EXTENSION INTERVENTION FOR SUSTAINING RICE PRODUCTION

BY

SYAM KUMAR B. G.

THESIS

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT

FOR THE DEGREE OF

MASTER OF SCIENCE IN AGRICULTURE

(AGRICULTURAL EXTENSION)

FACULTY OF AGRICULTURE

KERALA AGRICULTURAL UNIVERSITY

DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

VELLAYANI

THIRUVANANTHAPURAM

1999

DECLARATION

I hereby declare that this thesis entitled "EXTENSION INTERVENTION FOR SUSTAINING RICE PRODUCTION" 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 title of any other University or Society.

Vellayani
10.12.99

SYAM KUMAR. B.G.

CERTIFICATE

Certified that this thesis entitled "EXTENSION INTERVENTION FOR SUSTAINING RICE PRODUCTION" is a record of research work done independently by Sri. SYAM KUMAR. B.G. 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.

Dr. G. SOBHANA
Chairman, Advisory Committee
Associate Professor
Department of Agricultural Extension
College of Agriculture, Vellayani.

Vellayani,
10.12.99

APPROVED BY

CHAIRMAN

Dr. G. SOBHANA
Associate Professor,
Training Service Scheme,
College of Agriculture,
Vellayani, Thiruvananthapuram.

MEMBERS

1. **Dr. G. BALAKRISHNA PILLAI**
   Professor and Head,
   Department of Agricultural Extension,
   College of Agriculture,
   Vellayani, Thiruvananthapuram.

2. **Dr. N.P. KUMARI SUSHAMA**
   Associate Professor,
   Department of Agricultural Extension,
   College of Agriculture,
   Vellayani, Thiruvananthapuram.

3. **Smt. A.M. SANTHA**
   Assistant Professor,
   Department of Agricultural Economics,
   College of Agriculture,
   Vellayani, Thiruvananthapuram.

EXTERNAL EXAMINER

30/12/97
Dr. T. Rathakrishnan, Asso. Prof.,
AC&RI, Madurai.

ACKNOWLEDGEMENT

I extend my heartfelt thanks to Dr. G. SOBHANA, Associate Professor of the Department of Agricultural Extension and Chairman of my Advisory Committee for her meticulous guidance, timely suggestions, unfailing patience, constant encouragement and personal attention during the conduct of this research work and preparation of thesis.

I place on record my profound gratitude to Dr. G.B. Pillai Professor and Head, Department of Agricultural Extension for his insipiring words, honest advice and valuable suggestions rendered during the study.

I am extremely thankful to Dr. N.P. Kumari Sushama, Associate Professor, Department of Agricultural Extension and Smt. A.M. Santha, Assistant Professor, Department of Agricultural Economics, members of my advisory committee, for their whole-hearted co-operation and assistance extended throughout the course of this investigation.

I gratefully acknowledge my indebtedness to Sri. Shahul Hameed, Associate Professor, Department of Agronomy, Sri. P. Raghunath, Professor and Head, Department of Entomology and Ms. Prasanna Lekshmi Nair, Technical Assistant, K.H.D.P., for their immeasurable co-operation and deep involvement as resource persons during the extension intervention.

I earnestly express my utmost gratitude and thankfulness to Mrs. Swarnavi, Agriculture officer, Vilavoorkkal Krishi Bhavan for her immense help

and invaluable guidance throughout the conduct of this research work and above all for introducing me into the farming community.

I am extremely grateful to Mr. Sudheer, Agricultural officer, Nemom Krishi Bhavan for his generous and heart-felt co-operation at various stages of this study.

I avail this oppurtunity to thank Mr. C.E. Ajith Kumar, Programmer Department of Agricultural Statistics and Mr. Krishna Kumar, Alathara computers for their help during the analysis of data.

My profound thanks to all the teaching and non-teaching staff of the Department of Agricultural Extension, my colleagues and all my senior and junior friends of the Department for their encouragement and co-operation.

I am infinitely grateful to Mr. Surendran, Secretary, Nilamakkari padasekhara samiti in particular and to all my respondents for their unfailing participation, ever-lasting spirit and positive attitude rendered during the investigation.

I am gratefully indebted to Kerala Agricultural University for awarding the fellowship for the completion of the post-graduate programme.

I am immensly happy to place on record my gesture of thankfulness to Mr. Aniljith and Mr. Manoj of Sree Matha Computers, Pachalloor, for their sincerity and promptness in the neat presentation of my thesis.

Above all, I am deeply indebted to my parents and all my relatives for their encouragement and moral support at every stage of my study.

SYAM KUMAR. B.G.

CONTENTS

List of Tables

List of Illustrations

List of Photographs

INTRODUCTION

CHAPTER 1

INTRODUCTION

"Without food enough, India's hopes for improving human welfare, achieving social justice and securing democracy will become almost impossible attainment": Ford Foundation Team

These lines reflect the importance of food security for a successful and sustainable economy. Rice, being the staple food of the majority, plays a vital role in enhancing and ensuring food security. But the area and production have declined over the years and the productivity fluctuated with vagaries of monsoon coupled with inappropriate management practices.

In this era of economic liberalisation, the gap between agricultural and industrial sectors seems to be ever-widening. In our home State of Kerala too the picture is dismal. Last few years' statistics reveal that relative contribution of agricultural and allied sectors fell from 36.43 per cent in 91-92 to 29.72 per cent in 95-96 while that of secondary and service sectors has improved considerably (State Planning Board, 1993). The growth and diversification of agricultural sector is

necessary particularly from the view point of employment generation and balanced regional development. (State Planning Board, 1993).

The salient findings of the expert committee constituted by 'Nelvayal Samrakhshana Prasthanam' (1998), an autonomous body comprising of scientists, agricultural experts, students, farmers and social workers have brought to light that in 1955-56 we had 7.59 lakh hectares of rice crop with a total output of 8.84 lakh tonnes. The following two decades saw an increasing trend with area and production of rice reaching new peaks of 8.76 lakh hectares and 13.1 lakh tonnes respectively. But the statistics showed a downswing in the ensuing years with area and production touching a low point of 5.6 lakh hectares and 10.9 lakh tonnes respectively. In 1997, when the study was conducted the area under paddy was 4.75 lakh hectares and production was 9.42 lakh tonnes. Otherwise, we are losing paddy fields at an alarming rate of 60 hectares per day. If this downfall continues we would be totally dependent on neighbouring States by 2015. The study also revealed that majority of our farmers were functional illiterates. Another contrasting aspect brought to light by the study was that while more than 30 lakhs persons were unemployed in our State we were importing labour from adjoining States for farming operations.

The high population pressure combined with a cropping system getting more oriented towards perennial cash crops is worsening the situation. Such a shift in crop choice from agronomic considerations to economic market forces will drain away a lion's share of our resources for imports. It could be noted that the extreme diversity of biophysical resource base and agro climatic endowments of Kerala is left to the nourishment of selected plantation crops.

Another important dimension of rice cultivation is the escalating cost of cultivation. Among the districts, Thiruvananthapuram showed the highest cost of cultivation of Rs.22155/ha (Kerala State Co-operative Bank, 1997). The escalation in input costs has made the majority of small and marginal farmers incapable of adopting advanced technologies. At this vulnerable point, substitution with low cost technologies holds the key. But unfortunately the studies conducted in the National Agricultural Research Project (KAU, 1989) on the adoption patterns of recommended technologies in rice, revealed that many of these technologies have not gained sufficient popularity among the farming community. Moreover the expert committee constituted by 'Nelvayal Samrakhshana Prasthanam' (1998), has came across wide-spread irregularities and anomalies in the field application of technologies by farmers.

The area and production of rice crop in Thiruvananthapuram district over the years has dwindled drastically as being revealed by the data given below

Year	Area (hectares)	Production (tonnes)
1975-76	41399	66042
1985-86	26353	47106
1997-98	11368	19610

(State Planning Board, 1993).

Under these circumstances it is quite obvious that we could waste no time to assess the lacunae in the awareness and adoption pattern of the recommended technologies by farmers and bridge the same with appropriate and timely extension interventions for optimising production in the years to come. The present study, a humble attempt towards fulfilling the above mentioned goals has been laid out with these specific objectives.

Objectives:

1. To study the extent of awareness of farmers about selected recommended practices in rice cultivation.
2. To assess the attitude of farmers towards rice cultivation.
3. To measure the extent of adoption of selected recommended practices in rice cultivation by farmers.
4. To find out the factors influencing the awareness, attitude and adoption behaviour of farmers.

5. To analyse the impact of an extension intervention on awareness, attitude and adoption behaviour of farmers and on yield and benefit-cost ratio of rice crop.

Scope of the study

The study brings to light the level of awareness of farmers, their attitude towards rice cultivation and their adoption behaviour with regard to selected recommended practices in rice cultivation. Anomalies in the recommended and adopted practices can be found out and these information can be used to evolve purposive and more directed future extension intervention strategies. Moreover the profile analysis of the respondents would give an insight into the socio-economic, socio-psychological profile of the rice farming community from which meaningful interpretations could be made.

Limitations of the study

As this study was undertaken for the partial fulfilment of the Masters degree programme by a single researcher, it had the limitations of time and resources. The extension intervention could be focussed only towards dissemination of selected recommended practices found feasible and adaptable for this study. Moreover the study was limited to a single Padasekharam, since it demanded frequent interventions.

Presentation of the thesis

The thesis is divided into five chapters. The first chapter deals with the introduction detailing the need of the study, objectives, scope and limitations of the study. In the second chapter the review of literature in the subject area, conceptual model and the hypotheses developed for the study are furnished. The third chapter is devoted to the methodology used in the research work including the operationalisation of the concepts, measurement procedures of the variables, techniques of data collection and statistical methods used for the study. The fourth chapter deals with the results and discussion of the investigation. The fifth chapter gives the summary of the entire study emphasising salient findings.

The references, appendices and the abstract of the thesis are given at the end.

REVIEW OF LITERATURE

CHAPTER 2
REVIEW OF LITERATURE

A review of previous works either theoretical or empirical may assist in the delineation of new problem areas and they provide a basis for developing a theoretical framework for the study. It helps to understand where the researcher stands in comprehending the particular research problem. It also helps to operationalise the variables enabling data collection on the problem under investigation.

In accordance with the objectives of the present study the theoretical orientation is furnished on the following lines.

2.1 Concept of extension intervention and related impact studies.

2.2 Review of literature on recommended practices in rice cultivation including low cost technologies.

2.3 Dependent variables selected for the study *viz*., Awareness, Attitude and Adoption.

2.4 Independent variables selected for the study and their relationship with dependent variables.

2.5 Conceptual model of the study

2.6 Hypotheses of the study

2.1 Concept of extension intervention and related impact studies

2.1.1 Concept of extension intervention

White (1981) suggested that for successful intervention it is necessary to combine the technical intervention with a communication intervention so that people are involved in design and planning decisions, problem definition and problem solving from initiation through implementation and maintenance.

Roling and De Zeeuw (1983) defined intervention as a systematic effort to strategically apply resources to manipulate seemingly causal elements in an ongoing social process, so as to permanently reorient that process in directions deemed desirable by the intervening party.

Zuurbier (1984) opined that extension is an intervention which uses communication as its instrument to induce change.

Ban (1985) has defined extension as purposeful assistance to decision making and opinion formation.

2.1.2 Related impact studies

Wilson and Gallup (1955) suggested that for effective extension teaching, the extension worker should be able to attract attention, create interest, develop desire, ensure action and maintain satisfaction in the people.

Peterson (1966) reported that more the extension methods or teaching aids used, higher will be the chances of persons changing their practices favourably.

Tampi and Menon (1972) observed that lecture method was superior to film show method in gain in knowledge.

Meera (1981) in her study on the impact of farm women's training stated that trained farm women had higher level of adoption of improved agricultural practices than the untrained farm women. Also, trained farm women had a more favourable attitude towards improved agricultural practices than untrained farm women.

Sanoria and Sharma (1983) in their study on comparitive analysis of adoption behaviour of beneficiaries of farm development programme stated that adoption behaviour of beneficiaries of farm development programme was significantly higher than non-beneficiaries.

Rani *et al.* (1986) reported that use of media mix systems involving flip charts, flash cards, leaflets and line charts were effective in transmitting technical know-how.

Sajeevchandran (1989) in his study on the impact of development programmes in promoting pepper production found that the beneficiary farmers had fairly good awareness about the pepper package programmes. He also found that majority of farmers (73.3%) had medium level of attitude and adoption of pepper package programmes.

Kumar (1990) in an experimental study on the relative effectiveness of visual aids opined that a combination of lecture and slides had the maximum influence in gain in knowledge followed by lecture and flashcards and lecture and flannel graph. Similarly, he found that in retention of knowledge, lecture and flashcards proved more effective than lecture and slides.

Ramachandran (1992) found that the adoption behaviour of participant farmers in mini-kit trails was significantly superior than adoption behaviour of non-participant farmers.

2.2. Review of literature on recommended practices in rice cultivation including low cost technologies

Tanaka *et al.*, (1960) found that nitrogen applied in two splits viz., one at planting and the other at panicle initiation gave increased grain yield especially in the medium and late maturing varieties.

Singh and Khanna (1973) observed that increase in the seed rate beyond optimum did not influence the grain yield in paddy crop.

Pereiro (1975) recommended to keep the plot weed free for atleast 45 days from germination which will result in maximum yield from a long duration variety.

Bhalla (1976) defined low cost technology as technology which is low in terms of capital (physical plus working), labour skills and any other inputs.

Harishankar *et al.*, (1976) observed that neemcake treated urea increased the yield of transplanted rice over untreated urea application by 120 kg/ha.

Kannaiyan and Govindarajan (1979) reported that seed treatment with Bavistin controlled the blast disease in later stages.

A study conducted at CRRI (1980) revealed that adequate but not excessive seedling density is the primary requirement for optimum plant population in uplands.

Research report of CRRI (1980) stated that soaking the seeds in Agrosan GN yielded 2.7 to 2.9 t/ha as compared to 2.4 t/ha obtained with no soaking.

Another study conducted at CRRI (1981) revealed that optimum application of NPK fertilizers produced the highest yield of 6.1-8.0 t/ha, while without the fertilizer Nitrogen, yield decreased by 3.3 t/ha.

2.3 Dependent variables selected for the study viz., Awareness, Attitude and Adoption

2.3.1 Awareness

According to Dictionary of behavioural sciences, awareness means being conscious of something, perceiving and taking account of some event, occasion, experience or object.

Lionberger (1960) defined awareness as the first knowledge about an idea, product or practice. At the awareness stage a person has only general information about it.

Theodore (1988) found that same proportion of contact farmers (45%) and other farmers (45%) belonged to the high awareness category with respect to the awareness about technological units of contingency farming practices. Nearly equal number of contact farmers (40%) and other farmers (42.5%) were in the low awareness category.

Gangadharan (1993) observed that majority (68.5%) of pepper growers had medium level of awareness of improved agricultural practices.

Krishnamurthy *et al.*, (1999) reported that 65 per cent of the respondents were aware of the application of chemical fertilizers, while 61.66 per cent were aware of plant protection measures.

2.3.2 Attitude

Allport (1935) defined attitude as a mental and neural state of readiness organised through experience exerting a directive or dynamic influence upon the individuals' response to all objects and situations with which it is related.

Thurstone (1946) defined attitude as the degree of positive or negative affect associated with some psychological object towards which people can differ in varying degrees.

According to Sharma (1972) attitude means a personal disposition which impels an individual to react to some objects or situations.

Dahama (1976) opined that attitudes are learned responses and since they are always found in relation to object, ideas and persons, they play an important role in determining human behaviour.

Kuppuswamy (1984) stated that attitudes are learned in the course of life experience which make the individual behave in characteristic ways towards persons, objects or issues to which they get related.

Gangadharan (1993) indicated that majority (89%) of pepper growers had medium level of attitude towards improved agricultural practices.

Habal (1994) in his study on the attitudes of agricultural rural youth towards agricultural innovations observed that 52 per cent of respondents had neutral attitudes towards agricultural innovations and 28 per cent had a negative attitude towards agricultural innovations.

Sindhudevi (1994) reported that majority of agricultural labourers had low attitude towards scientific agriculture.

Boniface (1996) found that majority of neo-literate farmers (90.7%) had a high level of attitude towards scientific agricultural practices.

Haemalatha (1997) reported that more than 55 per cent of all the respondents selected were having high attitude towards rice based farming system.

2.3.3 Adoption

Wilkening (1952) postulated the adoption of innovation as a process composed of learning, deciding and acting over a period of time. The adoption or a decision to act has a series of actions and thought decisions.

Chatopadhyaya (1963) considered adoption behaviour as a stage in the adoption process where decision making is complete regarding the use of a practice and actions with regard to such a decision commences.

Rogers and Shoemaker (1971) defined adoption as decision to make use of the innovation. They considered adoption as a decision to continue full use of an innovation as the best course of action.

Nanjaiyan (1984) reported that 64 per cent of farmers had medium level of adoption in the cultivation of IR-20 paddy.

Nandakumar (1988) found a significant difference in the adoption level of recommended practices of paddy cultivation before and after the implementation of I.T.D.P.

Pulamte and Babu (1993) found that only 20.00, 13.00, 6.67 and 15.00 per cent of the respondents adopted the recommended level of urea, DAP,

fungicides and insecticides respectively. Majority of them used seed rate at high doses while about one-fourth of them practiced preparatory tillage and applied urea more than the recommended doses.

Haemalatha (1997) in her study on gender analysis of rice farmers in Thiruvananthapuram district found that only 40 per cent of the respondents were having high extent of adoption.

Maraty and Kumar (1998) in their study on the extent of adoption and yield gap in paddy reported that majority of the respondents (61.6%) had medium adoption of paddy production practices.

Jayalekshmy and Alagesan (1998) found that except for fertilizer application and plant protection, farmers did not adopt any other recommended practices in a big way.

Krishnamurthy *et al.*, (1999) found that only negligible per cent of respondents (1.66%) fully adopted the improved practices on a continuous basis.

Kumari (1999) in her study on rural women reported that majority of the respondents belonged to the medium adopter category with regard to adoption of agricultural technologies.

Prasad *et al.*, (1999) stated that marginal farmers exhibited low level of adoption of plant protection measures compared to small and big farmers.

2.4 Independent variables selected for the study and their relationship with dependent variables

2.4.1 Age

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Sarkar and Reddy	1980	NS	—	—
Naik	1981	P	NS	—
Vijaya	1982	NS	—	—
Vijaya Kumar	1983	—	—	N&S
Cherian	1984	N&NS	NS	—
Reddy and Reddy	1986	P	—	—
Swaminathan	1986	—	—	N&S
Prasannan	1987	—	—	N
Anithakumari	1989	—	—	NS
Sajeevchandran	1989	N&NS	N&S	NS
Lekshmi	1995	—	—	NS
Varma	1996	—	N&S	NS

From the preceeding reviews it could be assumed that age would influence the awareness and adoption of rice farmers regarding selected recommended practices and also their attitude towards rice cultivation. Therefore it was decided to include age as an independent variable in the present study.

2.4.2 Educational status

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Mathew	1980	—	NS	—
Surendran	1982	NS	P&S	—
Balachandran	1983	P&S	—	—
Viju	1985	P&S	—	—
Khanal	1986	—	N	P
Krishnamoorthy	1988	P	—	—
Sabapathi	1988	N&S	—	—
Sajeevchandran	1989	—	P&S	P&S
Thampan	1990	—	P&S	P&S
Varma	1996	—	P&S	—
Devi and Manoharan	1999	—	—	P&S

In view of the results of the studies listed earlier, it was decided to test the kind of relationship between educational status and awareness, attitude and adoption behaviour of the rice farmers.

2.4.3. Occupational status

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Sengupta	1960	P&S	—	P&S
Das and Sarkar	1970	P&S	—	P&S
Reddy and Reddy	1977	P	—	—
Somasundaram and Singh	1979	—	—	NS
Ravichandran	1980	—	NS	—
Sinha *et al.*	1984	—	P&S	—
Varma	1996	—	P&NS	—

The nature of results obtained in the above studies emphasize the need for testing the kind of relationship existing between occupational status and the dependent variables selected for the present study.

