INDIGENOUS PRACTICES IN RICE FARMING IN THRISSUR DISTRICT

By

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THESIS

Submitted in partial fulfilment of the
requirement for the degree of

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Department of Agricultural Extension

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1997

DECLARATION

I hereby declare that this thesis entitled "**Indigenous practices in rice farming in Thrissur district**" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, fellowship, associateship or other similar title, of any other university or society.

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CERTIFICATE

Certified that this thesis entitled **"Indigenous practices in rice farming in Thrissur district"** is a record of research work done independently by **Miss.Preetha, L.**, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.

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To my beloved parents

CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF PLATES

Introduction

CHAPTER I

INTRODUCTION

"CONSULTANT ADMIRES INDIAN AGRICULTURE IN 1889"

In 1889, Dr.J.A.Voelcker, Consulting Chemist to the Royal Agricultural Society of England, was sent by the British Government to study Indian agriculture. Voelcker toured the country extensively for over a year. In his report published in 1893 he stated: ".....no where would one find better instances of keeping land scrupulously clean from weeds, of ingenuity in device of water-raising appliances, of knowledge of soils and their capabilities as well as of the exact time to sow and to reap, as one would in Indian agriculture ....." It is wonderful, too, how much is known of rotation, the system of mixed crops and of fallowing. Certain it is that I, at least, have never seen a more perfect picture of careful cultivation, combined with hard labour, perseverence and fertility of resources, than I have seen at many of the halting placed on my tour (Dogra, 1983).

Since time immemorial, farm communities have developed innumerable ways of obtaining food and fibre from plants and animals. These traditional farming systems are not static and are seen as source of sound ideas, locally adapted cultivars and practices which could lead to sustainable use of local resources (Reijntjes, 1992).

However, increasingly rapid changes in economic, technological and demographic conditions demand increasingly rapid changes in farming systems. As a result, conventional science based research and extension activities in the tropics

have focussed on 'modern' agriculture with high level of external inputs, eg. agro-chemical, hybrid seed, fuel-based mechanisation etc. The emphasis has been on intensification and diversification so as to enhance productivity without caring for sustainability. So today new generation problems affect productivity levels. Some of the problems are declining nutrient use efficiency, multiple nutrient imbalance, adverse changes in physico-chemical properties of soil, inefficient water use, soil and water pollution and changing pest-disease-weed syndrome. Above all, the impact of exhaustive cropping is seen in the plateauing yield levels of major crop based rotations like wheat-rice and rice-rice.

Rice is a traditional and staple food crop of India originated in Indo China-Hindustan centre of origin. India has probably grown over 30,000 different varieties of rice. But with the advent of 'green revolution' and introduction of high yielding varieties, the National genebank holds only 7,000 of these traditional rice varieties. Moreover, the post-green revolution has led to slowing yield rates and decreasing input efficiency. With this the sustainability of rice production is being questioned. It has created serious problems of salinity, waterlogging and soil erosion in several regions. Over exploitation of natural resources may have short term gains but it could often lead to serious ecological degradation.

This calls for serious thinking with matching action on the part of policy makers, administrators and scientists concerned with food production to reorient research to develop sustainable food production technology. Post-green revolution agricultural science is now realizing the need to incorporate previously underutilized resources of farmers experimentation (Box, 1987), farmer participation in formal research (Biggs, 1989) and in technology development (Farrington, 1995) and

indigenous technical knowledge (Thurstone, 1990) in the development of technologies that enhance sustainability. "Farmer-back-to-farmer" (Rhoades and Booth, 1982), "Farmer first" (Chambers *et al.* eds., 1989) and other terms have been coined, that denote these new farmer-scientist research partnership. Current research at IRRI in non-irrigated areas and facing declining sustainability even in irrigated areas attempts to recognize, systematize and improve the process of incorporating farmers' knowledge into research (Fujisaka, 1990).

In recent years there has been a growing scientific interest in locally developed farming systems and technologies. The traditional practices that rely on indigenous knowledge are considered for productivity, sustainability, stability and equitability.

The local or indigenous knowledges (IK) of a farming population living in a specified area is derived from the local peoples past farming experience, both that handed down from previous generations and that of the present generation. IK is the information base for a society and is dynamic. They are highly localized, restricted and often integrated with belief systems and cultural norms. Alcorn (1984) and Hunn (1985) reported that IK and practices of local farmers may reveal ideas which contain "Seeds" of adaptive value.

Moreover as IK is passed on from one generation to another by word of mouth, unless conscious efforts are made to collect and document them, valuable information may be lost. Knight (1980), has called for the systematic documentation of traditional farmers' knowledge into an "information bank" from which agronomists, extension workers and other farmers can draw enlightenment and insight. However, collection and documentation of these practices is not the only

requirement. This infact may not take us very far unless the scientific rationale behind each of the traditional practice is probed into (Talwar and Singh, 1991).

In this study indigenous practice was operationally defined as resource-saving, site-specific, farmer-deviced technologies, experimented and adapted by themselves, which is simple to practice flexible in use and sustainable in effect.

The study was conducted to identify the indigenous practices followed by the rice farmers in Thrissur district of Kerala. Kerala has an estimated gross cropped area of 5.38 lakh hectares under paddy cultivation, which produces 10.85 lakh tonnes of rice/annum. Thrissur district is an important traditional rice growing tract of the State with wide variations in rice cultivation like the Kole lands, coastal lands and uplands. Hence a detailed study was conducted to identify the indigenous/ traditional practices followed by rice farmers in Thrissur district. Besides, this is the first systematic study ever attempted in this field. The main objectives of the study were as follows:

1. Identification and documentation of indigenous practices in rice farming in Thrissur district.

2. Assessment of knowledge of these indigenous practices by the rice farmers in relation to their personal, socio-economic and psychological characteristics.

3. Analyse the extent of adoption of these indigenous practices with relation to their personal, socio-economic and psychological characteristics.

4. To measure the evaluative perception of these indigenous practices by farmers, extension personnel and scientists.

Scope of the study

1. Documentation of indigenous practices in rice farming may be useful in preparing "an indigenous technology package for rice." Sound research and development on these practices, and a committed extension task force for eco-technology may result in successful implementation of sustainable farming.

2. Abstracting the science underlying indigenous knowledge system would help up to understand the concepts and practices depicting the ecologically sustainable options of resource use.

3. The results of this study would accelerate the technological change through re-oriented research wherein eco-friendly traditional technology can be integrated with productive modern technology to evolve economically efficient, socially acceptable and sustainable food production technology (Fig. 1).

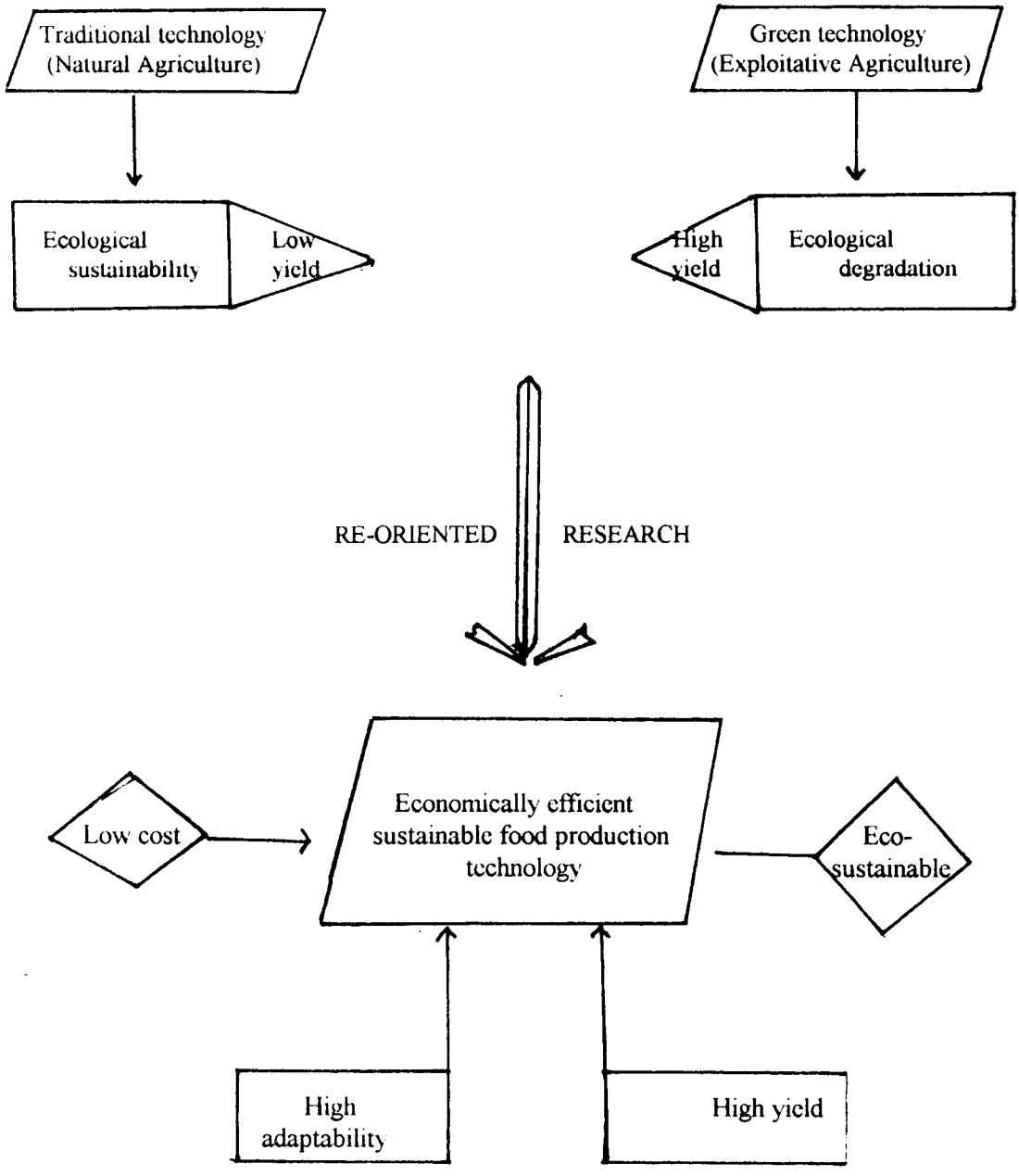
4. 'Information bank' or the 'memory bank' supplements the genebank with cultural information, thereby preventing the disintegration of genetic information.

5. Research on this complex folk science not only enables the scientists to come in direct contact with farmers but also attempts a multi-disciplinary approach for problem solution.

Limitations of the study

Single student investigation coupled with the peculiar characteristics of indigenous practices has posed many problems in conducting the investigation. The limitation perceived are as follows:

Fig.1. Scope of the study



1. Identification of indigenous practices otherwise required an exhaustive probe covering all the panchayaths of the Thrissur district. But lack of time and money on the part of the investigator facilitated only an explorative study covering just twelve randomly selected panchayats from the district.

2. Indigenous knowledge is much complex and entwined with the cultural aspects of the society. Hence a simple personal interview could do very little in identifying and documenting the indigenous practices. In fact, it required a multi-disciplinary approach using advanced data collection techniques like the Rapid Rural Appraisal (RRA).

3. Localisation of indigenous practice has affected the general applicability of each practice to different locations. This was a major constraint in the measurement of knowledge and extent of adoption of indigenous practices.

4. The study was based on the express information and opinion of the respondents, which may not be free from individual biases and prejudices. There could be some distortion in the interpretation of the responses of the respondents, though all care was taken to collect the information without any loss.

Inspite of these limitations it is expected to collect and document all available indigenous practices in rice farming and throw substantial light on the knowledge and adoption of the rice farmers with regard to these practices.

Presentation of the thesis

Besides the present introduction chapter, the second chapter viz. theoretical orientation deals with the review of selected important and related studies

in the field of the present investigation. The third chapter presents the methodology used in the study. The location of the study area, sampling procedure followed, quantification of variables selected for the study, statistical techniques employed etc. are dealt with in this chapter. The fourth chapter contains the results of the study and discussion on the results. The last chapter summarises the study with implications and suggestions for future research.

Theoretical Orientation

CHAPTER II

THEORETICAL ORIENTATION

Selection of research topic - INDIGENOUS KNOWLEDGE - and identification of variables related to the topic were done based on past literature, directly or indirectly related to the topic. A theoretical framework would help to form a clear concept about indigenous knowledge and its allied aspects. They are described under the following main heads.

2.1 Indigenous knowledge - meaning, concept and definition

2.2 Importance of indigenous knowledge

2.3 Identification and documentation of indigenous practices

2.4 Indigenous practices - few examples

2.5 Knowledge in indigenous practices by farmers

2.6 Extent of adoption of indigenous practices by farmers

2.7 Relationship of selected personal, socio-economic and socio-psychological characteristics of farmers with knowledge and adoption of indigenous practices

2.8 Evaluative perception of indigenous practices

2.9 Conceptual framework of the study

2.1 Indigenous knowledge - meaning, definition and concept

The knowledge of a farming population living in a specific area is derived from the local people's past experience, both that are handed down from previous generation and that of the present generation (Reijntjes, 1992). This knowledge in todays parlance is called local knowledge, traditional knowledge or simply indigenous knowledge (Chittiraichelvan and Raman, 1990).

Traditional knowledge or practice is any long established concept, method or practice. It can be either indigenous or exogenous. While indigenous knowledge or practice is any concept or practice belonging actually to a place; native. However, for convenience these two terms are used synonymously.

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

According to Warren (1989) the term "indigenous" is used to refer to a localized agricultural system which has developed over time with cropping pattern based on an agricultural knowledge system expressed in the local language; such a system is viewed to be in dynamic equilibrium with the environment, influenced by innovations emerging from within the system as well as those adopted from other indigenous systems and from the national and international agricultural systems.

Reijntjes (1992) defined indigenous knowledge as the knowledge of the people living in a certain area, generated by their own and their ancestor's experience and including knowledge originating from elsewhere which has been internalised by the local people.

Indigenous knowledge is highly localised and restricted. Local environmental factors and cultural conditions govern the evolution of indigenous knowledge. These vary between countries, regions and even farm to farm (Carter, 1988). Local beliefs and vernacular terms also have meaning and can be helpful in describing ideas (Sharland, 1989).

Farmers' practical knowledge about the local ecosystem is reflected in their farming techniques and in their skill in using the natural resources to gain their livelihood. They may reveal ideas which contains 'seeds' of adaptive value (Alcorn, 1984 and Hann, 1985) from which agronomists, extension worker and other farmers can draw enlightment and insight (Knight, 1980). Thus indigenous knowledge is a dynamic and everchanging accumulation of collective experience of a generation.

To summarise, indigenous/traditional knowledge is unique to a given culture or society. It is derived from spontaneous farmer experimentation or past farming experience. Indigenous knowledge is the information base for a society and facilitates communication and decision making. It is highly localised and dynamic as it changes through creativity and innovativeness as well as through contact with other systems.

2.2 Importance of indigenous knowledge

Srivastava (1980) reported that since traditional technologies have undergone a selective process over centuries of empirical testing they are very likely to represent optimal solutions. These traditional tools and techniques should be studied systematically and an organised efforts made for improving their efficiency and productivity.

Altieri (1987) observed that traditional crop selection, planting times and cultivation practices often reflect efforts to minimise insect damage.

Cashman (1989) emphasised the value and practicability of incorporating indigenous knowledge components in agricultural research to augment sustainable development that benefits all the rural people equally, men and women alike.

Groenfeldt (1991) reported that traditional knowledge of Asian agriculture, reflected technical knowledge of sustainability and found that modern agricultural development efforts often ignored I/TK. He also suggested that indigenous systems should be intelligently assisted rather than replaced.

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

Reijntjes *et al.* (1992) stated that indigenous farmers through a process of innovation and adaptation have developed numerous different farming systems, each of which is finely turned to its ecological, economic, socio-cultural and political environment.

Talwar and Singh (1992) commented that indigenous knowledge has undergone evolutionary process and is built from and based on thousands of years of experience. These are cheap source of identifying ideas which have considerable scope for commercial exploitation.

Tiwari (1993) indicated that yield levels had reached plateau and were showing decreasing trends in regions where green revolution was more successful. Integrated farming which aims at sustainability is based on traditional knowledge, he observed.

Vasu (1994) reported that traditional technologies are very much in tune with the cultural ethos and environmental conditions of the country. They may be of low technological level and requires minimal capital and maximum labour inputs.

Alders *et al.* (1991) described that traditional farmers have time tested experiences with coping strategies which have led to integrated farming systems.

The central point of the above review is that farmers' knowledge is the product of centuries of trial and error method of technology development. This knowledge provides a basis for identifying ecologically sustainable options of research use which are finely tuned, both biologically and socially. Abstraction and conceptualisation of indigenous knowledge and its integration with modern farming techniques can evolve efficient resource management system.

2.3 Identification and documentation of indigenous practices

According to Hoare (1980) the role of the extension officer as a synthesiser of the farmers' technical knowledge and findings of laboratory research is gaining evidence. According to them the extension officer has also to play the role of identifying and communicating knowledge relating to indigenous practices to institutional workers in the laboratories.

Knight (1980) called for the systematic documentation of traditional farmers' knowledge into an 'information bank' from which agronomists, extension workers and other farmers can draw enlightenment and insight.

A survey by Quintana and Arzadon (1989) on the use of plant materials for pest control in selected areas in the Philipines revealed the existence of indigenous and traditional methods of controlling pests that have evolved in these areas. The botanical pesticides were directed mainly against rice pest.

Chittiraichelvan and Raman (1991) reported that documentation of indigenous beliefs assumes greater importance to understand the scientific rationale to accelerate increased awareness among youth and pride among farmers.

One hundred and fifteen traditional beliefs covering various agricultural activities in rice farming was identified by Balasubramaniam (1992) from Palladam block of Coimbatore district in Tamil Nadu.

Reijntjes *et al.* (1992) stated that specialised indigenous knowledge is often kept secret or known only to select few. In any case peasants do not document their knowledge so that it can be made available to strangers. Their knowledge may be implicit within their practices, actions and reactions, rather than a conscious resource.

Babu (1995) identified 25 indigenous practices adopted by homestead farmers of central zone of Kerala.

Nine indigenous soil and water conservation practices followed by the IRDT and Government beneficiaries were identified by Nandini (1995).

In brief, systematic efforts for collecting indigenous practices were taken in different parts of the country. But they are often kept secret or known to selected few. Hence there is a pressing need for the systematic documentation of indigenous practice of local farmers before being lost. So it is imperative that scientists and extension workers collect and document such information for the benefit of researchers and posterity.

2.4 Indigeneous practices - Few examples

Sl.No.	Indigenous practices (IP)	Description of the IP	Place of the study	Literature source
I	SEED TREATMENT			
I)	Seed treatment with bones	Treating seeds with a decoction of extract of certain types of bones help them to withstand stress better. In case the prescribed bones are not available the boiled steep of silk seeling basins may be used	Ancient China	Sheng-Han (1982)
ii)	'*Kottam*' indigeneous seed soaking treatment for paddy	This treatment enhances the germination and uniform sprouting of paddy seeds. Approximately 15 kg of seeds are used for one '*Kottam*'. A mat of paddy straw is placed over a bamboo or sted trough steel of 30 to 45 cm diameter and two feet in height and well compacted. Below this containers straw ropes are placed in a criss-cross manner. The seeds are put into the container covered by straw and the straw ropes are tied tightly. The whole unit is then pulled out from the trough. The unit is called '*Kottam*' Approximately 20 litres of water are sprinkled over the Kottam and it is left in the corner of the house in shade for nearly 24 hours. The next day the Kottam is carried to the field for sowing.	Tamil Nadu	Kanagasabapathi (1993)

Sl.No. Indigenous practices (IP)	Description of the IP	Place of the study	Literature source
II. CROP MANURING AND IRRIGATION			
i) Cattle penning	This is a practice of keeping the cattle herd over night on the cultivated land so that the dung and the urine excreted can be directly absorbed by soil. It is followed in summer when the land is free from crops.	Tamil Nadu	Chakravarthy (1982) and Balasubramaniam (1992)
ii) Green manure	Some of the commonly used green leaf manures are `Calotropis' - *Calotropis gigantia* `Nuna' - *Morinda tinctoria* `Portia' - *Thespesia populnea* `Kattamani' - *Jatropha gossypifolia* *Ipomea* sp. and *Adathoda* sp. If green manure *Adathoda* is used, a quick greening of leaves of the crop can be seen just as with the application of artificial fertilizer.	Tamil Nadu	Kanagasabapathi (1993)
iii) Alternative wetting and drying of rice crops	Alternate wetting and drying of rice crop improves the soil and microbial activity. Also it helps to stimulate vigorous root growth of ineffective tillers.	Tamil Nadu	Deepa (1992)
iv) The bamboo tube well	The tube well, designed by a medium-sized farmer, was made from split bamboo lengths, iron rings and coir string. Its construction is simple and economical. Besides being cheap enough to be expendable if the well dries up, it can also be made from indigenous or easily available materials. The success and publicity of the prototype resulted in small village workshops set up all over the district to construct the wells.	Saharsa district (Bihar)	Dommen (1975)

Sl.No. Indigenous practices (IP)	Description of the IP	Place of the study	Literature source
III. PLANT PROTECTION			
A. Insect Pests			
i) Neemcake to control stem borer and gall fly	Sacs filled with 8 kg of neemcake is placed in irrigation channel of paddy for control of stem borer and gall fly. This practice is followed from 18 to 20 days after planting and has to be repeated every 25 days. This is also found effective against bacterial wilt.	Madurai district of Tamil Nadu	Vivekanandan (1994a)
ii) An insecticide formulation	A spray mixture of Phenoil (1 litre) + neem oil (1/4 litre) + Kerosene (1/2 litre) + soap (150 grams) is effective against green leaf hopper and brown plant hopper.	Pudukkottai district of Tamil Nadu	Vivekanandan (1994b)
iii) Control of Gundhi bug (Rice bug)	Farmers burn discarded cycle tyres and walk around the field with it and later deposit it in one place close to the field. The odour of the smoke is said to repel this bug. Also some pests attracted by the fire get burnt by it.	Faizabad district in Uttar Pradesh	Yadav (1995)
iv) A natural pesticide for low land rice	Vines or *Tinospora vumpii* are chopped and ground to paste in a mortar and pestle. Water is added to this paste and stirred thoroughly. Rice seedlings are soaked in this liquid for a whole night just before transplanting. About 10 to 15 kg of chopped vines are used for the treatment of seedlings needed for one hectares. Its action is comparable to that of chemical pesticides.	International Institute of Rural Reconstruction Silang, Cavite Philippines	Gupta (1994a)

Sl.No. Indigenous practices (IP)	Description of the IP	Place of the study	Literature source
B. Non-sect pests - Crab			
i) Crab control using tamarind seeds	To control crab menace farmers soak seeds of 'imli' (*Tamarindus indica*) in water for 24 hours and feed the seeds to the crab. About 5-6 seeds are placed around the crab (nest). According to the farmers, the seeds get firmly lodged in the mouth of crabs when they try to eat it and this caused death within a day or two.	Valsad district	Gupta (1994b)
Rodents			
i) Rodent control techniques (Fig.2)			
Rat control by hoodwinking (Fig.2a)	Farmers cut three or four foot long stems of calotropis and heat them in fire so that it becomes black. The blackened stems are kept around fields. This which resembles locally found species of snake is believed to scare the rats away.	Valsad district	Gupta (1994c)
Rat traps	Rat are kept under control by exploiting the rats inability to walk upside down on a flat surface (Fig.2b) by fixing flat stones in the midele of each leg of the cottage.	Zermat in Switzerland	Gupta (1994c)
	In the second case (Fig.2c) the rats can enter the basket but cannot climb over and negotiate its outer slopping edge to get to the rope leading to the food.	Maharashtra	Gupta (1994c)
Nematode i) Decoy crops	When a crop activates nematode but is not a suitable host plant for them, it is called a decoy crop, ex. Chrysanthemum is a decoy crop for tomato crop against the nematode *Meloidocyne incognita*	--	Alteiri and Liebman (1986)

Fig.2. Rodent control techniques

Fig.2(a)

Fig.2(b)

Fig.2(c)

Sl.No.	Indigenous practices (IP)	Description of the IP	Place of the study	Literature source
Birds				
i)	Paper birds to protect germinating crops	To keep away the raiding flock of birds the villagers make white paper birds locally known as "Egretta Garzetten" and attach them to sticks which they anchor in field, when the flock of the migrating birds, looks on the ground they see white birds and fly straight since they are scared of them.	Cam Binch district of Vietnam	Gupta (1995d)
IV.	WEED MANAGEMENT			
i)	Calotropis as a weed control crop	Cut branches of Calotropis (*Calotropis* spp.) are kept at entrance of rain water channel. It minimizes the striga population.	Nigeria	Gupta and Patel (1992)
ii)	To control the weed *Marselia quadrifolia*	This weed can be controlled in two ways, (a) Ten baskets of the fibrous pericarp of coconut are applied for 1 acre of paddy field, it releases some tannin like substances that inhibit weeds; (b) Use of Calotropis as green manure.	Tamil Nadu	Kanagasapathy (1993)
V.	WATER AND SOIL CONSERVATION			
i)	Summer ploughing	It is the practice of ploughing the fields (in summer) before the monsoon. It pulverises the soil, decreases the aeration and infilteration rate. Run off is hence reduced and more rain water percolates into the soil.	Tamil Nadu	Chakravarthy (1982) and Nandini (1995)
ii)	*In situ* conservation	When it rains heavily, farmers do not permit water to flow out of their individual farm plots and keep it confined where it falls. After a three day *in situ* they allow only decanted water to flow out This is a method of soil preservation	Kerala	Pisharoty (1993)

Sl.No. Indigenous practices (IP)	Description of the IP	Place of the study	Literature source
iii) Growing *Lantanna camara* in the bunds	Cultivation of bushy shrubs like *Lantanna camara* kept the bunds strong and prevented runoff.	Tamil Nadu	Nandini (1995)
VI. STORAGE			
i) Indigenous mud pot (*'Kudhir'*)	Large mud pots as high as 180 cm are used for storing paddy grains for long periods. They are made of clay, paddy straw and are airtight. Paddy stored inside such a bin does not absorb moisture.	Tamil Nadu	Kanagasabapathy (1993)
ii) Use of botanicals	a) Leaves of *Azadirachta indica, Vitex negundo* and *Pongamia glabra* are placed between the rows of paddy sacks for giving protection against storage pest.	Tanjavur district of Tamil Nadu	Vivekanandan (1994c)
	b) Mixing grains with dried tender stems of Clerodendron	Kerala	Gupta (1990e)
VII. PROVERBS			
i) *"Gobar Maito pani sada Tab Khet Me Dado pade Table Khet. Mc Dade Pade Gobar Maila Neem ki Kha Yase Khati Dooni"*	Composite manure raises the yield but neem doubles it.	Rajasthan	Singh and Saroj (1994)
ii) *"Dhan, Pan Aru Kera Teenom Pani Ke Chera"*	Paddy 'Paan' (Piper betel) and banana needs plenty of water.	Haryana	Dhukhia and Verma (1993)

Farmers' practical knowledge about local ecosystem - about the natural resources and how they interact - is reflected in their farming techniques and in their skill in using the natural resources to gain their livelihood. From the above examples, it is clear that India has vast treasure of outstanding agricultural practices in different parts of the country which has, for long, remained hidden from the farmers of other states and which deserve to be unearthed for the benefit of agriculture as a whole in India. Hence there is a need for lateral learning among the farmers so that extension workers, scientists and planners can learn from these insights.

2.5 Knowledge in indigenous practices by the farmers

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

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

Studies conducted by Juma (1987) and Rocheleau (1987), in East Africa showed that women usually possess remarkable knowledge about the qualities and uses of indigenous tree species and that many of those insights are unknown to men. Dankelman and Davidson (1988) and Shiva (1988) too reported the higher knowledge level of women.

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

Reijntjes *et al.* (1992) stated that indigenous knowledge is not uniformly spread through out a community and the individualo aptitudes for storing traditional knowledge and generating new knowledge differ. Each individual possess only a part of communities indigenous knowledge, he observed.

According to Balasubramaniom (1992) 84 per cent of small farmers and all big farmers were aware of cattle penning practices to improve soil fertility. Further, he reported that 100 per cent awareness was observed, in using cowdung cake as burrow fumigant, displaying crows carcass for scaring birds and beating empty drums to ward off birds.

The above literature speaks on the sound knowledge of farmers on indigenous practices. But these are seldom spread uniformly and hence varies between countries, regions and even farm to farm.

2.6 Extent of adoption of indigenous practices by the farmers

Bhaskaran and Praveena (1982) informed that over two-third of dry land farmers adopted off-season tillage, soil mulching and midterm correction whereas only less than five per cent of them adopted minimal irrigation techniques.

As reported by Chakravorthy (1982) the labour extensive indigenous farm practices namely the use of indigeneous wooden plough, the use of bow traps to kill rats and digging field burrows to catch rats was followed more by small and medium farmers than big farmers. Cattle penning and green leaf manuring were followed more by big farmers than the other categories of farmers.

Jayakrishnan (1984) observed that paddy growers had medium level of adoption of low cost technologies.

Balasubramoniam (1985) reported that summer ploughing was adopted by majority of the farmers (92%). He further found that sorghum raised as mixed crop with lab-lab was practised by 85 per cent of farmers.

Ramachandran (1988) reported that summer ploughing and intercropping were adopted by all the farmers while adoption level of other technologies varied due to a variety of reasons. According to Mann and Saxena (1990) though the desert dwellers are fully aware of the usefulness of indigenous practices, a significant proportion of the population donot follow them.

Deepa (1992) studied the effect of relevant traditional beliefs on the adoption of improved rice technologies. It was found that beliefs which have positive effect facilitated the adoption and the beliefs which have negative effect acted as obstacles in the adoption of recommended practices.

As observed by Balasubramoniam (1992), the indigenous practices adopted by more than 75 per cent of the farmers were summer ploughing, cowdung coating for cotton seeds, soaking sorghum in common salt, cattle penning, sorghum raised as mixed crop with lab-lab, displaying crows carcass for scaring birds, beating empty iron drums to ward off birds and coating red grams with red soil. Further it was reported that, out of 25 indigenous practices identified only fifteen practices were adopted by the farmers.

According to Babu (1995) about 24.22 per cent of the farmers were in the habit of using polybags tied up on poles to ward off birds and rodents.

Nandini (1995) reported the adoption of indigenous soil and water conservation practices by the respondents ranged from 8.33 to 100 per cent. Cent per cent of the respondents followed summer ploughing since it pulverised the soil for better retention of moisture in fields. 40 to 87.50 per cent adoption was found in practices like manuring, earthern bunding, stone wall construction, growing cover crops and intercropping. While the adoption percentage of practices like growing *Lantanna camara* on bunds, Agave planting and digging trenches around tree crops were considerably low.

