19.34	14
P_{31}	10.40	4.23	3.87	18.50	22
P_{32}	10.97	3.97	4.10	19.04	17
P_{33}	9.93	3.66	3.70	17.29	32
P_{34}	10.80	4.50	3.87	19.17	15
P_{35}	10.20	4.60	4.33	19.13	16

Table 9 Continued

Index

P_1 - Selecting the seeds from previous crop.

P_2 - Selection of '*Thalakkathir*' - Panicles which mature first and bend due to weight of the grains - for seed purpose.

P_3 - Use of Aiswarya for the first crop (June - September) and PTB-9 (locally '*Onpathu*') for second crop season (Oct - Feb).

P_4 - Seeds collected are dried under sun for two days and one night. Exact point of drying is found out by cutting the seeds to see a whitish centre.

P_5 - Land for nursery is ploughed five to six times using bullocks.

P_6 - Seeds are soaked in water for 18 - 24 hours.

P_7 - Sprinkling cowdung slurry over the seeds and raking them while heaping the soaked seeds in dark rooms for enhancing germination.

P_8 - One '*Para*' of seeds (about 7.5 - 8.0 kg) is required to sow about 20 cents of land.

P_9 - Duration of nursery for Aiswarya - 30-45 days and that for PTB-9 - 45-61 days.

P_{10} - Wood ash at the rate of ten tins per 'Para' (14 cents) is applied in nursery.

P_{11} - Bird scaring

(a) - Placing bird scarers over the bunds

(b) - Placing coconut leaf lets over the field

(e) - Stretching audio and video tapes

(d) - Placing different coloured plastic bags over the field

P_{12} - Flooding the field 24 hours prior to plucking seedlings from the nursery

P_{13} - Main field is ploughed three times using tractor

P_{14} - Two to three seedlings per hill was planted at a spacing of 10 - 15 cm

P_{15} - Planting depth - around 5 - 7 cm (half a finger)

P_{16} - Two hand weedings - one at 15 - 20 days after transplanting and other at flowering stage

P_{17} - Quinalphos at the rate of 300 ml per hectare of land against rice case worm

P_{18} - Spraying metacid against rice bug

P_{19} - Spraying Malathion against rice stem borer

P_{20} - Mancozeb and metacid are mixed and sprayed at the time of emergence of panicles.

P_{21} - Squirrels and Mynas were controlled by placing a plantain fruit containing carbofuran granules.

P_{22} - Owl perches for controlling rats

P_{23} - Cotton and jaggery mixture placed in front of the rat holes to control rats.

P_{24} - Placing dead rats along the bunds to keep the rats away

P_{25} - Cement and dried fish are mixed together and placed in front of rat holes

P_{26} - Keeping the twigs of a thorny plant locally known as '*Thodalimullu*' over the nursery beds to prevent rat attack on sprouting seeds.

P_{27} - Placing earthen pots with only their mouth portion above the ground to trap rats.

P_{28} - FYM and wood ash are applied at the time of final ploughing.

P_{29} - Application of poultry manure in place of FYM

P_{30} - Chemical fertilizers applied in three splits

P_{31} - Manual harvesting using sickles

P_{32} - Threshing is carried out by hitting the bundles on to hard surfaces

P_{33} - Dropping grains against wind was the most common practice of winnowing.

P_{34} - The grains are dried under sun for two days and filled in gunny bags and placed over wooden plat forms.

P_{35} - The straw is dried properly after several rakings and placed around a pole to form the '*Vaickol Thuru*'.

The practice which got the fifth rank was placing owl perches in the field to control rats. This practice was very cheap and easy to adopt. It formed a natural way in reducing the rat population. This might be the reason to select this practice as an efficient farmers' practice by the scientists/extension officials.

The practice which got a least score and a higher rank was the duration of nursery. For the variety Aiswarya, farmers were following the practice of keeping the seedlings there for 30-45 days and for PTB-9 the duration varied from 45-61 days. But the optimum nursery period for Aiswarya is 21 days and for PTB-9 it is 30 days (KAU, 1996). Over aged seedlings can cause lodging, lankiness and reduced yield. This may be the reason to get a lower index value for this practice.

4.6.2 By farmers

A perusal of the Table 10 revealed that the practice of using poultry manure in place of FYM got the highest score and ranked as the most efficient farmers' practice by the farmers. The reasons for using poultry manure were discussed earlier.

The next most efficient practice was sprinkling cowdung slurry over the soaked seeds. This practice can be done using family labour and fresh cowdung is a readily available material. This practice is very simple and the results can be very much observable. These may be the reasons for ranking this practice also as an efficient practice.

Bird scaring techniques got the third rank. These techniques are also simple, cost-effective and efficient. They can also be made using the locally

Table 10 Techno-socio-economic assessment of farmers' practices by farmers

(n = 20)

Practices	Technological index	Social index	Economic index	Techno-socio-economic index	Rank
P_1	11.67	2.98	3.62	18.27	12
P_2	9.03	3.84	3.41	16.28	27
P_3	12.06	3.98	3.97	20.01	6
P_4	9.76	3.73	2.98	15.47	29
P_5	11.13	4.23	3.93	19.29	8
P_6	10.97	3.98	3.96	18.91	9
P_7	12.53	4.88	4.78	22.19	2
P_8	10.16	3.93	3.64	17.73	18
P_9	11.13	2.76	2.96	16.85	23
P_{10}	11.26	3.86	2.73	17.85	17
P_{11}	11.87	4.98	4.97	21.82	3
P_{12}	11.50	2.78	3.98	18.26	13
P_{13}	10.57	4.53	3.97	18.07	14
P_{14}	11.16	3.43	2.67	17.26	22
P_{15}	10.70	4.90	5.10	20.70	5
P_{16}	11.37	3.68	4.31	19.36	7
P_{17}	9.93	4.19	3.81	19.93	16
P_{18}	11.76	3.28	2.68	17.72	19
P_{19}	10.70	2.93	3.91	17.54	20
P_{20}	9.93	3.31	4.83	18.07	14
P_{21}	11.87	4.26	5.36	21.49	4
P_{22}	9.73	3.81	4.83	18.37	11
P_{23}	10.21	2.67	5.10	17.98	15
P_{24}	8.33	2.03	3.03	13.39	34
P_{25}	10.16	2.64	2.08	14.88	31
P_{26}	8.86	3.08	4.87	16.81	24
P_{27}	9.53	2.01	3.89	15.43	30
P_{28}	10.37	3.86	4.34	18.57	10
P_{29}	12.83	3.93	6.18	22.94	1
P_{30}	8.58	2.76	2.98	14.32	33
P_{31}	9.38	3.23	3.68	16.29	26
P_{32}	8.34	4.01	4.03	16.38	25
P_{33}	10.13	2.67	2.03	14.83	32
P_{34}	9.81	3.56	3.98	17.35	21
P_{35}	10.03	3.08	3.04	16.15	28

Table 10 Continued

Index

P_1 - Selecting the seeds from previous crop.

