

**INDIGENOUS TECHNICAL KNOWLEDGE IN
AGRICULTURE IN HIGH ALTITUDE AND TRIBAL AREA
ZONE OF ANDHRA PRADESH**

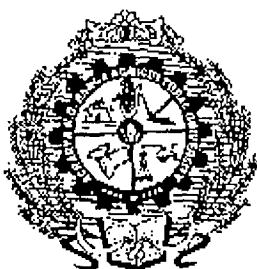
By

LAKSHMANA KELLA

M. Sc. (Ag.)

THESIS SUBMITTED TO THE
ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

**DOCTOR OF PHILOSOPHY
IN THE FACULTY OF AGRICULTURE**



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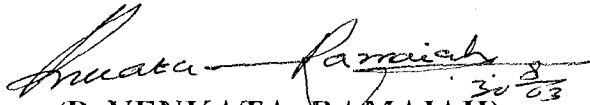
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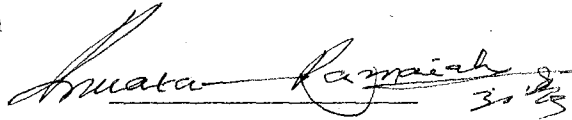
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No part of the thesis has been submitted for any other degree or diploma or has been published. The published part has been fully acknowledged. All the assistance and help received during the course of investigation have been duly acknowledged by the author of the thesis.


(P. VENKATA RAMAIAH)
Chairman of the Advisory Committee

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Chairman : **Dr. P. VENKATA RAMAIAH**
Professor & Head
Department of Agricultural Extension
Agricultural College
Bapatla

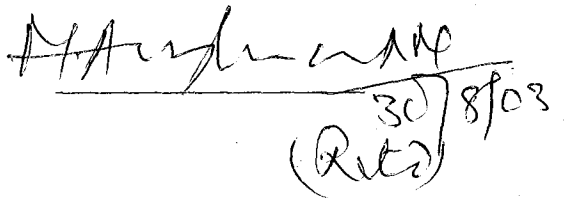

P. Punna Rao 30/8/03

Member : **Dr. P. PUNNA RAO**
Assistant Director of Extension
Directorate of Extension
Rajendranagar, Hyderabad.


A. Latchanna 30/8/03

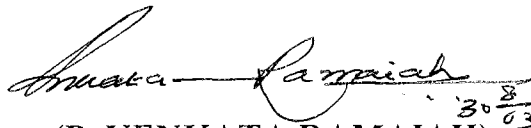
Member : **Dr. A. LATCHANNA**
Professor
AICRP on Weed control
Department of Agronomy
College of Agriculture
Rajendranagar, Hyderabad.

Member : **Sri. M. ANJANAPPA**
ARO (Statistics)
Extension Education Institute
Rajendranagar, Hyderabad.


Sri. M. Anjanappa 30/8/03
(Rtd)

CERTIFICATE

Mr. LAKSHMANA KELLA has satisfactorily prosecuted the course of research and that the thesis entitled "INDIGENOUS TECHNICAL KNOWLEDGE IN AGRICULTURE IN HIGH ALTITUDE AND TRIBAL AREA ZONE OF ANDHRA PRADESH" submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any University.


(P. VENKATA RAMAIAH) 30/8/03

Date: 30.8.2003.

Place: Hyderabad

Major Advisor

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(LAKSHMANA KELLA) 30/1/20

DECLARATION

I, Mr. LAKSHMANA KELLA, hereby declare that the thesis entitled
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HIGH ALTITUDE AND TRIBAL AREA ZONE OF ANDHRA PRADESH”
submitted to Acharya N.G. Ranga Agricultural University for the degree of
DOCTOR OF PHILOSOPHY, is a result of the original research work done by
me. I also declare that the thesis or part thereof has not been published earlier
elsewhere in any manner.



(LAKSHMANA KELLA)

Date: 30-8-21

Place: Hyderabad

Author : **LAKSHMANA KELLA**
Title of the thesis : **INDIGENOUS TECHNICAL KNOWLEDGE IN
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Major Advisor : **Dr. P. VENKATA RAMAIAH**
University : **ACHARYA N.G. RANGA
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ABSTRACT

Interest in Indigenous Technical Knowledge (ITK) has been fueled by the recent world-wise crisis and realization that its causes lies partly in over exploitation of natural resources based on inappropriate attitudes and technologies scientists now recognize that indigenous people have managed the environments in which they have lived for generations, often without significantly damaging local ecologies. Many feel that indigenous knowledge can thus provide a powerful basis from which alternative ways of managing resources can be developed.