2.7 Relationship of selected personal, socio-economic and socio-psychological characteristics of farmers with knowledge and adoption of indigenous practices

Jayakrishnan (1984) in a study of low cost technology among paddy growers found that main occupation had positive and significant relation with adoption.

A study conducted by Feder and Slade (1985) revealed that in areas where Training and Visit system was introduced, 47 per cent of the farmers preferred fellow farmers as the primary source of information, 19 per cent preferred the village extension workers, 16 per cent the contact farmers and 10 per cent agricultural radio programmes. In an area where T & V system was not introduced, the preferences for sources of information were: 82 per cent fellow farmers, 28 per cent demonstrations or field days, 9 per cent agricultural radio programmes and 2 per cent the village extension worker.

In Thailand, the most frequently cited source of technical change in the villages was local farmers. In some instances, as reported by Grandstaff and Grandstaff (1986), farmers had simply worked out their own innovations; in others, they had observed them on near by fields or during travel to more distant locations. The second most frequently cited source was the market. The Government (agricultural officers and teachers) was also mentioned but were not important sources of agricultural information.

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

According to Rhoades (1987) the traits of rainfed farmers are experimentation, risk taking and innovation eagerness to new information and practice and commonsense.

Wang (1988) stated that inadequacy of Government support or machinery in promoting developmental activities, most of the farmers group in for indigenous systems in crop growing. Warren (1989) reported that indigenous knowledge is dynamic, it changes through indigenous creativity and innovativeness as well as through contact with other knowledge systems.

Cornell (1990) indicated that farmers were most innovative in devising and experimenting the various component technologies where the extentionist did not attempt to be directive in promoting a technology package.

According to Stout (1990) in Low External Input Agriculture areas, intensification has to dependmainly on human and animal energy, as energy derived from fossil fuels is scarce and expensive. Other options to improve labour productivity by making better use of locally available resources or to decrease energy needs must be explored.

Bhovara (1991) reported that a significant proportion of population kept off from traditional farming systems. The major constraints of non-adoption were identified as personal, socio-cultural and economic factors. According to Chittiraichelvan and Raman (1991), a large number of beliefs have scientific rationale in terms of modern science.

Reijntjes *et al.* (1992) studied that in situations where land is limited and population continues to grow, traditional ways of farming may no longer be tenable.

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

Being a new field of investigation very few research studies on indigenous knowledge have been identified. Among them those concentrated on relationship of characteristic of farmers with their knowledge and adoption is meagre. Hence studies on relationship of farmers' characteristics, as presented in Table 1, with strength of indigenous belief are also included.

2.8 Evaluative perception of indigenous practices

Tully (1968) stressed that a farmer does not become interested in any

Table 1. Relationship of personal, socio-economic and socio-psychological characteristics of farmers with indigenous knowledge

Author	Age	Education	Farming experience	Annual income	Area	Personal locality exposure	Fatalism-Scientism	Social participation	Progressiveness traditionalism	Extension orientation	Economic motivation	Innovativeness	Cosmopoliteness	Rational orientation	Risk	Response variable
Chakravorthy (1982)		+NS						+NS		+S	+S					Adoption of indigenous practices
Selvanayagam (1986)	-NS	+S	-NS			+NS	+NS		-NS	+NS	-NS	+NS	+NS		-NS	Degree of belief in indigenous practices
Deepa (1992)	+NS	-S	+NS			-NS	+S		-S	-NS		-NS	-S	-S	-NS	Degree of belief in indigenous knowledge
Kalaivani (1992)	+S	-S	+S			-S		-NS	-S	-S			-S			Degree of belief in indigenous knowledge
Nandini (1995)																
IRDT	-NS	+S	-NS	+NS	+NS	-NS		+NS				+NS				Knowledge on soil conservation measure
Govt.	-NS	+NS	+NS	+NS	+S	+NS		-NS				+NS				
IRDT	-NS	+NS	-NS	-NS	-NS	-S		+NS				-NS				Adoption of soil conservation measures
Govt.	+NS	+NS	+NS	+NS	+NS	-NS		+NS				+NS				

information as he does perceive it as relevant to his own farming situation, his sources and his goals. The farmers' perceptions will depend on his values, beliefs and attitudes. They are likely to differ from person and between farmers and extension workers.

According to Smith (1972) in the lower price ranges that prevail, the high yielding variety technology is less profitable than the low yielding traditional technology.

Biggs and Tinnermeir (1974) narrates his explanations as there is much to be learned from traditional resource management practices being utilised on small farms through out the developing world. Such systems are usually low fossil fuels users, absorb relatively large quantity of labour, are dispersed widely over a variety of social and physical environment and thus should be relatively easy to transfer across cultures.

Chakravarthy (1982) studied the extent of influence of the perceived attributes of indigenous farm practices on adoption. Ten attributes of indigenous knowledge as decided by the experts were considered for the study. It includes profitability, lower perceived risk, observability, feasibility, flexibility and market-ability. It was found that farm practices in general were perceived to be more culturally compatible, safe and physically compatible, simple and flexible.

In a survey conducted by Gupta (1987) involving 61 scientists in HAU, Hissar, CRIDA, Hyderabad, it was concluded that scientists perceive peasant farming practices as intriquing, sub-optimal and unscientific.

Chittiraichelvan and Raman (1991) stated that despite advances in dry farming research, the rainfed farmers depend more in traditional practices involving less cost, having ecological and farming system adaptability and providing more or less stable productivity under aberrant weather conditions to contain the risk.

Kumar (1994) reported that socio-economics affect the farmer perception towards indigenous knowledge. It was found that acceptance of innovation was dependent on cost-effectiveness in the case of big farmers and the compatibility with established procedures in the case of small farmers.

Sanghi (1991) reported that a number of traditional agricultural systems which basically rely on indigenous knowledge are considered for productivity, sustainability, stability and equitability.

Kalaivani (1992) reported that 25.83 per cent of the respondents believed in the application of cattle manure for first crop (paddy) and green manure for the second crop. This belief had a positive effect in adoption of green manuring.

According to Reijntjes (1992) indigenous knowledge are seen as a source of sound ideas locally adapted cultivars and practices which could lead to sustainable use of local resources.

In general, indigenous practices are perceived as simple, profitable, efficient, labour-intensive, flexible and sustainable. However the level of perception varies with farmers, extension personnel and scientists.

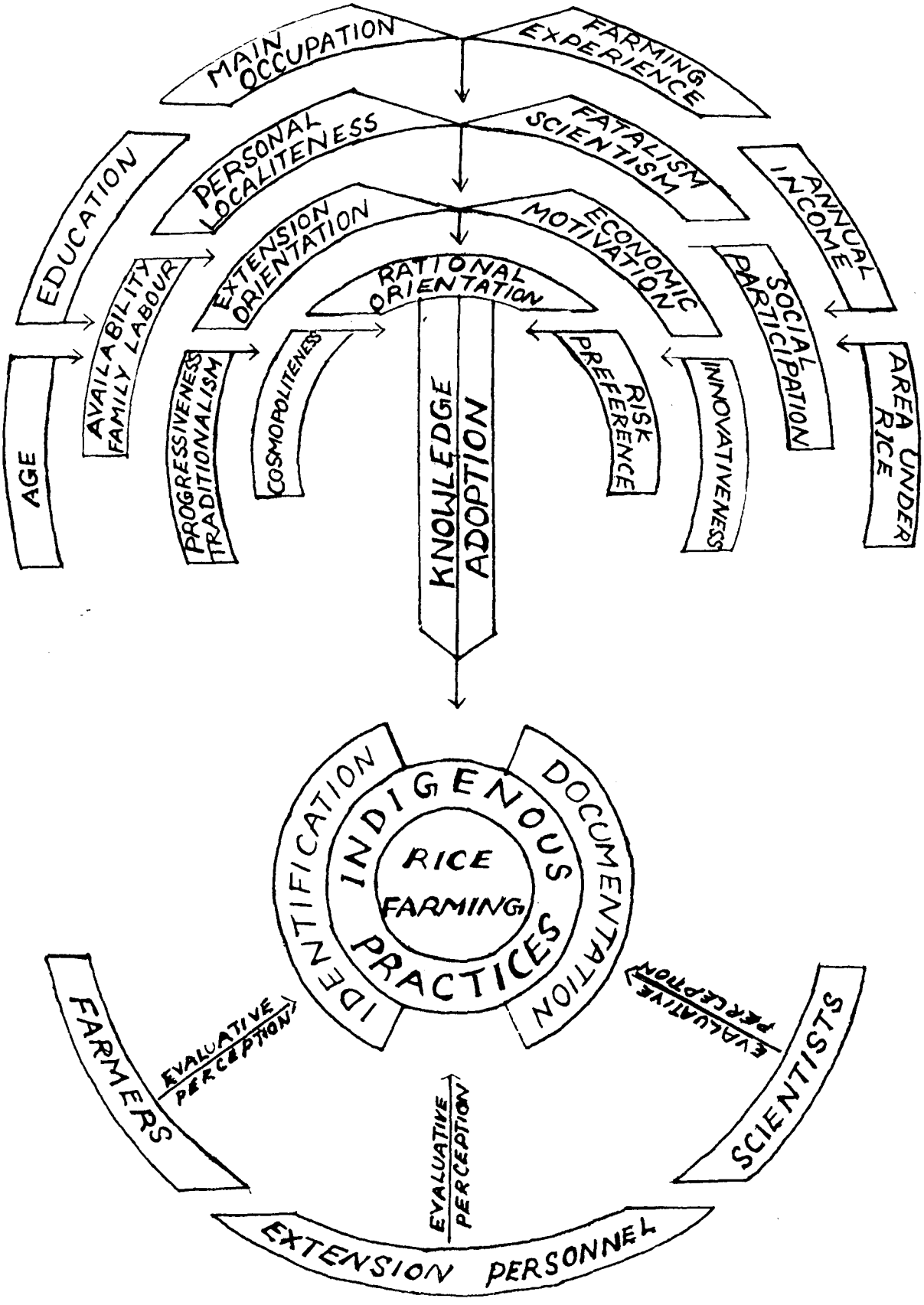
2.9 Conceptual frame work of the study

The main objective of the conceptual frame work being developed here is

to provide a comprehensive idea about the study. It is also expected to facilitate theoretical and empirical analysis about the same (Fig. 3).

It depicts the major objective of identification and documentation of indigenous practices in rice. It explains the wide spectrum of personal, socio-economic and socio-psychological characteristics (independent variables) that influence the knowledge and adoption of indigenous practices (dependent variable). This is shown with the help of an arrow, the arrow head pointing towards the dependent variable. Besides, the study on the role of rice farmers, extension personnel and scientists in evaluating the indigenous practices is also illustrated.

Fig.3. Conceptual frame work



Methodology

CHAPTER III

METHODOLOGY

Indigenous knowledge is not static. It can be seen as a dynamic and everchanging accumulation of collective experiences of generation which is not uniformly spread through out the community. If indigenous knowledge is to be brought into focus and popularised, systematic studies are essential. Methods of study on indigenous knowledge includes three activities (a) detecting indigenous methods as research topics, (b) identifying participants in the activity and (c) monitoring the process (Lightfoot, 1987).

This chapter deals with the procedures adopted in the identification and documentation of indigenous practices in rice cultivation, selection of sample population and to analyse and interpret the collected data. The set of methods described here contradicts the conventional methods of data collection and analysis. So this project is both a test of methods as well as search for facts.

The study was conducted in two phases - Phase I and Phase II. Phase I accomplished the major objective of identification and documentation of indigenous practices in rice cultivation. While phase II accomplished rest of the objectives i.e., (i) assessment of knowledge and the extent of adoption of selected indigenous practices by the farmers in relation to their personal, socio-economic and psychological characteristics and (ii) evaluative perception of selected indigenous practices by the farmers' extension personnel and rice scientists.

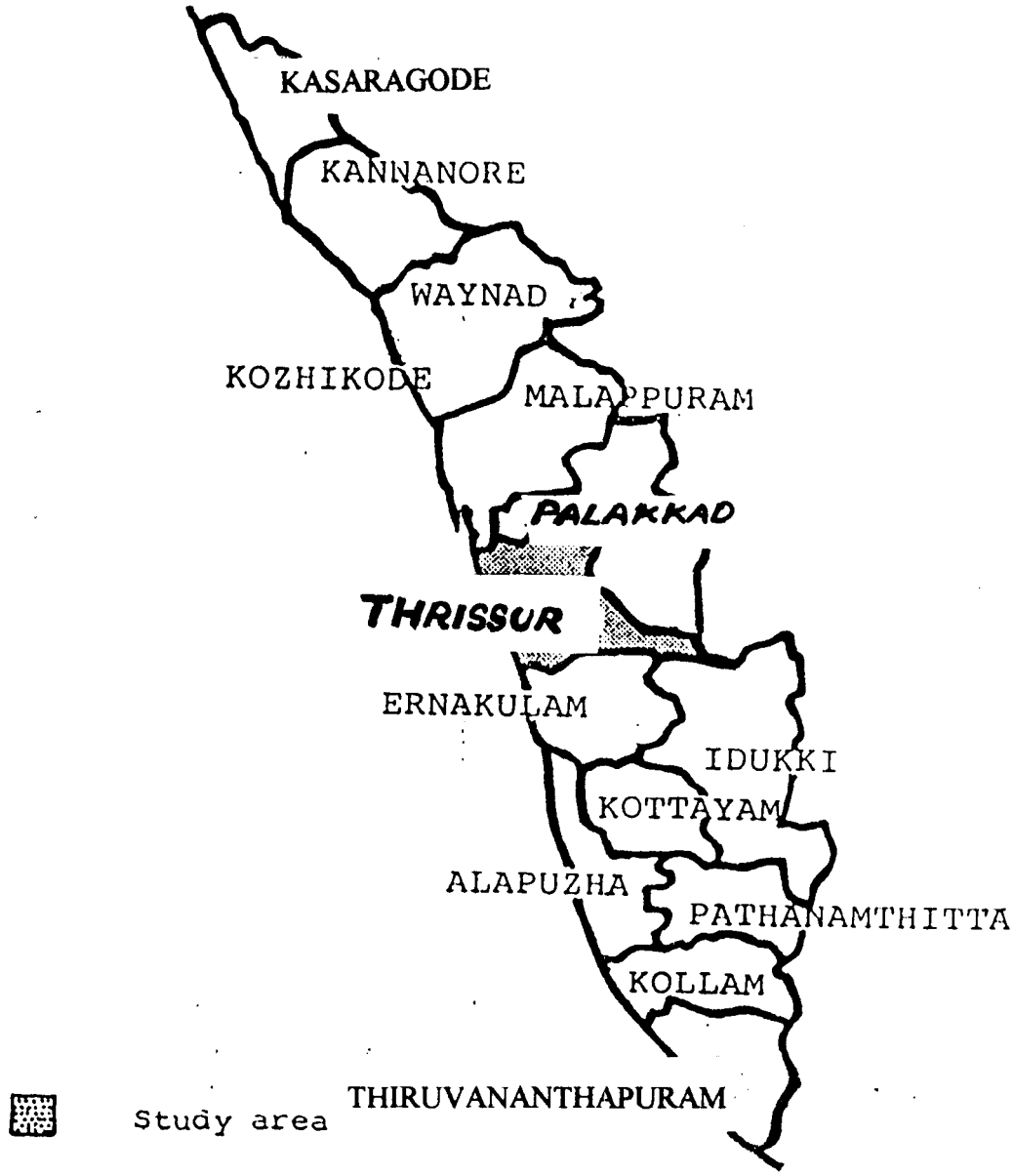
The methodology followed in the study is furnished under the following sub-heads.

3.1 Locale of the study

The study was conducted in all the three major sub-divisions of Thrissur district. Thrissur district (Fig. 4) was purposefully selected for the following reasons.

i) Rice is the major crop cultivated in Thrissur district since time immemorial

Fig.4. Map of Kerala showing the area of study



ii) Thrissur district with a gross cropped area of 67.15 thousand hectares under rice cultivation ranks second among the rice growing districts of the State.

iii) Next to Palakkad and Alappuzha, Thrissur district is the third largest producer of rice in the State.

iv) 22.3 per cent of the gross rice area in the district consists of kole lands. As far as Thrissur district is concerned kole lands with its peculiar cultivation techniques forms the rice granary of the tract (Johnkutty and Venugopal, 1993).

v) Last but not the least, being the first systematic study of this kind conducted in the State, it was convenient to select an area in the near vicinity of Kerala Agricultural University to get the benefits of its infrastructure and other resources.

3.2 Description of the area

The rice tracts of Thrissur district is divided into kole and non-kole lands. Non-kole lands are normal paddy fields. While kole lands are low lying lands located 0.5 m to 1 m below mean sea level. In a major portion of the area the land is flat and it remains submerged for about six months in an year. In the olden days, the kole lands were reclaimed from the kayal area by putting up temporary earthern bunds and cultivation of rice was done by farmers only in summer period from December to May (Punja crop). But now with the efforts of Government agencies like KLDC (Kerala Land Development Corporation) and irrigation department, an additional crop during mundakan season (September-December) is possible.

Kole land is the rice granary of the State. The gross rice area of kole lands in Thrissur district is estimated as 16606 ha which is 22.3 per cent of the gross area in the district. 'Kole' is a malayalam word - meaning bumper yield or high returns. When average productivity of the State is less than 2 t/ha, kole lands yield 4.5 t/ha (Johnkutty and Venugopal, 1993).

3.3 PHASE I

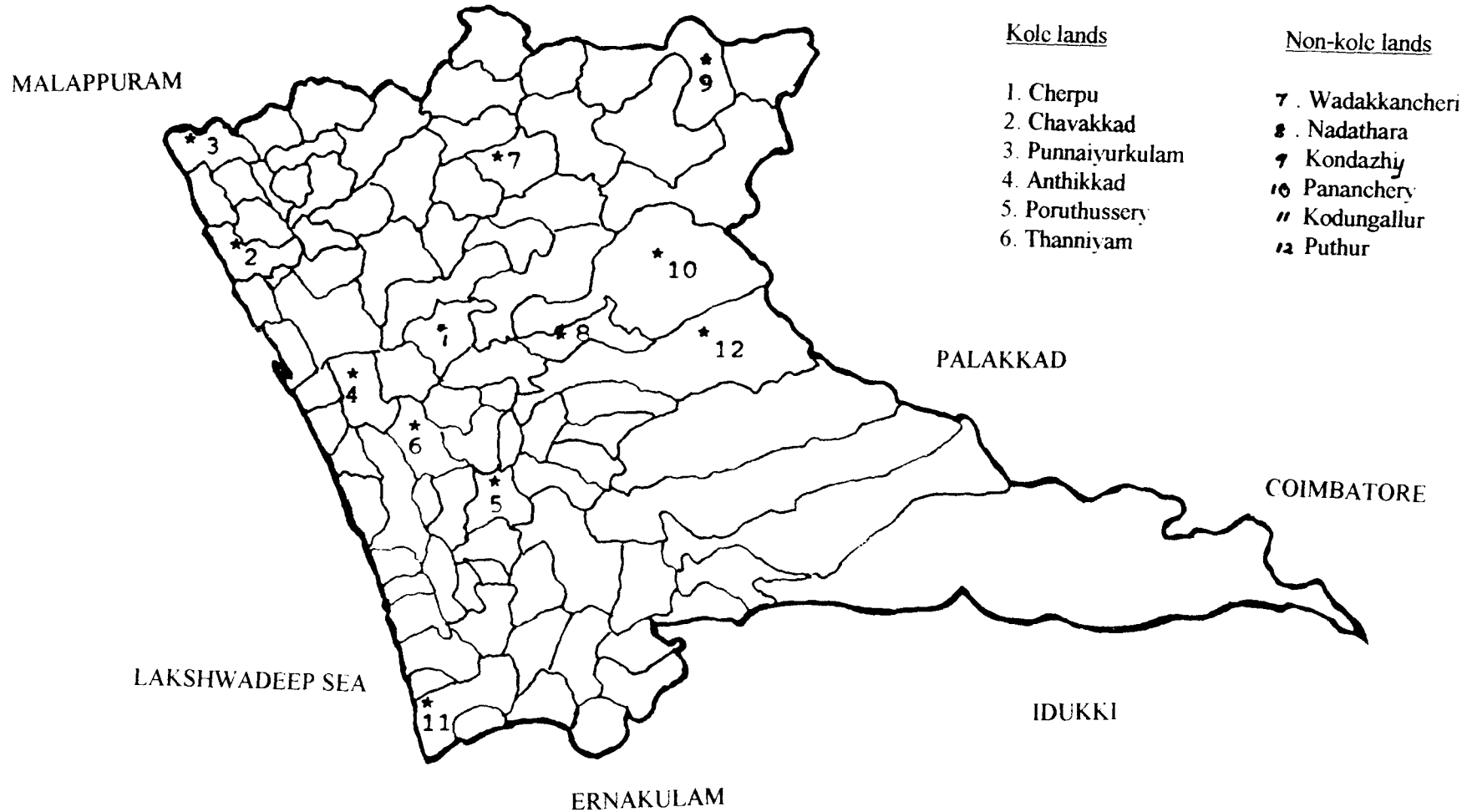
3.3.1 Selection of sample population

The sampling and sample population varied both in phase I and II. The initial investigation of identification of indigenous practice (Phase I) was more exploratory. From eighty nine panchayaths of Thrissur district, twelve panchayaths were selected using simple random sampling. Random selection of panchayaths were done both in kole and non-kole areas. Thus six panchayaths from kole areas and six from non-kole areas were selected, as presented in Table 2 and Fig. 5. From these representative pockets, all available indigenous practices followed by rice farmers were identified.

Table 2. List of panchayaths selected to implement Phase I of the study

Kole lands	Non-kole lands
1. Cherpu	1. Wadakkancheri
2. Chavakkad	2. Nadathara
3. Punnaiyurkulam	3. Kondazhy
4. Anthikkad	4. Panancheri
5. Poruthussery	5. Kodungallur
6. Thanniyam	6. Puthur

Fig.5. Map of Thrissur district showing the panchayaths selected for Phase I of the study



3.3.2 Identification of indigenous practices

Key informant interviewing was done in Phase I to identify the indigenous practices in rice farming. Key informants were selected with the help of agricultural officers of respective panchayaths, based on their personal and family experience in rice farming. It was assumed that farmers with long experience in rice farming will be better repositories of indigenous knowledge.

The task of interviewing was accomplished with a checklist of open ended questions on different farming practices in rice cultivation. Thus, their practices and preferences pertaining to the choice of seeds and sowing, nursery management, land preparation, manuring, irrigation, plant protection, weed management, soil fertility, harvesting and storage were identified.

3.3.3 Documentation of indigenous practices

Identification of indigenous practices was followed by its documentation. Documentation was done after a thorough analysis of these practices by the subject matter specialists. It involved agronomists, plant pathologists, entomologists and soil scientists. Understanding the rationality of the practice and abstraction of indigenous knowledge system as a whole depends much on research findings. However, owing to their limitation, subjective and objective analysis by the scientists was also considered to weigh the rationality of the practices.

Based on the discussion, the list of practices were documented by classifying them into rational and irrational practices. Rational indigenous practices that lacked adequate research backing were suggested for future research.

3.4 PHASE II

3.4.1 Selection of sample

In phase II one panchayath having maximum area under paddy cultivation was selected from each sub-division. Thus, Arimpur (Thrissur sub-division), Kondazy (Wadankkanchery sub-division) and Kuzhoor (Irinjalakuda sub-division) panchayaths were selected (Fig. 6).

Three wards from each panchayath were selected using simple random sampling (SRS) and using SRS from each ward fifteen farmers were selected. Thus in total 135 rice farmers were selected for the study, at the rate of 45 from each sub-division. Besides, 30 field extension personnel and agricultural assistants were selected at random for the evaluative perception of the identified indigenous practices. Similarly, for expert level judgement all available scientists in Thrissur district who have conducted research on rice were also included as the respondents for the study.

3.4.2 Selection of variables for the study

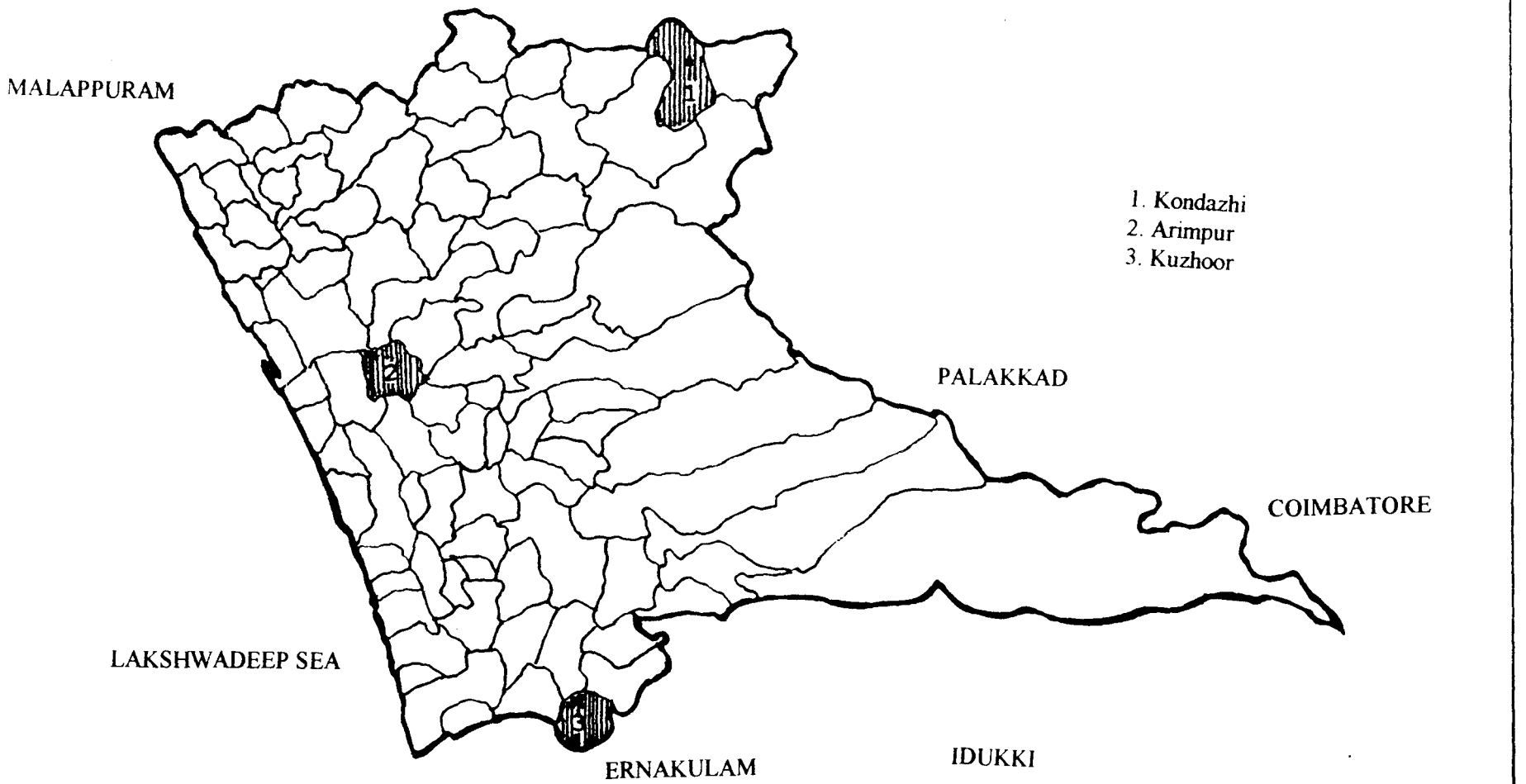
Based on the objectives, review of relevant literature, discussion with experts and personel interview with rice farmers (Phase I), the following variables were selected for the study.

A) Dependent variables

i) Knowledge of rice farmers in indigenous practices

ii) Extent of adoption of indigenous practices by rice farmers

Fig 6. Map of Thrissur district showing the panchayaths selected for Phase II of the study



B) Independent variables

X_1 Age

X_2 Education

X_3 Main occupation

X_4 Farming experience

X_5 Annual income

X_6 Area under rice cultivation

X_7 Availability of family labour

X_8 Personal localite exposure

X_9 Fatalism-scientism

X_{10} Social-participation

X_{11} Progressiveness-traditionalism

X_{12} Extension orientation

X_{13} Economic motivation

X_{14} Innovativeness

X_{15} Cosmopoliteness

X_{16} Rational orientation

X_{17} Risk preference

C) Evaluative perception of indigenous practices by farmers, extension personnel and rice scientists.

3.4.3 Construction of interview schedule and questionnaire

An interview schedule and questionnaire were prepared to aid the second phase of the study. The interview schedule (Appendix I) consisted of two sections.

The first section dealt with independent variables while the second section measured the knowledge and adoption (dependent variables) of the rice farmers as well as their evaluative perception about the identified indigenous practices. Knowledge, adoption and perception were measured using an arbitrarily prepared comprehensive measurement scale. Besides, a questionnaire (Appendix II) was also prepared to evaluate the perceptional levels of the indigenous practices by the Extension personnel and rice scientists.

To eliminate the effects of localisation, the variables - knowledge, adoption and perception were measured in terms of all the identified indigenous practices. Selection of practices for quantification of each variable was done only in the analysis stage.

3.4.4 Selection of practices for statistical analysis

Indigenous practices are site-specific. So only those practices devoid of the effects of localisation were selected for the statistical analysis of the variables. Selection of items were done using item analysis. Item analysis was done based on the following criteria.

a) It should not be a localised practice

b) It should differentiate the well informed farmer from poorly informed farmer

c) It should have certain difficulty index

All the practices documented in phase I were selected to carry out item analysis for developing a standardised knowledge, adoption and perception test.

Item analysis

For item analysis the knowledge score of respondents were considered. The total frequency of positive responses - awareness knowledge of indigenous practices were summed up. So maximum score possible for a respondent was equal to the number of identified indigenous practices and the minimum score zero.

Item analysis yields two kinds of information, item difficulty index and item descrimination index. Items are selected based on these two indices.

Item difficulty index

This measured the percentage of the respondents aware of a particular practice. It reveals how difficult and item is. Difficulty index was worked out by using the formula given

$$\text{Difficulty index of } i^{th} \text{ practice} = \frac{\text{Number of respondents aware of the } i^{th} \text{ practice}}{\text{Total number of respondents}}$$

As Coombs (1950) pointed out the difficulty of an item varied for different individuals. In the present study, the items with P value ranging from 0.25 to 0.75 were considered for the final test of variables.

Item discrimination index ($E^{1/3}$)

The use of this index was the next step in the process of selection of practices for the analysis. The index of discrimination indicates the extent to which an item descriminates the well informed from the poorly informed ones.