P_2 - Selection of '*Thalakkathir*' - Panicles which mature first and bend due to weight of the grains - for seed purpose.

P_3 - Use of Aiswarya for the first crop (June - September) and PTB-9 (locally '*Onpathu*') for second crop season (Oct - Feb).

P_4 - Seeds collected are dried under sun for two days and one night. Exact point of drying is found out by cutting the seeds to see a whitish centre.

P_5 - Land for nursery is ploughed five to six times using bullocks.

P_6 - Seeds are soaked in water for 18 - 24 hours.

P_7 - Sprinkling cowdung slurry over the seeds and raking them while heaping the soaked seeds in dark rooms for enhancing germination.

P_8 - One '*Para*' of seeds (about 7.5 - 8.0 kg) is required to sow about 20 cents of land.

P_9 - Duration of nursery for Aiswarya - 30-45 days and that for PTB-9 - 45-61 days.

P_{10} - Wood ash at the rate of ten tins per 'Para' (14 cents) is applied in nursery.

P_{11} - Bird scaring

(a) - Placing bird scarers over the bunds

(b) - Placing coconut leaf lets over the field

(c) - Stretching audio and video tapes

(d) - Placing different coloured plastic bags over the field

P_{12} - Flooding the field 24 hours prior to plucking seedlings from the nursery

P_{13} - Main field is ploughed three times using tractor

P_{14} - Two to three seedlings per hill was planted at a spacing of 10 - 15 cm

P_{15} - Planting depth - around 5 - 7 cm (half a finger)

P_{16} - Two hand weedings - one at 15 - 20 days after transplanting and other at flowering stage

P_{17} - Quinalphos at the rate of 300 ml per hectare of land against rice case worm

P_{18} - Spraying metacid against rice bug

P_{19} - Spraying Malathion against rice stem borer

P_{20} - Mancozeb and metacid are mixed and sprayed at the time of emergence of panicles.

P_{21} - Squirrels and Mynas were controlled by placing a plantain fruit containing carbofuran granules.

P_{22} - Owl perches for controlling rats

P_{23} - Cotton and jaggery mixture placed in front of the rat holes to control rats.

P_{24} - Placing dead rats along the bunds to keep the rats away

P_{25} - Cement and dried fish are mixed together and placed in front of rat holes

P_{26} - Keeping the twigs of a thorny plant locally known as '*Thodalimullu*' over the nursery beds to prevent rat attack on sprouting seeds.

P_{27} - Placing earthen pots with only their mouth portion above the ground to trap rats.

P_{28} - FYM and wood ash are applied at the time of final ploughing.

P_{29} - Application of poultry manure in place of FYM

P_{30} - Chemical fertilizers applied in three splits

P_{31} - Manual harvesting using sickles

P_{32} - Threshing is carried out by hitting the bundles on to hard surfaces

P_{33} - Dropping grains against wind was the most common practice of winnowing.

P_{34} - The grains are dried under sun for two days and filled in gunny bags and placed over wooden plat forms.

P_{35} - The straw is dried properly after several rakings and placed around a pole to form the '*Vaickol Thuru*'.

available materials and are quite easy to understand and practice. These reasons might have formed the basis for treating these techniques also an efficient farmers practices.

The plantain fruit bait used for controlling squirrels and Mynas was in the fourth rank when rated by farmers regarding its efficiency based on socio-economic and technical aspects.

Another practice which was rated as an efficient farmers' practice was regarding the planting depth. Planting depth followed by farmers in rice cultivation was 5-7 cm, while the recommendations stick on to 2-3 cm (KAU, 1996). So this aspect needs a thorough investigation.

The least efficient practice as rated by farmers was the common practice of winnowing dropping the grains against wind. This practice is very labour intensive and is very much dependent on climatic conditions. There are chances of mixing the chaff with grains which will finally affect the quality and price of the harvested produce. These may be the reasons to rate this practice as a least efficient practice by the farmers.

4.7 Efficiency index of farmers' practices

The data regarding the efficiency index is given in Table 11. From the Table it could be seen that the practice of using poultry manure instead of FYM got the highest value (45.51) and first rank. By matrix ranking this practice emerged on the most efficient farmers' practice in rice cultivation.

For transplanted rice, recommendations by the Kerala Agricultural University indicate that 5 t of FYM is needed for one hectare of land. But now availability of FYM is very less and farmers are unable to find such a

Table 11 Efficiency index of farmers' practices

Respondents / Practices	Techno-socio-economic index		Efficiency index (cumulated index)	Rank
	Scientists / Extension officials (n = 30)	Farmers (n = 20)		
P_1	17.96	18.27	36.23	17
P_2	17.09	16.28	33.37	29
P_3	21.16	20.01	41.17	5
P_4	19.36	15.47	34.83	24
P_5	18.17	19.29	37.46	12
P_6	21.03	18.91	39.94	7
P_7	22.47	22.19	44.66	2
P_8	18.27	17.73	36.00	18
P_9	14.94	16.85	31.79	31
P_{10}	20.23	17.85	38.08	11
P_{11}	22.51	21.82	44.33	4
P_{12}	21.19	18.26	39.45	8
P_{13}	17.63	18.07	35.70	19
P_{14}	17.66	17.26	34.92	23
P_{15}	17.57	20.70	38.27	10
P_{16}	20.09	19.36	39.45	8
P_{17}	18.00	19.93	35.93	18
P_{18}	18.80	17.72	36.52	15
P_{19}	17.89	17.54	35.43	20
P_{20}	18.39	18.07	36.46	16
P_{21}	23.02	21.49	44.51	3
P_{22}	21.96	18.37	40.33	6
P_{23}	18.96	17.98	36.94	14
P_{24}	16.01	13.39	29.40	32
P_{25}	18.58	14.88	33.46	28
P_{26}	20.64	16.81	37.45	13
P_{27}	18.54	15.43	33.97	26
P_{28}	20.66	18.57	39.23	9
P_{29}	22.57	22.94	45.51	1
P_{30}	19.34	14.32	33.66	27
P_{31}	18.50	16.29	34.79	25
P_{32}	19.04	16.38	35.42	21
P_{33}	17.29	14.83	32.12	30
P_{34}	19.17	17.35	36.52	15
P_{35}	19.13	16.15	35.28	22

Table 11 Continued

Index

P_1 - Selecting the seeds from previous crop.