2.4.4 Farming experience

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Jayavelu	1980	—	NS	—
Ravichandran	1980	—	P&S	—
Arumugam	1983	—	—	P&S
Alexander	1985	N	—	—
Sabapathi	1988	NS	—	—
Sutha *et al.*	1991	—	P&S	—
Rajkumar	1992	—	—	NS
Varma	1996	—	N	—
Sivaprasad	1997	—	—	NS
Sujatha and Annamalai	1998	—	—	PS
Sumathi and Alagesan	1998	—	—	PS

2.4.5 Annual income

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Kamarudeen	1981	—	N	—
Viju	1985	N	—	PS
Badagaonkar	1987	—	—	P
Aziz	1988	—	—	P
Varma	1996	—	P&S	—
Sivaprasad	1997	—	—	P
Padmaiah *et al.*	1998	—	—	PS

Though the researcher could find only limited reviews on the influence of annual income on the depedent variables selected for the present study, annual

income was believed to influence the awareness and adoption of farmers regarding selected practices in rice cultivation and also their attitude towards rice cultivation.

2.4.6 Social participation

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Ravichandran	1980	—	—	P&S
Haraprasad	1982	P&S	—	—
Vijaya	1982	—	P&S	—
Cherian	1984	—	P&S	—
Prasannan	1987	—	—	P&S
Anithakumari	1989	—	—	NS
Gangadharan	1993	—	—	P&S
Varma	1996	—	P&S	—
Sumathi and Alagesan	1998	P&S	—	P&S

The above results depciting the nature of relationship between social participation and the selected dependent variables prompted the researcher to include it as one of independent variables.

2.4.7 Extension orientation

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Kamarudeen	1981	P&S	P&S	P&S
Haraprasad	1982	P	—	P&S
Krishnamoorthy	1988	NS	—	P&S
Nandakumar	1988	P&S	—	NS
Jnanadevan	1993	—	—	NS
Sivaprasad	1997	—	—	NS
Veeraiah *et al.*	1998	—	—	P&S

Hence it was assumed that extension orientation would influence the awareness and adoption behaviour of farmers regarding the selected practices in rice cultivation and also influence their attitude towards rice cultivation.

2.4.8 Cosmopoliteness

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Kamarudeen	1981	P&S	P&NS	P
Vijayakumar	1983	—	P&S	—
Viju	1985	P	—	—
Prasannan	1987	N&S	—	P&S
Sabapathi	1988	NS	—	—
Swamy	1988	—	P&S	—
Sutha *et al.*	1991	—	—	P&S
Jaleel	1992	—	—	P
Gangadharan	1993	—	—	P&S
Veeraiah *et al.*	1998	—	—	P&S

The findings of the above research works conducted earlier emphasize the importance of the variable cosmopoliteness in influencing the dependent variables viz awareness, attitude and adoption behaviour of respondents. Hence it was decided to include cosmopoliteness as an indepedent variable.

2.4.9 Mass media participation

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Kamarudeen	1981	—	P&S	—
Haraprasad	1982	P&S	NS	P

Sainath	1982	—	—	P
Prasannan	1987	—	—	P&S
Krishnamoorthy	1988	NS	—	P
Nandakumar	1988	—	—	NS
Anithakumari	1989	—	—	P&S
Sajeevchandran	1989	—	P&S	P&S
Varma	1996	—	PS	—
Sumathi and Alagesan	1998	P&S	—	P&S

The significance and influence of mass media participation on the awareness, attitude and adoption behaviour of respondents is clearly brought out by the above researchers. Therefore, it was assumed that mass media participation would have some relationship with the dependent variables selected for the present study.

2.4.10 Scientific orientation

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Aristotle	1981	NS	—	—
Kamarudeen	1981	—	P&S	P&S
Cherian	1984	P	N	—
Swaminathan	1986	—	—	NS
Anithakumari	1989	—	—	P&S
Sajeevchandran	1989	P&S	—	P&S
Sumathi and Alagesan	1998	P&S	—	P&S
Devi and Manoharan	1999	—	—	P&S

The above studies pinpoint the importance of scientific orientation in the awareness, attitude and adoption behaviour of respondents and therefore it

was decided to test the kind of relationship between scientific orientation and the selected dependent variables of rice farmers in the present study.

2.4.11 Innovativeness

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Ravi	1974	—	—	P&S
Ravichandran	1980	—	N&S	P&S
Balasubramoni	1981	P	—	—
Anithakumari	1989	—	—	P&S
Sajeevchandran	1989	P	P	—
Nelson	1992	P	—	—
Varma	1996	—	P&S	—

Thus it is obvious from the above given previous review that innovativeness is exerting a significant influence on awareness, attitude and adoption behaviour of respondents. Hence it was also taken into consideration in the present study.

2.4.12 Economic motivation

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Jayavelu	1980	P&S	P	—
Aristotle	1981	P&S	—	—
Nandakumar	1988	P&S	—	—
Sajeevchandran	1989	P&S	P&S	—
Sutha *et al*	1991	—	—	P&S
Nelson	1992	N	NS	—
Rajkumar	1992	—	—	NS
Gangadharan	1993	—	—	P&S
Varma	1996	—	P&S	—
Sivaprasad	1997	—	—	P
Veeraiah *et al.*	1998	—	—	P&S

The role of economic motivation in influencing the awareness, attitude and adoption behaviour of respondents is made clear by the previous studies. Hence it would be interesting to validate its significance in the present study also.

2.4.13 Risk orientation

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Tripathy	1977	—	—	P
Rajendran	1978	—	—	P
Nanda Kumar	1980	P&S	—	—
Kamarudeen	1981	—	P	—
Naik	1981	NS	P	—
Cherian	1984	P&S	—	—
Viju	1985	—	P	—
Sajeev Chandran	1989	P&S	—	—
Rajkumar	1992	—	—	NS
Gangadharan	1993	—	—	P&S
Varma	1996	—	P&S	—
Sivaprasad	1997	—	—	P

After going through the preceeding studies it was assumed that risk orientation would influence the dependent variables selected for the study.

2.4.14 Self-confidence

Name of the researcher	Year of study	Relationship with dependent variables		
		Awareness	Attitude	Adoption
Varma	1996	—	P&S	—

The researcher could not find any study indicating the relationship of self-confidence with awareness and adoption. But based on expert opinion it was decided to test its relationship with the dependent variables.

P : Positive; N : Negative; P&S : Positive & Significant; N&S : Negative & Significant; NS : Non-significant

2.5 Conceptual model of the study

Based on the above review a conceptual frame work of the study was developed presented in Fig. 1.

2.6 Hypotheses of the study

Keeping in view of the objectives of the study and review of literature following hypotheses were framed for the present study.

1. There is no significant relationship among the dependent variables viz., Awareness, Attitude and Adoption, selected for the study.

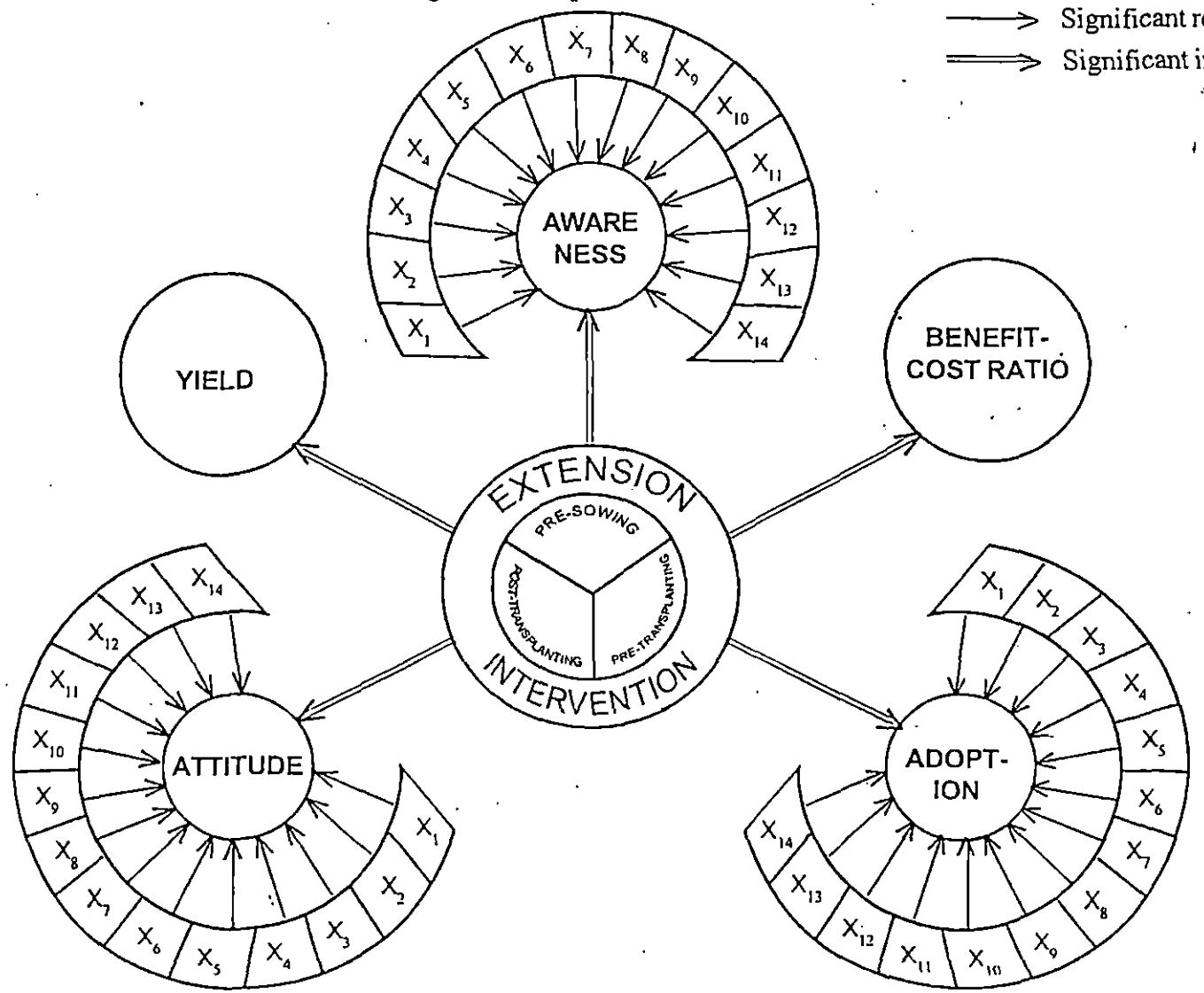
2. There is no significant relationship between the extent of awareness of farmers about selected recommended practices in rice cultivation and the selected socio personal characteristics.

3. There is no significant relationship between the attitude of farmers towards rice cultivation and the selected socio personal characteristics.

4. There is no significant relationship between the extent of adoption of the selected recommended practices in rice cultivation by farmers and the selected socio personal characteristics.

5. There would be no significant change in the dependent variables viz., awareness, attitude and adoption behaviour of rice farmers and in yield and cost-benefit ratio after extension intervention.

Fig. 1. Conceptual model of the study



X_1: Age; X_2: Educational status; X_3: Occupational status; X_4: Farming experience; X_5: Annual income; X_6: Social participation; X_7: Extension orientation; X_8: Cosmopoliteness; X_9: Massmedia participation; X_{10}: Scientific orientation; X_{11}: Innovativeness; X_{12}: Economic motivation; X_{13}: Risk orientation; X_{14}: Self-confidence.

METHODOLOGY

CHAPTER 3

METHODOLOGY

This chapter brings to light the methods and procedures followed in the conduct of the research study under the following subheads.

3.1 Locale of the study and sampling procedure employed

3.2 Operationalisation and measurement of dependent variables

3.3 Operationalisation and measurement of independent variables

3.4 Extension intervention

3.5 Impact of Extension intervention

3.6 Techniques of data collection

3.7 Statistical methods used

3.8 Categorisation of respondents

3.1 Locale of the study and sampling procedure employed

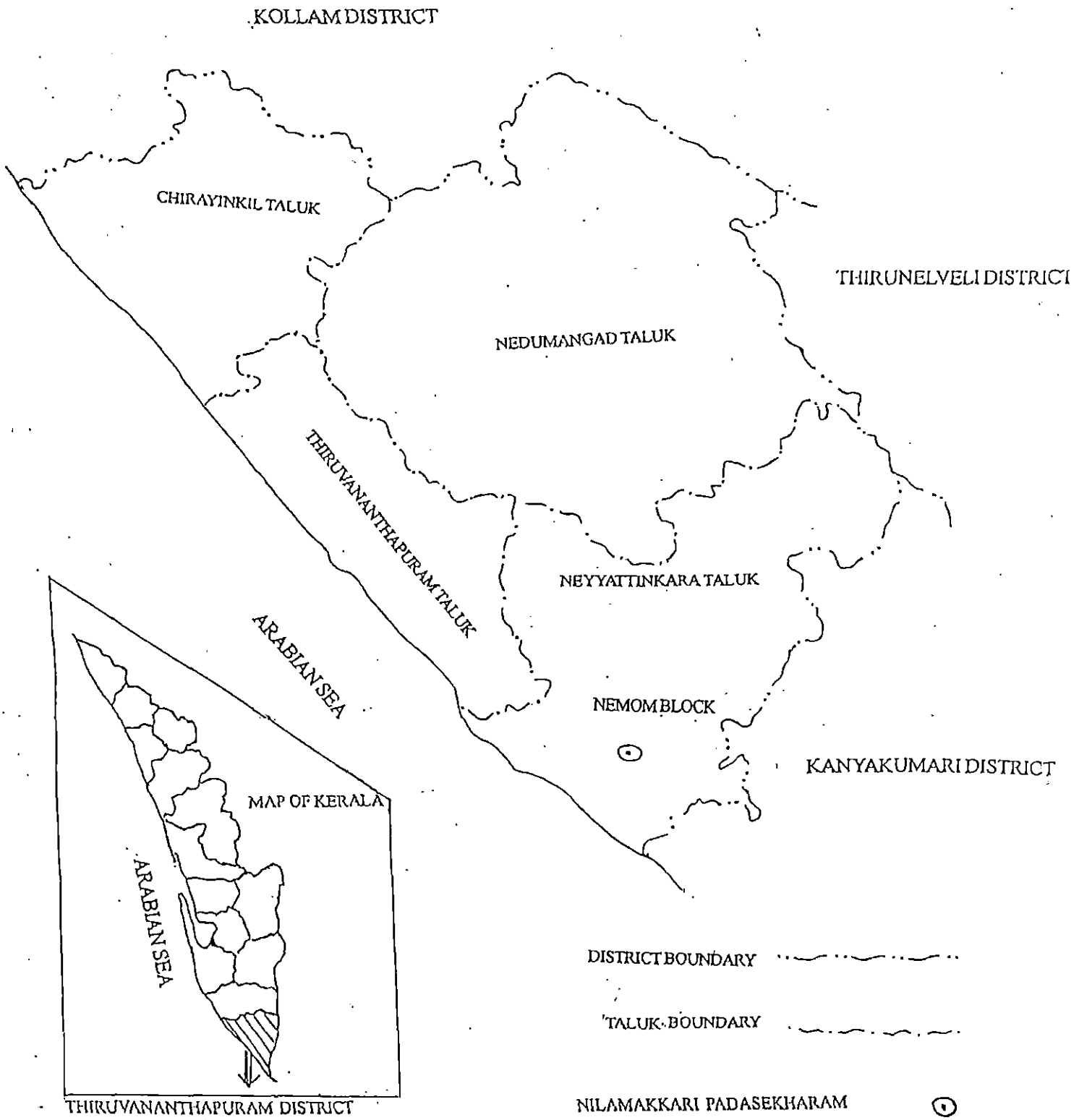
For the present study Neyyattinkara taluk of Thiruvananthapuram district was purposively selected due to the following reasons.

* Neyyattinkara taluk has comparitively more area under rice cultivation.

* Proximity of the taluk to the College of Agriculture, Vellayani.

* The researcher has more aquaintance with the rural community of the taluk.

Fig.2 MAP SHOWING THE LOCATION OF THE STUDY AREA



From among the 12 blocks in Thiruvananthapuram district, Nemom block was randomly selected for the study. From the seven padasekharams of Nemom block, Nilamakkari padasekharam was selected randomly. From the selected padasekharam which is owned by 80 rice farmers, 40 farmers were selected using random sampling procedure from the list of cultivators available with the Krishi Bhavan.

3.2 Operationalisation and measurement of dependent variables

A pilot study was conducted in a nearby non-sample padasekharam having similar socio-economic conditions to get a clear picture of the situations existing in the padasekharams. The dependent variables selected for the study include

(i) Extent of awareness of farmers about selected recommended practices in rice cultivation.

(ii) Attitude of farmers towards rice cultivation.

(iii) Extent of adoption of selected recommended practices in rice cultivation by farmers.

3.2.1 Extent of awareness of farmers about selected recommended practices in rice cultivation

In the study awareness has been operationalised as the feeling of being conscious of, perceiving and taking into account of the selected recommended practices in the rice cultivation by the respondents.

For the purpose of this study the method followed by Salunkhe (1978) was adopted with slight modification for measuring the awareness of farmers regarding the selected recommended technologies in rice cultivation including low cost technologies. For this purpose 16 practices were selected from an initial list of 27 practices after being rated by experts in the Kerala Agricultural University and the Department of Agriculture on the basis of their feasibility in the study area and their importance in contributing to yield. The pilot study conducted by the researcher also was of use in selecting the practices. The practices selected for testing awareness are given in the Appendix IV.

The questions related to these practices were framed and administered to the respondents and a score of one was given to every response of 'yes' and a score of zero to the 'no' response. The mean and standard deviation of the awareness score were calculated.

3.2.2. Attitude of farmers towards rice cultivation

The term attitude refers to the degree of positive or negative affect towards a psychological object. In the present study Likert's (1932) method of summated rating was used.

Collection of items :

The items to be included in the attitude scale were obtained through review of literature related to rice cultivation and discussion with experts of Kerala

Agricultural University. In total 30 statements relating to different aspects of rice cultivation was collected.

Editing of the statements :

The statements thus collected were carefully edited in accordance with the criteria suggested by Edwards (1957), so as to indicate both favourable and unfavourable attitudes towards rice cultivation. In order to know the relevance of each of the statement, the statements thus selected were subjected to judges rating. The responses were obtained in a four-point continuum viz., 'very much relevant', 'much relevant', 'some what relevant' and 'not relevant' with weightages of 4, 3, 2 and 1 respectively. The relevance of each of these statements was analysed and only those statements considered relevant by more than 50 per cent of the judges were included for the study. For the selection of statements to the final attitude scale item analysis was done.

For the purpose of item analysis, the statements were first administered to a group of 30 non-sample respondents and they were requested to respond to each statement in terms of their own agreement or disagreement with the statement on

a five-point continuum, namely 'Strongly agree', 'Agree', 'Undecided', 'Disagree' and 'Strongly disagree'.

The responses were assigned numerical weights as follows for positive statements.

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

The scoring pattern was reversed for negative statements. The sum of weightages for all the statements was worked out to get the attitude score of an individual respondent. The respondents' scores were arranged in descending order. Twenty five per cent of the respondents with higher total scores and 25 per cent of the respondents with lower total scores were selected from among the respondents. These two groups formed the criterion groups in terms of which evaluation of individual statements was made. The discrimination index, 't' was computed for each statement using the formula.

$$t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$ where

$\overline{X}_H$ - the mean score on a given statement for the high group

$\overline{X}_L$ - the mean score for the same statement for the low group

S_H^2 - the variance of the distribution of responses of the high group to the statement

S_L^2 - the variance of the distribution of responses of the low group to the statement

n_H - the number of subjects in the high group

n_L - the number of subjects in the low group

Those statements with 't' values above 1.75 were selected. Finally eight statements were selected for inclusion in the scale which consists of four positive and four negative statements. (Appendix I)

Reliability of the scale

A scale is said to be reliable only when it will consistently produce the same or similar results when applied to the same sample. Here the reliability was tested by means of split-half method as detailed below.