Scored obtained by 135 respondents were arranged in the descending order of total scores from the highest to the lowest and the respondents were divided into three equal groups arranged in descending order of total scores obtained by them. The three groups were G_1, G_2 and G_3 with 45 respondents in each group. The middle group namely G_2 was eliminated retaining only the terminal ones with high and low scores. The discrimination index for each question was worked out by using the formula given below

$$E^{1/3} = \frac{(S_1) - (S_3)}{N/3}$$

where S_1 and S_3 are the frequencies of correct answers in the group G_1 and G_3 respectively.

N = Total number of respondents in the sample

In this study, items with $E^{1/3}$ value above 0.4 were considered for final selection. However, this contradicted the studies of Lokhande (1973), Reddy (1976), Sadamate (1978) and Pillai (1983) who put these levels as 0.35 to 0.55, 0.17 to 0.79, 0.12 to 0.87 and 0.35 to 0.5 respectively.

The data pertaining to correct responses for all the items in respect of these two groups G_1 and G_3 were tabulated and the difficulty indices and discrimination indices calculated (Appendix-III). Based on the selection criteria, as mentioned above, 19 practices were selected (Appendix-IV) for analysis.

Fixing weightage for the practice

To fix weightage for the selected practices, schedule, as presented in Appendix-V was issued to the subject matter specialists for rating. It was suggested to be rated based on the effectiveness of each practice in serving the purpose. Rating was done on a 3 point continuum of very effective, less effective and least effective with scores of 3, 2 and 1 respectively.

Out of the 20 schedules issued, responses were obtained from 12 scientists. The weightages of each practice was calculated by finding the average value of the ratings obtained for each practice. The list of selected practices with their weightages are given in Appendix IV itself.

3.4.5 Operationalisation and measurement of variables

3.4.5.1 Operationalisation and measurement of dependent variables

The dependent variables for the present study were knowledge of rice farmers in indigenous practices (KRIP) and extent of adoption of selected indigenous practices by rice farmers (AIPR).

3.4.5.1.1 Knowlege of rice farmers in selected indigenous practices (KRIP)

Knowlege was operationalised as the quantum of indigenous knowlege possessed by rice farmers. Knowledge level in the study refers to the specific awareness of indigenous practices by the respondents in rice cultivation.

Knowledge was measured based on the awareness or unawareness of the indigenous practice by the farmers. Scores of 1 and 0 were assigned to each response respectively.

3.4.5.1.2 Adoption of selected indigenous practices by rice farmers (AIPR)

Rogers (1962) defined adoption process as the mental process an individual passes from first hearing about an innovation to its final adoption.

In this study, extent of adoption is operationally defined as the degree to which the rice farmers incorporate indigenous practices in the rice farming system.

Like knowledge, adoption was also measured in a dichotomous scale with scores of 1 and 0 for adoption and non-adoption of indigenous practices respectively.

Adoption index (AI)

Adoption index for individual respondent was calculated using the formula.

$$AI = \frac{1}{S} \times \frac{\sum_{i=1}^{K} W_i L_i P_i}{\sum_{i=1}^{N} W_i} \times 100$$

where

S = Number of sub-practices

N = Total number of practices under each sub-practices

K = Number of practices adopted by the farmers under each sub-practices

L_1 = Proportion of number of years of adoption of each practice

P_1 = Proportion of area under which each practices is been adopted

$\sum_{i=1}^{K} W_i$ = Total weightage of the K number of practices adopted

$\sum_{i=1}^{N} W_i$ = Total weightage of N number of practices under each sub-practice

3.4.5.2 Operationalisation and measurement of independent variables

1. Age

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

2. Education

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

Level of education	Scores
Illiterate	0
Primary	1
Secondary	2
Collegeate	3

3. Main occupation

It was operationalised as the vocation from which the farmer derives major part of his income.

The type of vocation and scoring process is as follows:

Agriculture as main occupation	3
Agriculture as secondary occupation	1

4. Farming experience of the respondent

It was operationalised as the total number of years since a farmer is engaged in rice cultivation.

5. Annual income

Annual income was operationally defined as the total earning of the rice farmer and the members of the family in an year from the farm and also other resources (in rupees).

6. Area under rice (in acres)

Area under rice cultivation is defined in terms of the area of wetland owned and cultivated by a farmer. To calculate the net wetland area under rice cultivation, the total wetland area is multiplied by the number of crops undertaken per year.

7. Availability of family labour

This variable was operationalised by taking into account the number of members in the family of the respondent who are utilized for rice cultivation by the farmer.

8. Personal-localite exposure

It was operationalised as the degree of interaction which a farmer had with the localites such as family members, friends, neighbours, relatives, local leaders and progressive farmers for getting the farm information. It was measured by assessing the frequency of contact and the scoring procedure followed by Chandrakandan (1982) was adopted.

Frequency of contact	Score
Within an interval of more than one month	1
Monthly once	2
Fortnightly once	3
Weekly once	4
Weekly more than once	5

The sum of the scores was taken as personal localaite exposure score of an individual respondent.

9. Fatalism and scientism

This was operationalised as a belief held by a farmer that human situations and acts are predetermined by some supernatural power and can never be little influenced by individual volition or by acts of any one else and scientism is a belief held by farmer that human situation and acts are the results of natural and/or social forces which can be understood and changed by volition or human effort. The scale developed by Sinha (1963) was used for this study.

The scale consisted of 3 statements and the respondents were asked to state their agreement on 3 point continuum. The scores for the respsonses of each statement in terms of agree, undecided, disagree were 3, 2 and 1 respectively.

10. Social participation

Was operationally defined as the degree of the involvement of the respondent in formal and informal social organisations either as a member or office bearer and the regularity in attending the meetings and activities. The scale used by Kamaruddin (1981) was used in this study. The scoring pattern was as follows:

Membership		Participation in meetings or activities	
No membership	0	Always	2
Member	1	Sometimes	1
Office bearer	2	Never	0

The membership scores were multiplied by participation scores for each organisation and added together to get the social participation score.

11. Progressiveness-traditionalism

Refers to the relative receptivity of a farmer towards modern values and practices (Sinha, 1963).

The scale consisted of 3 statements and the respondent were asked to state their agreement on 3 point continuum. The scores for the response of each statement in terms of agree, undecided and disagreement were 3, 2 and 1 respectively.

12. Extension orientation

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

Bhaskaran (1979) measured extension orientation taking into account both extension contact and extension participation and the scoring pattern developed by him was adopted. Here the response for contact of a farmer with different extension personnel were measured as follows.

Response	Score
Often	2
Frequently	1
Never	0

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

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

Response	Score
Whenever conducted	2
Sometimes	1
Never	0

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

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

13. Economic motivation

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

This was measured using Supe's scale (1969) with modification in the scoring procedure. Instead of a 5 point continuum of response as developed by Supe, a dichotomy of Yes or No response pattern was used as done by Prasad (1983). The scale consisted of 6 statements of which 6 statements were positive, while the last one was negative. A score of one was assigned for the 'Yes' response and 'Zero' score for the No response in the case of positive statement. The scoring pattern was reversed in the case of negative response. The score obtained on each statement were commutated to obtain the total score of a respondent on this variable. The maximum score that could be obtained by a respondent was six and minimum zero.

14. Innovativeness

This is operationalised as the degree to which the respondent was relatively earlier in adopting new ideas.

The procedure followed by Singh and Choudhary (1977) and adopted by Selvanayagan (1986) was used to measure the innovativeness of a farmer. In this procedure a question was asked as to when the farmer would like to adopt an improved practice in farming.

The responses were scored as follows:

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

15. Cosmopoliteness

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

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

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

b) The purpose of visit to the town in a month

The scoring pattern was as follows:

a) Frequency of visits to the nearest town

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

b) Purpose of visit to the town

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

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

16. Rational orientation

This was operationalised as the level of belief of a farmer in scientific recommendation. The question for response and scoring procedure developed by Jetley (1972) was used here.

Question: What do you feel about the increased yield in crops?

The increased yield may be due to	Score
a) Belief in stars and not in scientific recommendation	1
b) Belief in stars and scientific recommendation	2
c) Belief only in scientific recommendation	3

17. Risk preference

This is operationally defined as the positive or negative effects, feelings or effects towards risk held by a farmer towards farming in general. In general, the scale developed by Supe (1969) was used to measure risk preference of the respondents. The scale consisted of 6 statements of which 2 are negative statements. The responses were collected on a 5 point continuum and the scoring pattern for positive statement was as follows:

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

The scales obtained on each statement were cumulated to obtain total score of a respondent on this variable.

3.4.6 Operationalisation and measurement of evaluative perception of indigenous practices by farmers, extension personnel and rice scientists

Perception was operationally defined as the meaningful understanding and interpretation made by the respondent category about the various indigenous practices.

Perception was measured using the comprehensive scale. It was measured in terms of six attributes - simplicity, flexibility, efficiency, input availability, profitability and sustainability - by the farmers (135), extension personnel and all available rice scientists separately. These attributes of indigenous practices were selected based on review of literature and discussion with experts.

The responses to these attributes were measured in a dichotomous scale, where a score of 1 was given to high applicability of the attribute and a score of 0 for the low applicability of the attribute. Cochran's Q test was used to compare and contrast the levels of perception by the respondent categories.

Operational definition of attributes of indigenous practices

1. Simplicity

is the degree to which an indigenous practice is simple to be adopted by the farmers in terms of understanding as well as application.

2. Profitability

refers to the financial returns to a farmer as a result of adoption of indigenous practices.

3. Efficiency

is the degree to which an indigenous practice can yield maximum output per unit of input.

4. Sustainability

is the degree to which an indigenous practice is environmentally, socially and economically feasible and is capable of maintaining or enhancing the quality of natural resources.

5. Input availability

is the degree to which the labour and material inputs for carrying out the practice are easily available in time.

6. Flexibility

is the degree to which an indigenous practice is applicable to different farming conditions without posing any problem either to the environment or to the farmer.

3.4.6 Statistical analysis

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

Frequency table

The sample was classified into 10 different classes with respect to the dependent variables and later arithmatic mean, median and quartiles were worked out.

Correlation analysis

Correlation coefficient is a measure of the association between two or more variables. Correlation coefficient was worked out to measure the degree of association of knowledge and adoption with the different independent variables. Inter correlation analysis was also done to find out the extent of association between the various pairs of independent variables.

Mean

The respondents were grouped into categories with reference to the means of the independent variables. After grouping the respondents into two categories, the frequency of rice farmers falling under each category and their percentage were worked out.

Step down regression analysis

Step down regression analysis was carried out

(i) to find the independent variables contributing to maximum variability in knowledge and adoption

(ii) to trace the important components responsible for contributing maximum variability in the dependent variables.

Multiple linear regression analysis

Multiple linear regression analysis ~~analysis~~ was done

(i) to find out the relative contribution of each of the significant personal, socio-economic and socio-psychological variables on the knowledge and adoption of indigenous practices.

Multiple path coefficient analysis

Path analysis was originally developed by Wright (1921) and followed by Li (1955) and Singh and Chowdhary (1974) was used to know the nature of influence with direct or indirect effect of the personal, socio-economic and socio-psychological characteristics on the dependent variable.

Cochran Q test

Cochran Q test for K related samples provides a method for testing whyether three/more matched sets of frequencies or proportions differ significantly among themselves.

CHAPTER IV

RESULTS AND DISCUSSION

The chapter deals with the results obtained in this study and the discussion based on the results, keeping the objectives in view. The findings as well as the discussion on them are presented in the following sequence.

4.1 Identification and documentation of indigenous practices in rice farming

4.2 Distribution of rice farmers based on their knowledge of selected indigenous practices

4.3 Awareness knowledge per cent of selected indigenous practices by the farmers

4.4 Distribution of rice farmers based on the adoption of selected indigenous practices in rice farming

4.5 Adoption percentage of selected indigenous practices by the farmers

4.6 Distribution of the rice farmers based on their personal, socio-economic and socio-psychological characteristics

4.7 Influence of personal, socio-economic and socio-psychological characteristics of the rice farmers on their knowledge of indigenous practices

4.8 Influence of personal, socio-economic and socio-psychological characteristics on the adoption of indigenous practices by the rice farmers

4.9 Evaluative perception of indigenous practices by rice farmers, extension personnel and rice researchers

4.1 Identification and documentation of indigenous practices

In the phase I of the study indigenous practices followed and beliefs held by the rice farmers of Thrissur district were identified. The indigenous practices were not uniformly spread over the entire area. It is highly localised. Localisation is the effect of many factors, based on which it can be classified as

A) Physiographic localisation

B) Geographical localisation

C) Social localisation

Physiographic localisation is the effect of physiographic factors. It is related to land terrain which results in the demarcation of paddy fields of Thrissur into '*kole*' and '*non-kole*' lands. For example summer ploughing is an important operation in the rice fallows of '*non-kole*' lands while, though beneficial, it is impossible to practice in '*kole*' lands as it is the time for the only crop - The '*kole punja*'. Any how, summer ploughing in '*non-kole*' areas and submergence of '*kole*' areas affect the relative importance of pests and diseases and the practices aimed at their management.

Geographical localisation is the effect of geographical isolation of two places wherein a common practice in a locality is quite uncommon elsewhere. For example the earthern pot rodent tray deviced and used by a farmer on Chavakkad need not be the known to a farmers of distant place.

Social localisation is the impact of various factors like religious, caste, experience of farmers, economic status etc. For example '*Iruvathettam uchaal*' is a belief exclusively practiced by Hindu '*Nair*' families of Thrissur district. The

principle and procedure of this belief is less familiar to farmers belonging to other castes and religions.

The indigenous practices and associated beliefs that were identified were documented for better understanding and access. The documentation was done under three major sections.

A) MANAGEMENT PRACTICES

B) PLANT PROTECTION PRACTICES

C) BELIEFS AND PROVERBS

Each practice identified under these major sections are described along with its scientific rationale. The rationality or irrationality of the practice was based on previous scientific reports, relevant literature and discussion with experts. The final comment of scientists, abbreviated as 'SC' was also stated.

A) MANAGEMENT PRACTICES

1. Weather and climate

1. '*Njattuvela krishi*'

The term '*njattuvela*' is the combination of two Malayalam words '*Njar*' (seedling) and '*vela*' (work). So '*njattuvela*' means works related to agriculture. Thirteen and a half days constitutes one '*njattuvela*'. So climatologically an agricultural year in Kerala begins on April 14th or 15th of one year and ends on April 13th or 14th of next year, covering 27 '*njattuvelas*'. For convenience there are 27 '*njattuvelas*' in sequence and are named after the stars from '*Ashwathy*' to '*Revathy*' (Refer to Fig.7 for equivalent Christian and Malayalam calendars).

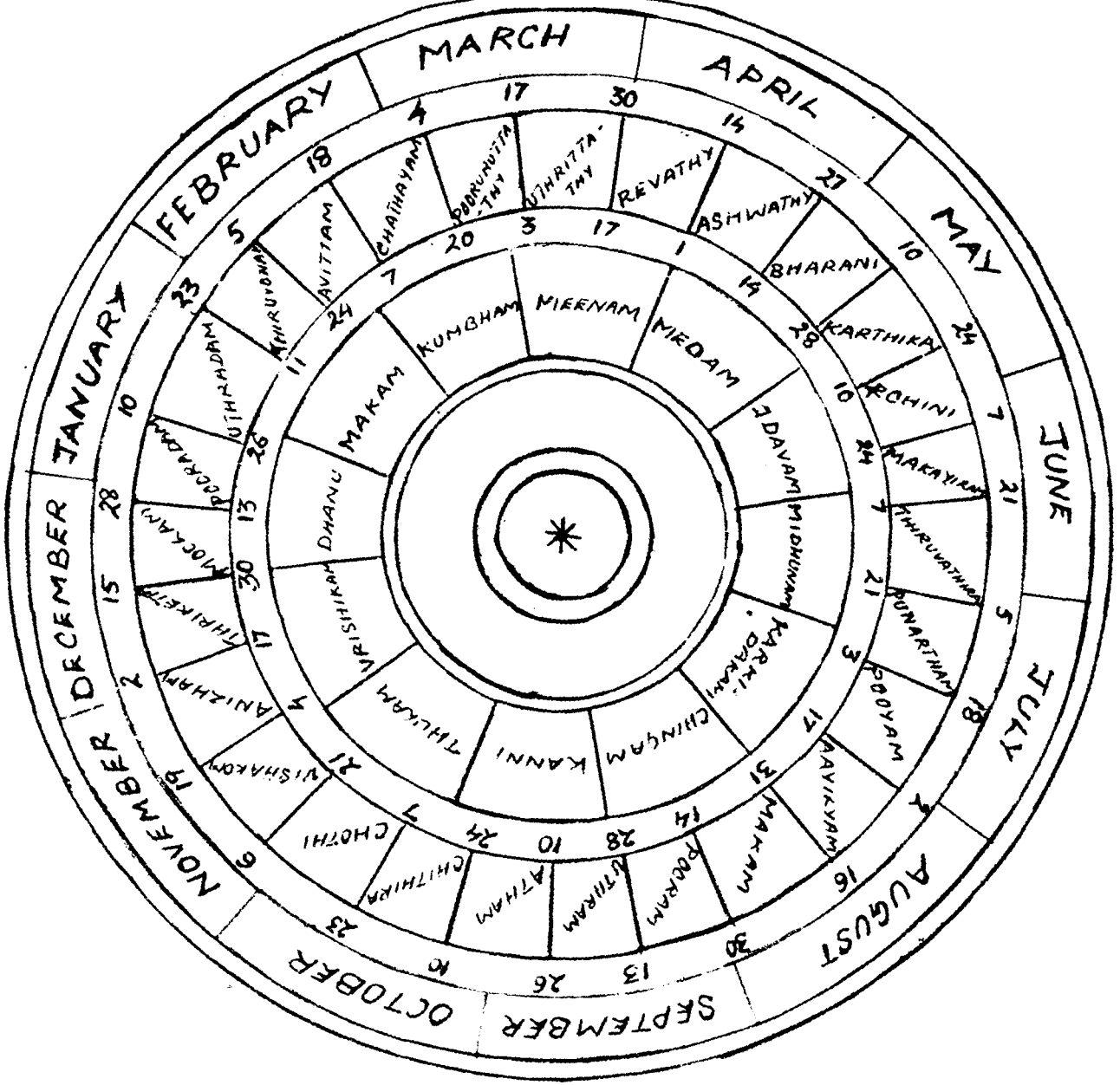


Fig.7. *'Njattuvela' calendar*

Source: Prof. V.P.S. Dev
R.A.R.S., Pattambi

'*Njattuvela*' is more associated with rice cultivation ('*Krishi*'). Hence the usage, '*Njattuvela krishi*'. Besides rice cultivation, all other farming is related with '*njattuvela*'. According to farmers, the commencement, intensification and end of monsoons takes place in specific '*njattuvelas*'. So farming operations are done based on '*njattuvelas*'.

Oral traditions have played a great role in inheriting the climatological knowledge over generations. Farmers were found to be very effective in communication when local names - '*njattuvelas*' were used. But unfortunately extension methods fail to sensitise with respect to local names. Such approach does not confirm to the principle of starting with what the receiver knows. So successful approach must take care of diversity to make communication effective.

SC : Rational practice

II. Seed and Seed Treatment

2. **'*Njavara*' rice variety**

'*Njavara*' is a traditional rice variety valued for its economic use in indigenous medicine. '*Njavara kizhi*' is considered as an effective treatment for chronic rheumatic diseases. '*Njavara*' grain fetches 6 to 7 fold price when compared with ordinary grains.

Medicinal value of '*Njavara*' is proved. Presently a research study is being conducted in Kerala Agricultural University to elucidate the unique growth, development and quality characteristics as well of '*Njavara*' rice. The study also

intends to analyse the active ingredient responsible for the bio-chemical superiority of '*Njavara*' variety over other land races of rice.

SC: Rational practice

3. Traditional medium duration variety for '*mundakan*' crop

Majority of farmers cultivate traditional variety for '*mundakan*' crop. Among them '*Chitteni*' is widely used. The reasons for this large scale adoption, as the farmer claims, is as follows.

i) Resistance to common pests and diseases
ii) Its capacity to resist possible floods during early '*mundakan*' is high
iii) Grains are tastier than that of high yielding varieties
iv) Average management practices reduces the cost of cultivation
v) Straw yield is high for medium duration tall traditional varieties

Only 8 per cent of '*mundakan*' rice area in Kerala is under high yielding varieties (HYV). Rest of the area is still under traditional cultivars. The reasons for this large scale adoption is as follows.

1) The straw content of traditional variety is more and hence the total dry matter is not considerably less than HYV. Morever straw being a fodder, it fetches a good price in the market. So the net income will be more or less same for both traditional and HYV.

2) The fertilizer requirement of traditional variety is low. The traditional varieties are resistant to pest and diseases. So the management cost being less, the benefit-cost ratio will be high.

3) Traditional varieties are resistant to iron toxicity. Hence Kerala soils which are predominantly laterite (high iron toxicity) is more adaptable to traditional varieties.

4) Under undesirable climatic conditions HYV (photo insensitive) delays flowering and maturation. Water stress at this later stages of crop maturity can cause severe crop damage. While flowering and maturation is never delayed in photo sensitive season bound traditional varieties and hence it evades the possible water stress in the later periods.

5) Morever season crop report too states that yield of second crop is less than first crop. Hence cultivation of HYV susceptible to pest and diseases is more unjustifiable.

SC: Rational practice

4. '*Mampookanikkal*' (or) '*Manjukollikkal*'

It is a seed drying technique where the seeds are exposed to three dews (nights) and three days successively. In case of some traditional varieties which are cultivated only once in an year ('*anduvithu*'), the seeds are renewed by this process. It is usually done in the month of April. While in high yielding varieties with low seed life '*mampookanikkal*' is done just before storage.

After '*mampookanikkal*' when the seeds are broken across, a white spot is seen at the centre. This is the shrunken embryo. According to farmers, this is the indication of complete drying.

As reported by Girija *et al.* (1993) the seeds of long duration varieties are subjected to mid season moisture treatment to increase its viability. Imbibition of water (dew) and consequent drying activates the metabolic processes of the old seeds and renews them.

SC: Rational practice

5. Old seeds soaked for 24 hours (longer duration) while new seeds are soaked for 12 hours (shorter duration)

The duration of seed soaking depends on the newness of the seeds. The old seeds are soaked for 24 hours while new seeds are soaked for 12 hours only.

Water is the most important requirement for germination. In course of time, moisture content of seed reduces. So the moisture requirement of old seeds is high and takes much time to absorb water. This fact is supported by the experimental report of Omana (1995) which states that cooking of old rice is time consuming than new rice, whose water requirement is low. Hence old seeds are soaked for a longer duration than new seeds.

SC: Rational practice

6. Soaking seeds by immersing seed sacs in flooded field waters

This is a seed soaking technique practiced in kole areas. Here seed sacs are left immersed in the flooded fields for two days and later cornered for germination.

This soaking technique is only a variation depending on necessity. Since majority of kole farmers own large holdings under rice cultivation the quantity of seed required will also be large and hence inconvenient to soak them separately in different containers. Moreover, kole fields are generally far away from the farmers' residence. So transportation of germinated seeds to the field is another inconvenience.

Therefore, this is a practice invariably demanded by necessity.

SC: Site specific rational practice

7. Seed treatment with cowdung

As a prophylatic measure farmers soak seeds in cowdung water.

Seeds absorb the available potassium and nitrogen from the cowdung solution. The decomposed cowdung water hence acts as a booster dose for the seeds.

SC: Rational practice

8. Placing soaked seeds in bamboo baskets lined with koova, banana and teak leaves

Farmers place the soaked seeds in bamboo baskets lined with koova, teak or banana leaves (Plate 1). After fillint the seeds (Plate 2), they are covered intact using '*mundakan*' straw and weighed over (Plate 3 and Plate 4) to germinate. According to farmers, teak, koova and '*mundakan*' straw in an intact atmosphere generate neat and hustens the germination process.

The rate of all bio-chemical reactions increases with increase in temperature. The heat produced as a result of compaction hastens the germination process. Moreover, the effectiveness of teak, koova, banana and karingotta leaves in

Plate 1 to 4. Soaking seeds in bamboo basket lined with teak leaves

Plate 1.

Plate 2.

Plate 3.

Plate 4.

germination of seeds and its storage has been reported by Pinhero and George (1989). According to the study, koova leaves were found very effective in storing the pregerminated seeds.

SC: Rational practice

III. Sowing and Nursery Management

9. *Virippu* sowing in '*Aswathy*' or '*Bharani*' '*njattuvela*'

In '*Virippu*', seeds must be sown in '*Aswathy*' or '*Bharani*' '*njattuvela*'.

In '*Virippu*', seeds should be sown in '*Aswathy*' (April 14-27) or '*Bharani*' (April 27-May 10) '*njattuvela*' for the following seasons.

1) Attack of gall fly in intense when the water level recedes in July. A crop sown in '*Aswathy*' or '*Bharani*' '*njattuvela*' gets hardened by this time and resists the attack of gall fly while late sown tender crop cannot stand the attack. The Package of Practices (1993) too recommends early sowing of '*virippu*' crop as a cultural control measure against gall fly.

2 Late sowing of '*virippu*' (I crop) will delay the commencement of '*mundakan*' (II crop) and '*punja*' (III crop). So for timely crop sequence the first crop has to be raised at the correct time.

SC: Rational practice

10. '*Mundakan*' sowing in '*Aayilyam njattuvela*'

For higher production, transplanting of '*mundakan*' crop must be done before August 16th in '*Aayilyam njattuvela*'.

Medium duration varieties are generally cultivated in '*mundakan*'. Sowing/transplanting should be commenced in '*Aayilyam njattuvela*' (August 2nd to August 16th).

Alexander *et al.* (1991) identified the maladies affecting the rice crop grown during '*mundakan*' season it was revealed that improper integration of weather brought about by the untimely commencement is the main factor responsible for the low yield. Commencement of the crop so as to coincide its post flowering phase with the weather situations as available during mid December to early February period shall boost up the yield by 1000 kg/ha on the average from the current level.

SC: Rational practice

11. '*Punja*' sowing in '*Pooradam njattuvela*'

'*Pooradam njattuvela*' is the best time for '*punja*' sowing.

'*Pooradam njattuvela*' extends from December 28th to January 10th. This is the correct time to sow the '*punja*' crop. This belief of the farmers corresponds with the scientific recommendation of crop sowing. Sowing of '*punja*' must be done before January 10th for the following reasons.

i) Late '*punja*' crop may leave no time for land preparation to raise the first crop - *Virippu*.

ii) In kole areas where '*punja*' crop is raised after dewatering flooded fields a late '*punja*' crop may face severe crop damage in final stages due to the possible heavy rains in April or May.

SC: Rational practice

12. Sowing or harvesting (for seed purpose) is not done on '*makara muka*'

The last three and a half days of '*danu masam*' and the first three and a half days of '*makara masam*' together constitute the '*makara muka*'. There are chances for acid rains (the first rain of the year after a long dry spell) in '*makara muka*'. The seeds sown or harvested (for seed purpose) at this time loses viability and fail to germinate.

This can be a soil borne effect. Drizzles received after a long dry spell dissolves the acids in soil thus increasing the soil acidity. The viability of seeds may be affected as a result of acid rains too. Acid rains are formed by dissolution of nitrous oxide from atmosphere with rain water. However, heavy rains can evade both these possibilities.

So far there are no meteorological reports on the occurence of acid rains during this period. But being adopted by 33.3 per cent of farmers it urges further investigation.

SC: Needs meteorological investigation on the occurrence of acid rains in the month of January ('*Dhanu-Makaram*' month).

13. '*Moonnam vithu ilackal*' in dry sown '*virippu*' field

It is a technique of uniform covering of the seeds in dry sown '*virippu*'. It is done by giving a shallow ploughing in the dry sown paddy fields.

Usually seeds are broadcasted in '*virippu*' season. So ploughing is the only alternative to cover the seeds and uniformly spread them. Seed covering is very essential as it protects them from direct sunlight and prevents both seed drying and drying of emerging seedlings. More over the loosened soil even gives a dust mulch effect.

SC: Rational practices

III. Mainfield preparation and transplanting

14. Cultivation of legumes in summer fallows

Farmers cultivate leguminous crops like cowpea in the summer fallows. After harvesting, the crop stubbles are incorporated into the soil. The farmers opine that the residual effect of summer crop on '*virippu*' is beneficial.

Cultivation of legumes in summer fallow is a beneficial practice as

1) it utilizes the residual moisture to form organic matter.
2) It acts as a crop cover and prevents reduction of soil carbon.
3) It helps nitrogen fixation
4) It increases soil depth thereby reducing iron toxicity.

15. Burning previous crop stubbles

Before '*virippu*' in non-kole areas, the farmer burns the fields using kerosene. This serves two purposes according the farmer (1) field sanitation and (2) improving soil fertility.

Burning previous crop stubbles is a rational practice as (a) it increases soil K and (b) destroys the resting stages of many insects and pathogens.

SC: Rational practice

16. Summer ploughing

Summer ploughing is an inevitable practice in the summer fallows. It pulvarises the soil and make it weed free. It starts with the harvest of '*mundakan*' crop, when the whole field is given a deep ploughing. Later on ploughing is done once in a month until '*virippu*'. In the olden days as one farmer said - a minimum of seven ploughings were given to summer fallows. But now the number has reduced owing to the non-availability of labour.

Summer ploughing is a highly beneficial and recommended practice is summer fallows because of the following reasons.

a) Hardening of laterite soil is the result of moisture reduction. Deep ploughing gives the effect of soil mulching and helps in soil moisture conservation.
b) Weed growth is the major problem in '*virippu*' fields, this can be eliminated by deep and frequent summer ploughing.

c) Resting stages of insects and pathogens gets destroyed when exposed to sunlight.

d) It pulverises the soil and increases the soil depth.

SC: Rational practice

17. Organic manuring with thick leaves of mango, jack, cashew etc.

Organic manuring with cowdung, ash and green manure is a proven traditional practice still followed by farmers.

Green manuring with thick leaves like that of mango, jack, cashew etc. are more preferred, since its residual effect lasts longer. Moreover, the farmers believe that the stain in mango leaves reduces root diseases and soil acidity.

Marykutty (1992) reported that continuous and excessive use of fast releasing sources like ammonium sulfate, glyricidia leaves etc. will not be beneficial in the long run. The negative effect of tender tissues can be overcome by the use of lignified thick leaves like mango, cashew, teak etc. The lignified tissues are slow decomposing and its residual effect lasts for a longer time. However, no studies on the prophylactic action of mango stain (against root diseases) and its buffer action (in acidic soil) have been reported.

SC: Rational practice

18. Incorporation of cashewnut shells during main field prepartion

According to a farmer, application of cashewnut shell at the rate of 60 kg/ha can eliminate the use of lime and plant protection chemicals in the field.