P_2 - Selection of '*Thalakkathir*' - Panicles which mature first and bend due to weight of the grains - for seed purpose.

P_3 - Use of Aiswarya for the first crop (June - September) and PTB-9 (locally '*Onpathu*') for second crop season (Oct - Feb).

P_4 - Seeds collected are dried under sun for two days and one night. Exact point of drying is found out by cutting the seeds to see a whitish centre.

P_5 - Land for nursery is ploughed five to six times using bullocks.

P_6 - Seeds are soaked in water for 18 - 24 hours.

P_7 - Sprinkling cowdung slurry over the seeds and raking them while heaping the soaked seeds in dark rooms for enhancing germination.

P_8 - One '*Para*' of seeds (about 7.5 - 8.0 kg) is required to sow about 20 cents of land.

P_9 - Duration of nursery for Aiswarya - 30-45 days and that for PTB-9 - 45-61 days.

P_{10} - Wood ash at the rate of ten tins per 'Para' (14 cents) is applied in nursery.

P_{11} - Bird scaring

(a) - Placing bird scarers over the bunds

(b) - Placing coconut leaf lets over the field

(e) - Stretching audio and video tapes

(d) - Placing different coloured plastic bags over the field

P_{12} - Flooding the field 24 hours prior to plucking seedlings from the nursery

P_{13} - Main field is ploughed three times using tractor

P_{14} - Two to three seedlings per hill was planted at a spacing of 10 - 15 cm

P_{15} - Planting depth - around 5 - 7 cm (half a finger)

P_{16} - Two hand weedings - one at 15 - 20 days after transplanting and other at flowering stage

P_{17} - Quinalphos at the rate of 300 ml per hectare of land against rice case worm

P_{18} - Spraying metacid against rice bug

P_{19} - Spraying Malathion against rice stem borer

P_{20} - Mancozeb and metacid are mixed and sprayed at the time of emergence of panicles.

P_{21} - Squirrels and Mynas were controlled by placing a plantain fruit containing carbofuran granules.

P_{22} - Owl perches for controlling rats

P_{23} - Cotton and jaggery mixture placed in front of the rat holes to control rats.

P_{24} - Placing dead rats along the bunds to keep the rats away

P_{25} - Cement and dried fish are mixed together and placed in front of rat holes

P_{26} - Keeping the twigs of a thorny plant locally known as '*Thodalimullu*' over the nursery beds to prevent rat attack on sprouting seeds.

P_{27} - Placing earthen pots with only their mouth portion above the ground to trap rats.

P_{28} - FYM and wood ash are applied at the time of final ploughing.

P_{29} - Application of poultry manure in place of FYM

P_{30} - Chemical fertilizers applied in three splits

P_{31} - Manual harvesting using sickles

P_{32} - Threshing is carried out by hitting the bundles on to hard surfaces

P_{33} - Dropping grains against wind was the most common practice of winnowing.

P_{34} - The grains are dried under sun for two days and filled in gunny bags and placed over wooden plat forms.

P_{35} - The straw is dried properly after several rakings and placed around a pole to form the '*Vaickol Thuru*'.

huge amount of organic manure. The cost of FYM is also comparatively higher and this may in turn increase the cost of cultivation of rice. Nowadays farmers are not willing to cultivate paddy just because of the reason that it is not profitable. Considering these circumstances there is a very low probability of adopting this practice by the farmers.

Poultry manure was an available material in the experimental locality. It is needed in very lesser quantities than FYM, since it is much more concentrated than FYM. FYM contains 0.5 per cent N, 0.2 per cent P and 0.5 per cent K. Poultry manure contains 3.03 per cent N, 2.63 per cent P and 1.40 per cent K. Under the tropical climatic conditions of this country the organic matter with wide C/N ratio is quickly lost and fresh applications are needed (IARI, 1971).

Poultry manure ferments quickly and have a narrow C/N ratio. So it will remain in soil for longer time. FYM may contain undigested weed seeds and this may cause weed problem during cultivation. Poultry is usually fed by artificial feeds when commercially reared and the chances of containing weed seeds in excreta are very much less than FYM.

The techno-socio-economic assessment of this practice revealed that technically, socially and economically this practice is very efficient.

The next higher index value (44.66) was given to the practice of sprinkling cowdung slurry over the soaked seeds in order to enhance the germination percentage. The seeds are raked 2-3 times, since more amount of heat would be produced on heaping and that should be dissipated. The technical reasons behind this practice was discussed earlier. Preetha (1997) reported the practice of soaking seeds in cowdung water as a prophylactic measure.

This practice is very simple and can be adopted by the farmers using family labour. As it increases the percentage of germination it is a very profitable practice also. However, more research is needed in this aspect to see whether this practice can reduce the seed rate and thereby minimising the input cost.

The next efficient farmers' practice which has got an index of 44.51 was the plantain fruit bait for controlling squirrels and Mynas. Both a bird and an animal are controlled using the same technique. This practice also is very simple and easy to adopt. A plantain fruit is cut longitudinally and some granules of carbofuran is put inside by pulling the cut ends slightly outwards. Then these fruit baits are placed on bunds. This technique reduces the over use of pesticides and is very cost-effective. The squirrels and Mynas are very fond of plantain fruit than rice grains and thus the bait is very efficient.

The bird scaring techniques got the fourth rank with an index value of 44.33. Four methods were adopted by them. They were (1) placing bird scarers over the fields. (2) Putting coconut leaflets straight on the fields (3) stretching audio and video tapes and (4) coloured plastic bags are tied on to poles and placed over the fields.

The 'bird scarers' could give an attire of human being and the high flying birds did not try to land on the field thinking that somebody is standing in the field. It requires some torn-clothes sticks, straw etc. to make a bird scarer. This is very simple, ecofriendly and can be easily adopted by farmers.

The coconut leaflets might have given an appearance that there were only plants and no grains. This practice is suitable for nursery when the seeds are sown. It is a very simple practice to practise and adopt.

The stretched audio-videotapes moved constantly in wind and reflected light in all directions. This technique was reported from the rice farmers in Thrissur district by Preetha (1997). This practice was a visual frightening technique. During wind they produced humming sound and sunshine-reflections scared the birds away from the field.