The scale was administered to 30 non-sample respondents. The summation of scores obtained by odd numbered items and the summation of scores obtained by even numbered items of the scale for each respondent were correlated by using Pearson's product-moment correlation coefficient. The coefficient of internal consistency 'roe' was worked out using the formula

$$roe = \frac{Pxy}{\sigma x \times \sigma y}$$ where

roe = the correlation coefficient between sum of scores on odd and even numbered items in the scale.

Pxy = the product moment of scores on odd and even numbered items

σx = the standard deviation of the distribution of scores on odd numbered items

σy = the standard deviation of the distribution of scores on even numbered items

The 'roe' value obtained will give half test reliability. Therefore it was corrected using Spearman Brown's prophecy formula and thus the reliability coefficient, r_{tt}, for the total length of the scale was obtained as given below.

$$r_{tt} = \frac{2\ roe}{1 + roe}$$

The obtained r_{tt} value 0.86 was highly significant and thus reliability was established.

Validity of the scale

It is the fidelity with which the scale measures what it intends to measure. The scale was tested for content validity as well as construct validity.

Content validity

The main criterion for content validity is how well the contents of the scale represents the subject matter under consideration. Since the items for the scale

were selected from the universe of contents it was ensured that the items covered all the important aspects of rice cultivation.

Construct validity

It is the degree to which a measurement of a given concept when employed in research is able to yield an entire set of relationships that makes a good theoretical sense to the researcher.

In the present study, construct validity was tested by calculating the correlation coefficient between attitude and scientific orientation. The attitude and scientific orientation scores of 30 respondents were measured and a correlation coefficient of 0.6028 was obtained, which was highly significant. Hence it was concluded that the scale had construct validity.

Administering the scale

The final scale with negative and positive statements was administered to the sample of rice farmers under study and the responses were collected on a five-point continuum namely 'Strongly Agree', 'Agree', 'Undecided', 'Disagree', 'Strongly Disagree', with weightages 5, 4, 3, 2 and 1 respectively. The procedure was reversed in the case of negative statements. The weightages on responses of all the

statements were summated to get the attitude score of each individual. The possible score ranges from 8 to 40.

3.2.3 Extent of adoption of selected recommended practices in rice cultivation by farmers

Adoption behaviour was operationalised as the extent to which the recommended technologies are put into practice by the respondents in rice cultivation.

In the present study the same 16 practices which were earlier selected for studying the awareness of respondents were used and their extent of adoption was measured by using the method adopted by Ramachandran (1992) with slight modifications. Here, 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.

Potentiality is the maximum degree to which the respondent can extend his adoption depending on the maximum utilization of the resources he commands or can command. A score of 'one' was given for full adoption, 'two' for partial/ improper adoption and 'zero' for non adoption. The adoption score of the respondent was obtained by summing the scores with respect to the selected practices.

3.3 Operationalisation and measurement of independent variables

3.3.1 Age : Age was operationalised as the number of years completed by the respondent at the time of enquiry. The respondents were classified into three categories using the criteria followed in Government of India Census Report (1991).

Young:	upto 34 years
Middle aged:	35-45 years
Old:	Above 45years

3.3.2 Educational status : Educational status was operationalised as the ability of the respondent to read and write or the extent of formal education possessed. The scoring procedure followed by Trivedi (1963) was adopted in the study with some modifications.

Category	Score
Illiterate (No education)	0
Primary school	1
Middle school	2
High school	3
Higher secondary	4
Collegiate	5

3.3.3 Occupational status : The occupational status was operationalised as the extent to which a respondent has agriculture as his main activity, in which he is regularly engaged to achieve utilitarian rewards. A farmer without any subsidiary occupation was given maximum score.

The occupational status of respondents was quantified by the procedure followed by Allaudin (1983) as follows.

Occupation	Score
Farming alone	4
Farming+ Farming labour	3
Farming + Business	2
Farming + Service (Government or Private)	1

3.3.4 Farming experience : Farming experience refers to the association of an individual to his farming profession. The scoring procedure followed by Rajapandi (1983) was adopted for this study also.

Farming experience	Score
upto 5 years	1
5-10 years	2
Above 10 years	3

3.3.5 Annual income : It was operationalised as the total income obtained from both agriculture and other subsidiary occupations for a period of one year. The below given scoring procedure was followed for this purpose

Income	Score
upto Rs 15,000	1
Rs 15001-Rs 25,000	2
Above Rs 25,000	3

3.3.6 Social participation : Social participation was operationalised as the degree of involvement of a farmer in formal organisations either as member or as office bearer. The social participation of farmer was quantified on the basis of

scoring system adopted in socio-economic status scale of Trivedi (1963) with slight modifications.

Membership	Score
Not participating in any organisation	0
Member in one organisation	1
Member in more than one organisation	2
Office bearer	3

3.3.7 Extension orientation : Extension orientation was operationally defined as the degree to which the farmer had contacts with extension agencies and participation in various extension activities.

The method used by Bhaskaran (1979) was used with slight modifications. The extension orientation consists of two dimensions viz. extension contact and extension participation.

(i) *Extension contact* : The extent of extension contact by the farmers was computed by giving scores to the items as follows.

Frequency of meeting AA/AO/BDO	Score
Two or more times a week	3
Once a week	2
Once to thrice a month	1
Never	0

(ii) *Extension participation*: The following activities were included to evaluate the extension participation of the respondents.

1. Meetings
2. Seminars
3. Exhibitions
4. Film shows
5. Farmers Days
6. Demonstrations
7. Field days

The respondent's participation in the above extension activities for the past one year was considered to arrive at extension participation scores as given below.

Frequency	Score
Whenever conducted	2
Occasionally	1
Never	0

The scores obtained for both the sub items by each of the respondent was calculated and summed up to get the extension orientation score of each respondent. The score ranges from 0 to 17.

3.3.8 Cosmopoliteness: This refers to the farmer's extent of contact with the outside village in terms of frequency and purpose of visits and membership in organisations. The method suggested by Desai (1981) was used for measuring cosmopoliteness of the respondents. It was measured in terms of the frequency of visits to the nearby town, purpose of visit and membership in organisations outside the village. The scoring procedure was as follows.

1. Frequency of visit to the nearby town	Score
Never	0
Once in a month	1
Once in a fortnight	2
Once in a week	3
Two/more times in a week	4

2. Purpose of visit	Score
Entertainment	0
Personal/Professional	1
Agricultural	3
3. Membership in organisations	Score
Outside the village	
Non-member	0
Membership in one organisation	1
Membership in more than one organisation	2

The total score on cosmopoliteness was obtained by summing up the scores for all the three sub-items for each individual. The possible score ranges from zero to nine.

3.3.9 Mass media participation: Mass media participation was operationally defined as the number and frequency of mass media information sources used or contacted by the respondents.

The procedure used by Anantharaman (1977) to measure the extent of participation of the respondents in different mass media was followed. The scoring was done as given below.

Mass Medium	Frequency	Score
Radio	Daily	5
	2-6 days a week	4
	Once a week	3
	Once a fortnight	2
	Rarely	1
	Never	0

Newspaper	Daily	5
	2-6 days a week	4
	Once a week	3
	Once a fortnight	2
	Rarely	1
	Never	0
Magazines/leaflets/ Bulletins	Regularly	2
	Occasionally	1
	Never	0
Films (seen during last year)	More then 6 times	3
	4-6 times	2
	1-3 times	1
	None	0

The total score of each respondent was computed by summing the scores on all the four sub items and was taken as his score on mass media participation. The score ranges from zero to fifteen.

3.3.10 Scientific orientation: Scientific orientation was operationally defined as the degree to which a farmer is oriented to the use of scientific methods in decision-making in farming.

The scale developed by Supe (1969) was used. The scale consists of 6 statements of which one was negative (given in Appendix II). The responses were collected on a five-point continuum as shown below.

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

The scoring pattern was reversed for the negative statement. The total scores thus obtained by an individual was taken as his score on scientific orientation. The score ranges from 6 to 30.

3.3.11 Innovativeness: This is operationalised as the desire expressed by a rice farmer to do something new for the sake of their own rather than to gain power, recognition or profit.

Innovativeness was measured by the scale developed by Prasad (1983) (Appendix II). This scale consisted of eight statements of which the first four statements were positive and the rest were negative. The responses were collected on a three point continuum and the scores of 2, 1 and 0 were given to Yes, Undecided and No responses respectively for positive statements and the scoring pattern was reversed for negative statements. The total score for the eight statements was taken as the score on innovativeness of that respondent. The possible score ranges from 0 to 16.

3.3.12 Economic motivation: Economic motivation was operationalised as the extent to which a farmer is oriented towards monetary profits as revealed by his behaviour and adoption of practices.

Economic motivation was measured by using the scale developed by Supe (1969). The scale consisted of six statements of which five were positive and one negative. Responses were collected on a five-point continuum with scores as follows.

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

The scoring pattern was reversed for negative statements. By summing up the scores over the items the economic motivation score of the respondent was obtained. The score ranges from 6 to30.

3.3.13 Risk orientation: Risk orientation was operationalised as the degree to which a rice farmer is oriented towards risk and uncertainty and has courage to face problems in farming. For the present study, the scale developed by Supe (1969) was used to measure the risk orientation of farmers. This scale consists of six

items (Appendix II) with three response categories viz. 'Agree', 'Undecided' and 'Disagree'. The weightage alloted were 3, 2 and 1 respectively for positive statements and 1,2 and 3 for negative statements. The score of an individual attempting the scale was obtained by adding up the weightages assigned to the responses for all the statements. The possible score range is 6 to 18.

3.3.14 Self - confidence : Self - confidence was operationalised as the extent of feeling about one's own powers, abilities and resourcefulness to perform any activity which the rice farmer desires to undertake.

This variable was measured using the scale designed by Pandyaraj (1978). The scale consists of eight items (Appendix II). The respondents were asked to give their responses in a five-point continuum ranging from 'strongly agree' to 'strongly disagree'. The scoring method followed was as follows for positive statements and vice - versa for negative statements.

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

Self confidence score for each individual was calculated by summing up the scores on individual statements. The possible score range of an individual in this scale ranges from 8 to 40.

3.4 Extension intervention

Extension intervention in the selected padasekharam was attempted after building up a strong rapport with the respondents through frequent farm and home visits and identifying and motivating contact farmers/local leaders in the area. Above all, the active guidance and assistance from the Agricultural officer of the area fecilitated a meaningful interaction with the farmers. To make the intervention more effective the invaluable services of resource persons from Kerala Agricultural University, Department of Agriculture and K.H.D.P were utilised besides the utmost effort of the researcher. The intervention was carried out by using various extension teaching methods and aids *viz*., method demonstration, training classes with the use of flash cards, flannel graphs, field visit to progressive farmers plots, slide shows *etc*., and was executed in these orderly stages as follows.

3.4.1 Pre-sowing extension intervention

With a view to bridge the gap in awareness and adoption of the recommended practices in rice cultivation and to develop favourable attitude towards rice cultivation, as a first step, a pre-sowing extension intervention was carried out two weeks before sowing in the nursery, emphasising the following recommended aspects of rice cultivation and its importance.

- High yielding variety suited for second crop
- Optimum seed rate
- Organic manuring in nursery
- Applications of phosphatic fertilizers in the nursery
- Soil-test based fertilizer application

3.4.2 Pre-transplanting extension intervention

This was carried out one week prior to transplanting. The following practices were emphasized through this intervention.

- Age of seedlings at transplanting
- Water management
- Depth of planting
- Planting density
- Fertilizer recommendation
- Liming

3.4.3 Post-transplanting extension intervention

This strategy was timed one week after transplanting covering the following aspects of rice cultivation.

- Critical weed control and herbicide dosage
- Need based pesticide application
- Plant protection aspects of blast and brown spot, the prevalent diseases in the padasekharam
- Urea-neem cake application

3.5 Impact of extension intervention

The impact of extension intervention is measured in terms of change in the awareness, attitude, adoption behaviour, yield and benefit - cost ratio after the extension intervention. The measurement procedure is discussed in the operationalisation and measurement of dependent variables and techniques of data collection.

3.6 Techniques of data collection

The data were collected with the help of well structured interview schedules. The information were gathered by interviewing the respondents individually. Before the collection of information a rapport was made with the respondents by farm and home visits. The data were collected in two stages *viz.*, pre-cultivation data collection before the second crop season prior to cultivation and post-harvesting data collection, both of which covered the following aspects.

- Extent of awareness of farmers about the selected recommended practices in rice cultivation.
- Attitude of farmers towards rice cultivation
- Extent of adoption of the selected recommended practices in rice cultivation by farmers.

- Yield data and benefit-cost ratio of previous Mundakan crop and current Mundakan crop.
- Selected socio-personal, socio-psychological, economic and communication variables of the respondents (only under pre-cultivation data collection)

The yield data of previous Mundakan crop was obtained from the records kept at the Krishi Bhavan. The current Mundakan season yield was obtained from the crop cutting survey records from the Krishi Bhavan. Benefit - cost ratio was computed taking into consideration the input-wise cost of cultivation incurred for each respondent and the returns he obtained in terms of grain and straw yield under the prevailing market prices.

3.7 Statistical methods used

The collected data were analysed using the following statistical tools.

3.7.1 Mean : The respondents were classified into low groups and high groups for the dependent and independent variables based on the respective mean scores.

3.7.2 Percentage : To make simple comparisons percentage analysis was done.

3.7.3 Correlation analysis : To find out the relationship between the independent (X) and dependent (Y) variables the Pearson's product moment correlation (r) was worked out using the formula

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

where

n= the sample size

$\Sigma xy - \frac{(\Sigma x)\ (\Sigma y)}{n}$ = the sum of products of x and y

$\Sigma x^2 - \frac{(\Sigma x)^2}{n}$ = the sum of squares of x

$\Sigma y^2 - \frac{(\Sigma y)^2}{n}$ = the sum of squares of y

3.7.4 Step-wise regression analysis : To know the relative contribution of each selected practice (Xs) in explaining variance in the dependent variable, yield (Y), the partial regression coefficients or partial b's were worked out for the practices included in the regression equation. The independent variables (recommended practices) selected for regression analysis and their code numbers are given in Appendix IV. Since the selected practices have been measured in different units, for example, varietal coverage in hectares, seed treatment in g/kg etc., a correction factor was effected by standardising each partial 'b' value using the standard deviation of the respective practice to obtain a standard 'b' called 'beta' weight using the formula

$$b_1^1 = \frac{\sigma X_1}{\sigma Y} \times \text{partial } b_1$$

where b_1'= the beta weight corresponding to the partial b_1

b_1= the partial regression coefficient of the independent variable X_1.

σX_1= the standard deviation of the independent variable X_1.

σY= the standard deviation of the dependent variable Y.

The absolute values of beta weights indicate the relative importance of the independent variables in predicting variation in the dependent variable. Step-wise regression analysis was resorted to find out the order of importance of the independent variables (Xs) in predicting the variations in the dependent variable (Y).

3.7.5 T-test : T-test was done to find out whether there is significant increase in the dependent variables under study after the extension intervention.

3.8. Categorisation of respondents

The respondents were categorised into low and high groups based on mean scores for all the dependent variables viz. awareness, attitude and adoption. Among the independent variables, for the following ones namely, age, educational

status, occupational status, annual income and social participation the respondents were categorised based on adopted scoring scales. For all the other independent variables categorisation was done based on mean scores into low and high groups.

RESULTS & DISCUSSION

CHAPTER 4

RESULTS AND DISCUSSION

The results and discussion of the study are presented under the following subheads.

4.1 Distribution of respondents based on the dependent variables.

4.2 Distribution of respondents based on the independent variables.

4.3 Relationship among the dependent variables.

4.4 Relationship between the selected independent variables and the extent of awareness about selected recommended practices in rice cultivation.

4.5 Relationship between the selected independent variables and attitude towards rice cultivation.

4.6 Relationship between the selected independent variables and the extent of adoption of selected recommended practices in rice cultivation.

4.7 Distribution of respondents based on the extent of adoption, practice-wise, before the extension intervention.

4.8 Reasons for the non-adoption of the selected recommended practices in rice cultivation. (as opined by the respondents)

4.9 Impact of extension intervention as reflected by percentage change in full adopters after extension intervention.

4.10 Impact of extension intervention on change in awareness, attitude and adoption behaviour of respondents and on yield and benefit-cost ratio of rice crop.

4.11 Contribution of selected recommended practices towards variance in yield of rice.

4.12 Predictive power of selected independent variables (recommended practices) on yield of paddy.

4.1 Distribution of respondents based on the dependent variables

From Table.1 it is clear that majority of the respondents (57.5%) were in the high awareness category while 42.5 per cent of the respondents were in the low awareness group. The data on attitude revealed that majority of the rice farmers (52.5%) had low level of attitude towards rice cultivation while about 47.5 per cent of farmers were having high attitude towards rice cultivation. With regard to adoption of selected recommended practices a good portion of respondents (52.5%) were in the low adopter category and 47.5 per cent of the respondents were in the high adopter category.

Table. 1 Distribution of respondents based on the dependent variables

Variables	Category	Range	Frequency	Percentage
Awareness	Low<11.57	7-16	17	42.5
	High>11.57		23	57.5
Attitude	Low<25.93	14-33	21	52.5
	High>25.93		19	47.5
Adoption	Low<21.86	12-31	21	52.5
	High>21.86		19	47.5

The high awareness of the respondents may be attributed to their fairly high educational status higher degrees of mass media participation and scientific orientation. (Table 2). None of the farmers were illiterate. Nearly 53 per cent of the respondents had high degree of mass media participation while 55 per cent had high scientific orientation. Majority of respondents were having low extension orientation (62.5%), innovativeness (52.5%) and risk orientation (57.5%) (Table. 2). These factors might explain their low level of attitude and adoption. A greater extension agency contact, participation in extension activities, ability to take risks and greater innovativeness would have favoured a positive attitude and greater adoption.

4.2 Distribution of respondents based on the independent variables

The data in Table. 2 showed that majority of respondents fell in the old age group (62.5%) while 22.5 per cent were in the middle age group. Only 15 per cent of rice farmers were in the young age group. This feature may be attributed to the fact that there is an increasing tendency among the educated rural youth to leave farming as a way of living and choose better prospects or white collar jobs, which ensures more security. Agriculture, they feel, is dependent on a host of uncertain factors and hence at times unreliable.

Table. 2 Distribution of respondents based on the independent variables

Variables	Category	Range	Frequency	Percentage
1. Age	Young upto 34 yrs		6	15.0
	Middle 35-45 yrs	25-66	9	22.5
	Old above 45 yrs		25	62.5
2. Educational status	Illiterate (0)		-	-
	Primary (1)		8	20.0
	Middle school (2)	1-5	11	27.5
	High school (3)		10	25.0
	Higher Secondary (4)		3	07.5
	Collegiate (5)		8	20.0
3. Occupational status	Farming alone (4)		8	20.0
	Farming+farming labour (3)		7	17.5
	Farming+business (2)	1-4	12	30.0
	Farming+Govt/ private service (1)		13	32.5
4. Farming experience	Low<10.93		18	45.0
	High>10.93	5-20	22	55.0
5. Annual income	upto Rs. 15000 (1)		13	32.5
	Rs. 15001-25,000 (2)	11,500	13	32.5
	Above Rs. 25,000 (3)	-28,300	14	35.0

Variables	Category	Range	Frequency	Percentage
6. Social participation	No participation (0)		20	50.0
	Membership in one organisation (1)	0-4	8	20.0
	Membership in more than one organisation (2)		6	15.0
	Office bearer (3)		6	15.0
7. Extension orientation	Low<7.5		25	62.5
	High>7.5	2-16	15	37.5
8. Cosmopoliteness	Low<4.48		17	42.5
	High>4.48	1-9	23	57.5
9. Mass media participation	Low<7.28		19	47.5
	High>7.28	3-14	21	52.5
10. Scientific orientation	Low<18.87		18	45.0
	High>18.87	10-28	22	55.0
11. Innovativeness	Low<10.5		21	52.5
	High>10.5	3-18	19	47.5
12. Economic motivation	Low<18.87		18	45.0
	High>18.87	5-30	22	55.0
13. Risk orientation	Low<8.17		23	57.5
	High>8.17	6-12	17	42.5
14. Self-confidence	Low<25.95		18	45.0
	High>25.95	15-40	22	55.0

* The figures in parantheses represents the respective scores.