Cashewnut shell liquid (CNSL) contains a mixture of alcohols and phenols. It is highly corrosive. However, no reports have been published on its liming capacity or phophyllactic action.

SC: Needs further research

19. '*Kundakoottal*'

'*Kundakoottal*' is a seedling treatment practice before transplanting. It is usually done with traditional rice varieties, but some farmers do it with high yielding rice varieties also. This is usually practiced in '*virippu*' and '*mundakan*' season.

Here, the seedling bundles are arranged one above the other in a circle forming pyramid shaped seedling hill (Plate 5). The bundles are placed with their roots facing out side. It is left so for 2 days before transplanting.

The heat generated in the hill controls the pest and diseases. Morever, the yellowing of leaves and degeneration of roots results in physiological changes after transplanting.

As a result of high relative humidity '*virippu*' crop is susceptible to pest and diseases. The high temperature in the seedling hill inactivates the larval stages of insect pests. However, the physiological changes as a result of yellowing and degeneration of roots has to be analysed. Yet it is assumed that increased temperature activates all the tiller buds and hence avoids staggered tillering.

SC: Area of further research

Plate 5. '*Kundakoottal*'

20. Removal of seedling tips

The farmers clip off the seedling tips before transplanting. This they say, is to prevent lodging at early stages (tall, medium duration varieties) and to stimulate vigorous growth of seedlings.

Removal of seedling tips is a common practice. It acts also as a mechanical pest control practice against rice stem borer which lays eggs in the leaf tips. So removal of leaf tips disposes the egg masses of the borer.

SC: Rational practice

21. Transplanting opposite to wind direction

In order to resist strong winds the seedlings are transplanted opposite to wind direction.

This is practised to avoid lodging of seedlings.

SC: Rational practice

22. Construction of bunds using coconut petioles and banana sheaths

Kole farmers construct strong bunds using coconut petioles and banana sheaths.

Construction of strong bunds is an inevitable practice in kole lands. This is to combat sudden and frequent floods which can lead to severe crop damage.

SC: Rational practice

IV. Crop Irrigation

IRRIGATION DEVICES

23. Swing baskets

24. Counterpoise bucket lift

25. Self-emptying type rope and bucket lift

26. '*Chakram*'

27. '*Petti*' and '*para*'

Several types of indigenous water lefts are in vogue in Kerala. They may be manually operated or animal operated.

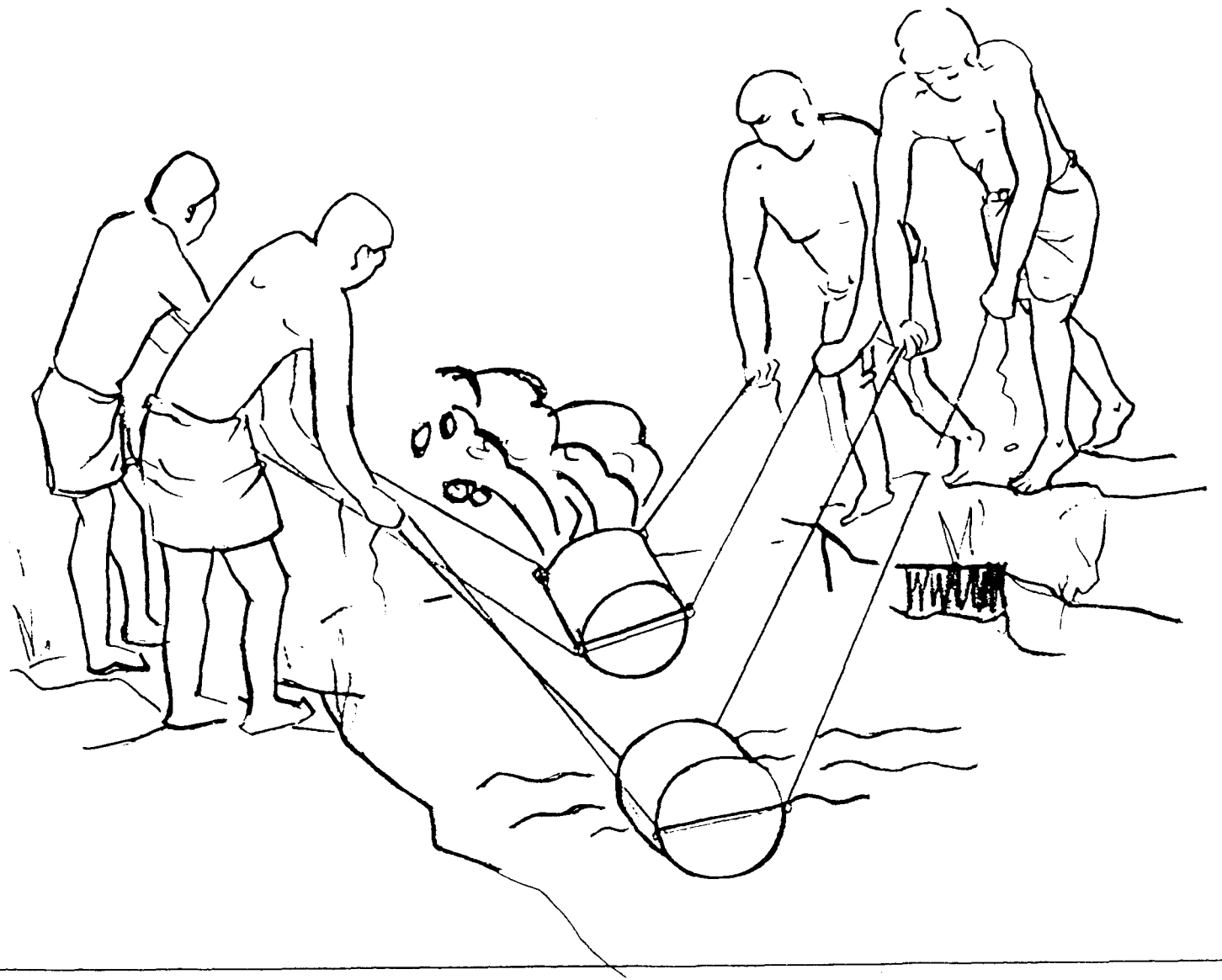
Swing basket is the most ancient water lifts. It consists of a basket or shovel like scoop to which four ropes are attached (Fig. 8).

Counterpoise bucket lift (Fig. 9) consists of a long wooden pole which is pivoted as a lever or on a post. A weight is fixed to the shorter end of the pole which serves as a counterpoise for the bucket suspended to the long arm of the liver.

The self emptying type rope and bucket lift is suitable for operation with a pair of bullocks. It consists of a metal or leather bucket and a rope which passes over a pulley (Fig.10).

'*Chakram*' (Fig.11) consists of small paddle mounted radially on an horizontal shaft. It is manually operated. The paddle when rotated pushes the water pushes the water to field surface. However, this device consumed large amount of time and labour to dewater even small blocks of land.

Fig.8. Swing basket



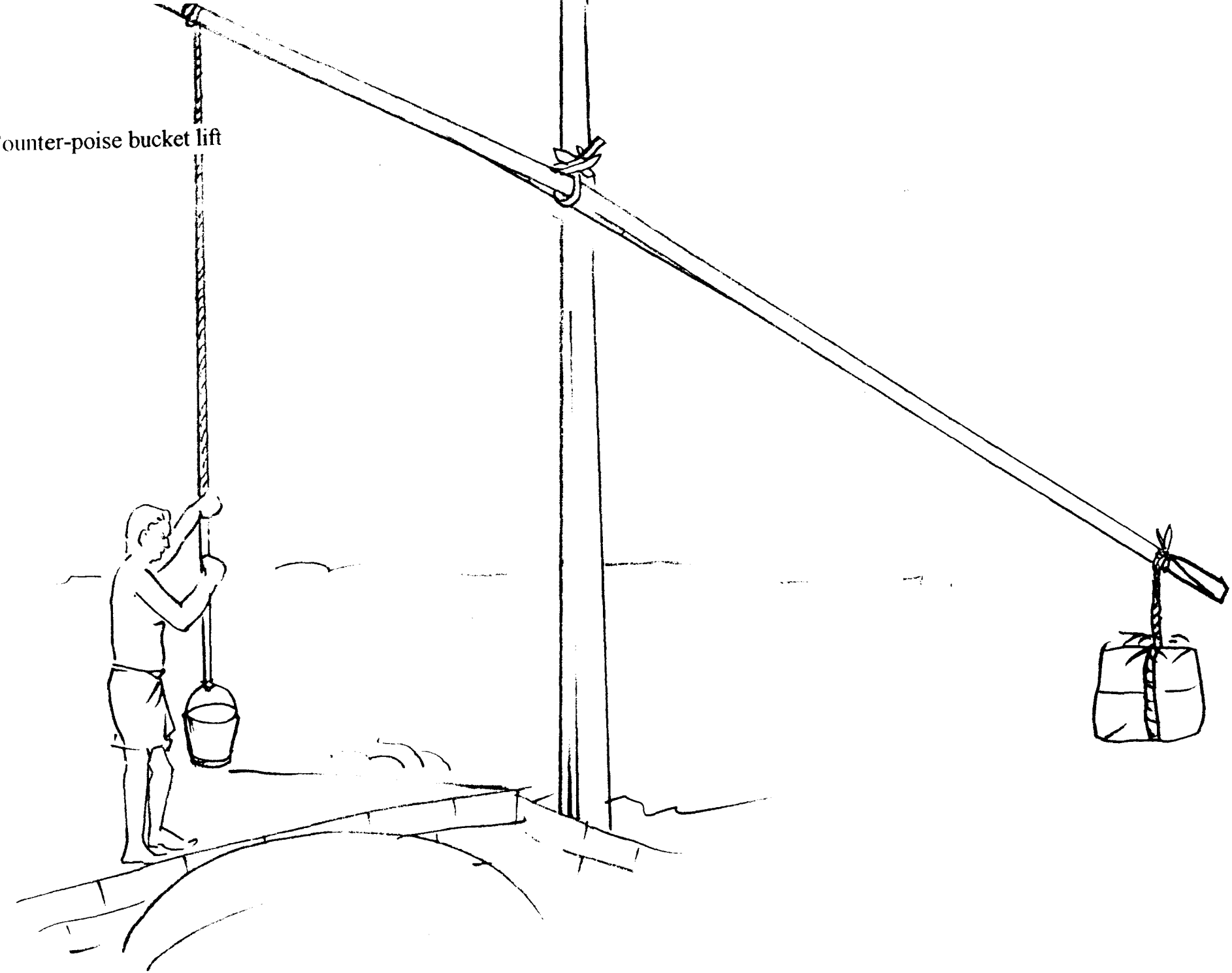


Fig.9. Counter-poise bucket lift

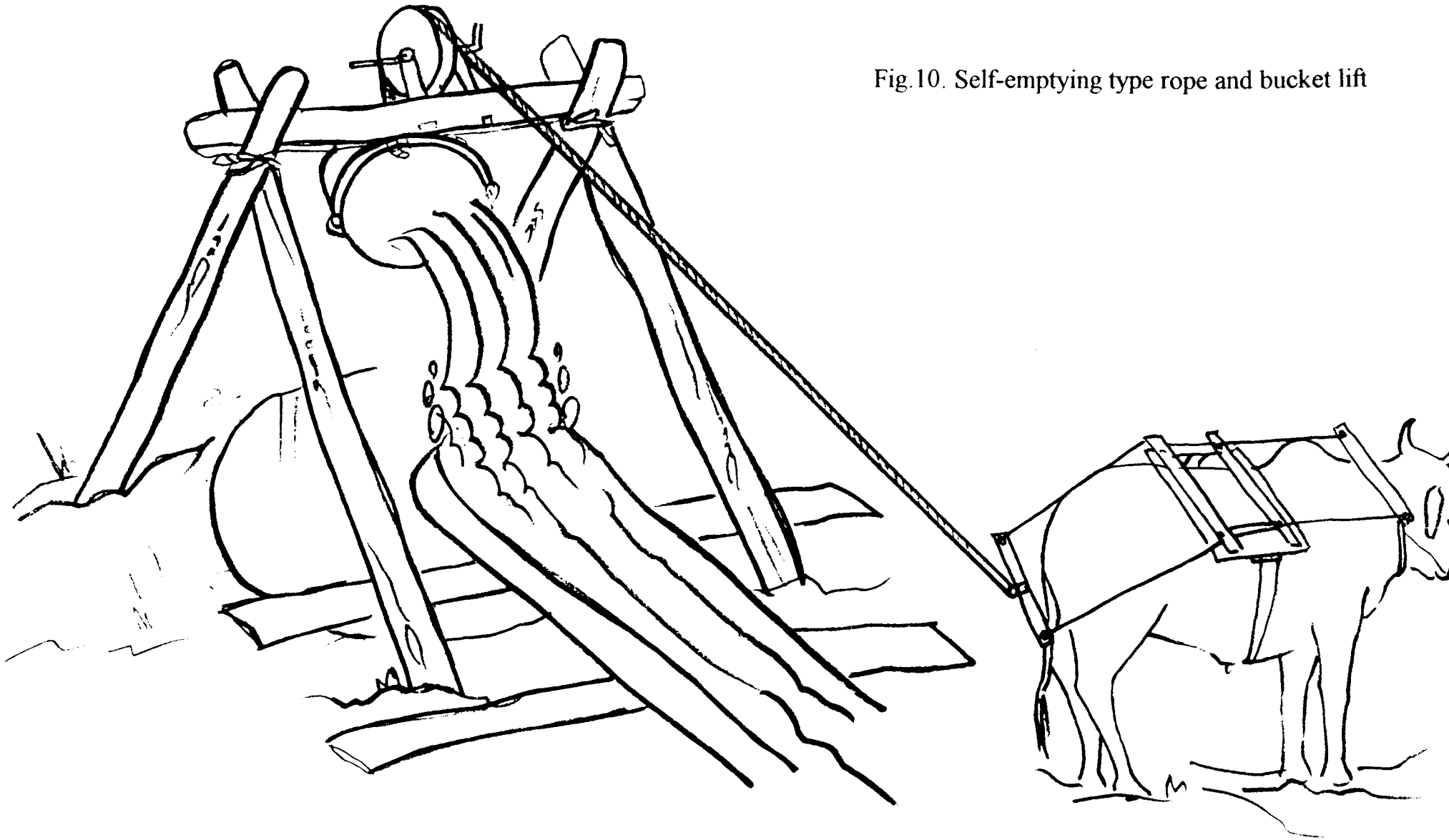


Fig.10. Self-emptying type rope and bucket lift

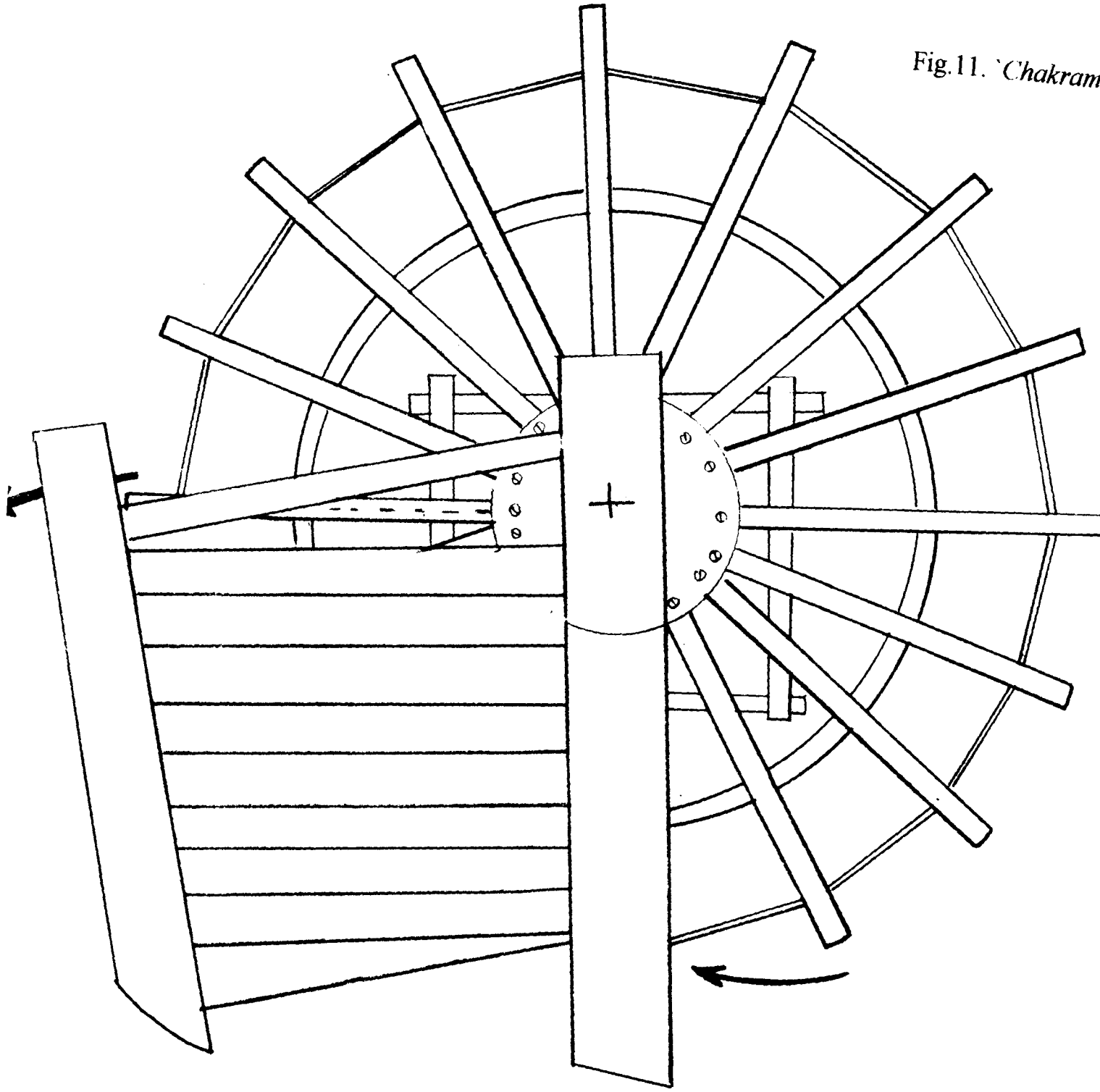


Fig.11. 'Chakram

Large scale drainage pumping is done by petti and para (Fig. 13). It is an axial flow propeller pump. It is still the only type of pump widely used for dewatering which is capable of giving a high discharge at a low head operating conditions (Saji, 1994).

Traditional farms are self contained production units. When mechanisation was not in vow, these indigenous devices were the only means to irrigate the fields. These irrigation devices were made using locally available fabrication facility which confined to the blacksmithy and carpentary prevailing in the region.

SC: Rational practice

V. Harvesting

28. Collection of grains for seed purpose from special sites

For seed purpose the seeds are collected from healthy tillers. The crops from such sites are harvested and thrushed separately so that they are not mixed with the common lot.

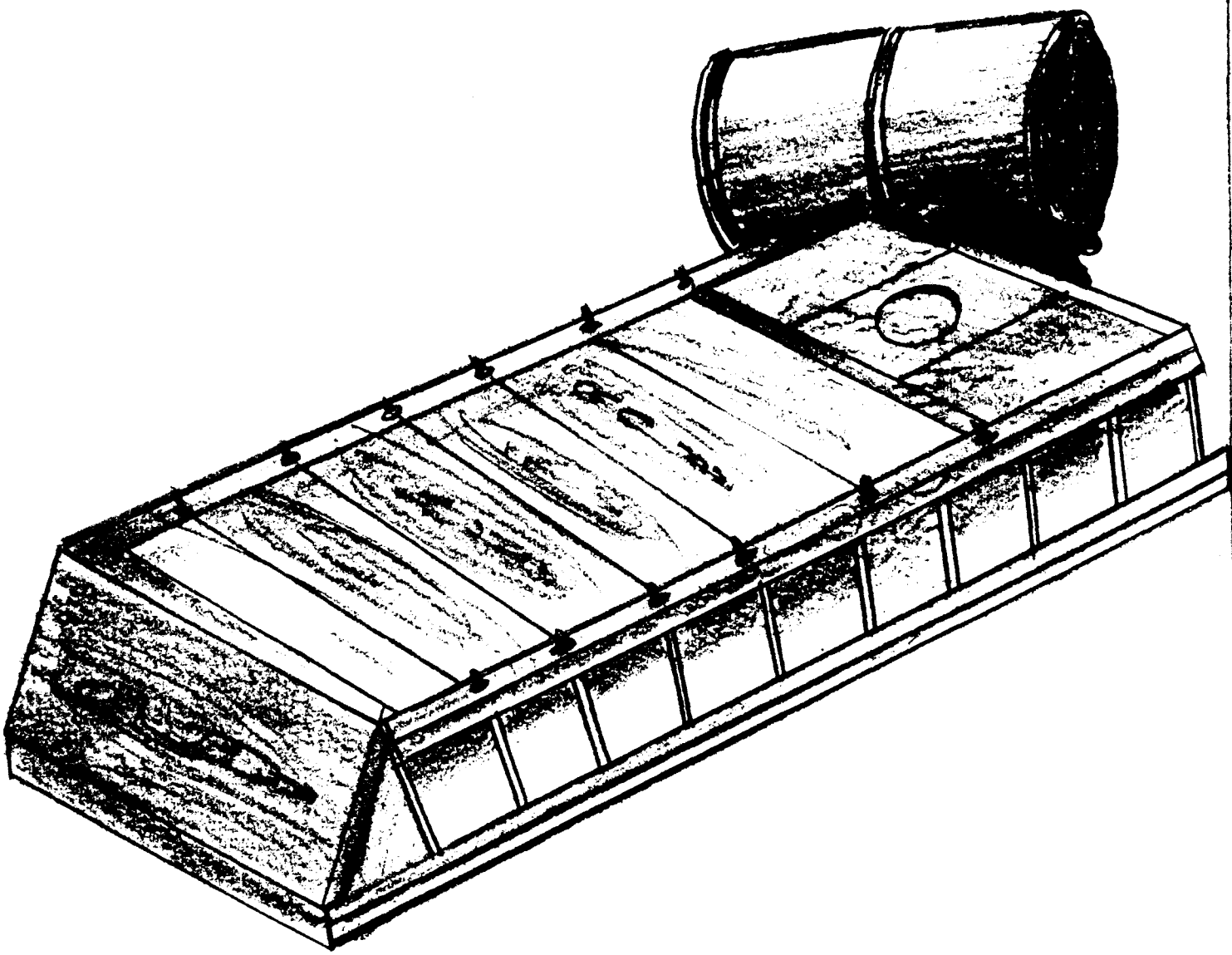
Collection of healthy and pure seeds is an important criteria of seed storage. So seed collection from healthy crop area is desirable.

VI. Seed drying and storage

29. Drying until embryo shrinks to a spot

After '*mampookanickal*' when the seeds are broken, a white spot is seen at the centre. This is the shrunken embryo. So drying is said to be complete when the embryo shrinks to a spot in the cross sectional view.

Fig.12. *'Petty'* and *'Para'*



This practice ensures complete drying.

SC: Rational practice

30. Storing seeds in cylindrical bamboo baskets plastered with cowdung

Bamboo and cowdung are believed to have some insect repellant properties. So farmers store grains in bamboo baskets plastered with cowdung.

So far there are no reports on the insect repellant properties of bamboo and cowdung. However, being a widely accepted belief it calls for further investigation.

SC: Needs further investigation

31. Storing paddy seeds in coir bags and never in plastic bags

Large quantities of paddy grains are stored in '*pathayam*' (large wooden box) while small quantities are stored in coir bags. The farmers do not prefer polythene bags to store the seeds.

The research findings and farmers' view contradict in this aspect. Harrington (1970) reported that seeds stored in polythene bags and rigid plastic containers remained viable for longer periods even under high humidity. A similar study conducted by Varkey *et al.* (1977) proved that viability of paddy seeds can be maintained up to an year or more by storing them in 100 guage polythene bags.

SC: Needs further research

32. Sunhot grains are not stored

Farmers do not store grains as soon as they are dried in sunlight.

In order to avoid steaming effect, it is desirable to store grains after cooling them.

SC: Rational practice

B) PLANT PROTECTION PRACTICES

33. Basal application of neem cake

As soil amendment, the farmers incorporate a basal dose of neem cake. According to farmers application of neem cake gives considerably reduces pests and diseases in paddy.

Neem cake serves both as a fertilizer and plant protectant against pest and diseases as reported by Vivekanandan (1994).

* Neem cake contains 5.2 per cent nitrogen, 10 per cent phosphoric acid and 1.4 per cent potassium. 11 kilogram of neem cake gives the effect of 1 kilogram of urea or 2.2 kilogram of ammonium sulphate.
* Neem cake contains many alkaloids, the most important being azadirachtin. When neem cake is applied as fertilizer, this alkaloid protects the rice plant.
* Azadirachtin repels the rice pests like BPH and green leaf hopper. It exhibits IGR (Insect growth regulatory) effect on rice plant.
* Fields where neem cake was applied show reduced incidence of Tungro virus diseases due to low vector population.
* Similarly grassy stunt transmitted by BPH also gets contained.

* Fertilization with neem cake also reduces the attack of rice stem borer.
* The activity of azadirachtin and other alkaloids persists in the field up to one month.

SC: Rational practice

I. Rice Bug

34. **Ash dusting** (this practice in general is applicable to all rice pests)

Application of highly alkaline ash dust over the rice crop.

a) The cuticle covering the insect body is protected by a waxy coat. Ash abrases the waxylayers and leads to desiccation. So abrasive materials like ash or dust in general controls all insects.

b) Studies report that the dusty and unattractive road side plants are avoided by insects.

c) For the control of rice bug dust formulation is more effective than sprays.

SC: Worth to be considered as a component of the IPM practices in rice cultivation

35. '***Chazhikettu***'

This is a widely accepted and adopted practice of the predecessors. Here a handfull of tillers in the paddy fields are tied together at 3 or 4 sites. Palm leaves inscribed with some mantras are tied on to them. It is claimed that bugs attack only the grouped tillers and the rest of the crop is least infested by bugs. This task is

performed by a specific race the "*mannans*" who take their share - the produce from the grouped tillers - after harvest.

It is a conflict between super natural powers and science. But what counts is its wide acceptance and adoption by the ancient farmers. As opined by the scientists, invalidation of such a widely accepted practice is not easy. What is worth investigating in this practice is not the logic behind the mantras, rather it may be the result of high density population of grouped tillers, the micro climate it provides or some other congenial factors that promotes and attracts bug infestation.

SC: Needs verification. It merits consideration.

36. Spray solution of garlic, asafoetida and pepper

Spraying a mixture of highly pungent pepper, garlic juice and asafoetida powder at panicle emergence and grain setting stages of paddy controls bug infestation.

The insect repellant properties may be the effect of pungent principles like allen in garlic, capscicin in chillies and piperine in pepper. However, there are no scientific reports on the insecticidal action of these products against rice bug.

SC: Should be considered for further research

37. Spraying neem oil and metacid

A spray solution of neem oil and metacid was used by farmers against rice bug.

Neem oil possesses a strong insect repellant action. Its effect on field pests and storage pests of rice was studied by Saxena *et al.* (1980). Metacid is a contact insecticide recommended against the rice bug. The antifeedant and repellant action of neem oil compels the rice bug to move about facilitating the entry of insecticide through contact action. This might lead to increased mortality of the bug.

However, no studies have been so far conducted to analyse the combination, compatibility and concentration of insecticides with plant extract to suppress pest population.

SC: Modern and traditional pest control practices should be blended to evolve effective and sustainable plant protection

38. Spray solution of fish oil ('*Chalanei*') and metacid or neem oil

Spraying a mixture of fish oil and metacid or neem oil is found effective against rice bug. The preparation of '*chalanei*' or fish oil is as follows. About three kilogram of '*chala*' fish (mullet) is put in an earthern pot which is half filled with water.The pot is kept under ground for about 3 days. The extract so prepared is called fish oil. Required amount of neem oil or metacid is added to the fish oil. Later a spray solution of 1:5 ratio is prepared by mixing fish oil-metacid solution with water.

Fish oil covers the insect spiracles resulting in asphyxiation. Also it has a repellant action. Metacid is a contact insecticide that kills the insects. For that matter inclusion of any contact insecticide can serve the purpose. Neem oil, as discussed earlier, though less effective is a sustainable pest control agent.

However, the compatibility of this complex mix of pesticide is a problem for further investigation. Here the pest is attacked by more than one active ingredient and also it reduces the quantity of chemical required. Therefore, this blend of indigenous and modern practices has to be analysed further.

SC: Needs further research

39. Spraying a mixture of soap water and tobacco

Farmers use a mixture of soap water and tobacco to control rice bug.

Soap covers the spiracle physically resulting in asphyxiation. It dissolves the waxy protective layer that covers the insect body. Tobacco contains alkaloids nicotine, nor-nicotine and anabasine. Until late 1940 nicotine was used as an insecticide. The present day field crop pests are not subjected to stress of this alkaloid. This could be the reason for effectiveness of tobacco decoction on rice pests.

Tobacco decoction with soap is a recommended practice for the control of sucking insects in vegetables. Its effect on rice pests should be further studied in order to supplement the farmers with sustainable and non-polluting alternatives to the use of hard pesticides.

SC: Effect of tobacco-soap combination on rice pests needs to be studied

BIOLOGICAL CONTROL METHODS

40. Placing nests of *Oecophylla smaragdina* (red tree ant) in fields

Farmers place the nest of *Oecophylla smaragdina* in the paddy fields either on the bunds or over stakes in 3 or 4 sites in the field.

This practice, known in the name of biological control today, is a sustainable pest control technique. Colonisation of these fierce red ants checks the growth of rice pests like rice bug, leaf rollers and hoppers. But colonisation of this orchard pest in an entirely different ecosystem especially in the presence of other ants like fire ant - *Solinopsis* sp. is a problem. However, *Oecophylla smaragdina* as a predator of rice pest can serve as an effective biological control agent on a short term basis.

SC: An effective biological control practice in the IPM series of paddy cultivation

41. Placing spider webs in paddy fields

Farmers collect spider webs from surrounding vegetation, fences etc. and place them in paddy fields.

Spiders like *Lycosa pseudoannulata* predates on several sucking pests, leaf eaters, caterpillars, beetles and grass hoppers. One spider per tiller can effectively protect the crop from pest attack. But transferring webs from one place to another results in irrepairable damage. So dispersing spiders eggs in paddy fields is rather more practical and viable. Unlike the case of *Oecophylla smaragdina* colonisation of spider is not a difficult task. So efforts should be taken to train the farmers in colonising predatory spiders in paddy fields.