The plastic covers placed over the field moved constantly during wind and produced unusual sound. The coloured bags would give the bird the impression that there was some unexpected thing happening in the surrounding. So they might get scared and flew away. This practice was also reported by Preetha (1997).

Use of Aiswarya for the first crop season and PTB-9 (locally known as 'Onpathu') for the second crop season was also rated as efficient practices. Aiswarya is relatively a new variety with red coloured rice and good yield. It is suitable for the first crop season as there is more availability of water during that season.

PTB-9 is comparatively a hardy variety and slightly lesser yielding than Aiswarya. But it is having higher straw yield. This variety is more resistant to drought, pest and diseases. So it is very much suited for the hardy conditions that prevails during second crop season.

The two practices which got least efficiency index were the duration of nursery and placing dead rats along the bunds to ward off rats. The reasons for their low efficiency has been discussed earlier.

4.8. Constraints faced by rice farmers.

The constraints experienced by rice farmers were classified under two heads viz., production constraints and economic constraints. A look in to the Table 12

Table 12 Constraints faced by rice farmers

n = 35

Sl. No.	Constraint	Frequency	Rank
I.	**Production constraints**		
01.	Incidence of pest and disease	19	3
02.	Scarcity of labour	33	1
03.	Non availability of inputs	6	6
04.	Lack of knowledge about the plant protection practices	17	4
05.	Uneven production	8	5
06.	Weather problems	29	2
II.	**Economic constraints**		
01.	High labour charges	30	1
02.	Price fluctuation of the product	19	3
03.	Inadequate credit facilities	15	4
04.	High transporting charges	7	6
05.	Inadequate marketing facilities	21	2
06.	High cost of material inputs	11	5

revealed that scarcity of the labour was ranked first among the production constraints. In fact, labour scarcity was the prime reason to discard rice cultivation by majority of the farmers. The second one was the weather problems. Inadequacy and untimely rainfall was experienced. Due to this farmers were forced to extend the nursery duration, harvesting time etc. Pest and disease incidence was another major problem. The third crop was abandoned due to the higher attack by pests.

Among the economic constraints the problem of higher labour charges ranked first. This in turn affected the cost of cultivation and made paddy cultivation a costly affair. Marketing facilities available were inadequate and the cultivators were getting only low prices. Majority of them were practicing farming for getting grains for home purpose only.

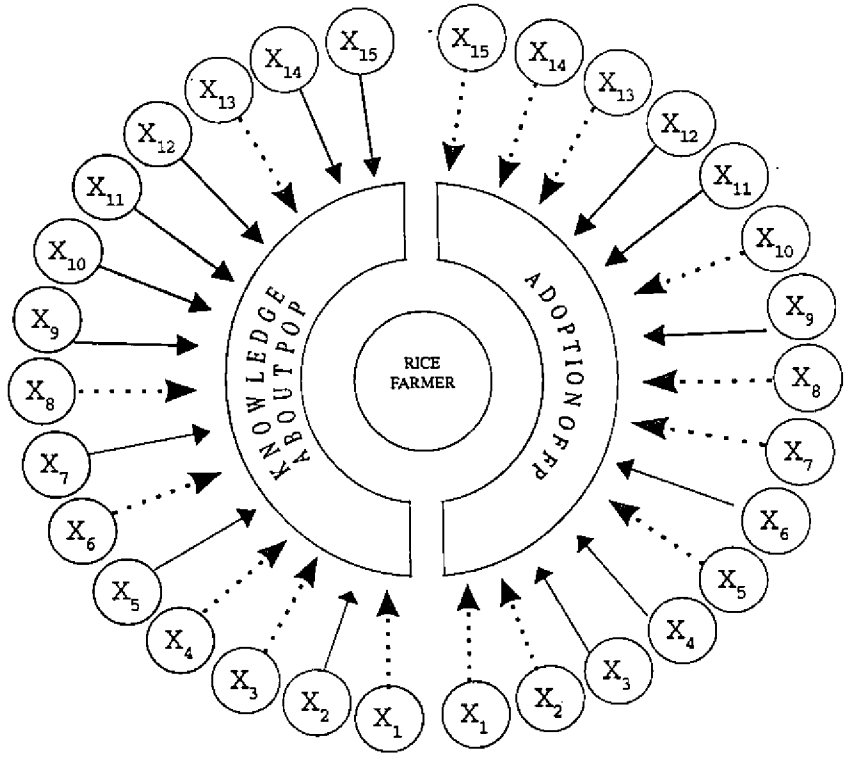
Farmers were experiencing a lot of constraints in the production front and during marketing. These affected the cost of cultivation of paddy very badly and most of the rice farmers turned to crops which were more profitable than paddy.

4.9 Empirical model of the study

An empirical model would facilitate to get a comprehensive idea regarding the results of the study. This was developed and presented in Fig. 6. Knowledge of rice farmers about the recommended practices and adoption of farmers' practices were the dependent variables. The relationship between the 15 independent variables with these two variables was shown on the top portion. 'Arrows' with dotted lines show no relationship. 'Arrows' with continuous lines show significant relationship.

Five farmers' practices which showed a high efficiency index were presented at the bottom portion as the feedback from progressive farmers and scientists/extension officials after assessing all the farmers' practices technically, socially and economically.

FIG. 6 EMPIRICAL MODEL OF THE STUDY



→ Significant Relationship

⋯→ No Relationship

FARMER'S PRACTICES

TECHNO-SOCIO-ECONOMIC ASSESSMENT

PRACTISING FARMERS

FEED BACK

SCIENTISTS & EXT. OFFICIALS

POP - Package of Practices Recommendations (KAU)

FP - Farmer's practice

X - Independent variables.

- Use Poultry Manure in place of FYM
- Sprinkling cowdung slurry over soaked seeds.
- Plantain fruit bait
- Bird scarring techniques
- 'Aiswarya' for first crop 'PTB-9' for second crop

SUMMARY

5. SUMMARY

Farmers follow a variety of practices. Some of them are indigenous, some of them are recommended and some of them are the results of their own trials. Indigenous Knowledge (IK) is unique to a given culture. IK of a farming population living in a specified area is derived from local people's past farming experiences. This form the basis for locally adapted ideas. This include cultivars and practices which could lead to the sustainable use of local resources.

Recommended practices are the contributions from scientific community. These practices are the results of systematic research and experimentations. These are communicated to the farming population by the extension network.