The educational status of the respondents revealed that none of them were illiterate. About 20 percent of the farmers had primary schooling. About 27.5 per cent of them had middle schooling, while 25 per cent of them had attended high schools. But only 7.5 per cent had attended higher secondary schools. Another 20 per cent of the rice farmers had undergone collegiate education. To find that none is illiterate is no wonder since Kerala had already achieved cent per cent functional

literacy. Thiruvananthapuram district in particular has the highest number of educational institutions. Therefore there is a higher chance of persons undergoing formal education. The younger generations of farming community are more qualified and they are opting still greener pastures.

The occupational status of the rice farming community showed that only 20 per cent of the farmers resorted to farming alone. About 17.5 per cent of them undertook farming labour also. Farming and business went side by side for 30 per cent of the respondents, while a good portion of the respondents (32.5%) were employed in government or private service. This may be another ramification of urban migration. The new age farmers who are economically motivated are seldom contented with farming alone. Their high educational status propel them to aspire for white collar jobs, thus farming for them is only a subsidiary occupation of secondary importance.

Majority of the respondents (55%) had high farming experience. About 45 per cent of them were in the low category. Rice cultivation, for majority of them, is a traditionally handed over occupation. They are emotionally indebted to continue rice farming. The old age farmers who forms majority of the sample had farming as their primary occupation.

The data on social participation showed that about 50 per cent of the respondents had no participation in any form. About 20 per cent were members of a single organisation. While 15 per cent had membership in more than one organisation, another 15 per cent of the respondents were office-bearers in organisations. This may be due to the fact that majority of the respondents were old aged people who might have lost their zeal in active social participation while the younger generations are keeping themselves busy with farming and subsidiary occupations. Moreover, rice farming they feel, is time consuming and laborious, virtually making them field-bound all the time.

The extension orientation profile of the respondents showed that 62.5 per cent were in the low group, while 37.5 per cent were in the high group. The younger generation farmers were taking up farming only as a subsidiary occupation. Their involvement in other avenues might have taken up much of their time and interest to participate in extension activities and seek guidance from extension agencies. At the same time, earnings from non-farm activities might be enabling them to lead a contented life and not to worry much about income from farming. Moreover, the old age farmers being more restrained in outlook and habits might not be actively participating in extension activities. This is revealed by the negative correlation of extension orientation with age. (Appendix III)

Regarding the cosmopoliteness a good portion of the respondents were in the high group (57.5%)and 42.5 per cent were in the low group. The fast changing life styles may be forcing them for greater interaction with the town and outside world for fulfilling their personal and professional needs.

Majority of the respondents 52.5 per cent had high mass media participation. About 47.5 per cent of the respondents fell in the low category. High literacy and educational status might have facilitated an easy and meaningful interaction with mass media channels. Moreover, the number and availability of mass media channels have multiplied in recent times making them more accessible.

It is clear from the table that a greater proportion of respondents (55%) had high scientific orientation. About 45 per cent of the respondents were in the low group. Greater education and meaningful mass media participation might have made them more objective and progressive in their outlook and more scientifically oriented.

The innovativeness of majority of the farmers was low with 52.5 per cent falling in the low category. Majority of the old age farmers tend to be orthodox with regard to the practices they are following. It could be noted from the inter-correlation matrix (Appendix III) that cosmopoliteness decreases with age.

Moreover, it was found that as age advances innovativenes decreases (Appendix III). These factors might have negatively influenced the innovativeness of farmers. Farming was the main occupation for only 20 per cent of the respondents. Majority might not be interested in trying innovative methods in rice farming which is a secondary occupation, often less profitable.

About 55 per cent of the respondents were in the high category with respect to economic motivation and another 45 per cent in the low group. Economic motive is a major driving force influencing the external behaviour, leading to actions for ensuring a better standard of living.

With regard to risk orientation majority of the rice farmers (57.5%) were in the low group and 42.5 per cent of them fell in the high group. This character was found to be negatively correlated with age (Appendix III). It is natural that younger more educated individuals with cosmopolitan outlook are ready to take risks and venture into new practices and enterprises. The old farmers may be hesitant to gamble with their life and resources.

Majority of the farmers (55%) were in the category of high group with respect to self-confidence. Their high educational status, greater awareness with the surroundings with high mass media participation and high scientific orientation might have added to their self-confidence.

4.3 Relationship among the dependent variables

Table. 3 brings to light a significant positive correlation at 1 per cent level between awareness and attitude and also between attitude and adoption, while awareness and adoption were significantly correlated at 5 per cent level.

Table. 3 Relationship among the dependent variables

Variables	Correlation coefficient
Awareness and Attitude	0.6432**
Attitude and Adoption	0.5896**
Awareness and Adoption	0.4013*

**Significant at 0.01 level

*Significant at 0.05 level

Greater awareness created by the impact of higher educational status and mass media participation (Table. 2) might have stimulated the individual to probe deeper into the relative efficiency, feasibility and adaptability of the recommended practices and favoured a positive attitudinal change towards these practices and hence there is significant positive correlation between awareness and attitude and also between awareness and adoption. A favourable inclination towards these recommended practices might have propelled them towards adopting the same for extracting their benefits ie., higher yields and income and this explains positive correlation between attitude and adoption. Thus the null hypothesis stating that there is no significant relationship among the dependent variables stands rejected.

4.4 Relationship between the selected independent variables and the extent of awareness about selected recommended practices in rice cultivation

The nature and degree of relationship between awareness and the selected characteristics of respondents is presented in the Table. 4. It is evident that the variables viz., educational status, social participation, extension orientation, mass media participation, scientific orientation and self-confidence were positively and significantly correlated with awareness at 1per cent level, while the characteristics namely cosmopoliteness, innovativeness, economic motivation and risk orientation were found positively and significantly correlated at 5 per cent level. A negative and significant correlation at 1per cent level was observed in the case of the variables age and farming experience, while occupational status was negatively correlated at 5per cent level. The variable annual income showed a positive non-significant correlation.

Table 4. Relationship between the selected independent variables and the awareness about selected recommended practices in rice cultivation

Independent variables	Correlation coefficient
X1- Age	-0.6446**
X2- Educational status	0.6337**
X3- Occupational status	-0.3542*
X4- Farming experience	-0.4757**
X5- Annual Income	0.3019NS
X6- Social participation	0.6047**
X7- Extension orientation	0.5976**
X8- Cosmopoliteness	0.3942*
X9- Mass media participation	0.5997**
X10-Scientific orientation	0.5144**
X11-Innovativeness	0.3247*
X12-Economic motivation	0.4023*
X13-Risk orientation	0.3962*
X14-Self-confidence	0.4751**

**Significant at 0.01 level
*Significant at 0.05 level
NS:Non-significant

The significant negative correlation between age and awareness can be explained by the fact that majority of the respondents were in the old age group and age had been negatively correlated with educational status, mass media participation and extension orientation (Appendix III). Thus lower level of education, lesser involvement in mass media channels and extension activities might be the reason for their low awareness and hence the result. The result is in conformity with that of Sajeev (1989). The same explanation holds good for the negative correlation of occupational status and farming experience with awareness. The result of correlation of farming experience with awareness agrees with that of Alexander (1985).

Education exposes the individual to a multitude of facts and information. Educated people are more likely to have better awareness of the sources of information including mass media channels and have more power of comprehension. This may be the reason for the significant positive correlation of education with awareness. The finding is in line with that of Padmaiah *et al.*(1998).

Annual income was seen positively but non-significantly correlated with awareness. This may be because most of the high income earners were younger farmers who were involved in business, goverment or private services etc., in addition to farming. They also had high educational status, extension orientation and massmedia participation (Appendix III). These factors might explain the above stated relationship.

The positive and significant correlation between social participation and awareness can be substantiated by the fact that interactions at individual, group and institutional levels might have widened the sphere of understanding of the person. The individual thus came in touch with a variety of authentic information from credible sources. This might have enhanced the degree of awareness of respondents. The result is in conformity with that of Sumathi and Alagesan (1998).

Involvement in the extension activities undertaken by Krishi Bhavan, Department of Agriculture and interactions with extension personnel provide the farmers with first hand information and necessary procedural skills about the technicalities and other related aspects of crop management. This explains the significant positive correlation between extension orientation and awareness. The result agrees with that of Nandakumar (1988).

Similarly, cosmopoliteness provides for meaningful interaction of respondents with the outsideworld and has a complementary effect on information exchange and accrual and also widens the outlook of farmers. This inturn might have reflected positively in the awareness. This finding supports the finding of Veeraiah *et al.*(1998).

Mass media play a crucial role in linking the individual with the outside world providing him with innumerable general and specific information. Moreover, the results of inter-correlation matrix (Appendix III) revealed a positive and significant

relationship of mass media participation with educational status and extension orientation. All these might have contributed to the significant positive correlation between mass media participation and awareness about the selected recommended practices.

Analysis of the results revealed that scientifically oriented individuals had more educational status, mass media participation and extension orientation. Scientifically oriented people tend to be more inquisitve and judgemental in their approach. These factors might be the reason for significant positive correlation of scientific orientation with awareness. This finding supports the finding of Sumathi and Alagesan (1998).

The positive and significant correlation between innovativeness and awareness may be due to the fact that innovative farmers are likely to have better understanding of improved agricultural practices. They are more receptive and earnestly desire to seek changes in their practices which widens their degree of awareness and hence this relation. Nelson (1992) had also reported similar results.

Economically motivated farmers in order to enhance and sustain the monetary gains, are generally open to ideas and information. They tend to be more innovative, in their quest for financial security. These factors may be the reason for the positive and significant relationship of economic motivation with awareness Nandakumar (1980) had also stated similar results.

Risk orientation was found to be positively and significantly related with awareness. This may be because younger farmers who were found to have high risk preference (Appendix III) are likely to be more venturesome. Moreover, younger farmers were found to have greater educational status, mass media participation and extension orientation (Appendix III). These factors might have influenced their awareness and hence this result. This finding is supported by Cherian (1984) and Sajeev (1989).

Self-confidence was found to have a positive significant relationship with mass media participation, extension orientation and cosmopoliteness (Appendix III). Greater knowledge acquired through education, good scientific judgement and cosmopolitan outlook might have reinforced their self-confidence and hence its positive correlation with awareness.

In the light of above discussion, the null hypothesis stating that there exist no significant relationship between the extent of awareness of farmers about selected recommended practices in rice cultivation and the selected socio-personal characteristics stands rejected but for the independent variable, annual income.

4. 5 Relationship between the selected independent variables and attitude towards rice cultivation

The nature and degree of relationship between attitude and the selected characteristics of the respondents is presented in the Table. 5. The study revealed that the variables age, occupational status and annual income were negatively and non-significantly related to attitude. But the characteristics viz. educational status, social participation and extension orientation showed positive significant correlation at 5per cent level, while scientific orientation and self-confidence were found to be positively and significantly related at 1per cent level. Farming experience was negatively correlated 5per cent level.All the other characteristics viz., cosmopoliteness, mass media participation, innovativeness, economic motivation and risk orientation were found to be positively and non-significantly correlated with attitude.

Table. 5 Relationship between the selected independent variables and attitude towards rice cultivation

Independent variables	Correlation coefficient
X1- Age	-0.2385NS
X2- Educational status	0.4000**
X3- Occupational status	-0.0900NS
X4- Farming experience	-0.3250*
X5- Annual income	-0.0234NS
X6- Social participation	0.3914*
X7- Extension orientation	0.3216*
X8- Cosmopoliteness	0.2635NS
X9- Mass media participation	0.2140NS
X10-Scientific orientation	0.4604**
X11-Innovativeness	0.2304NS
X12-Economic motivation	0.1437NS
X13-Risk orientation	0.1723NS
X14-Self-confidence	0.4420**

**Significant at 0.01 level
*Significant at 0.05 level
NS:Non-significant.

A perusal of the inter-correlation matrix (Appendix III) revealed that educational status, extension orientation and mass media participation were negatively correlated with age. The old farmers are likely to lose interest in active participation within and outside the social system and become more self-absorbed. Thus under conditions of reduced stimuli from external environment they are less likely to develop a pronounced attitudinal change which might explain the negative correlation of age with attitude.

Education exposes the individual to wide-ranging scientific and general information from reliable sources and also facilitates meaningful social interactions. All these would have created a favourable attitude in the respondents and hence its significant positive correlation with attitude. The result agrees with that of Surendran (1982).

As occupational status increases the educational status, extension orientation and mass media participation were found to decline (Appendix III). Thus farmers devoted to farming alone are likely to have lesser awareness about scientific crop husbandary. This is bound to reflect in their ways of farming with the resultant decrease in yield and income. Again, rice being a less profitable crop due to several factors such as high cost of cultivation, labour intensive nature etc., farmers might have developed less inclination towards the cultivation of the rice. Even then they are following rice cultivation as a matter of tradition. This may be the reason why occupational status is negatively correlated with attitude.

Majority of the farmers were low adopters of the selected recommended practices. This might have resulted in low returns and led to the development of an unfavourable attitude towards rice cultivation. This may be the cause of negative correlation between farming experience and attitude.

As far as annual income is concerned it showed a negative nonsignificant correlation with attitude. Since the high income group are farmers who have taken up other avenues for earning giving farming only second preference and hence this result. The finding is in confirmity with the results of Kamarudeen (1981).

Participation in societal activities would have helped in the exchange and acquiring of knowledge from reliable and authentic sources which might have indirectly led to the development of favourable attitude. This may be the casual factor for the significant positive correlation between social participation and attitude. Vijaya (1982) and Cherian (1984) had also reported similar results.

The independent variable extension orientation was found to have a positive and significant correlation with attitude. The more the involvement of farmers in extension oriented activities such as seminars, method demonstrations, field visits etc, the more knowledge they gather and their sphere of comprehension widens. They feel more convinced about the efficacies of the recommended practices and hence the results. The finding is in line with that of Kamarudeen (1981).

The independent variable cosmopoliteness was positively and non-significantly related with attitude. A farmer with a cosmopolitan outlook might have had greater interaction with well-informed farmers, extension agents and in general with the outside world. Such an individual often becomes more receptive to new ideas and thus a positive attitude towards rice cultivation might have developed within him. Vijaya kumar (1983) had also reached the same conclusion.

It is evident from the table that mass media participation was positively and non-significantly related with attitude. A greater participation in mass media channels might have exposed the farmer to the merits of improved technologies and led to the development of a favourable attitude. The finding supports the results indicated by Kamarudeen (1981).

Similarly, scientifically oriented individuals are more likely to be judgemental in their approach to novel practices, critically asessing its merits and demerits. This would have developed a favourable attitude towards rice cultivation and thus a positive and significant relationship between scientific orientation and attitude. The result is in conformity with that of Cherian (1984).

Innovative farmers are likely to have better understanding of the improved agricultural practices. Their desire to experiment with new ideas for greater rewards may be the reason for the positive correlation of innovativeness with attitude.

Likewise,a farmer seeking monetary gains is likely to be progressive and try out innovations in his field. Favourable results might have reinforced his attitude towards rice cultivation and this explains the positive correlation of economic motivation with attitude. Sajeev (1989) had also indicated similar relation.

Analysis of the inter-correlation matrix (Appendix III) revealed that risk orientation was positively and significantly correlated with educational status, cosmopoliteness and scientific orientation, the factors which significantly influence the awareness and hence indirectly the attitude of farmers. This explains the positive relationship of risk orientation with attitude. The finding is in line with that of Kamarudeen (1981) Naik (1981) and Viju (1985). The same reasons hold good for the positive and significant correlation between self-confidence and attitude.

Thus it could be concluded from the above discussion that the null hypothesis stating their exist no significant relationship between the attitude of farmers towards rice cultivation and the selected socio personal characteristics stands rejected but for the following independent variables viz., age, occupational status, annual income, cosmopoliteness, mass media participation, innovativeness, economic motivation and risk orientation.

4.6 Relationship between the selected independent variables and the extent of adoption of selected recommended practices in rice cultivation

The Table.6 shows that among the selected characteristics the variables viz., age, occupational status and farming experience were significantly and inversely

related to the extent of adoption at 1per cent level while annual income was negatively correlated at 5per cent level. The two characteristics namely cosmopoliteness and economic motivation were found to be positively and significantly correlated at 5per cent level. All the other variables showed a significant positive correlation at 1per cent level with the adoption of selected recommended practices.

Table. 6 Relationship between the selected independent variables and the extent of adoption of selected recommended practices in rice cultivation

Independent variables	Correlation coefficient
X1- Age	-0.6220**
X2- Educational status	0.6461**
X3- Occupational status	-0.4208**
X4- Farming experience	-0.4505**
X5- Annual Income	-0.3140*
X6- Social participation	0.6627**
X7- Extension orientation	0.6027**
X8- Cosmopoliteness	0.4019*
X9- Mass media participation	0.6900**
X10-Scientific orientation	0.6000**
X11-Innovativeness	0.5589**
X12-Economic motivation	0.3290*
X13-Risk orientation	0.6232**
X14-Self-confidence	0.5389**

*Significant at 0.05 level
**Significant at 0.01 level

An analysis of the inter-correlation matrix (Appendix III) reveals that educational status, mass media participation, extension orientation and scientific orientation were negatively correlated with age, occupational status and farming

experience of the respondents. These characteristics might have indirectly influenced the adoption behaviour and hence there is significant negative correlation between age, occupational status and farming experience with adoption of selected recommended practices in rice cultivation.

Increased educational status might have facilitated greater exposure and interaction both within and outside the social system which would have aided in greater adoption of the recommended practices. Education helps an individual to evaluate the practices on a scientific perspective, leading to an objective rationalisation of the validity and feasibility of the practices. This reason holds good for the positive and significant correlation between educational status and adoption. Padmiah *et al.* (1998) had also reported similar results.

Considering the positive and significant correlation of social participation and extension orientation with the extent of adoption it can be concluded that farmers with greater degree of social participation and involvement in extension activities would definitely have gathered more scientific information from reliable sources, changed their awareness and attitude favourably towards adoption of the recommended practices. Sumathi and Alagesan (1998) had also indicated similar results.

The positive and significant correlation observed between mass media participation and adoption may be due to the greater awareness created by mass media

and that would have motivated the individuals to seek more information. Authentic information from reliable sources might have facilitated greater adoption. The results supports the finding of Veeraiah *et al.* (1998).

The recommended practices are based on sound scientific principles. Naturally respondents with good scientific orientation conceive these ideas more favourably and are better adopters of such practices. This may bring out the positive significant correlation observed between scientific orientation and adoption. Similar results were reported by Sujatha and Annamalai (1998).

It was found that innovativeness was positively and significantly related to extent of adoption. Innovative farmers are progressive in their outlook and seek changes in their practices. This coupled with greater awareness, educational status and scientific orientation (Tables 1 and 2) might have ensured better adoption. Anitha Kumari (1989), Sujatha and Annamalai (1998) had also reached the same conclusion.

Economically motivated farmers are more receptive to improved technologies that ensure higher yields and income. They tend to be early adopters.

This explains the positive and significant relationship between economic motivation and adoption. The results are in conformity with those of Sivaprasad (1997) and Padmaiah *et al.*(1998).

Considering the positive, significant correlation between risk orientation and self-confidence with adoption, it could be stated that a farmer who dares to take risks are likely to be progressive and responsive to externally influenced desirable changes. Both risk orientation and self-confidence were found to be positively and significantly related to educational status, scientific orientation and extension orientation (Appendix III). These characteristics might have made them more aware of the scientific practices, their relative advantage, thus changing their attitude favourably towards greater adoption. These results agree with those of Ganagadharan (1993) and Veeraiah *et al.* (1998).