SC: An effective biological control practice in the IPM series of paddy cultivation

42. Use of '*Oduku*' leaves

The farmers administer this botanical pest repellant in two ways.

a) Fixing twigs of '*oduku*' tree in paddy fields

b) Manuring with a mixture of *oduku* leaves and poultry manures as basal dressing

'*Oduku*' - *Cleistanthus malabaricus* is a shrub belonging to the family Euphorbiaceae. It has medicinal value and is found in forest areas.

This practice is widely accepted and acknowledged by the extension personel and entomologists. It is also effective against stem borer and gall midge. So far no studies have been conducted to analyse the active principle responsible for the repellant action of *oduku* leaves. Hence a bio-chemical analysis of *oduku* leaves is a must.

SC: Needs for the research

43. Staking pieces of '*Chazhichakka*' or '*Eenthachakka*' in fields

'*Chazhichakka*' is a rotten smelling fruit. Pieces of the fruit tied to stakes in paddy attract bugs. The bugs that alight over it can be collected and disposed.

In the absence of knowledge of chemical composition of the fruit, the scientist suspect that the peculiar odour of the fruit may attract bugs.

SC: Needs further investigation

44. Avoiding overlapping cultivation

Attack of rice bug is stage - specific (to the early earhead or milky stage). Overlapping cultivation or cultivation of varieties with different duration will provide milky stage continously in the tract. This will facilitate the attack of rice bug.

Avoiding overlapping cultivation is a cultural control measure recommended by the package of practices (1993).

SC: Rational Practice

II. Leaf roller

45. Dragging nailed plants over the crop

46. Swinging twigs of '*Therakam*' (*Ficus asperrima*) shrub or any other thorny twig over the crop

47. Pulling kerosinated crops over the crop

The farmers follow this practice in order to disturb the rolls made by leaf folder. This is usually done after flooding the fields. They drag nailed planks or swing thorny twigs of '*Therakam*' (*Ficus asperrima*) - a spiny leaved shrub over the crop. This can be performed by a single person while pulling of kerosinated rope needs the involvement of two persons. Here, a rope dipped in kerosene is pulled across the plot from either sides.

The objective of all these practice is the same. This is a mechanical control method against leaf roller. Dragging spiny objects over rice leaves unfolds

the rolls made by rollers and exposes the caterpillar. The caterpillar that gets exposed either falls on flooded water and gets exposed to insecticide spray.

While use of kerosinated ropes avoids the use of insecticides as kerosene that floats on water kills the caterpillar through asphyxiation.

Use of insecticide after unfolding the rolls is an already recommended and viable practice for the effective control of leaf rollers. While the package of practices recommends the use of kerosinated ropes for caseworn alone. So studies need to be conducted to analyse the effectiveness of kerosene against leaf roller caterpillar.

SC: Rational practice

48. Collecting larva in '*Kundamuram*'

'*Kundamuram*' is a mechanical device used to collect leaf roller caterpillars. It is triangular in shape with greater depth which when moved over the crop (Plate 6) collects the caterpillars. The collected ones are later disposed by the farmers.

It is a mechanical control method. After collecting the larvae, according to the experts, the caterpillars can be either destroyed or retained for multiplying parasites from the infested ones. After multiplication these parasites can be released for sustainable biological control practice.

SC: Rational practice

49. Application of cashew ghee

Farmers apply cashew ghee in fields to kill the roller caterpillars. They claim it to be effective in controlling other pests also.

Cashew nut shell liquid (CNSL) contains a mixture of alcohols and phenols. It is highly corrosive. It is used in termite proofing of wooden structures and in the manufacture of marine paints. However, its use as an insecticide and as repellent against rice pest has not been reported.

SC: Requires further study

50. Manuring with '*Therattavalli*' (*Trichosanthes hispida*) - ash mixture

To control the attack of rice leaf roller, farmers manure the field with '*Therattavalli*' - *Trichosanthes hispida* (weed) and ash mixture.

Trichosanthes hispida is a trailer belonging to the family cucurbitaceae. There are no previous reports on the pest repellent properties of the plant.

SC: Needs further investigation

III. Stem borer

51. Burying tubers of '*Koduveli*' (*Plumbago roseus*) in paddy fields

In order to control stem borer some farmers bury tubers of *Plumbago roseus* in paddy fields at an early stage of the crop. Only three-fourth of the tuber is buried and rest is left exposed.

Plate 6. Use of '*Kundamuram*'

So far there are no reprots on this practice. A biochemical analysis of the plant has to be made to find the active ingredient, responsible for the repellant property.

SC: Needs further investigation

IV. Rice case worm

52. Drainage

Drainage is a cultural measure to control case worm population in fields.

Rice case worm is a serious pest in late '*virippu*' and early '*mundakan*' crop where there is water stagnation. The dry fields of modan and '*punja*' are free from this pest as water is much essential for larval survival. The caterpillar can breathe only from water which it does with the help of gills. So the pest infestation being found in fields with water stagnation, drainage is the best cultural control of rice case worm.

SC: Rational practice (recommended)

V. Grillids

53. Flooding

Farmers flood the fields to contain Grillid population.

Flooding prevents grillids from feeding and harbourage from the crop. Thus they either migrate on fall prey to predatory binds.

SC: Rational practice

VI. Crabs

54. Broadcasting groundnut cake or neem cake or lime over bunds

Farmers broadcast lime or groundnut cake or neem cake over the bunds in order to control crabs. This practice is commonly adopted by the kole farmers.

Devaiya (1991) reported the use of groundnut cake in the control of rodents. However, the active ingredient responsible for the repellant action of these amendments on crabs is yet to be identified.

SC: Needs further research

55. Drainage

Draining the fields in a cultural method to contain crab population.

Crabs are semi-aquatic animals. So drainage is an effective cultural control method.

SC: Rational practice

56. Trapping crabs using polythene covers kept at drainage points

Farmers place perforated polythene covers near the drainage points. The crabs that drain out along with water are trapped in these polythene covers and later disposed.

It is a mechanical control method.

SC: Rational practice, needs further investigation

57. Releasing flocks of geese in puddled field

This is a common practice of the kole areas where the crab population is very high. Ducks predate on crabs and other insect larvae thereby aiding biological control.

A biological control method for containing crab population.

SC: Rational practice

VII. Rodents

a) Cultural control

58. Strong and well plastered bunds

Farmers build strong bunds in order to avoid burrowing by rodents.

Constructing strong bunds is the most essential preliminary field operation. Usually rodents make burrows in the bunds. So a strong and well plastered bund keeps off the rodents from burrowing. However, width of bunds must be restricted. Wider bunds provide harbourage for construction of extensive burrow system by rats.

SC: Rational practice

b) Physical control

59. Flooding or smoking the burrow holes with coir

A kole farmer traps burrow rats by flooding or smoking the burrow holes. The borrows are either filled with water or smoked with coi. Smoking is done by igniting coir that is kept over the entrance of rat burrow and suffocates the rats inside and kills them.

The two common burrow rats in paddy fields are *Bandicota bengalensis* and *Rattus meltada* (soft-furred field rats or grass rats). Unlike the latter, *Bandicota bengalensis* never comes out of the borrow. It extend its burrow towards food source. So baiting and mechanical trapping are not effective. It is also not amenable to fumigation because of its high sensitivity to smell and ability to block the spread of gas. Usually the adults may try to escape but the young ones invariably gets killed due to suffocation by smoke or drowning in water.

So smoking or flooding burrows is an effective measure and the principle on animal ethology (that animals are afraid of smoke and water and gets killed when trapped) also supports the practice.

SC: Rational practice

60. Fixing coconut petioles invertedly

Fixing coconut petioles invertedly in paddy fields (Plate 7) is a commonly observed practice. It aids as a suitable perch for owls, which alights to predate on field rats.

The inverted coconut petioles act as owl perches. Its forked perch is more convenient for barn owls (*Tylo alba*) and spotted owlet (*Athene brama*) which predate on rodent at night. Owls play an important role in rodent control. Usually on owl consumes 1-6 rats per day (Nagarajan *et al.*, 1994). Inspite of this, predatory birds like myna (*Acridotheres tristis*) and drongo *(Dicrurus adsimilis*) visits the fields during day time. Gunathilagaraj (1994) reported that in fields with owl perches there

Plate 7. Owl perches

was no increase in number of live burrows. Rice yield from fields with owl perches was nearly two times greater than that of fields without perches.

SC: Rational practice

61. Application of neem cake urea mixture at booting stage

A farmer topdresses the paddy crop at booting stage to control rodents. The juicy rice culm invites rodents at the booting stage. So application of neem cake along with the second dose of nitrogen (urea) before panicle initiation keeps of rodents.

Neem cake - urea combination is known to increase Nitrogen uptake efficiency. But its effect on rodents is a new report. Perhaps the repellant action of neem may be the cause of rodent control. So it calls further investigation to analyse the effect of this combination on rodents.

SC: Requires investigation

c) Chemical control

62. Bating with leaves, bark or seeds of glyricidium (*Glyricidium sepum*) with cereals

A farmer uses bark, seeds and leaves of *G. sepum* as rat killer. Leaves and seeds of *G. sepum* are crushed and made into globules. The globules are placed in cereal balls (boiled rice or wheat) and are distributed in the fields.

While another farmer adds some attractants to form a perfect bait. The crushed leaves and seeds of *G. sepum* is mixed with boiled rice or wheat in the ratio

of 1:1. For every 100 grams of the mix one spoon of sugar and ten drops of coconut oil are added as attractants. They are mixed well and made into globules. These globules are placed on raised platforms in paddy fields.

The toxic effects of bark and seeds of *Glyricidium sepum* on rodents were studied by US scientists and their effectiveness was confirmed. *Glyricidium sepum* contains a substance called coumarin which gets converted into anticoagulant dicoumerol by bacterial fermentation. Anticoagulants are an effective method of pest control because they reduce the protein prothrombin and eventually cause death due to internal bleeding. Toxin of *Glyricidium sepum* does not act rapidly. Only repeated doses lead to fatal haemorrhaging. The advantages of using *Glyricidium sepum* are that it does not produce bait shyness in rats and is not toxic to humans. *Glyricidium sepum* works as effective on insects as well. In a survey, 72 per cent of Phillippines farmers interviewed in a given region reported that they keep Glyricidia branches in rice fields to repel bugs and pests (Martin, 1990).

Moreover, use of *Glyricidium sepum* baits seems to result in natural death and hence do not give rise any suspicion among other rats.

SC: Rational practice

63. Insecticide boiled rice

Farmers boil cereals in insecticide solution and place them near rat burrows in paddy fields.

It may be an effective rodent control measure. But use of poisonous insecticides is niether rational nor safe. There are chances for its consumption by

cattle, poultry and migratory birds. Moreover, use of insecticide degrades already polluted soil. So such irrelevant and in scientific practices should not be encouraged.

SC: Irrational practice

64. Baiting with cement - chemmeen (dried prawn) powder mix

Farmers use a mixture of cement and chemmeen powder as bait to kill rats. Chemmeen powder is used to attract rodents. The cement when taken by rats gets hardened in the stomach and disrupts the whole body mechanism.

Dried prawn powder is used as a bait attractant. Cement absorbs water from the stomach and hardens. This reduces the capacity of the stomach and blocks the passage.

SC: Rational practice

65. Baiting over tapioca chips or snail flesh

In this case, baits are kept in depressions made in split tapioca halves. This is placed in such a way that the split tuber halves remain above water level. Rodents generally prefers elevated places. So it climbs over platform to take food and gets killed. The bait can be any chemical on botanical rodenticide mixed with cereals and attractants baiting also is done with dead snails, where the bait is placed within the snail's shell.

Tatera indica (Indian gerbil or antelope) is an upland rat but it is seen in rice ecosystem also. *Tatera indica* along with *Rattus meltada* (grass rat) cause considerable damage to rice crop. These rodents prefer elevated places. The rats swim

towards and climb the platform to take the food. So this practice of placing baits on raised platforms is desirable. However, a study conducted in Moncompu revealed that rate prefer limeshell flesh among the bait traps. The order of preference was plantain fruit, coconut kernel, dried prawn, tapioca chips and broken rice and wheat.

SC: Rational practice

d) Mechanical control

66. '*Kumbham*'

'*Kumbham*' (Fig.13) is a death trap designed against *Bandicota bengalensis*. It is made of cheap available materials like bamboo pipes, umbrella cribs, plastic twine, banana fibre etc. It is placed along the rat burrow (Plate 8). It works based on the following principles.

1. Rats are not afraid of entering artificial hollow structures like bamboo.

2. Rats nibble and cut any thread instinctively. This instinct of rats is employed to stretch the umberlla rib and there by tighten the noose.

3. Finally use of baits to attract the rodents complements the technique.

The working of *Kumbham* is illustrated in Fig.13a, 13b and 13c.

As reported by George (1979), the utility of this trap was evaluated at the Kerala Agricultural University, Vellanikkara. It was found effective in trapping burrow rats like *Bandicota bengalensis* both during day and night.

SC: Rational practice

Fig.13. *'Kumbham'*

Fig.13(a)

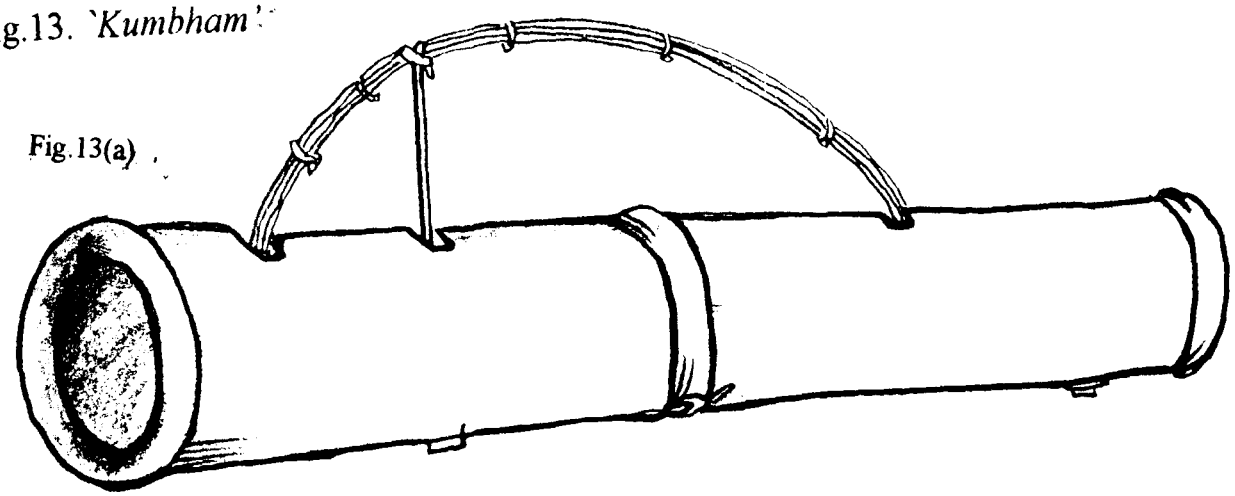


Fig.13(b)

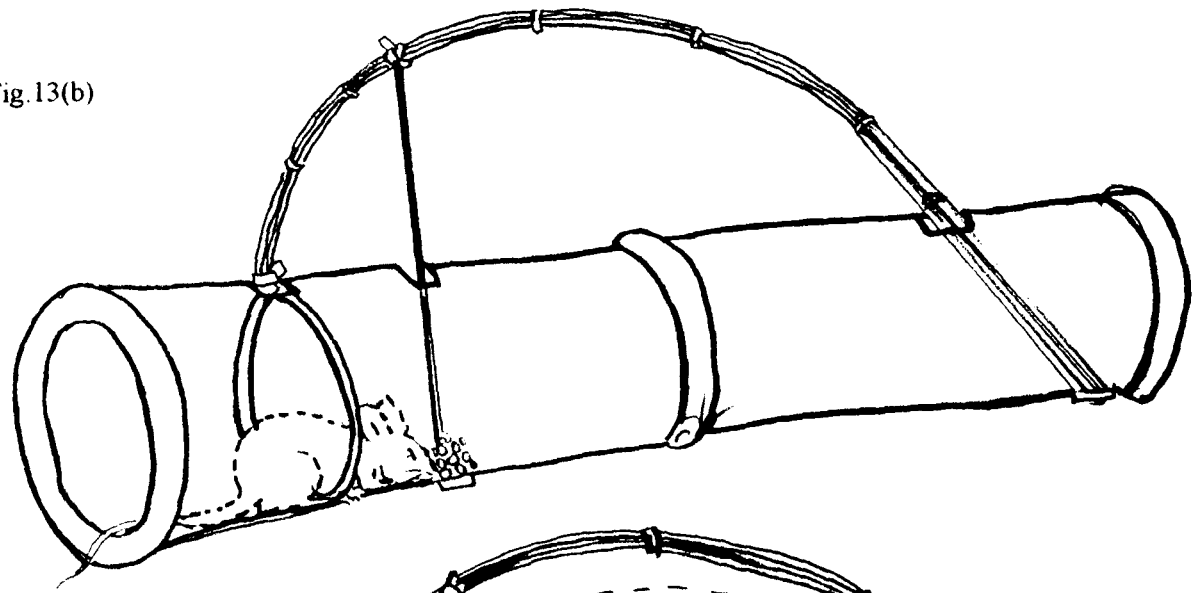


Fig.13(c)

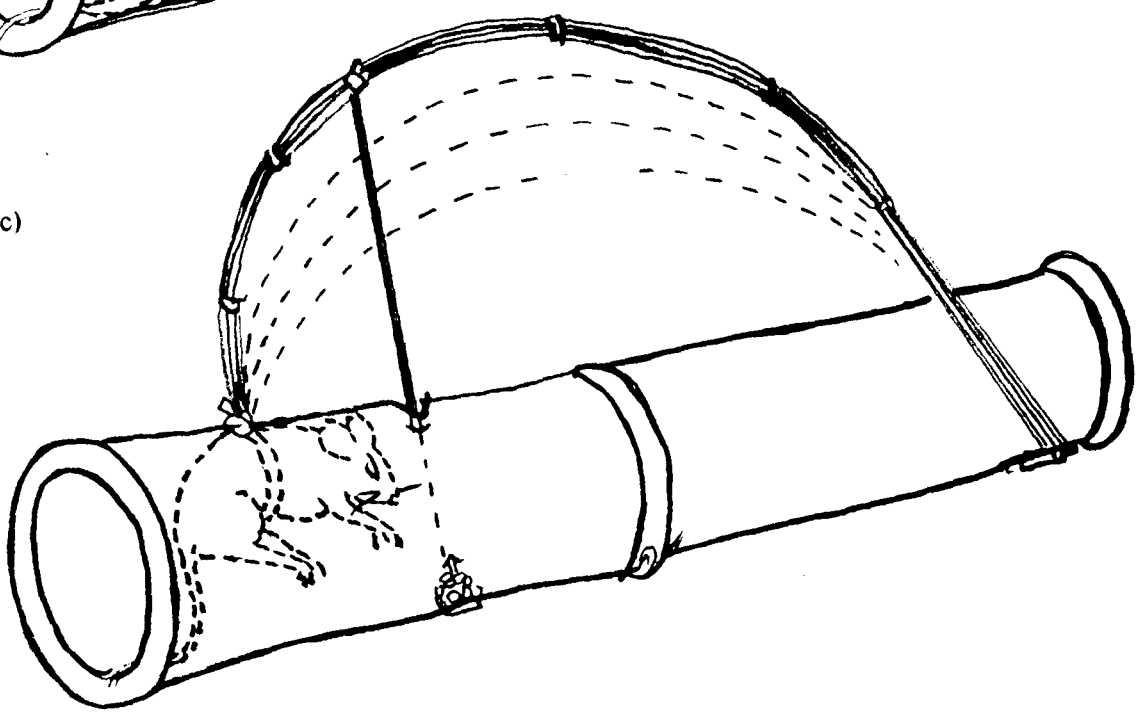


Plate 8. '*Kumbham*'

67. *'Adichil'*

This is also a death trap intended to kill *Bandicota indica*. It is made of locally available materials like bamboo strips, coconut petioles, wooden log etc. *'Adichil'* is placed in rat runways (Plate 9). The rodents are directed to the trap through artificial diversion paths.

Trapping is done using bait attractants. A heavy log is suspended by means of a lever mechanism and triggered over a metal strip. As the metal strip near the bait is disturbed, the log falls down thus breaking the back of rodents (Fig.14a and 14b).

As reported by George (1979) adichil is found effective against *Bandicota indica*. But this trap is not available in the market as such. This has to be fabricated on the basis of prototype standardised for the purpose.

SC: Rational practice

68. Saw toothed scissor trap

This is a break back type of death trap. It is made of metal and is permanent. Farmers place them in the site where rodent attack persists. Working of this trap is illustrated in Fig.15a and 15b.

Baiting is the principle of trapping. However this trap is commonly used in households and often placed where people donot walk.

SC: Rational practice

Fig.14. *'Adichil'*

Fig.14(a)

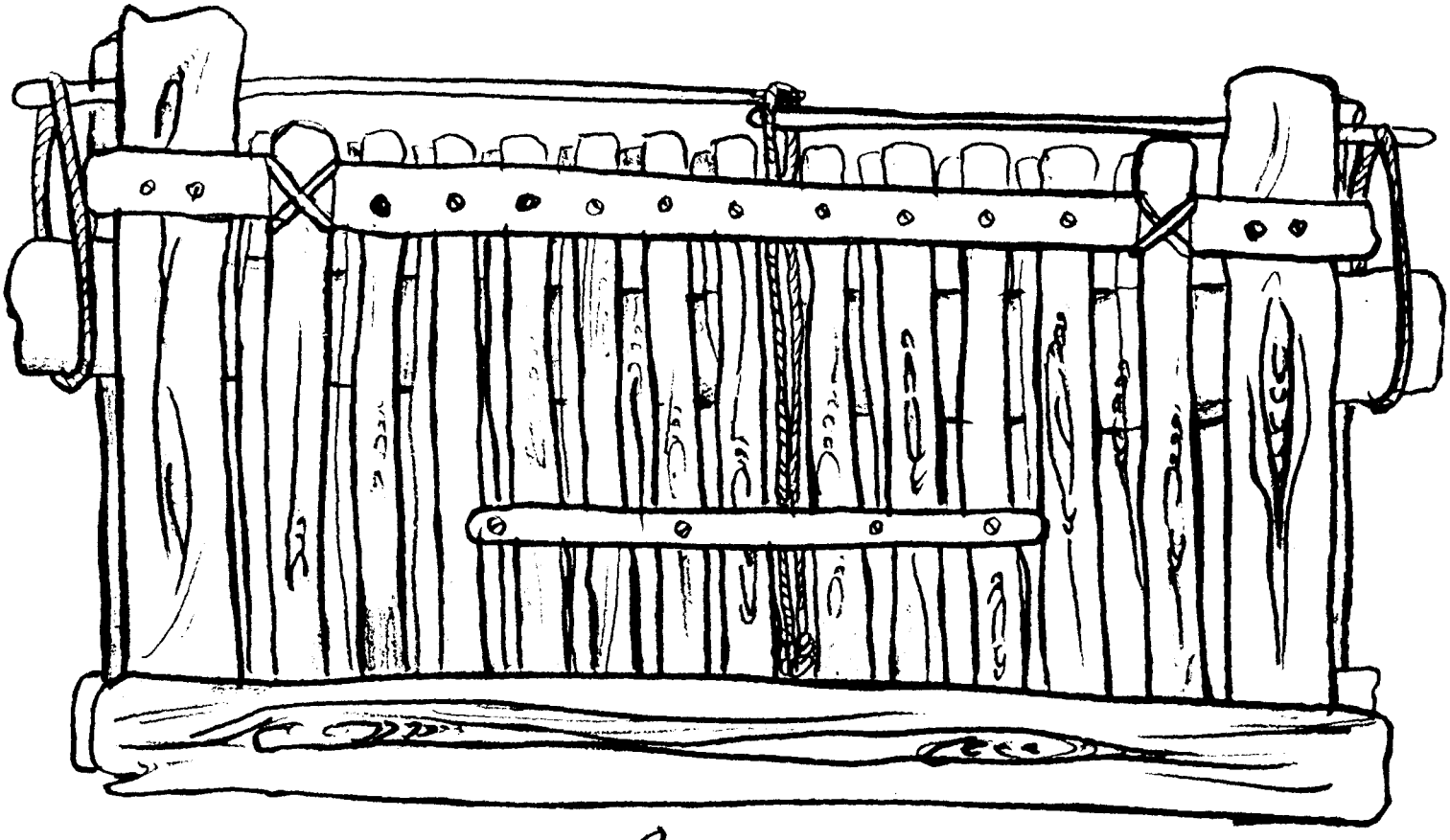


Fig.14(b)

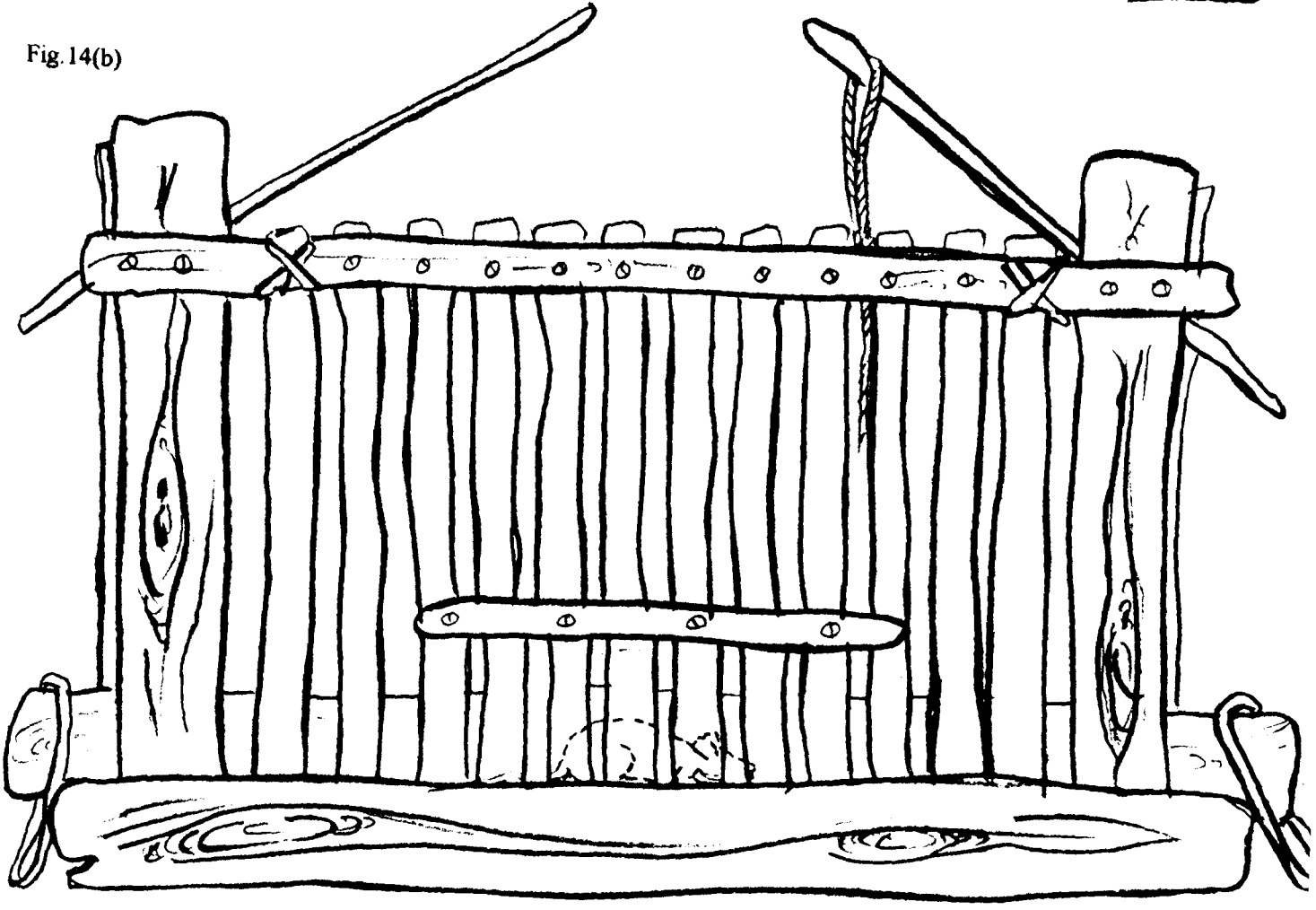


Plate 9. '*Adichil*'

Fig.15. Saw-toothed scissor trap

Fig.15(a)

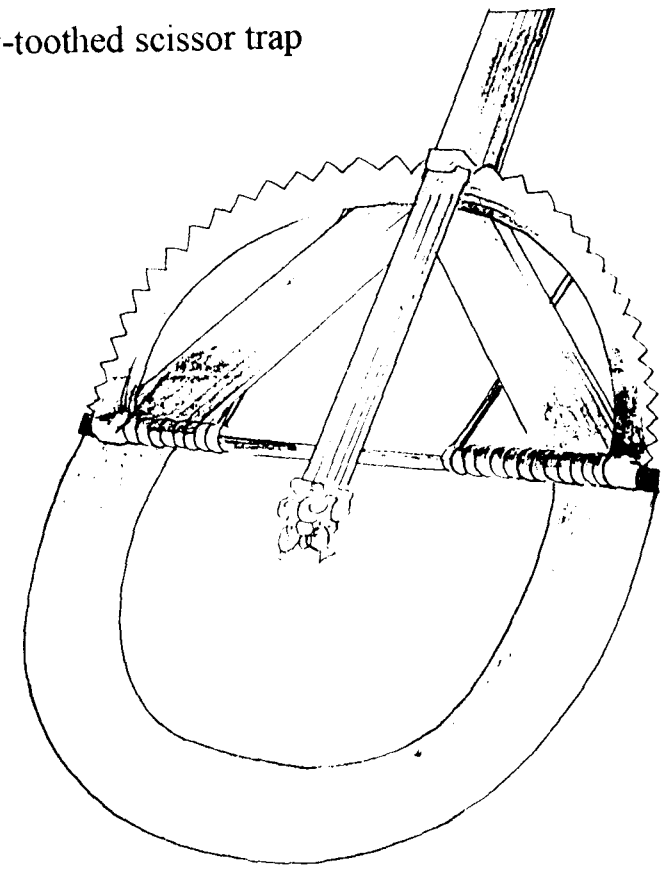
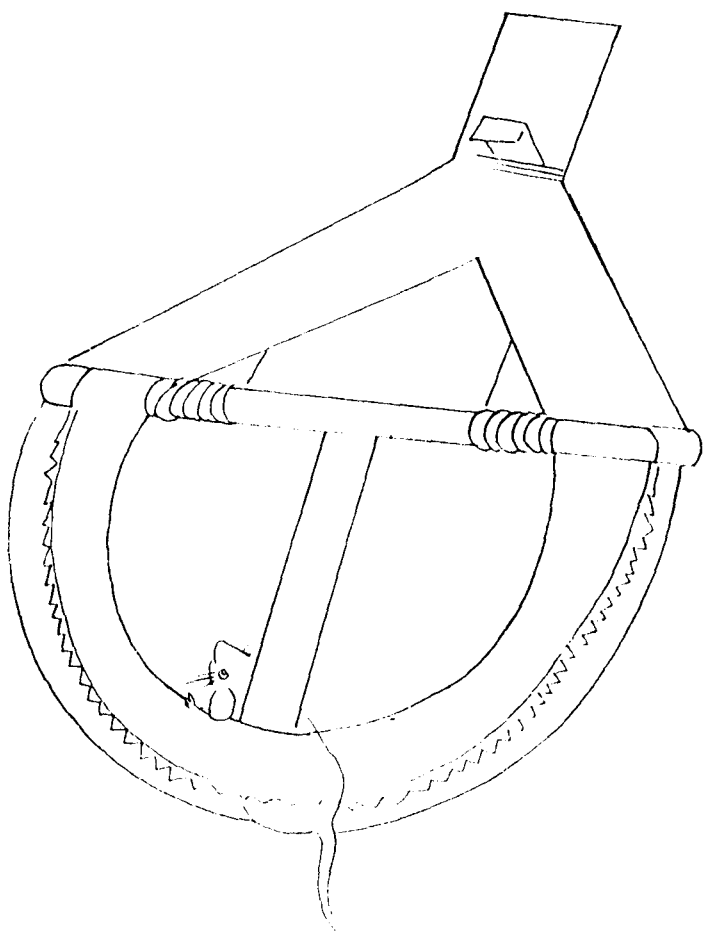


Fig.15(b)



69. Earthern pot trap

This is a live trap effective in wet land conditions where rats have a tendency to climb over platforms. It is made using local materials like wooden plank, earthern pot, nails and a coconut button. Working of the trap is illustrated in Fig.16a and 16b.