Existing research systems are not always able to generate the technologies suited to solve the problems of resource poor farmers, due to constraints on man power and funds. Such farmers are forced to develop their own technologies to suit their particular conditions. Thus farmer experimentations and farmers' practices have growing significance nowadays. Considering the strategic significance of sustaining rice cultivation in Kerala and in view of the thrust on rice cultivation given by the Government of Kerala, this study of 'techno-socio-economic assessment of farmers' practices in rice cultivation in Thiruvananthapuram district' is of topical importance.

In this study, farmers' practices are defined as all those practices which are actually followed by farmers in rice cultivation, including the indigenous

practices and recommended practices. Each of the farmers' practice has three aspects in it viz., the technical aspect, social aspect and economic aspect. The technical aspect include the dimensions such as relative advantage, compatibility, complexity, trialability and observability. Social aspect include the dimensions like simplicity and family labour utilization. Economic aspects consist of profitability and input availability. A farmers' practice efficient on all these dimensions can be treated as the most efficient farmers' practice. Knowledge of farmers' practices is very important for the planning of research and extension. Understanding farmers' practices can help in designing relevant improved technologies for limited resource farmers. For understanding and popularising these farmers' practices systematic studies are essential.

The study was conducted with the following objectives.

1. To identify and document farmers' practices in rice cultivation
2. To assess the efficiency of the farmers' practices on the basis of their techno-socio-economic aspects.
3. To assess the knowledge of rice farmers in the recommended practices of rice cultivation.
4. To find out the extent of adoption of farmers' practices and its relationship with selected characteristics of rice farmers.
5. To assess the eco-friendliness of farmers' practices as perceived by farmers.
6. To list out the constraints faced by rice farmers in rice cultivation

The study was conducted in Thiruvananthapuram district of Kerala

state. Thiruvananthapuram district has some rice growing belts and farmers are still continuing rice cultivation eventhough the crop is not profitable nowadays. One such area is the 'Andoorkonam Ela' of Andoorkonam panchayat. This area was selected on the basis of rating by a panel of researchers, extension workers and people's representatives from the district. Two sets of respondents were needed for the study viz., the practising farmers and researchers / extension officials. Since the research programme was of exhaustive and exploratory in nature involving non-participant observation for data collection only a modest sample of thirty five farmers were selected as the first category of respondents. Non participant observation method was selected in order to avoid missing of any data regarding farmers' practices. Thirty scientists/extension officials working with sufficient experience in rice cultivation was selected as the second category of respondents.

The dependent variables selected for the study were knowledge of the rice farmers about the recommended practices and adoption of farmers' practices. These two variables were quantified using measurements devised for the study. Fifteen independent variables were selected for the study which included age, education, farming experience, annual income, main occupation, area under paddy, exposure to information source, irrigation index, social participation, extension orientation, economic motivation, innovativeness, cosmopoliteness, risk preference and Participatory Technology Development (PTD). All these independent variables were quantified using the available procedures. The relationship between the independent and dependent variables was also studied.

The study was conducted in three phases. During the phase-I, a survey regarding the profile characteristics of farmers was done using a pretested and structured interview schedule.

Phase - II was the observation of farmers' practices in the selected farmers' fields and a comprehensive observation of all the farmers' practices was done.

Phase - III consisted of finding out the extent of adoption of farmers' practices; assessing the eco-friendliness as perceived by farmers and techno-socio-economic assessment of farmers' practices. Extent of adoption and assessment of eco-friendliness were done using structured schedules.

For assessing scientifically the socio-economic and technical aspects of the farmers' practices identified, matrix ranking methodology was adopted. The identified farmers' practices were given to farmers, scientists and extension officials and were asked to indicate their response in a three point continuum of 'extremely efficient', 'efficient' and 'not efficient' on all dimensions of technical, social and economic aspects. The mean score was taken and practices were ranked.

Ecofriendiliness as perceived by farmers was measured in a four point continuum of 'extremely ecofriendly', 'ecofriendly', 'not ecofriendly' and 'extremely not ecofriendly'.

Different statistical tools such as mean, percentage analysis and correlation analysis were used to analyse the data collected through non-participant observation technique and structured schedules.

The salient findings of the study were as follows.

1. Fifty one farmers' practices were observed. This included recommended practices, indigenous practices and results of farmer-experimentations. Farmers were following a blend of all these practices in rice cultivation. Thirty-five farmers' practices were selected from this list on the basis of their importance in rice cultivation and the techno-socio-economic assessment was done.
2. The practice of using poultry manure instead of FYM was rated as most efficient practice in rice cultivation. It got an efficiency index value of 45.51. The other practices which got a higher efficiency index values were.
   (a) Sprinkling cowdung slurry over soaked seeds (44.66)
   (b) Plantain fruit bait with carbofuran granules for controlling squirrels and Mynas (44.51)
   (c) Bird scaring techniques - stretching audio and videotapes, placing coloured plastic bags, bird scarers, coconut leaflets (44.33).
   (d) Use of 'Aiswarya' for the first crop season (June-Sept) and PTB-9 for the second crop season (Sept-Jan) (41.17).
3. Soaking the seeds in water for 18 to 24 hours, using the variety PTB-9 for the second crop season, preparation of the main field using tractor and manual harvesting were the practices adopted by cent per cent rice farmers.
4. About ninety per cent of the population adopted the practice of sprinkling cowdung slurry over the soaked seeds to enhance germination.
5. About fourty per cent of the farmers adopted combination of more than two bird scaring techniques.

6. More than sixty five per cent of the population adopted the plantain fruit bait containing carbofuran granules for controlling squirrels and Mynas.
7. Combination of more than two rat control measures were adopted by about seventeen per cent of the farmers.
8. Application of poultry manure in place of FYM was adopted by more than fifty per cent of the population.
9. Sprinkling cowdung slurry over the soaked and heaped seeds was rated as the most ecofriendly practice by the farmers.
10. The other ecofriendly practices were soaking seeds in water, selection of '*Thalakkathir*' for seed purpose, use of 'Aiswarya' for the first crop and PTB-9 for second crop, land for nursery is ploughed using bullocks, placing coconut leaf lets, stretching audio-video tapes and bird scarers to prevent bird menace and plantain containing carbofuran granules bait for squirrels and Mynas.
11. The plantain fruit bait for controlling squirrels and Mynas were rated as the most efficient farmers practice by extension officials/scientists.
12. The other practices in the order of their efficiency as rated by scientists/extension officials were
    a) Application of poultry manure in place of FYM
    b) Bird scaring techniques
    c) Sprinkling cowdung slurry over soaked seeds
    d) Owl perches for controlling rats
13. Farmers perceived the practice of using poultry manure in place of FYM as the most efficient farmers' practices on techno-socio-economic aspects.