A study was conducted aiming to document and classify the existing ITK and their blended technologies in the high altitude and tribal area zone of Andhra Pradesh, their rationality, attitude, extent of adoption, efforts of different institutions and agencies for their promotion, constraints and suggestions in adoption and finally conclude with a suggestive strategy for their higher adoptions.

A total of 518 ITKs including blended technologies were documented from 90 elderly farmer respondents spread over the study area. Of the 518 ITKs, 97 related to cereals, 85 belong to millets, 57 belong to pulses, 24 concerned with oil seeds, 58 refer to vegetables, 33 related to spices and condiments, 38 belong to fruit crops, 17 concern with fibre crop, 14 related to narcotics, 72 related to general agriculture and 23 belong to podu cultivation.

A total of 92 agricultural scientists viz., 32 from crop production, 30 from plant protection and 30 from Horticulture were contacted to judge the rationality of 518 ITKs including blended technologies. Totally 180 farmers representing the study area were interviewed. Two NGOs, RARS, KVK, 10 Agricultural Officers and 5 Assistant Directors of Agriculture to know their efforts in promotion of ITK and their blended technologies.

Majority of the ITKs (85.71%) were found rational and remaining ITKs (14.29%) were found not rational. More than 90% of the ITKs were found rational in the case of harvest aspects (96.87%), post harvest management (95.24%), seasons (92.86%),

varieties (91.58%) and preparatory cultivation (91.30%). A few ITK were found rational in the case of rain forecasting (20.00%).

Among the respondents, 65.66% had favourable attitude and 3.33% had highly unfavourable attitude towards ITK and their blending with modern technologies.

All the ITKs in ginger and majority of ITKs in the case of groundnut (86.67%), tapioca (80.00%), foxtail millet (77.77%), mesta (76.47%) were found adopted completely. Lower complete adoption was found in the case of rice bean (8.33%), paddy (18.67%), general agriculture (19.42%) and horse gram (20.00%).

Non governmental organizations took their role actively in extension activities viz., training programmes and meetings for promotion of ITKs including blended technologies. State Agricultural University documented existing ITK and their test verification besides organizing training programmes. State department of agriculture supplied indigenous inputs for the tribals.

Lack of direct and immediate effect by adoption of ITK (57.78 %), inadequate and untimely supply of agricultural inputs (70.00%) and lack of organized extension machinery to disseminate the proven ITKs and their blended technologies (40.55 %) found major technological, administrative and research and extension constraints respectively.

Improvement of sound research on ITKs and their blended technologies (85.56%) and made available the biofertilizers and neem products on subsidized rates by the government (78.33%) were the major suggestions for higher adoption of ITKs and their blended technologies.

The strategy for promotion of ITK adoption including blended technologies involves seven stages, which includes documentation, test verification of rationality, blending, validation, integration, dissemination and evaluation of the technologies.

LIST OF ABBREVIATIONS

%	:	Per cent
<	:	Less than
>	:	Greater than
ARS	:	Agricultural Research Station
BGA	:	Blue Green Algae
BT	:	Blended technologies
CA	:	Complete Adoption
DAATTC	:	District Agricultural Advisory and Technology Transfer center
FARMESA	:	Farm Level Applied Research Methods for Eastern and Southern Africa
FYM	:	Farm Yard Manure
IDS	:	Institute of Development Studies
IK	:	Indigenous Knowledge
ITK	:	Indigenous Technical Knowledge
ITKs	:	Indigenous Technical Knowledge Items
KVK	:	Krishi Vigyan Kendra
MOST	:	Management of Social Transformation Programme
NA	:	Non Adoption
NGO	:	Non Governmental Organization
NPV	:	Nuclear Polyhedrosis Virus
PA	:	Partial Adoption
RARS	:	regional Agricultural Research Station
SAU	:	State Agricultural University
SDA	:	State Department of Agriculture
TEK	:	Traditional Ecological Knowledge
TRIPS	:	Trade Related Intellectual Property Right
UNESCO	:	United Nations Education, Scientific and Cultural Organisation
USA	:	United States of America
WTO	:	World Trade Organization

INTRODUCTION

CHAPTER I

INTRODUCTION

India over several millenniums has been the treasure land of biological wealth intellectual knowledge and spiritual wisdom. She is the cradle of many human civilizations like the world famous Indus valley, Ganges delta and Shindhu valley. During both pre and post Vedic periods, arts, science and technology had flourished well in various fields. Ancient physicians invented extraordinary medicinal system named '*Ayurveda*' which is now recognized as health friendly system.