It is effective in controlling rodents in wetland conditions (*Rattus meltada*) and in garden lands *Tatera indica*).

SC: Rational practice

70. Burying large mud pots

This is the simplest technique of mechanical rodent control. Large mud pots are buried with its mouth remaining along the rat run way. Attracted by the baits in the pot the rats jumps into it and gets trapped.

The trap exploits the inability of the rats to climb smooth and curved surface. So the depth of the pot is important here.

SC: Rational practice

e) Acoustic physical control (Rat scarers)

71. '*Elimuli*'

It is an indigenous rodent scaring technique. The raw materials required are an earthern pot and leaves of *Pandanus* sp.

Fig.16. Earthern pot trap

Fig.16(a)

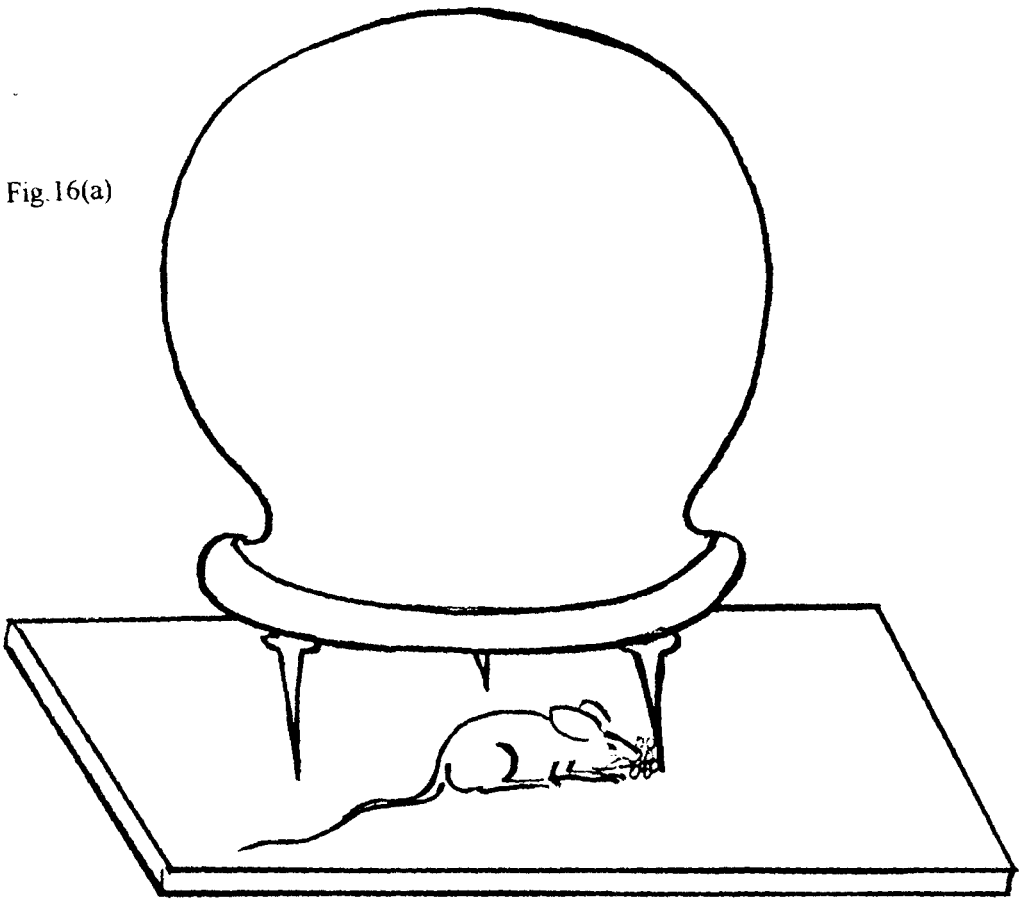
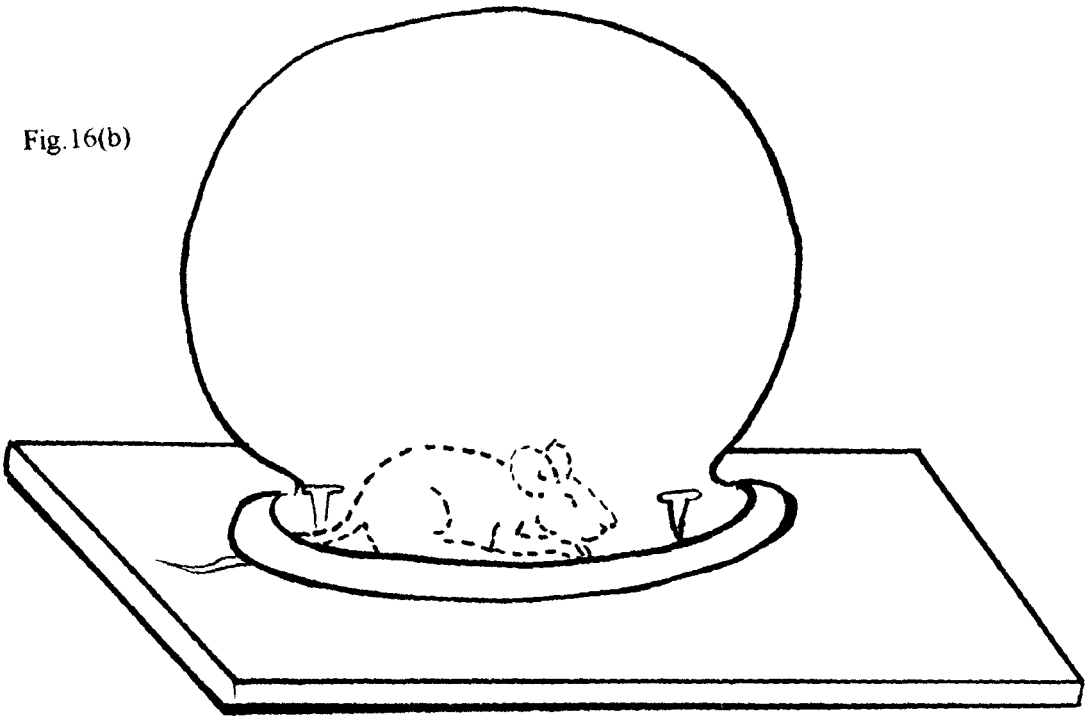


Fig.16(b)



The *Pandanus* leaf is inserted into the pot through a hole made at its bottom. The leaf when moved to and fro gives a 'bhum bhum' sound. This is usually done at night time. The farmers claim that this sound reaches to a greater distance across the field and is much effective in scaring the rodents. However, mechanical operation by a labourer is the only problem faced in adopting this practice.

SC: Rational practice

72. Drum beating

Beating of drums to drive away rats is the most common scaring technique used by the farmers.

Both are acoustic physical control methods. It is useful to scare rodents in large padasekharams. Care much be taken to operate the device only at the time of rodent visit (ie.,) night time. Changing of position, direction and frequency of sounding are to be ensured to prevent habituation.

SC: Rational practice

73. Fixing white flags in fields

Some farmers fix white flags in fields to scare rodents. They claim that rodents are afraid of white colour and hence are very effective.

This is a usual scaring technique. Animal pests are afraid of unusual sounds, colour or events. However, its effect lasts until the animal gets habitualised.

Later on it can serve as perches for predatory birds like black drongo (*Dicrurus adsimilis*), Myna (*Acrydotherus dristis*) and Owls.

SC: Rational practice

VIII. Bird pest

74. Bursting crackers

Farmers burst crackers in order to scare birds. This is done at nursery stage after sowing and at the grain maturing stage.

Loud explosive sounds are effective repellants for some species of pests. But many species quickly become habituated to loud noises if they appear harmless. Perhaps this acoustic method of bird scaring has led to the species specific tape recorded alarm calls which are though expensive, more effective to scare birds.

SC: Rational practice

75. Fixing human effigies (or) scare crows

Farmers fix human effigy or display carcass of crow in order to scare birds at sowing and ripening stage. It is tied to long poles and are placed in the fields. Both serve as visual frighteners.

Human effigies give the presence of farmers in the field and scare the birds while display of dead interspecific models warms the birds against a possible danger. However, scaring techniques can prove effective only for a very short duration.

SC: Rational practice

76. Use of plastic covers

Farmers tie polythene covers (Plate 10) to long poles and place them in the centre of the field, some of them put sand into the cover to intensify the noise.

With the blow of wind, the polythene sheet flaps and flutters and the sound that is produced wards off birds. However, habituation to unusual sound and sight makes the practice less effective in the long run.

SC: Rational practice

77. Use of audio-video tapes

Old and discarded audio and video tapes are used as bird scarers in two ways

1. Reets of audio tapes are tied to stake and placed at the centre of the field. Humming noise caused by the fluttering tapes scares the birds.

2. Video tapes are stretched across two poles along the full length of the bund. This is done just a foot above the crop leve. During sunshine the reflection caused by the tape scares the birds from the field.

Stretching tape reel is a visual frightening technique. They should be oriented in north sourth direction and slightly twisted to reflect sunlight through out the day. During sunshine the brightness and humming noise produced in the wind scares the birds from the field. This is usually practiced only at the vulnerable stages (i.e.,) sowing and ripening stages of the crop. If left permanent, it can fail to serve

Plate 10. Bird scarer

the very purpose of scaring birds. They are effective before dust and after dawn when the birds visit the fields in search of grains.

The reflection tape or the bird scaring tape method evolved by the scientists of All India Co-ordinated Research Project on Agricultural Ornithology (AICRPAO) works with the same rationale.

SC: Rational practice

78. Snaring technique

The farmers broadcast cereals like rice or wheat over the bunds and place snares made of banana fibre or plastic twines. Attracted by the grains the birds elight on the bunds and as they try to fly off after feeding, their legs get entangled in the snares and thus gets trapped.

It is a mechanical control method known as snaring technique.

SC: Rational practice

DISEASES

79. Liming

Farmers consider liming as the panacea to all crop diseases.

Liming to some extent resists fungal diseases. Except *Fusarium* sp. most other fungi prefer low pH. Liming increases the pH and controls the growth of fungi. However, though a rational practice its effectiveness is doubtful.

SC: Rational practice

STORAGE PEST CONTROL

80. Mixing insect repellent leaves with stored product

Along with stored products the farmers keep leaves of neem (*Azadiracta indica*), vayambu (*Acorus calamus*), karingotta (*Quassia indica*), karinochi (*Vitex negundo*) and bamboo (*Bambusa arundinaceae*). Some farmers also place pepper berries and leaves of ungu (*Pongamia pinnata*). The leaves of the plants are believed to have insect repellent properties.

Abraham *et al.* (1972) reported that some plant products when mixed with grains significantly reduced the pest infestation. The efficacy was in the following order.

Azadirecta indica > *Vitex negundo* > *Adathoda vasica* > *Clerodendrum infrotunatum* > *Acorus calamus*.

SC: Rational practice

C. BELIEFS AND PROVERBS

I. Weather and climate

1. Strong winds during panicle emergence is not desirable

According to farmers strong winds after panicle emergence leads to spikelet shedding. This results in chaffy and low grain production. Strong winds can also have an effects on bug population. The bugs can either migrate into the fields or get transported to distant places.

SC: Rational belief

2. **Relative humidity influences pest attack**

High relative humidity leads to increased pest attack. It is a factual belief. Insects (with the exception of thrips and mites) prefer humid conditions. Rice being a tropical water loving crop it can never escape the effect of high relative humidity in low lands. Consequently, the pest attack is also relatively high. Morever, low pest infestation of the temperate wheat crop under low relative humidity justifies the statement further.

SC: Rational belief

3. ***Kumbathil mazha peythal kuppayilum Nellu***

In '*kumbham*' (February 15th-March 14th) most of the crops including rice (Punja) enter into their reproductive stage. Rains at that time are beneficial for the crop. Hence the farmer believes that rains in '*kumbham*' brings grains in garbage too.

SC: Rational belief

4. ***Makarathil mazha peythal marunninum nellilla***

Rains in '*makarom*' (January 15th-February 14th) are not desirable. The '*mundakan*' crop is harvested in '*makaram*'. So rains in '*makaram*' lodge the entire crop and leaves no grains for medicinal purpose too.

SC: Rational belief

5. ***Ashwathiyillitta vithum Bharaniyilitta mangayum keduvarunnathalla***

Sowing for '*virippu*' starts by Vishu (April 14th/15th) i.e., '*aswathy njattuvela*'. With the receipt of initial rains, land is prepared and seeds are either broadcasted or dibbled. According to the proverb, seeds sown in '*ashwathy*' remain intact in soil as that of mangoes pickled in earthern jars (locally called 'bharani'). It means that seeds sown in '*ashwathy njattuvela*' remain viable in the soil until they get optimum moisture for germination.

SC: Rational belief

6. ***"Ashwathy njattuvela kallananu"***

'*Ashwathi njattuvela*' at times deceives the farmer. The initial one or two rains after sowing keep off for a while and as a result of water scarcity the germinated seeds may dry.

SC: Rational belief

7. ***Bharani jnattuvela vithaikkan nallathu***

Sowing in '*bharani njattuvela*' never deceives a farmer as the soil moisture content then, is always adequate for seed germination and growth.

SC: Rational belief

8. ***Medam thettiyal modan thetti***

This proverb is related to dry sowing '*virippu*' in upland paddy cultivation (*Modan*). It again reminds the fact of sowing in '*bharani njattuvela*' (in

'*medam*' month). Usually drought resistant crops are cultivated in rainfed uplands. Hence sowing must be essentially done by the end of '*Meda masam*' i.e., '*Bharani njattuvela*'. If late, the incession of south-west monsoons may prevent sowing.

SC: Rational belief

9. ***Thiruvathira thirimuriyathe peyyanam***

'*Thiruvathira njattuvela*' extends from June 21st to July 15th. The South-west monsoon intensifies in this njattuvela and it is highly beneficial for the rice crop - especially the semi dry '*virippu*'. Besides rice crop, rains in '*thiruvathira*' benefits other crops like black pepper too.

SC: Rational belief

II. Sowing or transplanting

10. Sowing or harvesting for (seed purpose) in veluthapaksham (waxing period) is not good

The farmers neither sow nor harvest the crop on pournami (full moon day) and the adjacent days.

As reported by Vivekanandan (1994) moonlit days are less beneficial for crops. On these days, leaf senescence of matured crop hastens and it reduces the grain weight. Grain harvested at this time is infested by storage pests. Sowing on pournami and adjacent days delays greening. Also spread of blast disease is more on such days.

SC: Irrational superstitious belief

11. Not sowing on *sankrama divasam*

Sowing on '*sankrama divasam*' is not practiced. '*Sankramam*' is the transition period between two months. On '*sankramam*' major celestial changes are believed to happen, which affect crop growth.

SC: Superstitious and irrational belief

12. **Sowing is not done on Thursdays**

Farmers believe that sowing on Thursdays extends the crop duration.

The 52 weeks each in a sun calendar is divided into 7 days and is designated by a name for the sake of convenience only. No other significance can be attached to each day.

SC: Such beliefs do not merit consideration

4. ***Aayilyam nalil nellu vithachal nannu***

The farmers believe that the star of rice is '*aayilyam*' and sowing paddy on this day is good.

The day '*aayilyam*' falls once or twice in every month. Therefore, sowing on any '*aayilyam*' day for a good crop has got no logic.

SC: Such beliefs do not merit consideration

14. ***Aayilyathil pakam - athathil parichunadam (or) Atham njattuvelayil nattillenkil attakkazheyilittu chavittanam***

These proverbs are related to '*mundakan*' crop. Medium to long duration season bound varieties are cultivated in '*mundakan*'. The Nursery for this crop has to be raised in '*aayilyam njattuvela*' (August 2 - August 16th). After 45 days in nursery, i.e., one-fourth of the crop duration, transplanting is done in '*atham njattuvela*' (September 26 - October 10). Transplanting after '*atham njattuvela*' is not advisable as short days affect early panicle initiation and results in considerable reduction in crop duration (maturity).

SC: Rational belief

15. ***Karshakantte udayadakkattu nellinu nallathu***

According to the farmers, the plant becomes happy when the farmer frequently visits the field litenally it speaks about the care and management given to the crop by the farmer.

This proverb points out to the state of life of the organism or plant. As applicable to any organism, plants too respond to a stimulus. This was experimentally proved by J.C.Bose. Besides, frequent visits to the plot makes the farmer aware of the timely management practices.

III. Plant Protection

16. Moonlight and while ear heads

The farmers adjust seed sowing in such a way that panicle emergence does not coincide with pournami (full moon day). It is believed that panicle

emergence on pournami increased white ear heads. White ear heads being caused by rice stem borer (RSB) the moonlit pournami day has something to do with its population.

Moths and weevils are affected by light. RSB is positively phototropic. Egg laying will be more in waxing period (period up to pournami when intensity of moonlight increases). However, no studies have been conducted to analyse the relation between crop stage and moonlight as the attack of RSB at vegetative and reproductive stage can cause dead hearts and white ear heads respectively.

SC: It is an area for further research; it needs to be verified.

17. ***Idampakkam koithal kuthippokum***

According to the farmers among seeds harvested 6-8 days prior to full moon ('*Idampakkam*') get attacked by storage pest.

During '*Idampakkam*', the intensity of moonlight increases and as a result the pest population increases in the field. Generally, the pests attacking the produce in the field are different from those attacking it in the store. In a few cases the attack which starts in the field gets transferred to store and the pest proliferate there. However, this transfer of pest is found more in vegetable seeds and tuber crops, than in rice grain. eg. Potato tuber moth, Sweetpotato weevil, Pulse beetle, Fruitfly in cucurbits.

18. ***Pooyathil njaru nattal puzhukkedu - mazha peythal pullum nellu***

This proverb projects the dual effects of '*pooyam njattuvela*'. Trans-planting of I crop ('*virippu*') should be done before '*pooyam njattuvela*', (i.e.,

before July 18th). If late, the crop will be susceptible to the attack of rice stem borer and gall fly. These two pests are the major threats of '*virippu*' crop. So to control them, late transplanting should be avoided.

Therefore, '*virippu*' transplanting must be completed in '*punarthem njattuvela*' (July 5th-18th) itself, so that rains in '*pooyam*' (July 18th-August 2nd) will benefit this crop. The second part of the proverb rightly quotes it - rains in '*pooyam*' produce grains not only in rice crop but also in grass.

SC: Rational belief

IV. Harvesting

19. Harvesting is not done on Tuesday and Saturday

The farmers believe that Tuesdays and Saturdays are not worth for harvesting crop.

No significance can be attached to each day of the week.

SC: Superstitious and irrational belief

V. Storage

20. '*Iruvathettam uchaal*'

On '*makaram*' 28th farmers do not touch the grains meant for seed purpose. It is believed that seeds when touched are liable to the attack of borers (locally called '*uche*'). This is widely believed and still practiced by some leading 'Nair' families of the district. On the day prior to '*makaram*' 28th the seed bins or '*pathaayam*' are covered by thorny twigs in order to prevent any touch.

SC: As no meteorological significance is assigned to this day, it is considered to be a superstitious belief with no scientific rationale.

.....

The study has identified many interesting and sustainable technologies and it is recognised that most of the practices are part of what is called modern technology such as green manuring, biological control etc. The farmers indeed followed what is now called integrated farm management, i.e., adopting sensible cultural practices, applying organic matter and soil amendments like neem cake for building the nutrient status of the soil, not pursuing pest control operations when there is minimal attack by pests and thus enabling the bio-control agents to act upon, growing local varieties to withstand adverse climatic conditions which are incidentally resistant to pests and diseases, and above all adopting natural methods of crop protection without harming the predators and parasites and also augmentation of natural enemies.

However, in developing countries as farmers become more prosperous, they incline to give up these practices and fail to synthesize an alternative system built upon our tradition, culture and ecosystem. Now it is seen that unsustainable farming practices have increased the trend in food production. Efforts should be undertaken to study the significance of indigenous practices of farmers innovations for sustainable food production. So what is required is to give 'Scientific re-spectability' to these practices and come up with a system where the product can be made available to farmers on a larger scale, at an affordable piece.

4.2 Distribution of rice farmers based on their knowledge about indigenous practices

The knowledge score of rice farmers ranged from 4.6 to 90.9 per cent. The arithematic mean of the knowledge score was 42.49 with a standard error of 1.67.

Table 3 and Fig. 17 explain the distribution of the farmers with respect to their knowledge score. The quartiles Q_1, Q_2 and Q_3 were identified from the cumulative frequency curve (Fig.18) as 33, 34 and 58 respectively. From the results it can be inferred that 50 per cent of the sample has a knowledge score between 33 and 58 with a median value of 44.

With the advent of green revolution new technological package was propagandised as the panacea for crop management and protection. Even the conventional secence based research and extension acitivities have focussed on modern agriculture. TOT programme by the extension agency, media and other voluntary organisation spared no efforts to teach and train the farmers in these productive technologies. All this coupled with their spectacular results have left the farmer with no other option but to acknowledge and internalise the modern system of farming. Moreover there is no ready package available for the acquisition and transfer of indigenous farming practices. So these may be the possible reasons for the low and medium knowledge of about indigenous practices among majority of the farmers.

However, the slowing of yield growth rates and decreasing input efficiency in irrigated rice, low and declining yields in non irrigated rice called for

Table 3. Distribution of farmers with respect to their knowledge score

(n = 135)

Sl. No.	Knowledge score	Frequency	Relative frequency (%)	Cumulative frequency
1	0-10	5	3.70	5
2	10-20	14	10.37	19
3	20-30	18	13.33	37
4	30-40	24	17.78	61
5	40-50	17	12.59	78
6	50-60	30	22.23	108
7	60-70	14	10.37	122
8	70-80	11	8.15	133
9	80-90	1	0.74	134
10	90-100	1	0.74	135

Mean = 42.49
SD = 19.42

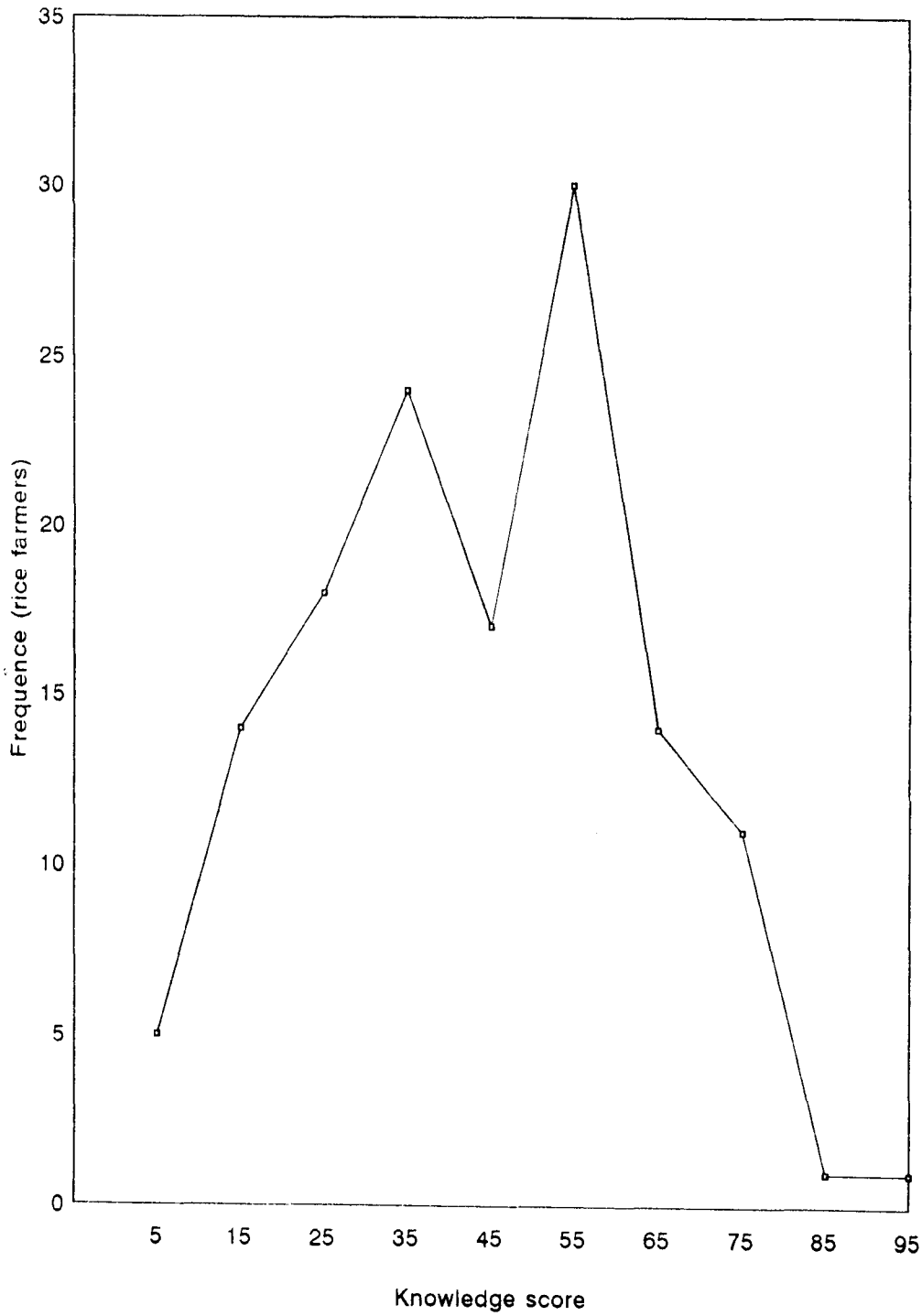


Fig.17. Graph showing the frequency distribution of rice farmers with respect to their knowledge score

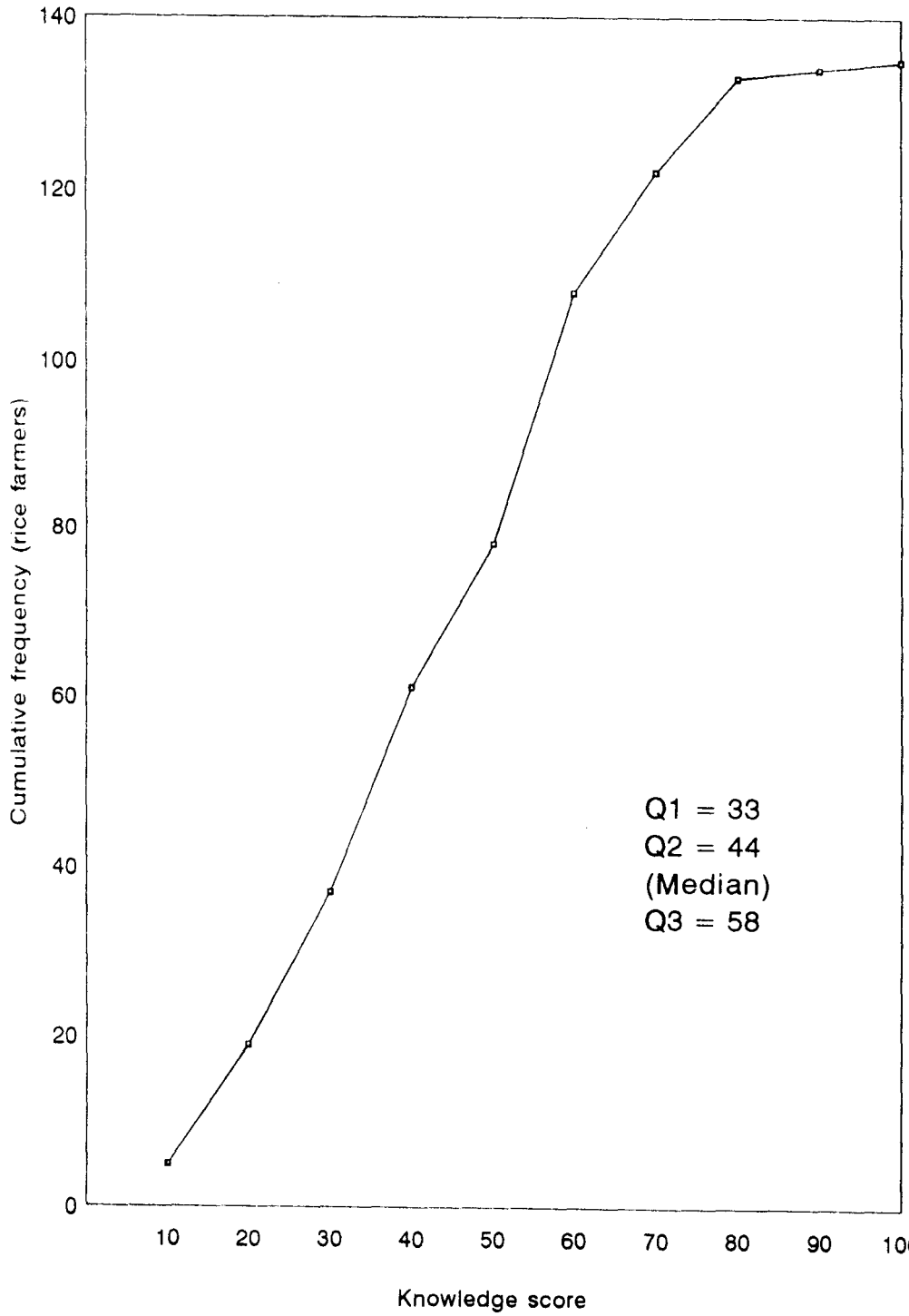


Fig.18. Graph showing the cumulative frequency distribution of rice farmers with respect to their knowledge score

sustainability of rice production. Hence the high knowledge in indigenous practices by 20 per cent of the farmers can be substantiated as the realization of farmers need to incorporate the underutilized resources of farmers experimentation and indigenous technical knowledge into the farming systems.