14. The other practices which were perceived as efficient by farmers in the order of their techno-socio-economic indices were

    a) Sprinkling cowdung slurry over soaked seeds

    b) Bird scaring techniques

    c) Plantain fruit bait for controlling squirrels and Mynas

    d) Planting depth - 5 to 7 cm.

15. Majority of the rice farmers (54.29 %) were in the low group regarding their knowledge about the recommended practices.

16. The variables education, annual income, social participation, innovativeness were significantly and positively correlated with knowledge level of the rice farmers.

17. The variables exposure to information source, extension orientation, economic motivation, risk preference and participation in PTD were also found to have positive and significant relationship with knowledge.

18. Most of the rice farmers (54.29 %) fell in the high category of adoption of farmers' practices.

19. Occupation, total area under paddy and economic motivation were found to have positively and significantly correlated with adoption.

20. Farming experience, social participation and innovativeness were positively correlated with adoption of farmers' practices.

21. Labour scarcity, high cost of labour, unavailability of water and incidence of pest and diseases were the major constraints in the production of rice.

5.1 Implications of the study

It can be seen that farmers are following practices which are a blend of recommended practices and locally developed or indigenous practices. These practices include most efficient practices and least efficient practices. The efficient practices are to be disseminated and the inefficient practices must be taken out of the system. The community place an important role in the production of farmers' practices but many local and cultural barriers restrict the dissemination of them.

The present study is first of its kind in assessing scientifically the socio-economic and technical aspects of farmers' practices in rice cultivation. Abstracting the science underlying farmers' practices will help us to develop newer concepts to accelerate the speed of technological change on a sustainable basis. New research projects can be formed with the integration of farmers know-how and modern technologies to manage the resources available more efficiently with emphasis on productivity and sustainability.

More than fifty per cent of the farmers are adopting farmers' practices. This implies that they are not satisfied with the modern technologies. They need more location specific technologies to cope up with the ever-growing environmental degradation and cost of cultivation. So farmers' participation and co-operation is an essential factor in planning and implementing research policies.

The farmers' knowledge about the recommended practices is in a low level. So a concerted effort from all disciplines especially from the extension division is needed to improve the knowledge level of farmers. Front line

demonstrations and demonstration plots are to be set up in view of popularising these practices and convincing farmers about the efficiency of these practices.

The knowledge of rice farmers about the recommended practices was influenced by the variable 'participation in PTD'. Hence rice researchers must promote Participatory Technology Development (PTD) by incorporating farmers' perspectives in the identification of research issues, setting of research priorities and dropping inappropriate lines of investigation.

Most of the efficient farmers' practices as perceived by scientists/ extension officials and farmers, put doubt on disseminating the same since there are no adequate supportive research findings. This implies a weak research back-up for large scale adoption of sustainable agriculture. Hence, sound research and development of efficient farming practices and a committed extension task force hold the key for a successful implementation of indigenous farming on a wider scale.

5.2 Future line of research

1. On-station research has to be conducted to improve the potentiality of farmers' practices which are rated as efficient.
2. A multi disciplinary research team must explore the prospects of developing farmers' practices as a major component in all research priorities.
3. Ecological investigation and sustainability aspects of farmers' practices are to be done.

4. Research efforts must be taken to produce the best blend of locally available technologies and the modern technologies.
5. In the present study, limited by time and resources only a limited area and sample was covered. An in-depth study regarding the techno-socio-economic aspects of all the practices available throughout the entire state of Kerala should be taken to get a clear picture about the integration of modern and locally developed technologies.

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*Original not seen

APPENDICES

APPENDIX - I

INTERVIEW SCHEDULE

Date :

Panchayat :

Ward :

Respondent No. :

1. Name and address of the respondent :
2. Age (in completed years) :
3. Education : Illiterate/Primary/Secondary/Collegiate
4. Main Occupation :
5. Farming experience (years) :
6. Annual income

(a) On farm :

(b) Off farm :

7. Area under cultivation

(a) Area owned :

(b) Leased in :

(c) Leased out :

8. Area under rice :

SL. No.	Type of land	No. of crops	Total area under cultivation
1.	Wet land		
2.	Dry land		

9. Exposure to information sources/Freq. of exposure

Sl. No.	Source	Never	Occasionally	Regularly
1.	Agri. Officer			
2.	Agri. Assistant			
3.	Progr. farmer			
4.	Scientist			
5.	Family members			
6.	Neighbours			
7.	Print Media			
8.	Radio			
9.	Seminars			

10. Irrigation index

Sl. No.	Source	Period of availability			Area
		Throughout	Partial	Never	
1.	Tanks				
2.	Well				
3.	Canal				
4.	River				
5.	Others (specify)				

11. Social participation

Sl. No.	Organisation	Nature of Membership (Member/Office bearer)	Regularity in attending meeting		
			Regular	Occass-ionally	Never
1.	Panchayat committee				
2.	Co-operatives				
3.	Cultural organisations				
4.	Farmers organisations				
5.	Neighbourhood assembles				
6.	Others (Please specify)				

12. Extension orientation

(a) Extension contact

SL. No.	Category of personal	Frequency of contact		
		Regular	Occasional	Never
1.	Asst. dir of Agri.			
2.	Agri. Officer			
3.	Agri. Assistant			
4.	Others (Please specify)			

(b) Extension participation

SL. No.	Activities	Regularity in attending		
		Attend whenever conducted	Occasional	Never
1.	Study tours			
2.	Seminars			
3.	Farm fair			
4.	Group farming meetings			
5.	Demonstrations			
6.	Others (Specify)			

13. Economic motivation

SL. No.	Statements	Agree	Disagree
1.	A farmer should work towards large yield and economic yield		
2.	The most successful farmers is one who makes the most profit		
3.	The farmers should try any new farming idea which may earn him more money		
4.	A farmer should grow cash crops to increase monitory profits in comparison to food crops		
5.	It is difficult for farmers children to make good start unless he provides them with economic assistance		
6.	A farmer must earn his living but the most important thing in life can't be defined in economic terms		

14. Innovativeness

Q. When would you prefer to adopt an improved practice in farming

1. As soon as it is brought to my knowledge

2. After of have seen some other farmers using it successfully

3. Prefer to want and take my own time.

15. Cosmopoliteness

(a) Frequency of visiting the nearest town :

Twice or more times a week

Once in a week

Once in a fortnight

Once in a month

Very rarely

Never

(b) Purpose of visit

16. Risk Preference

Sl. No.	Statement	SA	A	UD	DA	SDA
1.	A farmer should grow larger number of crops to avoid greater risks involved in growing one or two crops					
2.	A farmer should take more of chance in making a big profit than to be content with a smaller but less risky profit					
3.	A farmer who is willing to take greater risk than the average farmer usually does better finally					
4.	It is good for a farmer to take risk when he knows his chance of success is farely high					
5.	It is better for a farmer not to try a new farmer method unless most others in the locality have used it wish success					
6.	Trying entirely a new method in farming by a farmer involves risk, but it is worth it.					