In the light of the above discussion, the null hypothesis stating that there exist no significant relationship between the extent of adoption of the selected recommended practices in rice cultivation by farmers and the selected socio-personal characteristics is rejected for all the dimensions of selected socio-personal characteristics.

4.7. Distribution of respondents based on the extent of adoption, practice-wise, before the extension intervention.

Table. 7 reveals the percentage and frequency of respondents in different adopter categories for each selected practice before and after extension intervention. It brought to light that before the extension intervenyion only 40 per cent of the respondents were full adopters of HYV's. Half of them were partial adopters and only 10 per cent were non-adopters. Seed rate was adopted as per the recommendations by only 30 per cent, while 70 per cent were partial adopters. The application of optimum dosage of FYM was the second least adopted practice, fully adopted by a meagre 7.5 per cent of the respondents and partially adopted by 82.5 per cent of farmers. Phosphatic fertilizer was applied in the nursery in adequate dosage by 10 per cent of farmers. A great majority (65%) were non-adopters of this practice. Seed treatment which is a highly cost-effective practice was found to be fully adopted by 15 per cent of respondents, partially by 20 per cent while 65 per cent were not following the practice. As far as optimum stage of transplanting was concerned majority (55%) were full adopters and 45 per cent were following it improperly.

Table. 7. Distribution of respondents based on the extent of adoption, practice-wise, before and after the intervention

Practices	BEFORE INTERVENTION			AFTER INTERVENTION			Percentage increase in full adopters after extension intervention
	Non-adopters	Partial adopters	Full adopters	Non-adopters	Partial adopters	Full adopters	
Varietal choice	10 (4)	50 (20)	40 (16)	7.5 (3)	10 (4)	82.5 (33)	42.5
Seed rate	0	70 (28)	30 (12)	0	22.5 (9)	77.5 (31)	47.5
Farm yard manure application	10 (4)	82.5 (33)	7.5 (3)	10 (4)	67.5 (27)	22.5 (9)	15.0
Phosphatic fertilizer application	65 (26)	25 (10)	10 (4)	65 (26)	7.5 (3)	27.5 (11)	17.5
Seed treatment	65 (26)	20 (8)	15 (6)	20 (8)	7.5 (3)	72.5 (29)	57.5
Transplanting stage	0	45 (18)	55 (22)	0	17.5 (7)	82.5 (33)	27.5
Planting density	0	60 (24)	40 (16)	0	50 (20)	50 (20)	10.0
Planting depth	0	25 (10)	75 (30)	0	17.5 (7)	82.5 (33)	07.5
Soil testing	80 (32)	20 (8)	0	60 (24)	15 (6)	25 (10)	25.0
Fertilizer application (Basal)	0	40 (16)	60 (24)	0	32.5 (13)	67.5 (27)	07.5

Practices	BEFORE INTERVENTION			AFTER INTERVENTION			Percentage increase in full adopters after extension intervention
	Non-adopters	Partial adopters	Full adopters	Non-adopters	Partial adopters	Full adopters	
• Fertilizer application (Top dressing)	0	80(32)	20 (8)	0	47.5 (19)	52.5 (21)	32.5
• Urea-neem cake application.	80(32)	15 (6)	5(2)	20(8)	5 (2)	75 (30)	70.0
• Liming	37.5(15)	52.5(21)	10(4)	30(12)	32.5 (13)	37.5 (15)	27.5
• Critical weed control	77.5(31)	22.5(9)	0	65(26)	10(4)	25(10)	25.0
• Water management	0	27.5(11)	72.5(29)	0	17.5 (7)	82.5 (33)	10.0
• Need based pesticide application.	75(30)	25 (10)	0	75(30)	17.5(7)	7.5(3)	07.5
• Pesticide application. (Against leaf roller)	0	52.5(21)	47.5(19)	5(2)	17.5(7)	77.5 (31)	30.0
• Fungicide application. (Against blast disease)	25(10)	52.5(21)	22.5(9)	12.5(5)	37.5 (15)	50(20)	27.5

* Figures in parantheses indicate the frequency

It could be deduced from the above given table that about 40 per cent of farmers were sticking to optimum planting density while 60 per cent deviated from recommendations. None of the farmers fully adopted soil test based fertilizer recommendations. About 20 per cent were partial adopters with regard to soil testing. As far as basal fertilizer dosage was concerned majority (60%) were full-adopters while 80 per cent fell in the partial adopter category with regard to top dress dosage of fertilizers. The practice of applying urea-neem cake mixture was followed as per recommendation by a negligible 5 per cent of respondents and majority (80%) were non-adopters. About 15 per cent followed it partially. Liming which is an inevitable practice in our acidic soils was fully adopted by only 10 per cent of farmers and majority (52.5%) were partial adopters.

Considering the adoption rate of critical weed control, it could be observed that none were full adopters and a big majority (77.5%) were non-adopters, while 22.5 per cent followed it improperly. About 72.5 per cent of farmers fully adopted water management practices while majority (27.5%) were partial adopters.

It is unfortunate to notice that none of the respondents fully adopted the eco-friendly, cost-effective practice of need based pesticide application while 25 per cent followed it improperly.

As far as plant protection was concerned, majority (52.5%) fell in the partial category with respect to the pesticide and fungicide dosages. Again it was noticed that 25 per cent of the farmers did not apply fungicide at all. While 47.5 per cent fully adopted the required pesticide dosages, only 22.5 per cent could adopt the optimum fungicide recommendations.

Table. 8 Reasons for the non-adoption of the selected recommended practices in rice cultivation (as opined by the respondents.)

Practices	Reasons for non-adoption	Percentage of respondents*
1. Varietal choice	1. High cost of cultivation	62.50
	2. Unawareness of management practices	41.66
	3. Reduced yield in second crop	37.50
2. Seed rate	1. Low germination percentage	57.14
	2. To plant higher number of seedlings per hill	42.86
	3. Lack of awareness	32.14
3. Farm yard manure (FYM) application	1. Non-availability of FYM	54.05
	2. High cost of FYM	43.24
	3. Unaware of optimum dosage	29.73
4. Phosphatic fertilizer application in the nursery	1. Lack of awareness	47.50
	2. High cost of fertilizer	30.00
	3. Perceive as unimportant practice	25.00
5. Seed treatment	1. Lack of awareness	79.40
	2. Harmful to seeds	29.41
6. Transplanting stage	1. Lack of awareness	44.44
	2. Unpredictable monsoon	33.33
	3. Perceive as insignificant	27.70
7. Planting density	1. Higher density gives higher yield	55.88
	2. Lack of awareness	32.35
	3. Non-availability of seedlings	23.53
7. Planting depth	1. Lack of awareness	53.00
	2. For better anchorage	46.50
9. Soil-testing	1. Unaware of the procedure	65.00
	2. Tedious nature of work	47.50
	3. Delay in getting results	27.50
	4. Perceive no problem with the soil	15.00

Practices	Reasons for non-adoption	Percentage of respondents
10. NPK fertilizer application	1. High cost of fertilizer	43.75
	2. Lack of awareness	43.75
	3. High dose gives high yield	15.63
11. Urea-Neemcake application	1. Lack of awareness of the practice	65.79
	2. Lack of procedural knowledge	39.47
12. Liming	1. Lack of awareness	47.22
	2. Perceive as insignificant	33.33
	3. High cost	25.00
13. Critical weed control	1. Non-availability of labour in time	72.50
	2. High cost	52.50
	3. Weeds are beyond control	47.50
14. Water management	1. Lack of awareness	43.75
	2. Unpredictable monsoon	37.50
15. Need based pesticide application	1. Lack of awareness	57.50
	2. Cannot control pest	52.50
	3. High dose more effective	33.33
16. Fungicide application	1. Lack of awareness	64.52
	2. Lack of finance	55.00

* Multiple responses

4. 8 Reasons for the non-adoption of the selected recommended practices in rice cultivation (as opined by the respondents.)

The main reason attributed for non-adoption of the recommended high yielding variety was high cost of cultivation by about 62.5 per cent of the respondents. About 41.66 per cent reported the lack of awareness of management practices as the reason for non-adoption. For 37.5 per cent of the respondents low yield of second crop by using seeds of first crop of HYV was the reason for non-adoption. Though HYV's are input responsive, farmers are unaware of the corresponding increase in yield and income.

A good majority of respondents (57.14%) were complaining of poor germination percentage of seeds and therefore using higher seed rate than the recommended quantity. About 42.86 per cent of the respondents attributed the reason for non-adoption of optimum seed rate to plant higher number of seedlings per hill. About 32.14 per cent expressed the lack of guidance as the limiting factor. Thus, it is obvious that farmers expect higher yield with more seedlings per hill, which in contrary reduces yield by lowering tillering. The poor germination percentage may be due to poor quality of seeds and nursery management practices. They need to be better educated in these aspects.

Majority of the non-adopters (54.05%) in the case of farm yard manure (FYM)application were facing shortage of the manure. About 43.24 per cent of the respondents attributed non-adoption to high application and transportation cost, while 29.73 per cent of the non-adopters were unaware of optimum dosage. The farmers should be made aware of judicious use of available organic manures like poultry manure, incorporation of stubbles, utilisation of urban household waste, market waste etc. At the same time, community action need to be initiated to produce organic manure from urban and market wastes.

It is clear from the table that a good portion of respondents (47.50%) were pinpointing lack of guidance as reason for non-adoption of phosphatic fertilizer application, while 30 per cent were afraid of high cost. About 25 per cent of non-adopters viewed this as an unimportant practice. Thus farmers seem to be unaware of the cost effectiveness and importance of this practice.

With regard to seed treatment a sizable portion to the tune of 79.40 per cent were totally ignorant about this practice. At the same time 29.41 per cent feared that this practice is harmful to seeds. They lacked awareness about seed treatment and are expecting negative consequences.

For the adoption of optimum transplanting stage, lack of awareness and unpredictable monsoon were the limiting factors identified by 44.4 per cent and 33.33 per cent of farmers respectively, while 27.7 per cent perceived this as insignificant. Thus, they were unaware of at the same time under estimating this important practice.

As far as planting density was concerned, majority of respondents (55.88%) were expecting heavy yields with above optimum density. While 32.35 per cent complained lack of guidance, 23.53 per cent of non-adopters seemed to

suffer from non-availability of seedlings. Thus farmers have a wrong impression that yield increases with increase in seedlings per unit area. The poor germination percentage or underseeding may be the cause of non-availability of seedlings. About 53 per cent were unaware of optimum planting depth while 46.5 per cent plant deeper for better anchorage. They need to be enlightened in these aspects.

It is evident that majority (65%) were unaware of the procedure of soil sampling. About 47.5 per cent considered it as a tedious task. The delay in getting results prevented 27.5 per cent of farmers from adopting this practice while 15 per cent realised no problem with their soils. Thus it is obvious that farmers have a wrong perception that this simple effective practice need high skills. The delay in getting soil test results can be overcome by arranging the service of mobile soil test laboratory and by teaching the farmers the skill of soil sampling.

In the case of fertilizer application high cost of fertilizers and lack of awareness were equally affecting the adoption of this practice as reported by 43.75 per cent each, while 15.63 per cent of the respondents believed that overdose boosts yield. The farmers should be made aware of the balanced and integrated nutrient management aspects. Their misonception that fertilizer boosts yield beyond optimum should be rectified.

In the case of urea-neem cake application majority (65.79%) of the respondents were unaware of this remunerative practice. At the same time 40 per cent of non-adopters didn't have the knowledge to prepare this mixture. This deficiency can be made good by proper extension intervention.

The dosage of liming was unknown to 47.22 per cent of respondents. It is unfortunate that 33.33 per cent perceived this practice as insignificant. High cost is preventing 25 per cent of farmers from adopting this practice. Liming is an inevitable practice in acidic paddy soils. Farmers need to be made more aware of this practice.

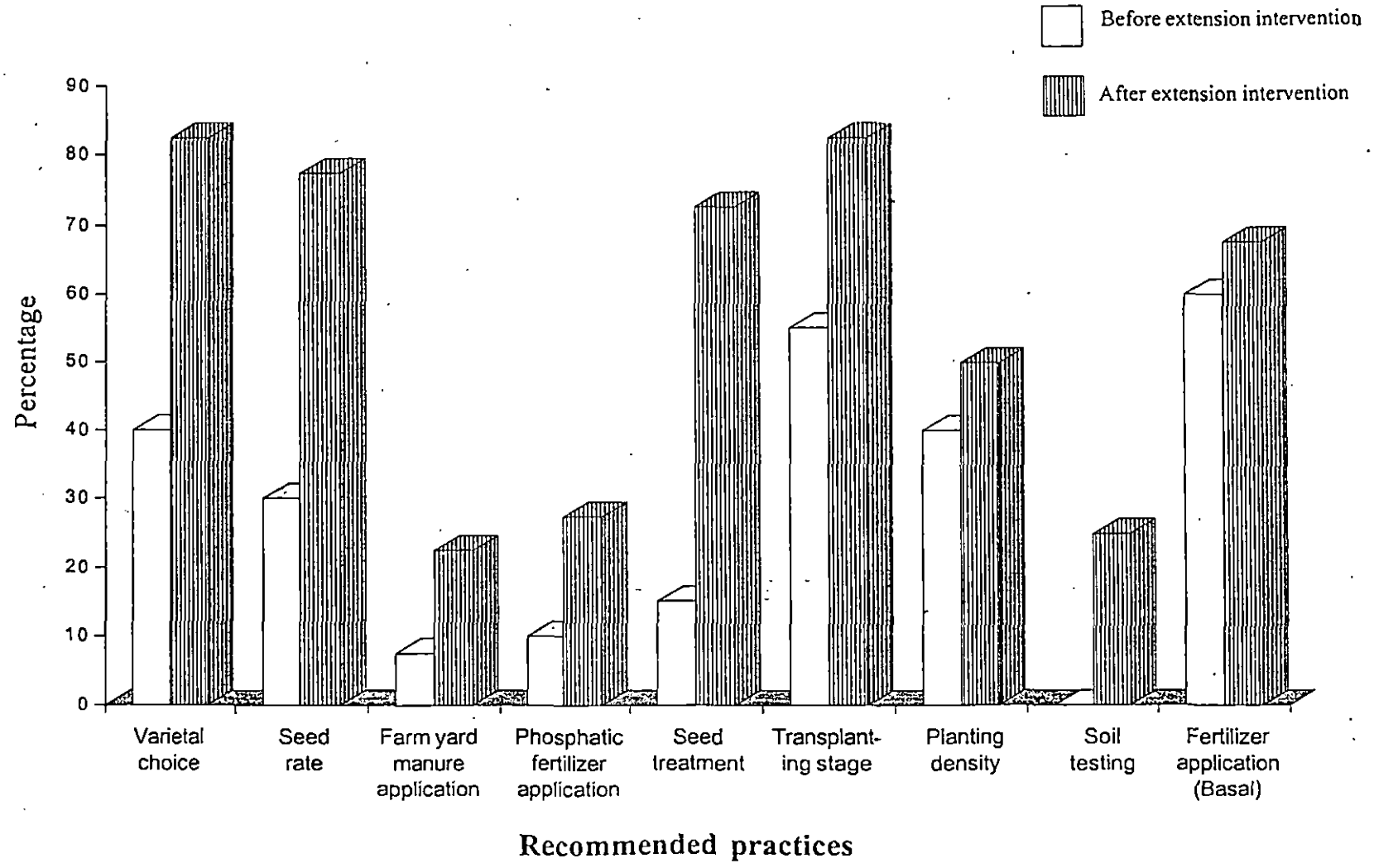
From the above table it is obvious that majority of non-adopters (72.5%) of critical weed control were complaining of non-availability of labour while 52.5 per cent were afraid of high costs. Moreover, 47.5 per cent felt that weeds cannot be controlled. Thus it is quite clear that non-adopters do not know the importance of critical weed control and they have a wrong notion that weeds are uncontrollable. As good as 43.75 per cent of farmers were not fully adopting water management practices due to lack of awareness, while 37.5 per cent complained of unpredictable monsoon. They need to be educated on the merits of critical weed control and water management practices.

About 52.5 per cent were under the impression that need based pesticide application cannot control pest. Majority (57.5%) lacked awareness about need based pesticide application. The farmers need to be taught on the relevance and method of need based pesticide application and consequences of irrational use of pesticides. About 33.33 per cent felt that over dosage is more effective. Thus by applying above optimum farmers are destroying the natural enemies of these pests and incurring unnecessary expenditure. This results pin-points the necessity of adequate extension intervention should be done in this regard. Majority (64.52%) were unaware of optimum fungicidal application. Lack of finance was preventing 55 per cent of respondents from adopting this practice. The farmers should be convinced that they can yield adequate returns if they resort to optimum dosage.

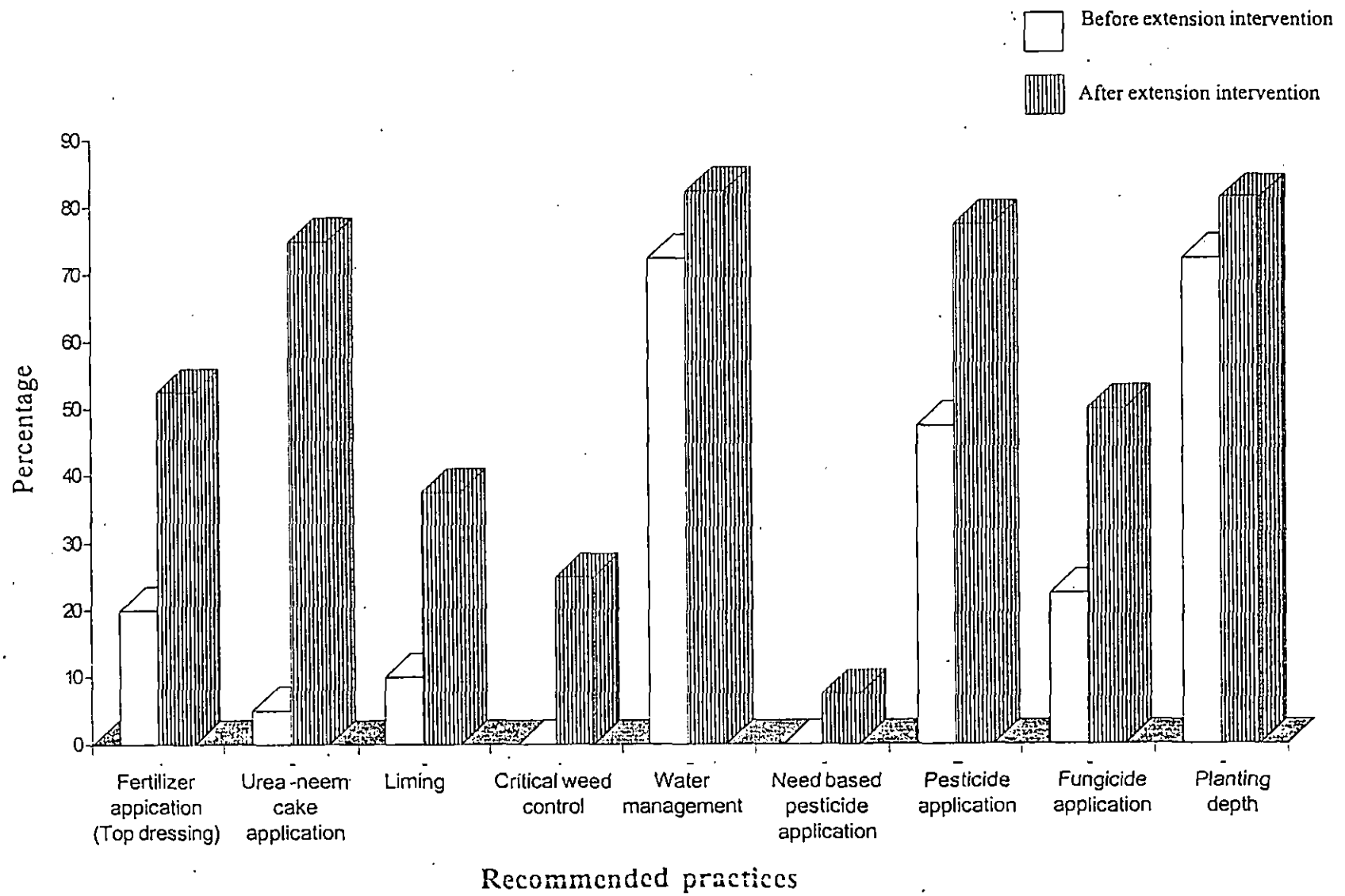
4.9 Impact of extension intervention as reflected by percentage change in full adopters after extension intervention.