4.3 Percentage of awareness knowledge of selected indigenous practices by the rice farmers

A perusal of Table 4 revealed that majority of the respondents (68.8%) were aware of using polythene covers to ward off birds. It is believed that most of the bird pests are scared away by this control method.

About 68.14 per cent were knowledgeable about in staking white flags to scare rodents. Soaking seeds in cowdung slurry and use of saw-toothed scissor trap to control rodents was familiar to 62.22 per cent of farmers.

Cultivation of traditional varieties for *mundakan* crop is a common indigenous practice. About 60.74 per cent of farmers were aware of this practice. The package of practice recommendation to avoid overlaping rice cultivation to contain rice bug population was believed by 59.25 per cent of farmers.

The per cent of awareness knowledge of rest of the indigenous practices was as follows. Green manuring using thick leaves - 58.65 per cent; seed treatment in bamboo baskets lined with koova, teak or karingotta leaves - 58.51 per cent; fixing coconut petioles invertedly to serve as owl perches - 55.55 per cent; drainage to control rice case worm - 54.07 per cent; use of kumbham to trap burrow rats - 52.59 per cent; keeping off sowing or harvesting (for seed purpose) in 'makara muka' - 51.11 per cent; basal application of neem cake - 47.4 per cent; placing

Table 4. Percentage of awareness knowledge of selected indigenous practices by the rice farmers

(n = 135)

Sl.No.	Indigenous practices	No.	%
I. SEEDS AND SEED TREATMENT			
1	Traditional medium duration varieties for '*Mundakan*' crop	82	60.75
2	Placing soaked seeds in bamboo baskets or baskets made of plaited coconut leaves lined with '*koova*', teak or bamboo leaves	79	58.51
3	Seed treatment with cowdung	84	62.22
II. SOWING AND NURSERY MANAGEMENT			
4	Not sowing or harvesting (for seed purpose) in '*Makara muka*' a period of acid rains	69	51.11
III. MAINFIELD PREPARATION AND TRANSPLANTING			
5	Green leaf manuring using thick leaves of mango, jack, cashew etc.	89	58.65
6	'*Kundakoottal*'	59	43.70
7	Basal application of neem cake	84	47.40
IV. CONTROL OF RICE BUG			
8	Spray solution of garlic asafoetida and pepper	43	31.85
9	Avoid overlapping rice cultivation	80	59.25
V. CONTROL OF RICE LEAF ROLLER			
10	Dragging thorny twigs over the crop	56	41.48
VI. CONTROL OF RICE CASE WORM			
11	Drainage	73	54.07
VII. CONTROL OF CRABS			
12	Releasing flocks of geese in puddled field	62	45.92
VIII. CONTROL OF RODENTS			
13	Fixing coconut petioles invertedly	75	55.55
14	'*Kumbham*' - rat trap form burrow rats	71	52.59
15	Saw toothed scissor traps	84	62.22
16	Fixing white flags in fields	92	68.14
IX. CONTROL			
17	Use of audio-video tapes	47	34.81
18	Use of plastic covers	93	68.88
X. CONTROL OF STORAGE PESTS			
19	Mixing insect repellent leaves with stored products	61	45.18

insect repellant leaves in stores - 45.18 per cent; 'kundakoottal' - 43.7 per cent; dragging thorny twigs to over the crop to contain rice roller population - 41.48 per cent; stretching tape reels to scare birds - 34.81 per cent and application of spray solution of garlic, asafoctida and pepper to control rice bug - 31.85 per cent.

4.4 Distribution of rice farmers based on adoption of indigenous practices in rice farming

The adoption index of rice farmers ranged from 1.00 to 92.50. The average adoption index was found to be 31.306 with a standard error of 1.655.

The distribution of farmers based on adoption index is furnished in Table 5 and Fig. 19. The quartile classes as derived from the cumulative frequency curve (Fig. 20) is as follows - $Q_1 = 18$, $Q_2 = 28$ and $Q_3 = 43$. This clearly explains that 50 per cent of the farmers had an adoption index ranging from 18 to 43 with a median of 28.

As discussed earlier, the absence of an organised support from agricultural scientists and extension agency for the adoption of indigenous farming coupled with increased productivity levels of modern technology has forced the farmers to rely more on new agricultural know how.

According to Venkatraman (1995), even agricultural experts express doubts about taking up ecological farming on an extensive scale without adequate research findings. Morever, the sudden switch over from chemical to ecological agriculture may spell disaster and discourage the farmers and the compensation of this yield loss during transition stage is not backed up by a strong research and extension machinery. Another underlying problem is the lack of a convincing

Table 5. Distribution of farmers with respect to their adoption index

(n = 135)

Sl. No.	Adoption index	Frequency	Relative frequency	Cumulative frequency
1	0-10	14	10.37	14
2	10-20	30	22.22	44
3	20-30	29	21.48	73
4	39-40	22	16.30	95
5	40-50	20	14.81	115
6	50-60	7	5.19	122
7	60-70	6	4.44	128
8	70-80	5	3.70	133
9	80-90	1	0.74	134
10	90-100	1	0.79	135

Mean = 41.31
SD = 19.23

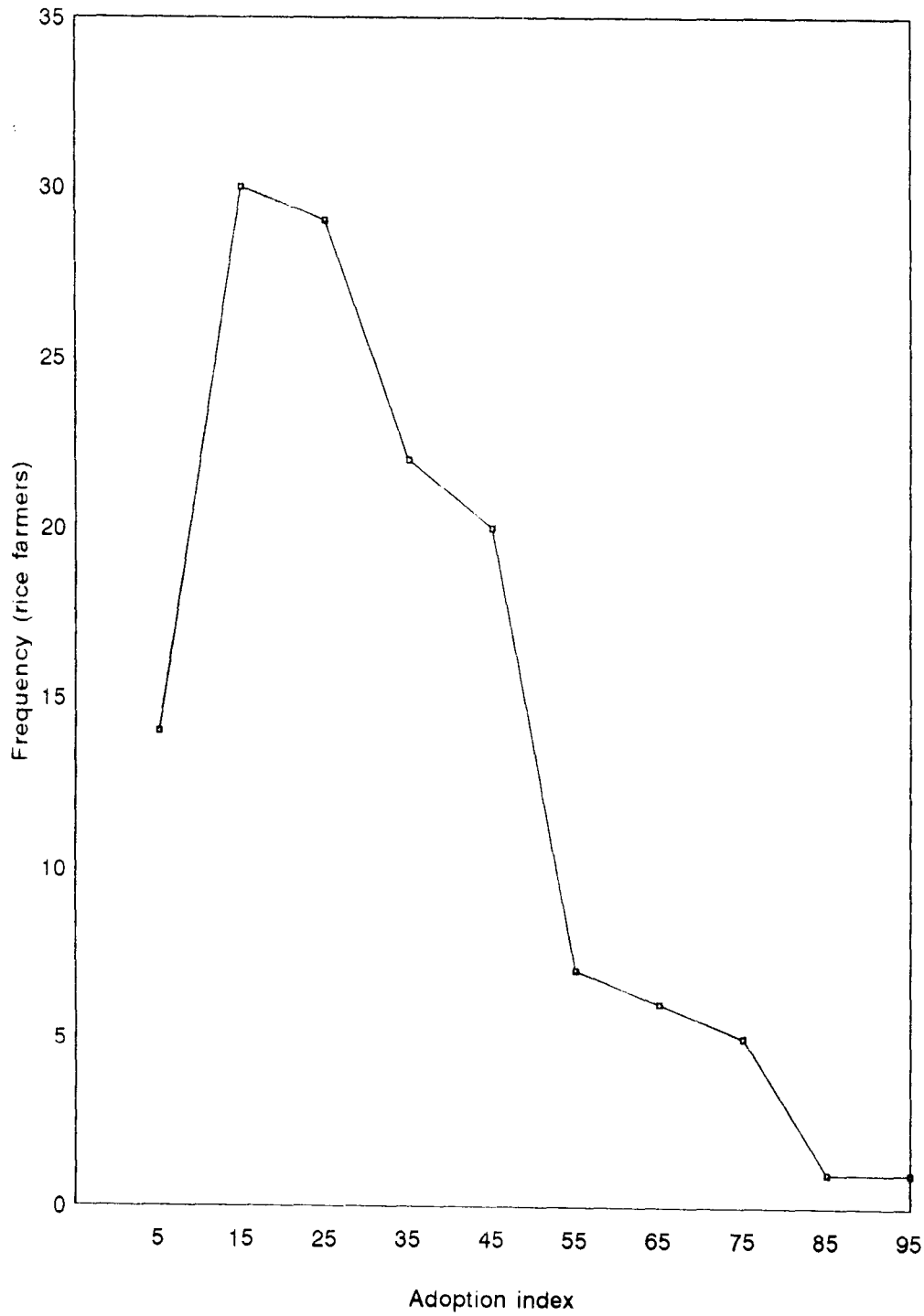


Fig.19. Graph showing the frequency distribution of rice farmers with respect to their adoption index

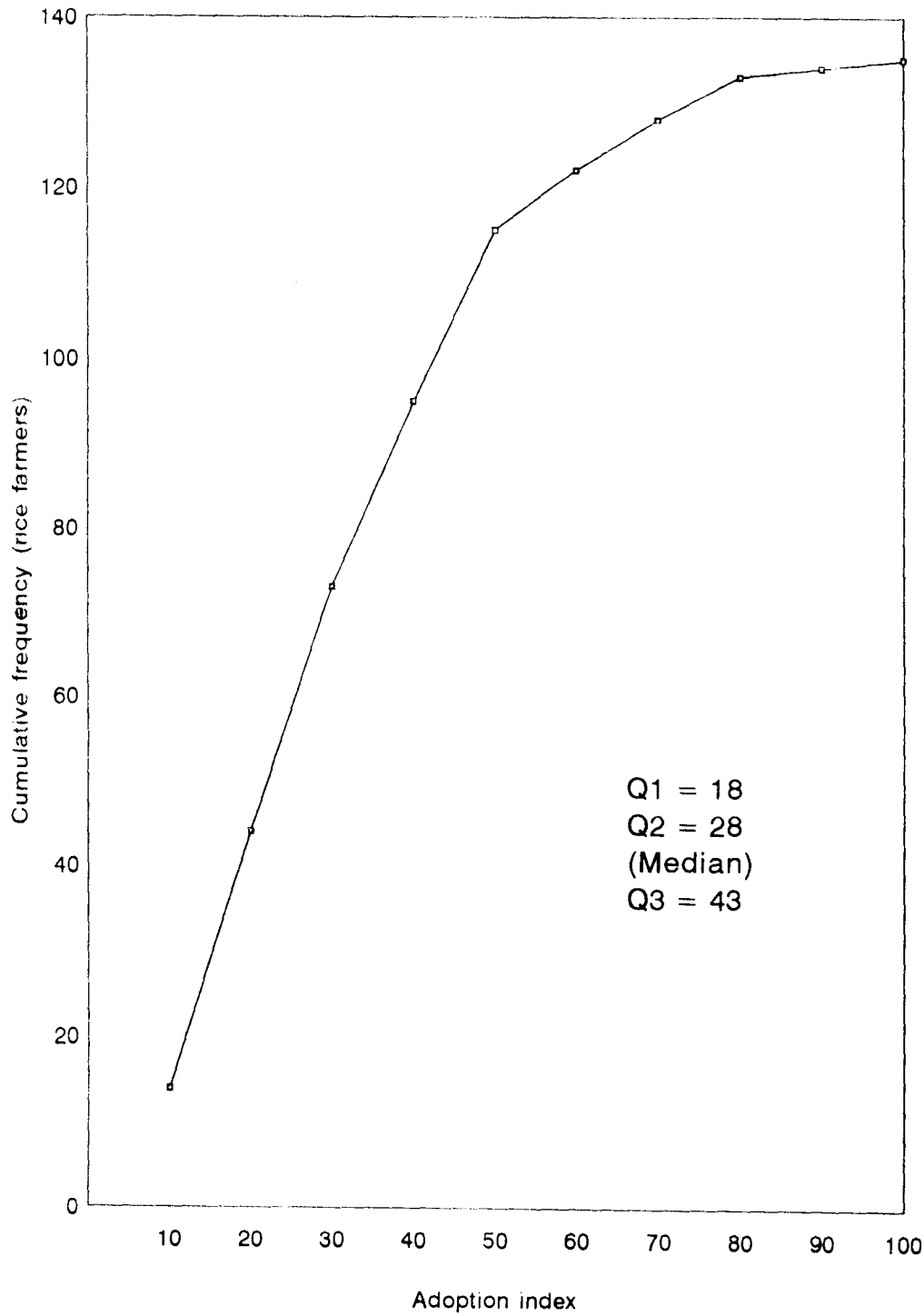


Fig.20. Graph showing the cumulative frequency distribution of rice farmers with respect to their adoption index

indigenous technology package. Hence the medium level adoption by 54.07 per cent of farmers and low level adoption by 36.30 per cent of farmers may be influenced by the above factors.

The high level adoption of indigenous practices by 9.63 per cent of farmers may be attributed to the sustainable and low cost elements of indigenous farming.

4.5 Adoption percentage of selected indigenous practices by rice farmers

Practice wise adoption percentage of selected indigenous practices is furnished in Table 6. In the case of seeds and seed treatment, 52.6 per cent of farmers placed soaked seeds in bamboo baskets lined with '*koova*', '*karingotta*' and teak leaves. This was practised to hasten germination. 47.4 per cent cultivated traditional variety for second crop '*mundakan*' and 35.5 per cent soaked seeds in cowdung slurry.

Keeping off sowing or harvesting (for seed purpose) was a common practice associated with management operation which was followed by 33.33 per cent.

Among the practices associated with transplanting and mainfield preparation, 42.2 per cent of farmers commenced the field operation by basal application of neem cake. While green leaf manuring using thick leaves was practised by a higher percentage of farmers (55.8%). However, 'kundakoottal' which is a labour intensive practice was adopted by only 40 per cent of the farmers and this practice was more confined to the traditional varieties.

Table 6. Adoption percentage of selected indigenous practices by the rice farmers

(n = 135)

Sl.No.	Indigenous practices	No.	%
I. SEED AND SEED TREATMENT			
1	Traditional medium duration varieties for '*Mundakan*'	64	47.4
2	Placing soaked seeds in baskets made of plaited coconut leaves lined with '*koova*', teak and banana leaves	71	52.6
3	Seed treatment with cowdung	48	35.5
II. SOWING AND NURSERY MANAGEMENT			
4	Not sowing or harvesting (for seed purpose) in '*Makara muka*' - period of acid rains	*45*	*33.33*
III. TRANSPLANTING AND MAINFIELD PREPARATION			
5	Green leaf manuring using thick leaves of mango, jack, cashew etc,	75	55.5
6	'*Kundakoottal*'	54	40.0
7	Basal application of neem cake	57	42.2
IV. CONTROL OF RICE BUG			
8	Spray solution of garlic, asafoetida and pepper	37	27.4
9	Avoiding overlapping rice cultivation	65	48.2
V. CONTROL OF RICE LEAF ROLLER			
10	Dragging thorny twigs over the crop	42	31.11
VI. CONTROL OF RICE CASE WORM			
11	Drainage	47	34.81
VII. CONTROL OF CRABS			
12	Releasing flocks of geese in puddled fields	52	38.5
VIII. CONTROL OF RODENTS			
13	Fixing coconut petioles invertedly	47	34.8
14	'*Kumbham*' - rat trap for burrow rat	63	46.6
15	Saw toothed scissor trap	7	5.18
16	Fixing white flags in fields	80	59.2
IX. CONTROL OF BIRD PESTS			
17	Use of audio-video tapes	4	2.9
18	Use of plastic covers	77	57.0
X. CONTROL OF STORAGE PESTS			
19	Mixing insect repellent leaves with stored products	60	48.88

As a part of integrated pest management, 48.2 per cent of farmers avoided overlapping rice cultivation to control rice bug. While, spray solution of garlic, asafoetida and pepper was used only by 27.4 per cent though it involves less cost. Similarly only 31.11 per cent of the farmers adopted the low cost practice of dragging thorny twigs over the crops.

About 34.81 per cent of farmers followed cultural control method to contain case worm population by draining the field. Some farmers (38.5%) released flocks of gees in puddled field as a biological measure to control crab population.

Among the four practices selected to control rodent population, scaring rodents using white flags was adopted by 59.2 per cent of farmers, while fixing owl perches was followed by 34.8 per cent of farmers. These practices are relatively simple and cost affective.

Use of 'kumbham' was widely adopted by the farmers (46.6%). This can be justified by the fact that 'kumbham' is the only indigenous rat control technique that is effective in trapping burrow rats. Saw-toothed scissor trap though aware to 62.22 per cent of farmers, it was adopted by only 5.18 per cent of farmers. The low adoption percentage may be due to the non-availability of traps in the local market and lack of knowledge about its make.

Bird pests were physically controlled by tying polythene covers to stakes. This type of bird scare was followed by 57 per cent of farmers. While only 2.9 per cent using audio/video tape as bird scare. This can be due to the unawareness of the farmers about its efficiency.

About 48.88 per cent of farmers used botanicals to control storage pests. This may be the result of awareness of farmers regarding the ill-effects of chemicals in stores and its high cost.

4.6 Distribution of respondents based on their personal, socio-economic and socio-psychological characteristics

An attempt was made to know the distribution of respondents based on their personal, socio-economic and socio-psychological characteristic and the results are presented in Table 7.

A perusal of Table 7 reveals that agriculture was the main occupation of 88 per cent of the respondents. Majority of them were in high category in the case of variables like annual income (68.15%), area under rice cultivation (67.41%), Innovativeness (67.41%), economc motivation (66.67%), progressiveness-traditionalism (63.71%), fatalism-scientism (61.49%), rational orientation (61.48%), extension orientation (60.0%), social participation (57.04%), education (55.55%), risk preference (54.81%), personal-localite exposure (54.08%) and age (51.11%). Regarding rest of the variables only less than 50 per cent of the respondents were in high category. Among them a majority (63.7%) was found in low category in the case of variable availability of family labour followed by social participation (42.96%), cosmopoliteness (50.37%) and farming experience (51.11%).

4.7 Influence of personal socio-economic and socio-psychological characteristics on the knowledge of rice farmers about indigenous practices (KRIP)

By means of simple correlation analysis, the relationship of personal,

Table 7. Distribution of the rice farmers based on their personal, socio-economic and socio-psycological characteristics

(n = 135)

Variable	Characteristic	Category	Range	Frequency	Percentage
1	Age	Low	< 51.95	66	48.89
		High	51.95 & above	69	51.11
2	Education	Low	< 1.691	60	44.44
		High	1.69 & above	75	55.56
3	Main occupation	Low	< 2.76	16	11.85
		High	2.76 & above	119	88.15
4	Farming experience	Low	< 30.99	69	51.11
		High	30.99 & above	66	48.89
5	Annual income	Low	< 42,000	43	31.85
		High	42,000 & above	92	68.15
6	Area under rice cultivation	Low	< 3.30	44	32.59
		High	3.30 & above	91	67.41
7	Availability of family labour	Low	< 6.07	86	63.70
		High	1.07 & above	49	36.30
8	Personal-localite exposure	Low	< 4.96	62	45.92
		High	4.96 & above	73	54.08
9	Fatalism-Scientism	Low	< 2.11	52	38.51
		High	2.11 & above	83	61.59
10	Social participation	Low	< 3.85	58	42.96
		High	3.85 & above	77	57.04
11	Progressiveness-traditionalism	Low	< 4.99	49	36.29
		High	4.99 & above	86	63.71
12	Extension-orientation	Low	< 7.35	54	40.00
		High	7.35 & above	81	60.00
13	Economic motivation	Low	< 4.9	45	33.33
		High	4.9 & above	90	66.67
14	Innovativeness	Low	< 1.9	44	32.59
		High	1.9 & above	91	67.41
15	Cosmopolitiness	Low	< 6.25	68	50.37
		High	6.25 & above	67	49.63
16	Rational orientation	Low	< 2.57	52	38.52
		High	2.57 & above	83	61.48
17	Risk preference	Low	< 13.24	61	45.19
		High	13.24 & above	74	54.81

socio-psychological and socio-economic characteristics of rice farmer with their KRIP was studied. The findings are presented in Table 8.

a) Simple correlation analysis of KRIP with their personal, socio-economic and socio-psychological characteristics

It was found that out of the seventeen independent variables included in the study only five variables showed positive and significant relationship with KRIP. They are main occupation (X_3), farming experience (X_4), availability of family labour (X_7), personal localite exposure (X_8) and risk preference (X_{17}). While negative and significant influence was exerted by education (X_2), progressiveness traditionalism (X_{11}) and rational orientation (X_{10}). Rest of the variables age (X_1), annual income (X_5), area under rice (X_6), fatalism-scientism (X_9), social participation (X_{10}), extension orientation (X_{12}), economic motivation (X_{13}), innovativeness (X_{14}), cosmopoliteness (X_{10}) and rational orientation (X_{16}) did not exert any significant influence on KRIP.

b) Multiple Linear Regression Analysis (MLR)

In correlation analysis, collective variability of all the seventeen variables on the dependent variable was studied. In order to study the relative contribution of each of the independent variable on the dependent variable and the total predictability of the linear model in representing the relationship, MLP was done. The results of MLP are presented in Table 9.

The findings of MLR analysis revealed that the F value (2.76) obtained was significant, indicating that all the variables together contributed significantly to the variation in KRIP. However, co-efficient of determination revealed that only

Table 8. Results of simple correlation analysis of knwoledge of indigenous pratices by rice farmers with their personal, socio-psychological and socio-economic characteristics (n = 135)

Variable No.	Characteristics	Correlation coefficient
X_1	Age	0.145 NS
X_2	Education	-0.216*
X_3	Main occupation	0.245**
X_4	Family experience	0.165*
X_5	Annual income	-0.078 NS
X_6	Area under rice cultivation	-0.049 NS
X_7	Availability of family labour	0.183 NS
X_8	Personal-localite exposure	0.427**
X_9	Fatalism-Scientism	0.158 NS
X_{10}	Social participation	-0.048 NS
X_{11}	Progressiveness-traditionalism	-0.263**
X_{12}	Extension orientation	-0.056 NS
X_{13}	Economic motivation	-0.102 NS
X_{14}	Innovativeness	-0.018 NS
X_{15}	Cosmopolitiness	-0.116 NS
X_{16}	Rational orientation	-0.207*
X_{17}	Risk preference	0.283**

** Significant at 1% level
* Significant at 5% level
NS - Not significant

Table 9. Results of Multiple Linear Regression Analysis of knowledge of indigenous practices of rice farmers with personal, socio-psychological and socio-economic characteristics

(n = 135)

Variable No.	Characters	Regression coefficient	Standard error regression coefficient	Value
X_1	Age	0.033	0.232	0.140 NS
X_2	Education	-0.832	2.968	-0.280 NS
X_3	Main occupation	5.176	2.840	1.823 NS
X_4	Farming experience	-0.040	0.223	-0.181 NS
X_5	Annual income	0.000	0.000	1.354 NS
X_6	Area under rice cultivation	-1.202	0.605	-1.985*
X_7	Availability of family labour	-0.400	1.477	-0.271 NS
X_8	Personal-localite exposure	2.979	0.821	3.628**
X_9	Fatalism-scientism	-1.395	1.220	-1.144 NS
X_{10}	Social participation	0.455	1.029	0.443 NS
X_{11}	Progressiveness-traditionalism	-3.063	1.593	-1.922 NS
X_{12}	Extension orientation	0.187	0.638	0.293 NS
X_{13}	Economic motivation	0.618	1.616	0.383 NS
X_{14}	Innovativeness	0.315	2.322	0.136 NS
X_{15}	Cosmopoliteness	0.353	1.176	0.300 NS
X_{16}	Rational orientation	-2.458	3.132	-0.785 NS
X_{17}	Risk preference	6.702	0.626	1.070 NS
	Intercept	23.78		
	R^2	0.286		
	F	2.76**		

** Significant at 1% level
* Significant at 5% level
NS - Not significant

28.6 per cent of the variation in KRIP was explained by these seventeen independent variables.

c) Step down regression analysis

MLR analysis gave the joint influence of all the selected independent variables on KRIP. But it is always better to have a reduced model in which, there is less number of predictors in explaining the relationship. So to obtain the best subset of predictors on KRIP, step down regression analysis was done. Various steps of the analysis are presented in Table 10. This ended up with the selection of six variable namely fatalism-scientism (X_9), annual income (X_5), area under rice (X_6), personal localite exposure (X_8), main occupation (X_3) and progressiveness-traditionalism (X_{11}). The regression co-efficient and their standard error in the reduced model is also shown in Table 10. It was interesting to note that the regression model with these selected six predictors is fit enough to explain 27.05 per cent of the total variation in the dependent variable (KRIP), where as the full model with 17 variables yielded only 28.6 per cent.

Indigenous knowledge of a farmer increased with his personal localite exposure. Indigenous practices are locally developed technologies. This folk wisdom is usually integrated with the belief system, cultural norms and traditional methods of communication like songs and proverbs. They are spread through informal meeting or other social gatherings. So communication of farmer with their family members, neighbours, relatives and other progressive farmers plays a key role in the spontaneous diffusion of these self developed technologies. This reveals the local network of farmers who assemble regularly to discuss and disseminate the farm concepts and results of farm experimentation. Moreover the 'folk wisdom' seldom

Table 10. Results of step down regression analysis of knowledge of indigenous practices by the rice farmers with personal, socio-psychological and socio-economic characteristics

(n = 135)

Step No.	Variable for regression	R^2	Multiple correlation coefficient R	F value
1	X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15}, X_{16}, X_{17}	0.535	0.2862	2.96*
2	X_{14}	0.5350	0.2862	2.96*
3	X_1	0.5349	0.2861	3.18*
4	X_4	0.5348	0.286	3.43*
5	X_2	0.5345	0.2857	3.72*
6	X_7	0.5341	0.2852	4.06*
7	X_{15}	0.5335	0.2847	4.45*
8	X_{13}	0.5326	0.2837	4.91**
9	X_{12}	0.5379	0.2829	5.48**
10	X_{16}	0.5285	0.2799	6.11**
11	X_{10}	0.5248	0.2754	6.90**
12	X_{17}	0.5201	0.2705	7.91*
	Remaining variables X_9, X_{15}, X_6, X_3, X_8, X_{11}			

** Significant at 1% level
* Significant at 5% level

finds place in media as they are tied on to a specific locality or culture and are often kept secret.

The next important variable was main occupation owing to its significant correlation co-efficient and high direct effect which was supplemented by a fairly high indirect effect through personal localite exposure. With agriculture as main occupation a farmer accumulates vast experience in various farm operations. His practical knowledge is reflected by his experience in farming. Numerous farming practices have been developed through a process of innovation and adaptation by the farmers. They learn to manipulate and derive advantage from local resources and natural processes by conducting various experiments. Hence a farmer with main occupation as agriculture has a tremendous knowledge on indigenous farming.

The next variable that exhibited a direct negative effect on knowledge was annual income. Only a farmer who is financially sound will be more enthusiastic to invest more money on the much guaranteed and promising modern technologies. While a poor farmer will be more inclined towards indigenous practices owing to the high cost and complexity of modern practices. Gupta and Patel (1992a) and Gupta and Patel (1992b) reported that indigenous practices were cost effective and easy to practice. So the negative impact of annual income on indigenous knowledge of farmers is not susprising.

The variable fatalism-scientism also established direct effect on KRIP. Indigenous knowledge includes both technical and non-technical field covering various social and religious taboos, beliefs and customs (Sanghi, 1991). An element of supernaturality and fatalism is integrated with the indigenous believes or practices. So while there is a general perception that modern practices are more factual and scientific. Under such circumstances fatalistic and scientific belief of a

farmer will influence KRIP. More fatalistic a farmer is, more will be his KRIP and more scientific a farmer is lesser will be his KRIP.

The next important variable that showed negative influence on KRIP is the area under rice cultivation or the landholdings of rice farmer. Though the experts endorse all the positive aspects of indigenous farming, they express doubts about taking it up on an extensive scale without adequate supportive research finding. This discourages large scale adoption of indigenous practices by the farmers. In addition to it, lack of a ready package of practice for indigenous farming prevents the farmer from learning more about these farmers' innovations. This could be the possible explanation of low KRIP for large farmers.

The variable progressiveness-traditionalism also showed negative and significant correlation with KRIP. This statement is self explanatory. As the progressiveness of the farmers increases his quest to learn more about modern practices increases. A progressive farmer adopting a traditional practice is subject of ridicule. This was a general observation in the case of most of the farmers who had fairly good access to the extension agencies. While the traditionalism has a positive effect on KRIP. Traditional farmers were less influenced by modern technologies and were more inclined towards indigenous practices which they believe are simple, cost-effective and eco-friendly.

Out of the seventeen independent variables selected for the study, only eight showed significant correlation with KRIP and unusually, as a result of inter correlation among the variables, those variables that did not show any significant correlation with the dependent variables in simple correlation analysis exhibited significant effect in multiple linear regression analysis. Above all only 28.6 per cent of the total variation in the dependent variable was caused by these variables.

This depicts that the independent variables selected for the study were not exhausive enough. In fact they were selected based on past research studies, discussion with experts, review of literature and field experience. But these variables are not the exact factors that influence KRIP. The results of this study indicate that there are some other latent elements that govern the development and dissemination of indigenous knowledge of the farmers.

4.8 Influence of personal, socio-economic and socio-psychological characteristics on the adoption of indigenous practices by the rice farmers (AIPR)

The relationship of AIPR with their personal, socio-psychological and socio-economic characteristics was established in this study first by simple correlation analysis and the findings are presented in Table 9.

a) Simple correlation analysis of AIPR with the personal, socio-economic and socio-psychological characteristics of the rice farmers

A perusal of Table 11 showed that out of seventeen independent variables, family labour (X_7), personal localite exposure (X_8), fatalism-scientism (X_9) and risk preference (X_{17}), showed positively significant relationship with AIPR, while the social participation (X_{10}), progressiveness-traditionalism (X_{11}), extension orientation (X_{12}), cosmopliteness (X_{15}) and rational orientation (X_{17}) had negatively significant relationship with AIPR.