17. Participatory Technology Development (PTD)

(a) Participation in PTD

Sl. No.	PTD experiments	Yes	No
1.	Hormone application		
2.	Bio-farming		
3.	Control of fungal diseases		
4.	Integrated Pest and Disease Management		
5.	Nemasol application		

(b) Perception about PTD

Sl. No.	Statements	Agree	Disagree
1.	PTD is a sure way of solving agricultural problems		
2.	PTD is a wasteful exercise		
3.	PTD helps only in increasing rivalry among farmers		
4.	PTD makes the farmer dependent on researcher all the time		
5.	It is a waste of time to participate in PTD trials		
6.	Technology development must be exclusively left to researchers and farmers must have no roles		

18. Knowledge of rice farmers about the recommended practices

Sl. No.	Question	Answer
1.	Name two HYV	(i) (ii)
2.	Amount of FYM needed for cultivation	
3.	Name two important pests of rice	(i) (ii)
4.	Name two chemicals for controlling these pests	(i) (ii)
5.	Name a chemical for seed treatment	
6.	Amount of lime to be added on main field	
7.	Most essential plant nutrients needed	
8.	Name two important diseases	(i) (ii)
9.	Name two fungicides	(i) (ii)
10.	How many split application of chemical fertilizers are needed	

APPENDIX - II

Observation schedule

1) Respondent No. :

2) Name of the farmer :

3) Area under paddy :

4) Season of cultivation :

5) Number of crops/Year :

6) Observations regarding farmers' practices :

Sl. No.	Operations	Practices followed
01.	**Selection of seeds**	
i.	Variety	
ii.	Source	
iii.	Preference	
iv.	Measurements	
v.	Seed treatments	
02.	Nursery	
i.	Land preparation	
ii.	Water management	
iii.	Soil amendments	
iv.	Manures and fertilizers	
v.	Plant protection	
vi.	Bird/rodent control measures	
vii.	Sowing the seeds	
viii.	Duration of the nursery	
ix.	Plucking seedlings	
03.	**Main field preparation**	
i.	Preparing the land	
ii.	Training and plastering buds	
iii.	Soil amendments	
iv.	Basal application of manures and fertilizers	
v.	Seedling treatments	
vi.	Planting of seedlings	
vii.	Planting depth	
viii.	Spacing adopted	

Sl. No.	Operations	Practices followed
04.	Plant protection Name of pest	Stages of infestation and control measures taken
i.		
ii.		
iii.		
iv.		
05.	Water management	
06.	Weeding	
07.	Application of manures of fertilizers (top dressing)	
08.	Bird scaring technique	
09.	Rodent control measures	
10.	Harvesting	
11.	Transportation	
12.	Threshing	
13.	Winnowing	
14.	Storage of seeds and Hay	

APPENDIX – III

KERALA AGRICULTURAL UNIVERSITY

Dr. C. Bhaskaran,
Associate Professor,
Training Service Scheme

Department of Ag. Extension
College of Agriculture,
Vellayani - 695 522
Dated :

Sir/Madam,

Mr. Manoj, S., one of the M.Sc. (Ag.) student of this department is undertaking a research study titled, 'Techno-Socio-Economic assessment of farmers' practices in rice cultivation in Thiruvananthapuram district for thesis work for Masters' Degree in Agricultural Extension under my guidance.

Taking into consideration your rich professional experience and expertise, I request you to kindly evaluate the farmers' practices listed for their efficiency on techno-socio-economic dimensions. I also request you to kindly assign weightages for each practice on the basis of their importance in rice cultivation and the rationality assessment of these practices may also be kindly done.

I request you to kindly fill up the proforma enclosed and return to me at your earliest convenience.

Yours Sincerely

(Sd/-)
(C. Bhaskaran)

List of farmers' practices

P_1 - Selecting the seeds from previous crop.

P_2 - Selection of '*Thalakkathir*' - Panicles which mature first and bend due to weight of the grains - for seed purpose.

P_3 - Use of Aiswarya for the first crop (June - September) and PTB-9 (locally '*Onpathu*') for second crop season (Oct - Feb).

P_4 - Seeds collected are dried under sun for two days and one night. Exact point of drying is found out by cutting the seeds to see a whitish centre.

P_5 - Land for nursery is ploughed five to six times using bullocks.

P_6 - Seeds are soaked in water for 18 - 24 hours.

P_7 - Sprinkling cowdung slurry over the seeds and raking them while heaping the soaked seeds in dark rooms for enhancing germination.

P_8 - One '*Para*' of seeds (about 7.5 - 8.0 kg) is required to sow about 20 cents of land.

P_9 - Duration of nursery for Aiswarya - 30-45 days and that for PTB-9 - 45-61 days.

P_{10} - Wood ash at the rate of ten tins per 'Para' (14 cents) is applied in nursery.

P_{11} - Bird scaring

(a) - Placing bird scarers over the bunds

(b) - Placing coconut leaf lets over the field

(e) - Stretching audio and video tapes

(d) - Placing different coloured plastic bags over the field

P_{12} - Flooding the field 24 hours prior to plucking seedlings from the nursery

P_{13} - Main field is ploughed three times using tractor

P_{14} - Two to three seedlings per hill was planted at a spacing of 10 - 15 cm

P_{15} - Planting depth - around 5 - 7 cm (half a finger)

P_{16} - Two hand weedings - one at 15 - 20 days after transplanting and other at flowering stage

P_{17} - Quinalphos at the rate of 300 ml per hectare of land against rice case worm

P_{18} - Spraying metacid against rice bug

P_{19} - Spraying Malathion against rice stem borer

P_{20} - Mancozeb and metacid are mixed and sprayed at the time of emergence of panicles.

P_{21} - Squirrels and Mynas were controlled by placing a plantain fruit containing carbofuran granules.

P_{22} - Owl perches for controlling rats

P_{23} - Cotton and jaggery mixture placed in front of the rat holes to control rats.