The Table.7 brought into focus the distribution of respondents as non-adopters, partial adopters and full adopters with respect to the selected recommended technologies after the intervention. It could be inferred that the highest percentage increase in full adopters was noticed with regard to the urea-neem cake application to the tune of 70 per cent.

Bar diagram showing percentage change in full adopters after extension intervention



Bar diagram showing percentage change in full adopters after extension intervention



This was followed by the adoption of seed treatment practice, recommended seed rate and high yielding variety with percentage change in full adopters being 57.5, 47.5 and 42.5 per cent respectively.

The practice of urea-neem cake application was method demonstrated to them and this would have favoured higher comprehension and greater adoption. To add to this neem cake was easily available at affordable rates. The inherent cost-effectiveness of the seed treatment practice might have motivated the farmers towards adoption of this practice in their own fields. Moreover, this practice was vividly demonstrated to them. The effectiveness of optimum seed rate and high yielding varietal choice in establishing a healthy plant stand as revealed by visits to progressive farmer's field during the intervention might have convinced the farmers and yielded better adoption. Moreover, the availability of HYV seeds in time (i.e., from Cropping Systems Research Centre, Karamana) together with their relatively higher yield might have facilitated greater adoption.

It can be inferred from Table 7 that percentage change in full adopters with regard to top dressing of fertilizers and pesticide application against leaf roller, the major pest in the selected padasekharam, were 32.5 per cent and 30.0 per cent respectively. The high cost of fertilizers and lack of awareness may be still blocking the way towards higher adoption of these practices.

It can also be concluded from Table.7 that the most adopted practices after the extension intervention were varietal choice, optimum transplanting stage, optimum planting depth and water management with 82.5 per cent of the respondents adopting it fully.Adoption of optimum seed rate and pest control measures against the leaf roller pest stood next with 77.5 per cent of the respondents being full adopters after the intervention. The practices of urea-neem cake application, seed treatment and basal NPK fertilizer application took the following three places with 75, 72.5 and 67.5 per cent of the respondents being full adopters after the intervention. The plant protection aspects and certain agronomic practices such as nutrient management and water management were disseminated by lecture -cum-slide shows. Apart from this, use of flash cards and flannel graphs were resorted to wherever found feasible. All these would have paved the way for better knowledge gain, retention and better adoption.

The Table.7 also revealed that 50 per cent each of the rice farmers fully adopted the optimum planting density and fungicide application against blast disease, the major disease in the area. With regard to liming only 37.5 per cent showed full adoption after the intervention. The farmers need to be enlightened that above optimum planting density reduces tillering and yield. They should be made more

aware of adequate disease control measures. The farming community need to be more convinced on the importance of liming in acidic paddy soils.

It is to be noted that the practices of need based pesticide application, farm yard manure application, soil testing, critical weed control and phosphatic fertilizer application in the nursery were among the least adopted practices fully adopted by 7.5, 22.5, 25, 25 and 27.5 per cent of the respondents respectively. The farmers might still have misconceptions about the effectiveness of need based pesticide application. Non-availability and high costs involved in the application of farm yard manure may be restraining them from adopting the recommended doses. They should be made more aware of the relative increase in yield by applying farm yard manure and also need to be encouraged to substitute farm yard manure with other available organic wastes. Role of farm yard manure in improving and maintaining soil productivity need to be emphasized. With regard to soil testing, critical weed control and phosphatic fertilizer application in the nursery, the farmers might be still lacking the procedural knowledge or having apprehensions about the relative advantage of these cost-saving practices. Through continuous interventions by incorporating result demonstrations these deficiencies need to be rectified in the future.

4.10 Impact of extension intervention on change in awareness, attitude and adoption behaviour of respondents and on yield and benefit-cost ratio of rice crop

The mean scores of the dependent variables viz., awareness, attitude and adoption behaviour of respondents and on yield and benefit-cost ratio of rice crop obtained before and after extension intervention are presented in Table. 9. The mean scores were subjected to t-test to know whether there is any significant change in the scores before and after intervention. It could be noticed from the table that there was a significant increase in the awareness of respondents about the selected practices in rice cultivation after the extension intervention. Though majority of farmers belonged to the high group with respect to awareness about the recommended practices in rice cultivation, as much as 42.5 per cent were in the low group (Table. 1). They had very

Table.9 Comparison of the mean scores of the dependent variables and yield and benefit-cost ratio before and after the extension intervention

Variables	Mean score		t-value
	Before	After	
Awareness	11.46	15.83	2.268*
Attitude	26.20	28.90	1.842 NS
Adoption	21.45	25.48	2.540*
Yield	1561.90	1696.75	2.063*
Benefit-cost ratio	0.786	0.840	1.771 NS

* Significant at 0.05 level

NS : Non-significant

low participation in extension activities and in general a good proportion (50%) of respondents had no social participation at all (Table. 2.). During the course of the intervention the participation of all the 40 sample farmers in the three stages was ensured by the researcher through frequent personal contact. Active participation in the intervention targeted to selected recommended practices in rice cultivation coupled with their fairly high educational status and extension orientation would have helped in enhancing their level of awareness. Moreover extension intervention had utilized suitable combinations of extension teaching methods and aids to facilitate greater learning.

The extension intervention could not bring about significant change in the attitude of respondents towards rice cultivation. Attitude is the degree of positive or negative affect towards a psychological object, an inclination of mind fairly resistant to change stimulated by external environment. Earlier in the survey it was observed that the respondents in general lacked cosmopoliteness, extension orientation and innovativeness (Table.2.). Individuals actively participating in extension activities more readily develops favourable attitudes towards scientific principles. Similarly those individuals receptive to new ideas can be more easily influenced towards desirable attitudinal changes than who are less innovative. Moreover years of unscientific and uneconomical rice

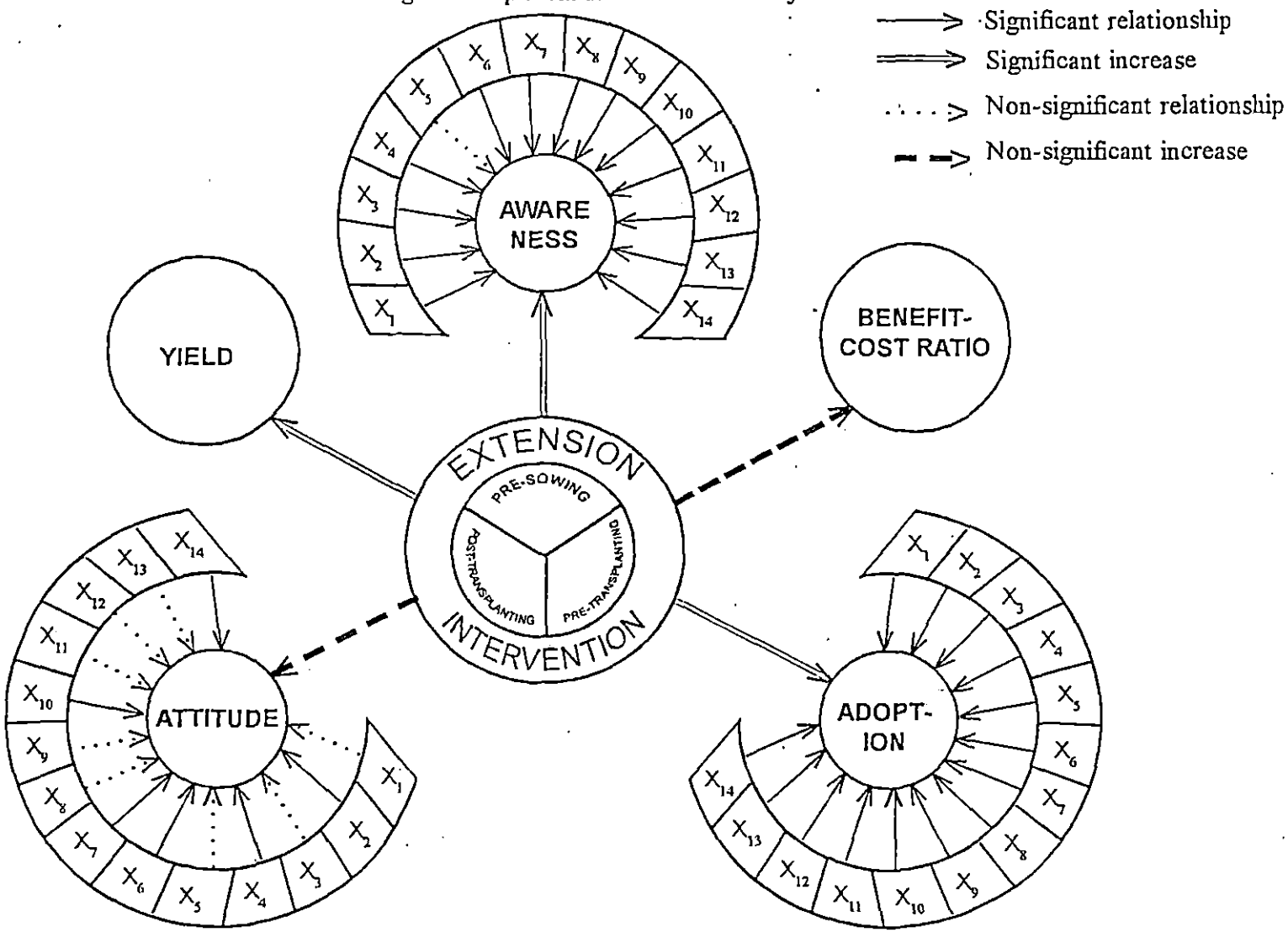
cultivation with the resultant low yields and income might have created a strong negative inclination towards rice farming. Farmers particularly those maintaining conservative outlook need a series of positive reinforcements over a period of time for bringing about significant change in their attitude towards rice cultivation.

A perusal of Table.9 indicated that the adoption of the selected recommended practices increased significantly after the extension intervention. The selected practices were disseminated using appropriate extension teaching methods and aids and timed in such a way as to facilitate greater knowledge retention by the farmers. It was earlier observed that majority of the respondents were having comparatively high self-confidence and economic motivation (Table. 2.). The farmers with a greater awareness of the relative advantage of the recommended technologies after the intervention and motivated towards higher economic gains might have adopted the advocated practices confidently. It could be assumed that even though their attitude towards rice cultivation did not improve significantly after the intervention, as a first step, the adopters might be convinced about the significance of the recommended practices in terms of yield and income as reflected in their own fields. This may have a reinforcing effect which could be directed towards a positive attitude change and further adoption by sincere, purposeful and effective future extension interventions.

The yield showed a significant change after the intervention. As much as 52.5 per cent of the farmers were in the low category of adopters of the selected recommended practices before the intervention (Table.1.). Timely exposure to the relevance of scientific practices using appropriate intervention strategies have significantly increased the adoption behaviour as evident from Table.9. It is to be noticed that high yielding varieties are particularly responsive to the crop management practices followed. Adoption as per scientific recommendations might have improved the plant stand, pest and disease resistance, nutrient availability, uptake and utilisation and in effect would have exerted positive influence on the yield of paddy.

Table. 9 showed a non-significant increase in the benefit-cost ratio of the sample farmers inspite of significant increase in the adoption of the selected recommended practices and yield of paddy. It was observed during the course of investigation that none of the farmers adopted all the recommended practices. Instead, they tried out different combinations among the disseminated practices. The reasons for non-adoption of the selected practices had been discussed earlier in this chapter (Table.8). As stated before, the high yielding varieties are susceptible to crop husbandry practices, expressing their full potential under near perfect conditions of scientific management. Therefore, the increase in yield achieved under the present circumstances would not have made a significant impact so as to ensure higher

Fig. 4. Empirical model of the study



X_1: Age; X_2: Educational status; X_3: Occupational status; X_4: Farming experience; X_5: Annual income; X_6: Social participation; X_7: Extension orientation; X_8: Cosmopoliteness; X_9: Massmedia participation; X_{10}: Scientific orientation; X_{11}: Innovativeness; X_{12}: Economic motivation; X_{13}: Risk orientation; X_{14}: Self-confidence.

profits and benefit-cost ratios. Other outside factors as lower price realisations, higher input costs, varying labour costs, general inflation, unscientific credit orientation, poor labour management, etc., might have influenced the benefit-cost ratio.

Thus the above discussion brought to light that the null hypothesis stating that there would be no significant change in the dependent variables viz., awareness, attitude and adoption behaviour of rice farmers and in yield and benefit-cost ratio after extension intervention stands rejected but for the variables attitude and benefit-cost ratio.

4.11 Contribution of selected recommended practices towards variance in yield of rice

The step-wise regression model showing the final step with the variables included is presented along with Table.10. The variable critical weed control with maximum contributions to the extent of 14.13 per cent was entered first into the regression equation followed by others in the subsequent steps until the R^2 value remained stable. The eleventh step where R^2 value was highest was taken as the final step. As could be observed from the table, as much as 67 per cent of the variation in the yield of paddy was explained by the eleven variables out of eighteen included in the regression model. As much as 33 per cent of the variation remains unexplained.

Table. 10 Results of step-wise regression analysis of selected independent variables (recommended practices) with yield of paddy

Steps	Variables entered	Code no:of the variable	Value of variation explained R^2	% of variation	Increase in percentage of variation
1.	Critical weed control	X_{13}	0.1413	14.13	14.13
2.	Varietal choice	X_1	0.2449	24.49	10.36
3.	NPK fertilizer application	X_{10}	0.3433	34.33	9.84
4.	Pesticide appln.	X_{15}	0.4179	41.79	7.46
5.	Seed treatment	X_5	0.4661	46.61	4.82
6.	Fungicide appln.	X_{16}	0.5130	51.30	4.69
7.	Liming	X_{12}	0.5663	56.63	5.33
8.	Neem-cake application	X_{11}	0.6061	60.61	3.98
9.	Planting density	X_7	0.6403	64.03	3.42
10.	Seed rate	X_2	0.6582	65.82	1.79
11.	Phosphaticfertilizer application (Nursery)	X_4	0.6746	67.46	1.64

Regression model

$$Y= 8.9605 +0.4434x_1+0.3229x_2+0.0000x_3+0.1536x_4+0.4138x_5+ 0.0000x_6+0.1540x_7+0.0000x_8+0.0000x_9+0.2174x_{10}+0.2068x_{11}+0.0951x_{12}+ 0.2941x_{13}+0.0000x_{14}+0.1590x_{15}+0.1062x_{16}$$

The result thus emphasizes the importance of critical weed control in influencing the yield of paddy. But earlier observations indicated that more than 50 per cent of farmers lacked awareness of this practice (Table. 7). This practice would have enabled the plot weed free during critical stages of plant growth. The choice of

high yielding variety turned out to be the second important factor contributing to 10.36 per cent of the variation in the yield. High yielding varieties obviously have the potential to break the yield barrier. It is to be noted that more than three-fourths' of the farmers were full-adopters of this practice (Table. 7). NPK fertilizer application dosage came next accounting for 9.84 per cent of the variation in yield. This together with neem-cake application would have ensured sufficient nutrient availability over the period of crop growth. The data presented by Table. 7 shows that there was 55 per cent increase of full-adopters of this practice after the intervention. Other variables in the order of importance were pesticide application, seed trearment, fungicide application, liming, neem cake application, planting density, optimum seed rate and phosphatic fertilizer application in the nursery. The adoption of optimum pesticide and fungicide dosages and seed treatment practice might have induced greater pest and disease control and resistance. It is to be noted that the percentage increase in full adopters after the intervention of these three practices were 30 per cent, 50 per cent and 27.5 per cent respectively. Lime application at the recommended rate would have corrected the negative aspects related to soil acidity. But still 30 per cent of respondents were non-adopters of this practice even after extension intervention.

Adoption of recommended seed rate, planting density and age of seedling at transplanting would have resulted in a healthy plant stand promoting tillering and reducing weed growth. Among these practices the following practices viz., phosphatic fertilizer application in the nursery and critical weed control were fully adopted by less than 50 per cent of respondents after the extension intervention (Table. 7). This pin-points to the need for more concentrated efforts by the extension agencies towards creating awareness and improving adoption of these practices by rice growers.

4.12 Predictive power of selected independent variables on yield of paddy

The partial regression coefficients and the corresponding beta weights presented in the Table. 11 brought to focus the relative importance of each variable included in the regression model in predicting the yield of paddy. The variables were arranged in the table in the descending order of the absolute magnitude of corresponding beta weights. Thus the variety followed by seed treatment, critical weed control, seedrate, NPK fertilizer application, neemcake application, planting density, pesticide dosage and phosphatic fertilizer application in the nursery were found most influential in predicting variability in the yield of paddy. The reasons for their predictive efficiency may be the same as discussed for their contribution towards variation , discussed earlier.

1.. Pre-sowing intervention - General orientation

2. Lecture on soil sampling

3. Lecture on urea neem cake application

4. Lecture - cum - slide show on nutrient management and cultivation aspects

5. Lecture - cum - slide show on plant protection measures

6. Pest population assessment

7. Urea neem cake application in the field

8. Field level intervention on critical weed control

Table. 11 Predictive power of selected independent variables (recommended practices) on yield of paddy.

Rank No.	Variablity	Variable No.	Beta weight 'b'	Partial 'b'	t-value
1.	Varietal choice	X_1	0.411	0.443**	3.08
2.	Seed treatment	X_5	0.392	0.414**	2.94
3.	Critical weed control	X_{13}	0.254	0.294**	2.64
4.	Seed rate	X_2	0.201	0.323*	2.45
5.	NPK fertilizer appln.	X_{10}	0.185	0.217**	2.60
6.	Neem-cake application	X_{11}	0.170	0.207**	3.48
7.	Liming	X_{12}	0.086	0.095	1.44
8.	Pesticide appln.	X_{15}	0.134	0.160*	2.19
9.	Phosphatic fertilizer application	X_4	0.131	0.154	1.37
10.	Fungicide application	X_{16}	0.088	0.106*	2.56
11.	Planting density	X_7	0.151	0.182*	2.28

** : Significant at 0.01 level

* : Significant at 0.05 level

$R^2 = 0.6746$

The partial b's were tested for their significance by computing the t-values and comparing with the table value. In the case of the following variables namely, seed rate, planting density, pesticide application and fungicide application the partial b's were found to be significant at 5 per cent level of probability, while the variables varietal choice, seed treatment, critical weed control, NPK fertilizer application and neemcake application were found significant at 1 per cent level. The possible explanations for their significant impact may be the same as discussed in the earlier paragraphs.

SUMMARY

CHAPTER V

SUMMARY

Agriculture and industry are the twin pillars of a vibrant economy. An imbalance in one sector ultimately affects the growth and perfomance of the other resulting in a lop-sided growth of the economy. It seems India with her new face in the light of economic liberalisation is seldom striking a balance between these two sectors and to be worse the gap is ever-widening. This would prove disastrous in her struggle towards self-sufficiency and economic prosperity. In our home state Kerala, a ramification of this impact has been ever-decreasing area and production of our staple food crop, rice. Though this deliterious trend of large scale shift in cultivation is covered up under arguable excuses such as increasing urbanisation,decreasing size of land holding, high population pressure etc., such a downswing is going to pay a heavy price. Statistical reports are confirming this downfall and expert studies have revealed several lacunae in the field of rice cultivation. These ranges from defective policy framework to unscientific management practices adopted by the farming community.

Under these circumstances a study which brings to light the deficiencies in the area of rice cultivation, management practices adopted, conditions of the farming community coupled with sincere well planned efforts to fill the identified

gaps seems the need of the hour. Hence, the present study was undertaken with the following specific objectives.