Rest of the variables like age (X_1), education (X_2), main occupation (X_3), family experience (X_4), annual income (X_5), area under rice (X_6), economic motivation (X_{13}) and innovativeness (X_{14}) did not have any influence on AIPR.

Table 11. Results of simple correlation Analysis of adoption of indigenous practices by rice farmers with their socio-psychological and socio-economic characteristics (n = 135)

Variable No.	Characteristics	Correlation coefficient
X_1	Age	0.103 NS
X_2	Education	-0.082 NS
X_3	Main occupation	0.117 NS
X_4	Farming experience	0.098 NS
X_5	Annual income	-0.064 NS
X_6	Area under rice	0.024 NS
X_7	Availability of family labour	0.189*
X_8	Personal-localite exposure	0.391**
X_9	Fatalism-scientism	0.380**
X_{10}	Social participation	-0.360**
X_{11}	Progressiveness-traditionalism	-0.221**
X_{12}	Extension orientation	-0.323**
X_{13}	Economic motivation	0.043 NS
X_{14}	Innovativeness	-0.055
X_{15}	Cosmopoliteness	-0.281**
X_{16}	Rational orientation	-0.253**
X_{17}	Risk preference	0.616*

** Significant at 1% level
* Significant at 5% level
NS - Not significant

b) Multiple Linear Regression Analysis

Using all the seventeen independent variables MLR was done in order to give the relative contribution of each of the independent variable to the dependent variables. The findings are presented in Table 12.

The findings of MLR analysis in Table 12 revealed that the F value (5.41) obtained was significant, indicating that all the variables together contributed significantly to the variations of AIPR. However, co-efficient of determination revealed that 44.0 per cent of the variation is AIPR was explained by these seventeen independent variables.

c) Step down regression analysis

To get the joint influence of the best subset of predictors on AIPR, step down regression analysis was done. The results of step down regression analysis are presented in Table 13.

It was found that out of the total contribution to variation of 44 per cent, 43.46 per cent was contributed by even variables namely age (X_1), main occupation (X_3), family experience (X_4), personal-localite exposure (X_8), social participation (X_{10}), economic motivation (X_{13}) and risk preference (X_{17}). Thus these variables could be considered the best in predicting AIPR.

Risk preference of indigenous farmer is the most important variable owing to its positive and significant correlation co-efficient on AIRP. Indigenous practices are less costly but uncertain. It is generally believed that indigenous practices, especially the use of plant protection chemicals and fertilizers donot show

Table 12. Results of Multiple Linear Regression Analysis of adoption of indigenous practices of rice farmers with personal, soci-psychological and socio-economic characteristics

(n = 135)

Variable No.	Characteristics	Regression coefficient	Standard error of regression coefficient	t value
X_1	Age	0.172	0.205	0.839 NS
X_2	Education	-0.027	2.622	-0.010 NS
X_3	Main occupation	2.857	2.509	1.139 NS
X_4	Farming experience	-0.162	0.197	-0.819 NS
X_5	Annual income	-0.000	0.000	-0.545 NS
X_6	Area under rice cultivation	-0.196	0.535	-0.366 NS
X_7	Availability of family labour	-0.016	1.305	-0.013 NS
X_8	Personal localite exposure	0.881	0.725	1.215 NS
X_9	Fatalism-scientism	0.272	1.077	0.252 NS
X_{10}	Social participation	-1.542	0.907	-1.697 NS
X_{11}	Progressiveness-traditionalism	0.366	1.907	0.260 NS
X_{12}	Extension orientation	-0.367	0.564	-0.064 NS
X_{13}	Economic motivation	3.031	1.427	2.123*
X_{14}	Innovativeness	-0.246	2.052	-0.120 NS
X_{15}	Cosmopoliteness	0.506	1.039	0.487 NS
X_{16}	Rational orientation	-1.479	2.767	-0.535 NS
X_{17}	Risk preference	2.706	0.553	4.890**
	Intercept	-29.30		
	R^2	0.44		
	F	5.41**		

** Significant at 1% level
* Significant at 5% level
NS - Not significant

Table 13. Results of step down regression analysis of adoption of indigenous practices by rice farmers with the personal, socio-psychological and socio-economic characteristics

(n = 135)

Step No.	Variable for regression	R^2	Multiple correlation coefficient R	F value
1	$X_1, X_2, X_3, X_4, X_5, X_6$ $X_7, X_8, X_9, X_{10}, X_{11}, X_{12}$ $X_{13}, X_{14}, X_{15}, X_{16}, X_{15}$	0.442	0.6635	5.41**
2	Down X_2	0.4402	0.6635	5.80**
3	Down X_7	0.4402	0.6635	6.24**
4	Down X_{12}	0.4402	0.6635	6.75**
5	Down X_{14}	0.4401	0.6634	7.32**
6	Down X_1	0.4398	0.6632	7.98**
7	Down X_9	0.9395	0.6630	8.77**
8	Down X_6	0.4388	0.6625	9.70**
9	Down X_{15}	0.4381	0.6619	10.83**
10	Down X_{16}	0.4372	0.6612	12.24**
11	Down X_5	0.4346	0.6592	13.94**
	Remaining variables X_1, X_4, X_3, X_8 X_{13}, X_{10}, X_{17}			

** Significant at 1% level

any immediate and persistent effect unless they are used at frequent intervals. Rice being a short duration crop, the farmers prefer to use chemicals to contain pest population and trigger the crop growth at the earliest. Under such circumstances only a farmer with high risk preference will show the courage to use indigenous practices, whose effect is gradual and doubtful.

The next important variable influencing AIRP is economic motivation of farmers. It is obvious that farmer tends to undergo a process of change only when there is a strong economic usage. According to Reijntjes (1992) modern agriculture is High External Input Agriculture (HEIA) while traditional agriculture is Low External Input Agriculture (LEIA). Though the productivity of indigenous practice is not on par with modern agriculture, its benefit-cost ratio is high. So nationally a farmer is economically motivated towards the use of indigenous technology than the use of modern technology. This justifies the positive impact of economic motivation on AIRP.

Age of the farmer and his farming experience are the next important variables that had positive influence on AIRP. The old farmers with long experience in rice farming are more aware about the beneficial effects of indigenous farming and hence have developed an attitude to adopt them until now. While the younger generation are more suspicious about the effectiveness of indigenous farming. Moreover, the use of indigenous practices, they feel, gives them a 'traditional look' in this progressive world of science. Hence indigenous technology is more adopted by the old and experienced farmers.

The variable personal-localite exposure was also positively and significantly correlated with AIRP. Indigenous practices are farmers innovations. A

farmer who develops, implements and endorses his innovation is rather the most credible source of information. The farmer-to-farmer communication or communication with other localite sources of information is a determinant factor influencing AIRP. Hence as the personal localite exposure of the farmer increases the adoption of the IP also increased cimultaneously.

Another variable that had positive correlation with AIRP was main occupation. With agriculture as main occupation, the farming experience of the farmer increases. It enables the individuals to realise the merits of indigenous farming. Hence a farmer with agriculture as main occupation will be more knowledgeable about the benefits of indigenous farming, thereby promoting higher adoption.

Similar to KRIP, the results of statistical analysis of AIRP are unsatisfactory. Out of the seventeen independent variables, only nine showed significant correlation with AIRP. Besides, economic motivation (X_{15}) with an insignificant simple correlation co-efficient exhibited significant multiple correlation co-efficient. This is supposed to be the result of inter-collinearity among the independent variables. Moreover, only 44 per cent of the total variation was contributed by these seventeen variables.

Therefore, it is worth to be mentioned again that this practices and strange findings reveal the improper selection of the variables. There may be a set of new variables that has a real impact on AIRP. Hence such variables should be identified and analysed in further such attempts.

4.9 Evaluative perception of indigenous practices by farmers, extension workers and scientists

Cochran's Q test was used to test the significance of difference between the three groups with regard to the perception attributes of various indigenous practices. The results of the analysis are presented in Table 14.

The table reveals that cent per cent of the respondents perceived indigenous practice as sustainable. Indigenous farming is sustainable food production technology which produces enough to meet the needs of the society, is profitable to the practitioner, conserves natural resource base and provide healthy and safe environment in the long run.

Indigenous practice was perceived as simple by 90.39 per cent of the respondents. Adoption of indigenous practice does not involve any complex procedures for which farmers require specific skills. Moreover, indigenous practices are farmers innovations experimented and adapted in their own fields. Hence simplicity in their use and practice needs no further explanation. For example application of ash is a very common pest control method which is very simple to practise. Besides, unlike modern plant protection chemicals these materials have no specificity in their use, as application of ash is equally applicable to all rice pest for that matter. Hence flexibility of indigenous practice, as perceived by 89.73 per cent of respondents, is an important attribute of indigenous practice.

Similarly high availability of inputs is another important attribute of indigenous farming, perceived by 80.36 per cent of the respondents. Inputs used in indigenous farming are cheap and locally available. The indigenous integrated farming system comprises of crop and livestock in which wastes of one enterprise is

Table 14. Evaluative perception of indigenous practices by rice farmers, extension workers and scientists (percentage of positive response)

Perception attributes	Farmers (135)	Extension workers (21)	Scientists (14)	Total (170)	Q value
Simplicity	85.19	96.50	89.47	90.39	0.099 NS
Profitability	78.47	68.60	22.71	56.59	4.860 NS
Input availability	63.43	82.90	94.74	80.36	1.190 NS
Efficiency	67.10	35.61	13.02	38.58	9.410**
Flexibility	86.35	88.95	93.91	89.73	0.060 NS
Sustainability	100.00	100.00	100.00	100.00	0

more efficiently used as input in another within the system. The animals are raised on agricultural wastes and the animal power is used for agricultural operations and the dung used as manure and fuel. Hence cheap and easy availability of input is not a controversal point. Hence low production cost with sustaining yields must yield a higher productivity. But in contrast to this, indigenous practices were perceived as less profitable and less efficient by 56.59 per cent and 38.58 per cent of respondents, respectively. This low level perception of these attributes reveals the lack of interest and expertise in integrated indigenous farming system. This is the result of modern farming techniques which are input intensive, resource degrading and environment polluting.

In fact the farmers have to practice more than one interprise on their farms to increase the productivity and supplement income because of small farms. The productivity of the present farming systems is low as a result of inefficient integration. This integration is based on traditional knowledge. But unfortunately farmers' technology development is undirected and uncertain. Farmer innovations are perceived as less efficient by the technologists. This fact is quite evident from the results presented in Table 14.

It reveals the significant difference in the perception of efficiency of indigenous practices among the respondent categories. When 67.10 per cent of farmers perceived indigenous farming as efficient, only 35.61 per cent and 13.02 per cent of extension personnel and scientists, respectively, perceived it as efficient.

Very little research is being done to develop modern integrated farming system with emphasis on indigenous or traditional practices. Obviously, there is need to reorient out research to develop location specific integrated farming system

suitable for small farms. This calls for a strong recognition and acknowledgement of the efficacy of indigenous practices. The experts must support the development of this capacity of farmers as effectively as possible. It is this co-operation between farmers, agricultural advisers and researchers that holds promise for successful development of site-specific techniques for sustainable agriculture.

Summary

CHAPTER V

SUMMARY

The growing concern about environmental degradation, shrinking natural resource base and the urgency to meet the food needs of a burgeoning population, are compelling farm scientists and policy makers to seriously examine alternatives to chemical agriculture. A sustainable agriculture backed up by green technologies in an integrated farming system has been considered a promising and potential pathway. This can be realised by an intensive use of all natural resource and time honoured indigenous/traditional knowledge (I/TK) and skills. This traditional knowledge in todays parlance is called local knowledge or simply indigenous knowledge.

Indigenous knowledge (IK) is unique to a given culture. IK of a farming population living in a specified area is derived from local people's past farming experience both that handed slows from previous generation and that of present generation. They are seen as source of sound ideas, locally adapted cultivars and practices which could lead to sustainable use of local resources. They are highly localised and individual aptitudes for storing traditional knowledge and generating new knowledge differ from place to place and farmer to farmer. So unless conscious efforts are made to collect and document them, valuable information may be lost for ever.

Only countable studies have so far been conducted in the field of indigenous/traditional knowledge, especially on rice. Rice being a traditional crop and the staple food of Kerala, this study on indigenous/traditional practices followed by farmers in rice cultivation in Thrissur district is of topical importance.

The study was conducted with the following objectives.

i) To identify and codify indigenous practices in rice farming in Thrissur district

ii) To assess knowledge of these indigenous practices by the rice farmers in relation to their personal, socio-economic and psychological characteristics.

iii) To analyse the extent of adoption of these indigenous practices in relation to their personal, socio-economic and psychological characteristics.

iv) To measure the evaluative perception of there indigenous practices by farmers, extension personnel and scientists.

The study was conducted in two phases - Phase I and Phase II. Phase I achieved the major objective of identification and documentation of indigenous practices. While phase II accomplished the rest of the objectives.

Phase I was conducted in twelve randomly selected panchayaths of Thrissur district which consisted of six kole area panchayaths and six non-kole area panchayaths. All possible indigenous practices followed by rice farmers were collected using an arbitrarily prepared open ended schedule.

To conduct the second phase, 135 respondents were selected by simple random sampling. Respondents were selected from the highest paddy producing panchayaths, one each from the three subdivisions of Thrissur district. The required information was collected by personally interviewing them with a structured inter-view schedule. The major results of the study were as follows.

1. The study in its first phase identified 80 indigenous practices and 20 indigenous believes related to rice cultivation of Thrissur district. It was interesting to find that the plant protection practices outnumbered (61.4%) the management practices. The identified practices were documented under different sub-practices and described along with its rationality, as claimed by literatures and experts.

2. There was significant variation in the knowledge score of indigenous practices of rice farmers. It varied from 4.6 to 90.9 per cent with an average of 42.99 per cent, twenty five per cent of farmers secured below 28.33 per cent (low knowledge) and twenty five per cent scored above 58.0 per cent (high knowledge), while the score range varied from 28.33 to 58 per cent for fifty per cent of the farmers (medium knowledge).

3. Analysis of awareness knowledge of selected indigenous practices revealed that use of polythene covers to scare bird pest is the mostly commonly known practice among farmers (68.88%). The analysis of adoption percentage of indigenous practices revealed that staking white flags in fields is the most widely adopted practice among farmers (59.2%).

4. Adoption index too showed significant variation with a range of 1 to 92.5 per cent. Fifty per cent of the farmers had medium adoption index ranging from 16.67 to 43.5 per cent, while 25 per cent had low adoption index (below 16.67) and 25 per cent had high adoption index (above 43.5).

5. The simple correlation analysis to study the influence of personal, socio-economic and socio-psychological characteristics of rice farmers on their

knowledge in indigenous practices revealed that out of 17 variables, only four variables showed positive and significant relation with KIRP while three variables showed negative and significant relation MLR analysis explained that 28.6 per cent of the variation in the dependent variable was caused by the independent variables. Besides, only two variables viz., area under rice (X_6) and personal localite-exposure (X_8) showed significant multiple linear coefficient.

The step down regression analysis pointed out that 27.05 per cent of the variation was explained by six variables namely fatalism-scientism (X_9), annual income (X_5), area under rice (X_6), main occupation (X_3), personal-localite exposure (X_8) and risk orientation (X_{17}).

6 The simple correlation analysis to study the influence of personal, socio-economic and socio-psychological characteristics of rice farmers on their extent of adoption of indigenous practices recorded that out of 17 variables, four variables showed positive and significant relation with AIRP while five showed negative and significant relationship with AIRP. The MLR analysis explained 44 per cent variation in the dependent variable by these selected characteristics and only two variables namely economic motivation (X_{13}) and risk preference (X_{17}) were positively and significantly related to AIRP.

Step down regression analysis explained that 43.46 per cent of the variation was explained by seven variables viz., age, main occupation (X_3), farming experience (X_4), personal-localite exposure (X_8), economic motivation (X_{13}), social participation (X_{10}) and risk preference (X_{17}).

7 Among the six attributes, efficiency of IP was perceived with significant difference among farmers, extension workers and scientists. Besides, indigenous practices were perceived, by respondent categories as sustainable (100 per cent), flexible (89.74 per cent), efficient (38.85 per cent), input availing (80.36 per cent), profitable (56.59 per cent) and simple (90.39 per cent).

Implications of the study

Indigenous practices followed by the rice farmers illustrate how well they learned to manipulate and derive advantage from local and natural resource. Though these practices are less efficient as modern practices they are integrated into the farming systems even now. The community plays an important role in the production of indigenous practices but many local and cultural barriers restricts the dissemination and conservation of this specialised knowledge. So a systematic documentation of these indigenous practices is inevitable to conserve the old farming traditions and knowledge of the farmers from being lost.

Abstracting the science underlying indigenous knowledge system would help us to develop newer concepts to accelerate the pace of technological change on a sustainable basis. New research projects with an integration of indigenous knowledge with modern technical know-how would lead to an efficient resource management withmore emphasis on productivity and sustainability.

The knowledge of farmers in indigenous practices and their extent of adoption are found to be medium in fifty per cent of the farmers. This implies that most of the old farming traditions are being gradually lost by the farmers. Foreign technology, education, values and many factors lead to the loss of indigenous

knowledge and also indigenous practice. Farmers are more inclined towards modern technology at the cost of sustainability. The knowledge of farmers in indigenous practice was more affected by personal-localite exposure and main occupation. This reveals that indigenous knowledge is the result of farmers' experiments which get diffused through various types of web-of-word-of-mouth.

Extent of adoption of indigenous practices was more influenced by risk preference and economic motivation of the rice farmers. This is because indigenous farming is a low cost technology with an element of uncertainty.

There was no significant difference in the perception of simplicity, profitability, sustainability, input availability and flexibility attributes of indigenous practice by the respondent-categories, while efficiency of indigenous practice showed varied response among the respondent categories. The scientist who perceived indigenous practices as less efficient, though endorsed all the positive aspects of ecological farming, expressed doubts about taking it on a extensive scale without adequate supportive research findings. This implies a weak research back up for large scale adoption of sustainable agriculture.

Hence rice researches must promote Participatory Technology Development (PTD) by incorporating farmers perspectives in the identification of research issues, setting of research precosites and dropping of inappropriate lines of investigation. In a nutshell, sound research and development of indigenous farming practices and a committed extension task force for sustainable agriculture hold the key for a successful implementation of indigenous farming on a wider scale.

Suggestions for future research

1. On-station research has to be conducted on there indigenous practices so as to improve its potentiality and accelerate the pace of technological change.

2. A multidiciplinary expert team, must comprehend their identified folk wisdom to form a special indigenous technology package.

3. Research efforts must be taken to produce the best mix of indigenous and modern technologies.

4. Teaching and training programmes in the agricultural universities should be oriented towards inculcating indigenous knowledge as a major component. Besides these programmes should be included in the curriculam of colleges so that students can increase respect for age old practices of farmers and also learn from their ancesstors.

5. In the present study only a sample district with a limited sample size was covered. An indepth survey covering the entire state including more number of crops would help to get a more realistic picture about the integration of various indigenous practices followed in the state.

6. In further studies on indigenous practices special care has to be taken to select the variables, influencing the development and dissemination of indigenous practices.

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*Originals not seen

Appendices

APPENDIX-I

INTERVIEW SCHEDULE

INDIGENOUS PRACTICES IN RICE FARMING IN THRISSUR DISTRICT

Date :

Panchayat :

Ward :

Respondent No. :

SECTION-I

1. Name and address of the respondent :
2. Age (..... in completed years) :
3. Education :
4. Main occupation : Agriculture as main occupation/ Agriculture as secondary occupation
5. Farming experience : (in years)
6. Annual income (in Rs.) :
   a) On farm income :
   b) Off farm income :
   Total

7. Area under rice

Sl.No.	Type of land	No. of crops	Total area uncer cultivation
1	Wet land		
2	Dry land		
	Total		

8. Availability of family labour

a) Do family members engage in rice cultivation? : Yes/No

b) If yes, specify the activities in which they are engaged :

c) No. of family members engaged in rice cultivation :

9. Personal-localite exposure
Whom do you contact for getting information about farming?

No.	Information sources	Extent of contact		
		Always	Occasionally	Never
1	Family			
2	Neighbour			
3	Friends			
4	Relatives			
5	Progressive farmers			
6	Others (specify)			

10. Fatalism-scientism
Please state your agreement, disagreement or undecidedness with each of the following statement

Statement	A	UD	DA
a) Higher yields depend purely on natures will			
b) Change to new farming pattern or practices often involve great risk and so put the farmer in loss			
c) Traditional ways of living and farming are age proven and therefore should not be disturbed			

11. Social participation

Sl. No.	Organisations	Nature of membership		Regularity in attending activities		
		Member	Office bearer	Regularly	Occassionally	Never
1	Panchayath committee					
2	Co-operatives					
3	Group management committee					
4	Farmers organisations					
5	Others (specify)					

13. Progressiveness-Traditionalism
Please indicate your agreement with the following statement

Sl. No.	Statements	A	UD	DA
1	Girls should be educated			
2	Caste system is of no more utility under present condition and therefore its relative barriers and restrictions should be done away with			
3	Child birth is a human affair and not God given. Therefore, should be under the control of man			

14. Extension orientation
a) Extension contact

Sl No.	Extension personnel	Frequency of contact		
		Often	Frequently	Never
1	Agricultural Assistant			
2	Village Extension Officer			
3	Agricultural Officer			
4	Block Development Officer			
5	Assistant Director of Agriculture			
6	Others (specify)			
	Total			

b) Extension participation

Sl. No.	Activities	Frequency of participation		
		Whenever	Sometimes	Never
1	Meetings			
2	Seminars			
3	Exhibitions			
4	Campaign			
5	Demonstration			
6	Farmers day			
7	Film show			
8	Field day			
9	Training			
10	Others (specify)			

15. Economic motivation

Indicate whether you agree or disagree with the following statement

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

16. Innovativeness

a) When would you prefer to adopt an improved pratice in farming?

1. As soon as it is brought to my knowledge
2. After I have seen some other farmers using it successfully
3. Prefer to wait and take my own time

17. Cosmopoliteness

a) Frequency of visiting the nearest town

Twice or more times a week/once in a week/once in a fortnight/once in a month/very rarely/never

b) Purpose of visit

All visits relating to agriculture/some relating to agriculture/personal or domestic matter/entertainment/any other purpose (specify)

18. Rational orientation

a) What do you feel about the increased income and improvement in life

They may be due to:

1. Beliefs in stars and not in scientific recommendations
2. Beliefs in stars and scientific recommendations
3. Beliefs only in scientific recommendation

19. Risk orientation

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

APPENDIX-II

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE
VELLANIKKARA - THRISSUR

Dr.C.BHASKARAN
Associate Professor & Head

Department of Agricultural Extention
Dated: 22-06-1995

Sir/Madam,

Ms.Preetha,L., one of the M.Sc.(Ag) students of the Department is undertaking a research study titled 'Indigenous practices in rice farming in Thrissur district' as a part of her research work under my guidance.

In view of your professional experience and expertise you have been identified as a judge for evaluating the perceptual attributes of indigenous practices listed. Perception of measured on six attributes viz., simplicity, efficiency, profitability, flexibility, input availability and sustainability. Your degree of response (high or low) to the attribute has to be indicated using a ' ' mark.

I request you to kindly spare some of your valuable time for the purpose and return the list duly filled at the earliest. A self-addressed stamped envelope is enclosed herewith. Hoping your kind co-operation.

Yours sincerely,

(Dr.C.Bhaskaran)

Encl: 1. Schedule
2. Stamped self-addressed envelope

APPENDIX-III

Difficulty index and discrimination indices of the items selected for the study

Sl.No.	Frequency of correct answers gives by each group of respondents		Total frequency of correct answers	Difficulty index P	Discrimination index E 1/3
	G_1	G_2			
1	2	3	4	5	6
1	17	4	21	15.55	0.28
2	7	1	8	5.93	0.17
*3	31	11	42	31.11	0.44
4	44	31	75	55.53	0.28
5	45	45	90	66.66	0
6	42	25	67	49.62	0.37
*7	32	11	43	31.85	0.46
*8	29	10	39	28.88	0.42
9	42	26	68	50.37	0.35
10	27	13	40	29.62	0.31
11	32	24	56	41.48	0.17
*12	29	11	40	29.62	0.4
13	42	36	78	57.77	0.13
14	44	42	86	63.7	0.07
15	42	23	65	48.14	0.42
16	39	19	58	42.96	0.44
*17	37	18	55	40.74	0.42
18	1	0	1	0.74	0.02
*19	28	10	38	28.14	0.4
20	45	45	90	66.66	0
21	41	43	84	62.22	0
22	45	45	90	66.60	0
23	29	17	46	34.07	0.26
24	21	17	38	28.14	0.08
25	14	3	17	12.59	0.24
26	45	39	84	62.22	0.13
27	24	27	51	37.77	0.06
28	14	12	26	19.25	0.07
29	45	45	90	66.66	0
30	40	27	67	49.62	0.28
31	45	45	90	66.66	0
32	45	45	90	66.66	0
*33	34	13	47	34.81	0.46
34	32	19	51	37.77	0.28
35	45	42	87	64.44	0.2
*36	29	5	34	25.18	0.53
37	3	0	3	2.22	0.06

Contd.

Appendix-III.Continued

1	2	3	4	5	6
38	0	1	1	0.74	0.22
39	8	0	8	5.92	0.17
40	29	14	43	31.85	0.33
41	5	0	5	3.70	0.11
42	3	0	3	2.22	0.066
43	7	0	7	5.18	0.155
*44	42	23	65	48.14	0.42
*45	36	11	47	34.81	0.55
46	4	0	4	2.96	0.08
47	12	7	19	14.07	0.11
48	32	19	57	37.77	0.28
49	32	17	49	36.29	0.33
50	7	2	9	6.60	0.11
51	0	0	0	0	0
52	21	9	30	22.22	0.26
53	0	0	0	0	0
54	7	2	9	6.6	0.11
*55	33	9	42	31.11	0.53
56	2	0	2	1.48	0.04
*57	32	7	39	28.88	0.55
58	45	45	90	66.66	0
59	6	13	19	14.07	0.15
*60	37	17	54	40.00	0.44
61	0	0	0	0	0
62	0	0	0	0	0
63	0	0	0	0	0
64	19	7	26	19.25	0.26
65	17	3	20	14.28	0.26
*66	21	9	36	26.66	0.46
67	38	41	79	58.51	0.06
*68	29	11	46	29.62	0.4
69	33	19	52	38.51	0.31
70	0	5	5	3.70	-0.11
71	4	0	4	2.96	0.08
72	0	0	0	0	0
*73	45	18	63	46.66	0.6
74	45	45	90	66.66	0
75	45	45	90	66.66	0
*76	31	4	35	25.96	0.6
*77	49	11	60	44.44	8.84
78	13	8	21	15.55	0.11
79	45	45	90	66.66	0
*80	33	6	39	28.88	0.6

APPENDIX-IV
INDIGENOUS PRACTICES SELECTED FOR THE STUDY
ALONG WITH THEIR WEIGHTAGES

Sl.No.	Indigenous practices	Weightage
1	2	3
I. SEED AND SEED TREATMENT		
1	Traditional medium duration variety for *Mundakan*crop	1.8
2	Placing soaked seeds in bamboo baskets or baskets made of foliated coconut leaves lined with coova, teak and banana leaves	2.8
3	Seed treatment with cowdung	3.0
II. SOWING AND NURSERY MANAGEMENT		
4	Not sowing or harvesting (for seed purpose) in 'Mokene muka' - a period of acid rains	0.6
III. TRANSPLANTING AND MAINFIELD		
5	Green leaf manuring using thick leaves	2.0
6	'Kundakootal'	2.2
7	Basal application of neem cake	3.0
IV. CONTROL OF RICE BUG		
8	Spray solution of garlic, as afoctida and pepper	1.0
9	Avoiding overlapping rice cultivation	3.0
V. CONTROL OF RICE LEAF ROLLER		
10	Dragging theory twings over the crop	3.0
VI. CONTROL OF RICE CASE WORM		
11	Drainage	3.0
VII. CONTROL OF CRABS		
12	Releasing flocks of geese in puddled fields	2.0

Continued

Appendix-IV. Continued

1	2	3
VIII. CONTROL OF RODENTS		
13	Fixing coconut petioles invertedly	2.4
14	'*Kumbham*'	2.8
15	Saw toothed scissor trap	2.6
16	Fixing white flags in field	1.4
IX. CONTROL OF BIRD PESTS		
17	Use of audio-video tapes	2.4
18	Use of plastic covers	1.6
X. CONTROL OF STORAGE PESTS		
19	Mixing insect repellant leaves with stored products	2.2

INDIGENOUS PRACTICES IN RICE FARMING IN THRISSUR DISTRICT

By

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ABSTRACT OF A THESIS

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ABSTRACT

A research study was conducted to identify and codify the indigenous practices in rice farming in Thrissur district. The study also aimed at analysing the relationship of knowledge and adoption of indegenous practices of rice farmers with their personal, socio-psychological and socio-economic characteristics. The evaluative perception of the identified indigenous practices by the rice farmers, extension personnel and rice scientists was also done.

The study was conducted in two phases - phase I and phase II. The sample selected for the study consisted of 135 rice farmers and all available extension personnel and rice scientists of Thrissur district. The phase I of the study was conducted in 12 selected panchayaths and the phase II was conducted in 3 selected panchayaths of Thrissur district.

The research endeavour identified 80 indigenous practices and 20 indigenous beliefs related to rice cultivation of Thrissur district. The identified practices and beliefs were documented and described along with its scientific rationale.

The phase II revealed significant variation in knowledge score of rice farmers in indigenous practices. It varied from 4.6 to 90.9 per cent. Adoption index too showed significant variation with a range of 1 to 92.5 per cent.

Statistical analysis reveal that 27.05 per cent of the variation in knowledge of rice farmers about indigenous practices was influenced by six variables namely fatalism-scientism, annual income, area under rice cultivation, main occupation, personal-localite exposure and risk preference, while 43.46 per cent of variation in adoption of indigenous practices of rice farmers was explained by their age, main occupation, farming experience, personal-localite exposure, economic motivation, social participation and risk preference. The indigenous practices were perceived as sustainable by 100 per cent of the respondent categories whereas only 38.58 per cent of the respondent categories perceived them as efficient.

The knowledge in indigenous practices and their extent of adoption are found to be medium in 50 per cent of the rice farmers. This implies that most of the old farming traditions are being gradually lost by farmers. Hence a systematic and organised effort to document these indigenous practices is an urgent need to improve the efficiency and productivity of crop cultivation. This calls for a multi-disciplinary approach to comprehend and analyse the identified folk wisdom to enhance its potentiality and accelerate the pace of technological change.