P_{24} - Placing dead rats along the bunds to keep the rats away

P_{25} - Cement and dried fish are mixed together and placed in front of rat holes

P_{26} - Keeping the twigs of a thorny plant locally known as '*Thodalimullu*' over the nursery beds to prevent rat attack on sprouting seeds.

P_{27} - Placing earthen pots with only their mouth portion above the ground to trap rats.

P_{28} - FYM and wood ash are applied at the time of final ploughing.

P_{29} - Application of poultry manure in place of FYM

P_{30} - Chemical fertilizers applied in three splits

P_{31} - Manual harvesting using sickles

P_{32} - Threshing is carried out by hitting the bundles on to hard surfaces

P_{33} - Dropping grains against wind was the most common practice of winnowing.

P_{34} - The grains are dried under sun for two days and filled in gunny bags and placed over wooden plat forms.

P_{35} - The straw is dried properly after several rakings and placed around a pole to form the '*Vaickol Thuru*'.

Technical aspects include :

(1) Relative advantage : degree to which a practice is perceived as being better than the idea supersedes
(2) Compatibility : degree to which a practice is perceived as being consistent with the existing values, past experiences and needs of potential adopters.
(3) Complexity : Degree to which a practice is difficult to understand and use
(4) Trialability : is the degree to which a practice may be experimented with a limited basis
(5) Observability : degree to which the results of a practice are visible to others

Social aspects include

(1) Simplicity : degree to which a practice is perceived to be easier in adoption.
(2) Labour utilization : degree to which a practice is perceived to employ more family labour than hired labour.

Economic aspects include

(1) Profitability : degree to which a practice is perceived to give better yield
(2) Input availability : ease and ready availability of inputs required for a practice.

Practices	Technical aspects														
	Relative advantage			Compatibility			Complexity			Trialability			Observability		
	EE	E	NE	EE	E	NE	EE	E	NE	EE	E	NE	EE	E	NE
P_1															
P_2															
P_3															
P_4															
P_5															
P_6															
P_7															
P_8															
P_9															
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Practices	Social aspects						Economic aspects						Weightage 1/10	Rationality	
	Simplicity			Labour utilization			Profitability			Input availability				Rational	Irrational
	EE	E	NE	EE	E	NE	EE	E	NE	EE	E	NE			
P_1															
P_2															
P_3															
P_4															
P_5															
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EE - Extremely Efficient E - Efficient NE - Not Efficient

Ecofriendliness of farmers' practices as perceived by farmers

Sl. No	Practices	Extremely ecofriendly	Ecofriendly	Not ecofriendly	Extremely not ecofriendly
01	Selection of '*Thalakkathir*' for seed purpose				
02	Use of Aiswarya for first crop and PTB-9for second crop				
03	Soaking seeds in water				
04	Sprinkling cowdung slurry over soaked seeds				
05	Land for nursery is ploughed using bullocks				
06	Placing bird scorers				
07	Placing coconut leaf lets				
08	Stretching audio video tapes				
09	Coloured plastic bags				
10	Quinalphos against caseworm				
11	Malathion against rise stemborer				
12	Metacid against rice bug				
13	Metacid + Mancozeb mixture				
14	Plantain + carbofuran bait to control squirrels and Mynas				
15.	Owl perches				
16.	Cotton + jaggery bait for rats				
17.	Placing dead rats				
18.	Cement + dried fish bait				
19.	Application of fertilizers in splits				
20.	Application of poultry manure instead of FYM				

TECHNO-SOCIO-ECONOMIC ASSESSMENT OF FARMERS' PRACTICES IN RICE CULTIVATION IN THIRUVANANTHAPURAM DISTRICT

By

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ABSTRACT OF THE THESIS
SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE
MASTER OF SCIENCE IN AGRICULTURE
FACULTY OF AGRICULTURE
KERALA AGRICULTURAL UNIVERSITY

DEPARTMENT OF AGRICULTURAL EXTENSION
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VELLAYANI
THIRUVANANTHAPURAM

2000

ABSTRACT

In developing countries existing research systems are not always able to generate technologies needed to solve the problems of resource poor farmers. Such farmers are forced to develop their own technologies suited for particular conditions. So farmers' practices and farmer experimentations have got growing significance now a days. A research study was under taken to asses the socio-economic and technical aspects of farmers' practices in rice cultivation in Thiruvananthapuram district. Farmers practices included all those practices which were actually followed by farmers in the rice cultivation consisting indigenous and recommended practices.

The experimental area selected was Andoorkonam Ela of Kaniyapuram village panchayat. The study was conducted in three phases. Phase-I consisted of collecting data regarding the profile characteristics of rice farmers. During Phase-II, all farmers' practices were collected using non-participant observation technique. The third phase consisted of techno-socio-economic assessment and assessing the ecofriendliness of farmers' practices. For this study, two sets of respondents were taken- the practicing farmers and scientists/ extension officials.

The research endeavour identified 51 farmers' practices in rice cultivation. These practices were documented and described along with their scientific rationale.

Majority of the farmers (54.29 per cent) were in the low knowledge group regarding the knowledge of farmers about the recommended practices.

However, most of them (54.29 per cent) were in high adoption category regarding the adoption of farmers practices.

The variables education, annual income, exposure to information source, social participation, extension orientation, economic motivation, innovativeness risk preference and participation in PTD were having a positive and significant correlation with knowledge of rice farmers about the recommended practices.

Adoption of farmers' practices was influenced by the variables such as occupation, farming experience, total area under paddy, social participation, economic motivation and innovativeness.

Soaking the seeds in water for 18-24 hours, using the variety PTB-9 for the second crop and preparing the main field using tractor were practices which showed cent per cent adoption.

About ninety per cent of the farmers adopted the practice of sprinkling cowdung slurry over the soaked seeds.

Application of poultry manure in place of FYM was adopted by more than fifty per cent of the rice farmers.

The most ecofriendly practice as perceived by farmers was the sprinkling of cowdung slurry over soaked and heaped rice seeds in order to enhance germination.

Using poultry manure in place of the costly and unavailable FYM was the most efficient farmers' practice as rated by farmers and scientists/ extension officials. The other efficient farmers' practices were the 'plantain fruit bait for squirrels and mynas' and bird scaring techniques such as 'placing coconut leaflets, placing coloured plastic bags, bird scarers and stretching audio and video tapes over the field.

A systematic and organised effort should be taken to document and assess these farmers' practices throughout the state which is inevitable to improve efficiency and productivity in rice cultivation. A multi disciplinary approach is essential for such type of research and a comprehensive feed back should be given to the research system in Kerala.