1. To study the extent of awareness of farmers about selected recommended practices in rice cultivation.
2. To assess the attitude of farmers towards rice cultivation.
3. To measure the extent of adoption of selected recommended practices in rice cultivation by farmers.
4. To find out the factors influencing the awareness, attitude and adoption behaviour of farmers.
5. To analyse the impact of an extension intervention on awareness, attitude and adoption behaviour of farmers and on yield and benefit-cost ratio of rice crop.

The study was conducted in Neyyattinkara Taluk of Thiruvananthapuram district which was purposively selected. A random sample of 40 farmers were selected from a single padasekharam from Nemon block. Both the Nemon block and the padasekharam were selected using random sampling.

The awareness of respondents was measured by using the schedule developed for the study, following the method adopted by Salunkhe(1978). The attitude of farmers was measured by the attitude scale developed for the study using the method of summated rating, as described by Likert (1932). The adoption of

farmers was measured by using the scale adopted by Ramachandran (1992) with slight modifications. The selected characterstics of respondents were measured by using either adopted scales or schedules developed for the study.

Extension intervention was attempted in orderly and planned stages after building up rapports with the farming community. The interventions were carried out as pre-sowing, pre-transplanting and post-transplanting interventions using appropriate teaching methods and aids. The service of resource persons from KAU, Department of Agriculture and KHDP were also resorted to. The data were collected from the respondents with the help of structured interview schedule both before and after the extension intervention. The data collected were analysed using appropriate statistical methods like mean, percentages, correlation analysis,step-wise regression anlaysis and t-tests. The salient findings of the study are presented below.

1. Analysis of the results revealed that majority of respondents had high awareness about the selected recommended practices in rice cultivation. About 53 per cent had unfavourable attitude towards rice cultivation and 52.5 per cent were low adopters of recommended practices in rice cultivation before the intervention.

2. The profile analysis of the sample showed that more than half of them belonged to the old age group. None of them were illiterate and possessed varying degrees of formal education. Nearly one-third of them undertook farming as subsidiary occupation along with their private or government jobs. Majority belonged to the high category with respect to farming experience. The annual income of over one-third of them were above Rs. 25,000/-. As far as social participation was concerned nearly 50 per cent had no social participation at all while the rest had varying degrees of participation in different organisations. The extension orientation of nearly two-thirds of the respondents were low.

In the case of the variable cosmopoliteness majority fell in the high group. The participation in mass media channels of the majority was high. Regarding scientific orientation majority were in the high group. But majority had low innovativeness. About 55 per cent of the respondents were in the highgroup as far as economic motivation was concerned. But a good portion (57.5%) were hesitant to take risks and belonged to the low group as far as risk orientation was concerned. Majority (55%) had high self-confidence

3. Correlation analysis of the dependent variables revealed that all the three dependent variables viz., awareness, attitude and adoption were positively and significantly correlated among one another.

4. Among the socio - personal characteristics selected for the study educational status, social participation, extension orientation, cosmopoliteness, mass media participation, scientific orientation, innovativeness, economic motivation, risk orientation and self confidence were positively and significantly correlated with awareness of respondents about selected recommended practices in rice cultivation.

5. The independent variables viz., educational status, social participation, extension orientation, scientific orientation and self-confidence were positively and significantly correlated with the attitude of farmers towards rice cultivation, while farming experience showed significant negative correlation.

6. As far as adoption of the selected recommended practices was concerned, all the selected characteristics were found to have significant influence on the adoption behaviour of respondents with the following variables viz., age, occupational status, farming experience and annual income showing significant inverse relationship.

7. Among the reasons cited for the non-adoption of recommended practices, lack of awareness stood in the way of majority of respondents in the case of adoption of seed treatment, phosphatic fertilizer application in the nursery, optimum transplanting stage , Planting depth, planting density,water management, soil- testing, optimum fertilizer dosages, urea-neem cake application,

liming and plant protection measures. High cost of cultivation makes majority of farmers from not adopting the HYV, use of farmyard manure, NPK fertilizers and weedicides at the recommended levels. While unpredictable monsoon makes their transplanting uncertain and low germination percentage prompts them to adopt higher seed rate . Majority were facing non-availability of farm yard manure. The farmers were resorting to higher planting density and higher or lower pesticide dosages for better yield and control of pests respectively.

8. From the results of the t-test it could be inferred that there was a significant change with respect to the following variables viz., awareness of farmers about the selected recommended practices in rice cultivation, their adoption behaviour regarding the above mentioned practices and yield of paddy after the extension intervention. Percentage analysis of the adoption of the selected recommended practices revealed that urea-neemcake application showed the highest percentage increase in adoption (70%) followed by seed treatment and seed rate with an increase of 57.5 per cent and 47.5 per cent respectively. The step-wise regression analysis brought to light that the following practices namely critical weed control, varietal choice, NPK fertilizer application, pesticide application, seed treatment and

fungicide application contributed to more than 50 per cent of the variation in the yields of paddy. As far as predictive efficiency of the variables was concerned the variable varietal choice stood first followed by seed treatment and critical weed control.

9. Maximum percentage increase in full adopters was seen in the case of adoption of urea-neem cake mixture application followed by seed treatment and recommended seed rate.

Implications of the findings of the study

Adequate and immediate steps should be taken by the extension agencies to enhance the level of awareness of farmers, to correct their misconceptions and change their attitude favourably to facilitate better adoption of the recommended scientific practices in rice cultivation. A sincere directed effort on the part of extension workers to carry over the findings from research stations to the farmer's field is the need of the hour. Scientists, extension workers and farmers should form an interactive linkage envisaging a participatory approach for problem identification and problem solving.

Lack of timely credit facilities was seen a major hindrance for optimum input uitilisation besides lack of awareness. Adequate flow of credit from financial institutions at the most critical periods should be ensured and credit availing procedure should be made farmer-friendly. Governmental subsidies could also supplement financial security.

Moreover, the farmers need to be motivated for active participation in extension activities for developing a sound scientific orientation. This would definitely pave the way for positive attitudinal changes towards better adoption of the scientific crop management practices ensuring higher yields and profits.

From general observation it was noted that most of the previous extension activities were confined to lecture classes alone. This could be effectively supplemented with method and result demonstrations, field visits to the progressive farmers fields, suitable combination of audio-visual aids, particiaptory appraisal and other innovative methods for deriving maximum benefits.

Suggestions for future research

This study was limited to a single padasekharam with a restricted sample size and therefore, generalization of results for the whole state is not possible. So the study can be undertook in a comprehensive manner incorporating more dimensions of personal characteristics and crop management practices to facilitate generalization. More experimental studies to evolve suitable combination of media mix systems for maximum knowledge gain and retention can be undertook for efficient diffusion of innovations. Studies relating to marketing behaviour, infrastructral availability and utilisation, credit and management orientation etc., in particular to rice farmers might help planners and policy makers for formulating farmer supportive policies.

REFERENCES

References

Alexander, M. S. 1985. Training needs of small rubber growers. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Allaudin, S. 1983. A comparitive study of methods of measuring innovations. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Allport, G. 1935. Attitude. *A Handbook of Social Psychology*. Mass Clark University Press. Worcestor

Anantharaman, M. 1977. A study of training needs of small and marginal farmers. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Anithakumari, P. 1989. Transfer of technology on pulses and oilseeds in the Onattukara tract of Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Aristotle, D. 1981. Impact of village adoption scheme of a nationalised bank. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Arumugam, M. 1983. A study on the training needs of sericulturists. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Aziz, A.E. 1988. Adoption of drought management practices by farmers - A critical analysis. M.Sc. (Ag.) thesis, K.A.U., Thrissur

Baby, K, B. 1995. Cause and effect analysis of in - migration of agricultural labourers. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Badagaonkar, S.S. 1987. Measurement of farmers' knowledge and factors affecting the adoption behaviour of groundnut cultivators of Uttara Kannada district of Karnataka state. *The Mysore Journal of Agricultural Sciences* **21** (3) : 363

Balachandran, K.P. 1983. Effectiveness of farm journals in disseminating agricultural information to farmers of Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Balasubramoni, V. 1981. Farmers' service co-operative society - A participative analysis M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

* Ban, Van den, A.W. 1985. *Inleiding tot de voorlichtingskunde.* Seventh revised edition Meppel : Boom

Bhalla, A.J. 1976. Appropriate technology problems and promises. Oxford publishing company, New Delhi : 330

Bhaskaran, C. 1979. A critical analysis of the interpersonal communication behaviour of small and other farmers in a less progressive, progressive and more progressive village in Kanyakumari district of Tamil Nadu. M.Sc. (Ag.) thesis, U.A.S, Bangalore

Boniface, B. 1996. Agricultural information source utilisation pattern of neo-literate farmers in rural areas. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Chatopadhyaya, S.N. 1963. A study of some psychological correlates of adoption of innovations in farming. Ph.D. thesis, Division of Agricultural Extension, I.A.R.I., New Delhi

Cherian, B. K. 1984. Awareness and attitude of farmers, agricultural extension workers and officers towards training and visit system. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Dahama, O.P. 1976. Extension and Rural Welfare. Ramprasad and Sons, Agra

Das, K.K. and Sarkar, R.D. 1970. Economic motivation and adoption of farming practices. *Indian journal of extension education.* 6 (1&2) : 103-107

Desai, G.R. 1981. A critical analysis of the contribution of education and extension guidance on economic performance of cotton farmers of Karnataka state. Ph.D. thesis, U.A.S., Dharwad

Devi, N.M. and Manoharan, M. 1999. Contributing characteristics of guava cultivators. *Journal of Extension Education* 10 (2) 2431-2433.

Directorate of Central Rice Research Institute. 1980. *Annual Research Report.* C.R.R.I., Cuttack

Directorate of Central Rice Research Institute. 1981. *Annual Research Report.* C.R.R.I., Cuttack

Edwards, A.L. 1957. *Techniques in attitude scale construction.* Appleton Century Crofts Inc., New York

Fathimabi, P.K. 1993. Welfare schemes for agricultural labourers : A multidimensional analysis. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Gangadharan. 1993. Adoption of improved agricultural practices by pepper growers of Idukki district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Government of India. 1991. *Census Report Vol. I*, Part - I A

Habal, E.L. 1994. A study of attitudes of agricultural rural youth towards agricultural innovations in Nekla-El-Enab village of Italty. *Alexandria Journal of Agricultural Research* **40** : 95-114

Haemalatha, S. 1997. Gender analysis of rice farmers in Thiruvananthapuram district M.Sc. (Ag.) thesis, K.A.U., Vellayani

Haraprasad, D. 1982. Study on the impact of agricultural programmes implemented by the SFDA among Farmers of Thiruvananthapuram district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Harishankar, Baburam and Rathi, K.S. 1976. Effect of neemcake blended urea on the yield and uptake of nutrients by rice grown under transplanted and direct sown condition *J. Indian Soc. soil sci.*, 24 : 211-213

Jaleel, M.M. 1992. Factors influencing the development of agriculture among the 'Kanikkar' tribe of Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Jayalekshmy, N and Alagesan, V. 1998. Technology adoption and production constraints in sesamum in Cauvery-Mettur Project area. *Journal of Extension Education* 9 (3) : 2093-2076

Jayavelu, N. 1980. An analysis of factors responsible for the participation and non-participation of cotton growers in regulated market. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Jnanadevan, R. 1993. An analysis of selected development programmes for promoting coconut production in Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellanikkara

Kamarudeen, M. 1981. A study on the impact of National Demonstration Programme on paddy cultivation in Trichur district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Kannaiyan, S. and Govindarajan, K. 1979. Effect of certain fungicides on control of seedling diseases in dapog rice culture. *IRRI Newsletter* 4 (5) : 18

KAU. 1989. *NARP status report - Southern region.* Directorate of Extension, Kerala Agricultural University, Thrissur

Kerala State Co-operative Bank. 1998. *Scales of finance.* Thiruvananthapuram

Khanal, N. P. 1986. Impact of farm broadcast on the adoption of agricultural innovation by the farmers of Nuwakot district of Nepal. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Krishnamoorthy, B. 1988. Impact of radio lessons on the knowledge and adoption of fertilizer among participant and non-participant farmers in Mandya district. M.Sc. (Ag.) thesis, U.A.S., Bangalore

Krishnamurthy, M.K., Prasad, G.T.R. and Dhananjaya, B. 1999. Awareness and adoption of improved technologies among cashew farmers. *Journal of extension education* 10 (1) : 2351-2353

Kumar, S. S. 1990. An experimental study on the relative effectivenss of selected visual aids in teaching neo-literates. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Kumari, P. 1999. Adoption of improved household and agricultural technologies by rural women. *Journal of Extension Education.* 10 (1) : 2312-2317

Kuppuswamy, B. 1984. *An introduction to social psychology.* Asia Publishing House, Mumbai

Lekshmi, P.S. 1995. Social forestry - A diagnostic analysis. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Likert, R. 1932. A technique for the measurement of attitudes. *Arch. Psychol.* No : 140

Lionberger, H.R. 1960. *Adoption of new ideas and practices.* Iowa University Press, U.S.A.

Maraty, P. and Kumar, R. P. 1998. A study on the extent of adoption and yield gap in paddy. *Journal of Extension Education* 9 (1) : 1925-1927

Mathew, Joy. 1980. A study on the role of youth in the agricultural development in rural areas. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Meera, B. 1981. Impact of farm women's training in agriculture. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Naik, B. K. 1981. Awareness and attitude of farmers and extension workers towards T&V system in Andhra Pradesh. M.Sc. (Ag.) thesis, S.V. Agricultural College, Thirupathi

Nandakumar, P.P. 1988. Impact of I.T.D.P. on Yerava tribal community in Virajpet taluk of Kodagu district, Karnataka, M.Sc. (Ag.) thesis, U.A.S., Bangalore

Nanjaiyan, K. 1984. Rationality in decision making by small farmers. Ph.D. thesis, Centre for Agricultural and Rural Development Studies, Coimbatore

Nelson, S. 1992. Role of krishi bhavans in agricultural development in Thiruvananthapuram district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Nelvayal Samrakshana Prasthanam (Kerala). 1998. *Study Report - 1998*. Department of Science and Technology, New Delhi

Nizamudeen, A. 1996. A multi-dimensional analysis of Kuttimulla cultivation in Alapuzha district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Padmaiah, M., Ansari, M.R. and Sundaraswamy, B. 1998. Adoption behaviour of farmers in relation to their socio-economic and psychological characters. *Journal of Extension Education*. 9 (2) : 1988-1992

Pandyaraj, S. 1978. A study of the communication behaviour of the Agricultural Extension Personnel. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Pereiro, G.A. 1975. Effect of the duration of weed control and weed competition on rice yields. Centro Agri colo. 2 (10) : 27-31

Peterson, A.V. 1966. Visual aids in co-operative extension service. Prentice Hall Inc. Engle wood cliffe : 233-250

Prasad, N.M. 1983. Comparitive analysis of achievement motivation of rice growers in the three states of India. M.Sc. (Ag.) thesis, U.A.S., Bangalore

Prasad, R.M. 1978. A study on farmers' functional literacy programme M.Sc. (Ag.) thesis, K.A.U., Vellayani

Prasad, V. G., Ramaiah, S., Shivarama, K. and Jamuna, K.V. 1999. Adoption of plant protection measures in paddy by the farmers. *Journal of Extension Education.* 10 (1) : 2305-2311

Prasannan, K.M. 1987. Extent of adoption of messages by contact farmers in T&V system. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Pulamte and Babu, R.A. 1993. Adoption of modern rice technology by Manipur hill farmers. *Indian Journal of Extension Education.* 29 (1):136-138

Rajapandi, S. 1983. Watermanagement : Knowledge and use of irrigation practices under irrigated conditions, M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Rajendralal. 1998. Multidimensional study on the special component plan schemes for the scheduled caste farm families. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Rajendran, P. 1978. A study of the factors affecting the adoption of selected agricultural practices. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Rajkumar, K. 1992. Agricultural modernisation and technology adoption - An analysis. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Ramachandran, C. 1992. Impact of rice mini-kit trials on the adoption behaviour of farmers. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Rani, Asha and Malaviya, A. 1986. Media mix systems - low cost nutritious recipes communication. *Journal of Extension Education* (2) : 43-45

Ravi, K.C. 1974. Information seeking and adoption behaviour of Tapioca growing farmers. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Ravichandran, V. 1980. A study on attitude, extent of adoption and problems encountered by registered sugarcane growers. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Reddy, L.B. and Reddy, S.V. 1986. Factors related to the knowledge level of recommended dryland agricultural technology - multivariable study in Andhra Pradesh. *Journal of Educational Research and Extension* . 22 (3) : 188-191

Reddy, S. M. and Reddy, S.V. 1977. Personal and socio-economic characteristics associated with attitude of farmers towards crop loan system. *Indian Journal of Extension Education.* 13 (3&4) : 33-37

Rogers, E.M. and Shoemaker, E.F. 1971. *Communication of innovations - A cross cultural approach.* The Free Press, Collier Macmillan Ltd., New York

Roling, N. 1988. *Extension science - information systems in agricultural development.* Cambridge University Press : 39-41

Roling, N. and De Zeeuw, H. 1983. Improving the quality of rural poverty - Final report of the research project. *The small farmer and development co-operation.* International Agricultural Centre, Wageningen :32 .

Sabapathi, K. K. 1988. Training needs in agriculture of Irulas of Attappady. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Sainath, S. 1982. A study on adoption behaviour and motivation pattern of grape cultivators of Bangalore district of Karnataka state. M.Sc. (Ag.) thesis,.U.A.S., Bangalore

Sajeevchandran. 1989. Impact of development programmes in promoting pepper production in Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Salunkhe, G.V. 1978. A scale to measure small farmer's attitude towards S.F.D.A. *Indian Journal of Extension Education.* 14 (1&2) : 66-69

Samad, A. K. 1979. Response of special package programme for agricultural development in Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Sanoria, Y.C. and Sharma, D.K. 1983. Comparitive analysis of adoption behaviour of beneficiaries of farm development programme. *Indian Journal of Extension Education*. .19 (1&2) : 84-86

Sarkar, A.P. and Reddy, V.S. 1980. A study on the impact of Intensive Agricultural Extension System (T&V system) in West Bengal. *Research Studies in Extension Education*. APAU

Sengupta, P. 1960. *Women workers of India*. Asia Publishing House, Mumbai

Sharma, O.P. 1972. Comparitive study of scales of Likert and Guttman. A technique for measuring attitude of extension personnel. *Studies in Extension Education*, N.I.C.D., Hyderabad

Sindhudevi, P. 1994. Differential preference of work by agricultural labourers and their employment and wage pattern in Thiruvananthapuram district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Singh, S.N. and Singh, K.N. 1970. A multi-variate analysis of adoption behaviour of farmers. *Indian Journal of Extension Education* 6 (3&4) : 39-44

Singh, V. and Khanna, A.N. 1973. Effect of dates of sowing, seed rates and fertilizer dose on the yield of PR-27 paddy in Uttar Pradesh. *Indian Journal of Farm Science* (1) : 102-105

Sinha, H.S.P., Sinha, A.K. and Sinha, K. 1984. A study of attitude of farmers of Chotanagpur towards soil conservation programme. *Indian Journal of Extension Education*. 20 (3&4) : 9-18

Sivaprasad, S. 1997. Problems and prospects of self-employment of trained rural youth in agriculture. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Somasundaram, D. and Singh, S.N. 1979. Factors affecting knowledge of adopters and non-adopters among small farmers. *Indian Journal of Extension Education* 15 (1&2) : 30-33

State Planning Board 1993. *Statistics for Planning*. Thiruvananthapuram

Sujatha, P. and Annamalai, R. 1998. Differential adoption behaviour by different categories of farmers and their characteristics associated with adoption behaviour. *Journal of Extension Education*. 9 (1) : 1905-1908

Sumathi, P. and Alagesan, V. 1998. A correlative analysis between the characteristics of respondents with their awareness and adoption behaviour of IPM in Groundnut. *Journal of Extension Education*. 9 (3) ; 2143-2145

Supe, S.V. 1969. Factors related to different degrees of rationality in decision making among farmers. Ph.D. thesis, Division of Agricultural Extension, I.A.R.I., New Delhi

Surendran, K. 1982. Impact of O.R.P. on agricultural production. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Sutha, T., Muthiah, M. and Annamalai, R. 1991. Differential knowledge level and adoption behaviour of rubber growers. *TamilNadu Journal of Extension Education*. 2 (4) : 340-343

Swaminathan, N. 1986. Impact of pulses mini-kit demonstration for small and marginal farmers in Chengalpettu district. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Swamy, B.N. 1988. A critical analysis of the achievement motivation, attitude towards National Agricultural Extension Project in and communication pattern of contact farmers in Bangalore district. M.Sc. (Ag.) thesis,.U.A.S., Bangalore

Tampi, A.M. and Menon, A.G.G. 1972. A case study on the the effectiveness of two extension methods for imparting knowledge. *Agric. Res. J. Kerala* 10 (1) : 42-45

Tanaka, A., Patnaik, S. and Chandani, A.C.T. 1960. Influence of increasing levels of P and K on the yield and other nutrient uptake by rice plant. *Proc. Ind. Acad. Sci.* 49 : 158-168

Thampan, C. 1990. Training strategy for the farmers of Kasargode district. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Theodore, R.K. 1988. Awareness, conviction and adoption of technological units of contigency farming practices for rice by contact and other farmers of Tanjavur district. M.Sc. (Ag.) thesis, T.N.A.U., Coimbatore

Thomas, S. 1998. Role of farm women in planning and management of watershed. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Thurstone, L.L. 1946. *Comment Amer. J. Social.* 52 : 39-50

Tripathi, A. 1977. A study of technological gap in adoption of new rice technology in central Orissa and the constraints responsible for the same. Ph.D. thesis, I.A.R.I., New Delhi

Trivedi, G. 1963. Measurement analysis of socio-economic status in rural families. M.Sc. (Ag.) thesis, I.A.R.I., New Delhi

Varma, P.H. 1996. A multi-dimensional analysis of self-employment among farm women. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Veeraiah, A., Daivadeenam, P. and Pandey, R.N. 1998. Knowledge and adoption level of farmers trained in KVK about Groundnut cultivation. *Indian Journal of Extension Education* 33 (1&2) : 58-63

Vijaya, K. 1982. An evaluative study on the impact of Intensive Agricultural Extension system in Thungabhadhra Command Area in Anantapur

district in Andhra Pradesh. M.Sc. (Ag.) thesis, S.V. Agricultural College, Thirupathy

Vijayakumar, P. 1983. Impact of Special Agricultural Development Units on the agricultural development of rural areas of Kerala. M.Sc. (Ag.) thesis, K.A.U., Vellayani

Viju, A. 1985. Adoption behaviour of tribal farmers, M.Sc. (Ag.) thesis, K.A.U., Vellayani

White, A. 1981. *Community participation in water and sanitation : concepts, strategies and methods*. International Reference Centre for Water supply and Sanitation, Tech. paper 17

Wilkening, A. 1952. Information leaders and innovators in farm practices. *Rural Sociology* 17 : 272-275

Wilson, M.C. and Gallup, G. 1955. Extension teaching methods and other factors that influence administration of agricultural and house economic practices. *Federal extension service circular*. USDA, Washington D.C

* Zuurbier, P.J.P. 1984. *De Besturing en organisatie van de Landbouwvoorlichtingsdienst*. Doctoral dissertation, Agricultural University, Wageningen

* Original not seen

APPENDICES

APPENDIX - I

The statements selected for measuring the attitude with their respective 't' values

Sl.No:	Statements	't' value
1.	Rice cultivation makes land unsuitable for other crops.	4.23
2.	Only large farmers can afford rice cultivation.	5.62
3.	Rice cultivation requires good skills and hence not practicable.	3.40
4.	Rice cultivation makes farmers more indebted.	2.58
5.	The standard of living of farming community can be enhanced through rice cultivation.	3.95
6.	Rice cultivation can be made profitable nowadays as improved technologies are available.	4.80
7.	Rice cultivation is essential for a community to be self-sufficient.	5.28
8.	Paddy land should not be reclaimed for any other purpose but for rice cultivation.	2.35

APPENDIX - II

DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE, VELLAYANI
THIRUVANANTHAPURAM

"EXTENSION INTERVENTION FOR SUSTAINING RICE PRODUCTION"

INTERVIEW SCHEDULE

Respondent no:
Date :

1. Name and address of the respondent :
2. Name of the taluk :
3. Age :
4. Educational status :
   Illiterate/ Primary/ Middle school/High school/Higher secondary/Collegiate
5. Occupational status :
   Farming alone/Farming + farm labour/Farming + Business/ Farming + Government or Private service
6. Farming experience : ..... Yrs
7. Annual income :
   upto Rs. 15000/Rs.15001 - Rs. 25,000/Above Rs. 25,000
8. Social participation

Sl.no.	Particulars	Member	Office bearer
1.	Panchayat		
2.	Co-operative society		
3.	Youth Club		
4.	Karshaka Viaksana Samiti		
5.	Others (specify)		

9. Extension orientation

(i) Extension contact

Sl.no.	Extension personnel	Frequency
1.	Agricultural Assistant	Never/once to thrice a month/once a week/ Two or more times a week
2.	Agricultural Officer	Never/once to thrice a month/once a week/ Two or more times a week
3.	Block Development Officer	Never/once to thrice a month/once a week/ Two or more times a week

(ii) Extension participation

Sl.no.	Item	Frequency
1.	Agricultural Asistant	Never/Occasionally/ whenever conducted
2.	Seminars	Never/Occasionally/ whenever conducted
3.	Exhibitions	Never/Occasionally/ whenever conducted
4.	Film shows	Never/Occasionally/ whenever conducted
5.	Farmer's days	Never/Occasionally/ whenever conducted
6.	Demonstrations	Never/Occasionally/ whenever conducted
7.	Field days	Never/Occasionally/ whenever conducted

10. Cosmopoliteness

Sl.no.	Item	Frequency
1.	Frequency of visit to the nearby town	Never/Once in a month/ Once in a fortnight/Once in a week/Two or more times a week
2.	Purpose of visit	Entertainment/ personal /Professional/ Agricultural/Other purpose
3.	Membership in organisations out side the village	Non member/Membership in one organisation/ Membership in more than one organisation

11. Mass media participation

Sl.no.	Mass media source	Frequency
1.	Radio	Daily/2-6 days a week/ Once in a week Once in a fortnight/Rarely/Never
2.	Newspaper	Daily/2-6 days a week/ Once in a week Once in a fortnight/Rarely/Never
3.	Magazines/leaflets/Bulletins	Regularly/Occasionally/Never
4.	Films (seen during last year)	More than 6 times/ 4-6 times/ 1-3 times/None

12. Scientific Orientation

Please give your degree of agreement or disagreement with each of the following statements.

Sl.No:	Statements	SA	A	UD	DA	SDA
1.	New method of farming give better results to a farmer than old method.					
2.	The way of farming by our fore fathers is still the best way to farm today.					
3.	Even a farmer with lot of experience should use new methods of farming.					
4.	A good farmer experiments with new ideas in farming.					
5.	Though it takes time for a farmer to learn new methods in farming it is worth the efforts.					
6.	The traditional methods of farming have to be changed in order to raise the standard of living of a farmer.					

13. Innovativeness

Please indicate your degree of approval to the following statements.

Sl.No:	Statements	Yes/ UD/ No
1.	Do you want to learn new ways of farming?	
2.	If the agricultural extension worker gives a talk on improved cultivation aspects, will you attend to it?	
3.	If the government helps you in establising a farm else where, will you accept the deal?	

Sl.No:	Statements	Yes/ UD/ No
4.	Do you want a change in your life?	
5.	A farmer should try to farm, the way his parents did?	
6.	Do you want your sons to be farmers?	
7.	It is better to enjoy today and let tomorrow take care of itself.	
8.	A man's future is in the hands of God.	

14. Economic motivation

Please give your degree of agreement or disagreement with each of the following statements.

Sl.No:	Statements	SA	A	UD	DA	SDA
1.	A farmer should work towards higher yields and economic profits.					
2.	The most successful farmer is the one who makes more profit.					
3.	A farmer should try any new farming idea which may earn him more money.					
4.	A farmer should grow more food crops for home consumption and to increase monetary profits.					
5.	It is difficult for the farmer's children to make a good start unless he provides them with financial assistance.					
6.	A farmer must earn his living but the most important things in life cannot be defined in economic terms.					

15. Risk orientation

Please give your response on the following statements.

Sl.No:	Statements	Agree	Undecided	Disagree
1.	A farmer should grow large number of crops to avoid greater risks involved in growing one or two crops.			
2.	A farmer should take more of a chance in making a big profit that to be content with a smaller but less risky profit.			

Sl.No:	Statements	Agree Undecided Disagree
3.	A farmer who is willing to take greater risks than the average farmer usually does better financially.	
4.	It is good for a farmer to take risks when he knows his chance of success is fairly high.	
5.	It is better for a farmer not to try new farming methods unless most other farmers have used them with success.	
6.	Trying an essential new method in farming by a rice farmer involves risk but it is worthy.	

16. Self-confidence

Please give your agreement or disagreement with each of the following statements.

Sl.No:	Statements	SA A UD DA SDA
1.	I feel no obstactle can stop me from achieving my final goal.	
2.	I am generally confident of my ability.	
3.	I am bothered by inferiority feelings that I cannot compete with others.	
4.	I am not interested to do things at my own initiatives.	
5.	I usually work out things for myself rather than to get someone else to show me.	
6.	I get discouraged easily.	
7.	Life is a strain for me for much of the time.	
8.	I find myself worrying about something or other.	

17. Awareness and Adoption

Please indicate the cultivation practices which you are aware of/have adopted, among the following practices.

1. Are you aware of the high yielding varieties suited for Mundakan Season?
   Have you adopted it? Yes/No
   If yes, Area :..... ha Variety :..... Yes/No
   If No, Reasons for non adoption .....

2. Do you know the optimum seed rate for broadcasting in transplanted crop?
   Have you adopted it? Yes/No
   If yes, indicate seed rate..... Kg/ha Yes/No
   If No, Reasons for non adoption .....

3. Do you know the quantity of farm yard manure to be applied for wet land paddy?
   Have you adopted it? Yes/No
   If yes, quantity..... Kg/ha Yes/No
   If No, Reasons for non adoption .....

4. Are you aware of phosphatic fertilizer application in the nursery? Yes/No
   Have you adopted it? Yes/No
   If yes, Dosage :..... Kg/ha of seed
   If No, Reasons for non adoption .....

5. Have you heard of seed treatment practices before sowing the crop? Yes/No
   Have you adopted it? Yes/No
   If yes, Dosage :..... g/Kg of seed
   If No, Reasons for non adoption .....

6. Do you know the optimum stage for transplanting the medium duration variety of paddy? Yes/No
   Have you adopted it? Yes/No
   If yes, Number of days after sowing .....
   If No, Reasons for non adoption .....

7. Are you aware of the optimum planting density to be adopted in the main field? Yes/No
   Have you adopted it? Yes/No
   If yes, Number of hills/m^2 .....
   If No, Reasons for non adoption .....

8. Do you know the desired planting depth to be adopted while transplanting? Yes/No
   Have you adopted it? Yes/No
   If yes, depth in cms.....
   If No, Reasons for non adoption .....

9. Have you heard of soil testing? Yes/No
Have you adopted it? Yes/No
If yes, Mention the procedure .....
If No, Reasons for non adoption .....

10. Do you know the optimum recommended fertilizer dosages for high yielding medium duration variety? Yes/No
Have you adopted it? Yes/No
If yes, Dosage: .....NPK Kg/ha (Basal, Topdress)
Time of application .....
If No, Reasons for non adoption .....

11. Do you know the practice of urea neemcake application? Yes/No
Have you adopted it? Yes/No
If yes, Dosage: ..... Kg (urea and neem cake)
If No, Reasons for non adoption .....

12. Are you aware of lime application in main field? Yes/No
Have you adopted it? Yes/No
If yes, Dosage: ..... Kg
If No, Reasons for non adoption .....

13. Have you heard of cricitical weed control practices? Yes/No
Have you adopted it? Yes/No
If yes, Give details (including dosage)
If No, Reasons for non adoption .....

14. Are you aware of the water management practices in transplanted paddy? Yes/No
Have you adopted it? Yes/No
If yes, Give details
If No, Reasons for non adoption .....

15. Are you aware of need based pesticide application for plant protection? Yes/No
Have you adopted it? Yes/No
If yes, Give details (including name of the pest and pesticide dosage)
If No, Reasons for non adoption .....

16. Do you know the optimum fungicide dosage to be applied for important diseases in paddy prevalent in the area? Yes/No
Have you adopted it? Yes/No
If yes, Give details (including name of the pest and pesticide dosage)
If No, Reasons for non adoption .....

18. Attitude

Please indicate your agreeableness or disagreebleness with respect to the following statements.

Sl.No:	Statements	SA	A	UD	DA	SDA
1.	Rice cultivation makes land unsuitable for other crops.					
2.	Only large farmers can afford rice cultivation.					
3.	Rice cultivation requires good skills and hence not practicable.					
4.	Rice cultivation makes farmers more indebted.					
5.	The standard of living of farming community can be enhanced through rice cultivation.					
6.	Rice cultivation can be made profitable nowadays as improved technologies are available.					
7.	Rice cultivation is essential for a community to be self-sufficient.					
8.	Paddy land should not be reclaimed for any other purpose but for rice cultivation.					

APPENDIX - III

INTER - CORRELATION MATRIX

	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_1	1.0000														
X_2	0.6663**	1.0000													
X_3	-0.5141**	-0.6124**	1.0000												
X_4	-0.6192**	-0.5908**	0.6026**	1.0000											
X_5	-0.3448*	0.3856*	-0.6748**	-0.4824**	1.0000										
X_6	-0.6510**	0.6543**	-0.6667**	-0.6145**	0.6523**	1.0000									
X_7	-0.5277**	0.6763**	-0.5168**	-0.5755**	0.6726**	0.6235**	1.0000								
X_8	-0.6304**	0.6777**	-0.6775**	-0.3464*	0.6886**	0.6615**	0.6762**	1.0000							
X_9	-0.5090**	0.6192**	-0.6791**	-0.4936**	0.6907**	0.3623*	0.6921**	0.3520*	1.0000						
X_{10}	-0.6695**	0.3248*	-0.4164**	-0.5269**	0.5937**	0.6377**	0.3436*	0.6281**	0.6836**	1.0000					
X_{11}	-0.6648**	0.6519**	-0.5225**	-0.5934**	0.3417*	0.5169**	0.6031**	0.5749**	0.6281**	0.6258**	1.0000				
X_{12}	-0.4018*	0.6160**	0.5749**	0.5907**	0.5271**	0.6131**	0.5671**	0.3096ns	0.5749**	0.6084**	0.5053**	1.0000			
X_{13}	-0.6684**	0.5540**	-0.3372*	-0.4733**	0.5964**	0.6472**	0.2438ns	0.6708**	0.6498**	0.3269*	0.6262**	0.2589ns	1.0000		
X_{14}	-0.5763**	0.6422**	-0.4533**	-0.3093*	0.4388**	0.3320*	0.6773**	0.6284**	0.6326**	0.5894**	0.5080**	0.5664**	0.5849**	1.0000	
Y_1	-0.6446**	0.6337**	-0.3542*	-0.4757**	0.3019ns	0.6047**	0.5976**	0.3942*	0.5997**	0.5144**	0.3247*	0.4023*	0.3962*	0.4751**	1.0000
Y_2	-0.2385ns	0.4000*	-0.0900ns	0.3250*	-0.0234ns	0.3914*	0.3216*	0.2635ns	0.2140ns	0.4604**	0.2304ns	0.1437ns	0.1723ns	0.4420**	1.0000
Y_3	-0.6220**	0.6461**	-0.4208**	-0.4505**	-0.3140*	0.6627**	0.6027**	0.4019*	0.6900**	0.6000**	0.5589**	0.3290*	0.6232**	0.5389**	1.0000

X_1: Age; X_2: Educational status; X_3: Occupational status; X_4: Farming experience; X_5: Annual income; X_6: Social participation; X_7: Extension orientation; X_8: Cosmopoliteness; X_9: Massmedia participation; X_{10}: Scientific orientation; X_{11}: Innovativeness; X_{12}: Economic motivation; X_{13}: Risk orientation; X_{14}: Self-confidence.

Y_1: Awareness; Y_2: Attitude; Y_3: Adoption

*Significant at 0.05 level; **Significant at 0.01 level; ns - non-significant

APPENDIX - IV

Sl. No.	Independent variables	Code number of the variables
1.	Varietal choice	X1
2.	Seed rate	X2
3.	Farm yard manure application(Nursery)	X3
4.	Phosphatic fertilizer application (Nursery)	X4
5.	Seed treatment	X5
6.	Transplanting stage	X6
7.	Planting density	X7
8.	Planting depth	X8
9.	Farm yard manure application (Main field)	X9
10.	NPK fertilizer application	X10
11.	Neem cake application	X11
12	Liming	X12
13	Critical weed control	X13
14	Water management	X14
15	Pesticide application (against leaf roller)	X15
16	Fungicide application (against blast disease)	X16

EXTENSION INTERVENTION FOR SUSTAINING RICE PRODUCTION

BY

SYAM KUMAR B. G.

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

DEPARTMENT OF AGRICULTURAL EXTENSION
COLLEGE OF AGRICULTURE
VELLAYANI
THIRUVANANTHAPURAM

1999

ABSTRACT

The present study 'EXTENSION INTERVENTION FOR SUSTAINING RICE PRODUCTION' was undertook to study the extent of awareness and adoption of farmers regarding the selected recommended practices in rice cultivation, their attitude towards rice cultivation and to assess the impact of an extension intervention in the awareness, attitude and adoption levels and also on the yield and benefit-cost ratio of rice crop. For this study Neyyattinkara taluk of Thiruvananthapuram district was purposively selected. Forty farmers were selected using random sampling procedure from the selected padasekharam which was selected randomly. The data were collected using a well-structured interview schedule. The extension intervention was carried out in three stages viz., pre-sowing, pre-transplanting and post-transplanting extension intervention.

The study revealed that majority of the farmers had low attitude towards rice cultivation and low adoption of the recommended practices. But majority possessed high awareness about the recommended practices. Regarding the personal characteristics majority had low social participation, extension orientation, innovativeness and risk orientation and high level of educational status, farming

experience, cosmopoliteness, mass media participation, scientific orientation, economic motivation and self-confidence. Among the major hurdles inhibiting the adoption of the advocated practices lack of awareness stood first followed by high cost of inputs.

The correlation analysis showed that the following variables viz., educational status, social participation, extension orientation, scientific orientation, innovativeness, risk orientation, cosmopoliteness, mass media participation, economic motivation and self-confidence were positively and significantly related to awareness and adoption of respondents with regard to selected recommended practices while age, occupational status, farming experience and annual income showed significant negative correlation with adoption. The variables age, occupational status, and farming experience were negatively correlated with awareness. As far as attitude of farmers towards rice cultivation was concerned only the following variables namely, educational status, social participation, extension orientation, scientific orientation and self-confidence showed significant positive association.

Among the selected recommended practices the following namely, varietal choice, seed rate, seed treatment, transplanting stage, planting depth, basal and top dress fertilizer dosages, urea-neem cake mixture application and pesticide

dosage were fully adopted by more than 50 per cent of the respondents after the extension intervention. Maximum percentage increase in full adopters was seen with regard to urea-neem cake application followed by seed treatment and seed rate.

Step-wise regression analysis showed that critical weed control followed by varietal choice, NPK fertilizer application, pesticide application, seed treatment and fungicideapplication showed significant contribution towards variation in the yield of paddy. As far as predictive efficiency of the variables was concerned varietal choice followed by seed treatment and critical weed control took the first three places. The results of t-test brought to light that the extension intervention could significantly bring about change in the extent of awareness of farmers about selected recommended practices in rice cultivation, extent of adoption of selected recommended practices in rice cultivation by farmers and yield of rice crop.