Similarly the biological wealth of India could be evidenced in the report of Kothari (2001). India is classified among the 12 mega diversity centers of the world, in relation to crops. As many as 167 species of crops, 320 species of wild crop relatives and several species of domesticated animals have originated here. The genetic diversity with in these species is astounding. Some examples are rice (50,000 varieties), sorghum (5000 varieties), mango (1000 varieties), pepper (500 varieties), cattle (27 breeds), goat (22 breeds), sheep (40 breeds), poultry (18 breeds) and buffalo (8 breeds). This amazing diversity is not a freak of nature, but a result of careful selection and even cross breeding over centuries by India's farmers and pastoralists. Hence, Indian agriculture, to such an extent, is much traditional and dates back to about 10,000 years.

When India attained independence it faced a shortage of food supply during 1950's and 60's due to various other reasons. It's food production is a success story following the green revolution in the late 1960s. However, there have been reports of either stagnating or declining levels of crop productivity in recent years. Over exploitation of natural resources and excessive chemicalisation of agriculture have led to poor sustainability of farm production.

Besides this, botanical pest control is distinct possibility in a tropical country like India where we are endowed with biodiversity of such plants. More than 1000 species of plants are known to have insecticidal properties, 380 species with anti fedant properties, 300 species with repellent properties and 30 species each possessing attractant and insect growth regulatory (IGR) properties (Jayaraj, 2002).

The systematic knowledge of plants and plant ecosystems that characterize traditional societies was transmitted from generation to generation. Scientists first learned the crop management practices by observing the activities of traditional farming societies. Many examples of pest management using indigenous inputs were found in ancient literature. The earliest known mention of poisonous plants occurs in *Rigveda*, composed in India during the second millennium B.C. (Chopra *et al.*, 1949). The ancient Romans used false or white hellebore (*Veretrum Album* or *V. viridae*) as a rodenticide, and the Chinese were credited with discovering the insecticidal properties of *Derris Sp.* (Feinstein, 1952). In A.D. 970, the Arab scholar Abu Mansur listed 584 natural materials possessing pharmacological and poisoning properties. The tobacco plant preparations have been similarly used in the middle east for nearly two centuries (Frear, 1943).

In the coming years, competitiveness of countries in the production of agricultural commodities and products is likely to play a major role in international trade. The cost of production of farm products has to be reduced considerably, quality improved, farmer's profitability maximized and environmental pollution avoided. Use of pest avoidance tactics, enhancement of biological pest suppression and adoption of other non chemical methods of pest management would certainly be able to improve our capabilities in solving much of the pest problems.

Interest in Indigenous Technical Knowledge (ITK) has been fueled by the recent world wide ecological crisis and the realization that its causes lie partly in the over exploitation of natural resources based on inappropriate attitudes and technologies. Scientists now recognize that indigenous people have managed the environments in which they have lived for generations, often without significantly damaging local ecologies. Many feel that indigenous knowledge can thus provide a powerful basis from which alternative ways of managing resources can be developed.

Hence, for the countries like India, the alternative for the modern technologies are indigenous methods. Also the capital and technological skill requirements in the use of indigenous methods are generally low and their adoption often requires little restructure of the traditional societies. Indigenous methods are nothing but indigenous knowledge or ITK. By adopting such indigenous knowledge our ancestors did not face any problem of large scale pest outbreak or economic crisis unlike the today's farmer.

Indigenous knowledge (IK) is, broadly speaking, the knowledge used by local people to make a living in particular environment. It can be defined as "A body of knowledge built up by a group of people through generations of living in close contact with nature" (Johnson, 1992). Generally speaking, such knowledge evolves in the local environment, so that it is specifically adopted to the requirements of the local people and conditions. It is also creative and experimental, constantly incorporating outside influences and inside innovations to meet new conditions. It is usually a mistake to think of indigenous knowledge as "old fashioned", "backwards", "static" or "unchanging".

Indigenous people are the original inhabitants of a particular geographic location, who have a culture and belief system distinct from the International system of knowledge (eg., the tribal, native first or Aboriginal

people of an area). According to Indian anthropologists a tribe identifies the people who live in Primitive or backward conditions under a head man or chief. The tribes are also known as adivasees i.e. aboriginals. It is commonly believed that they were the original natives and had long settled in different parts of the country before the Indo-Aryans entered and settled down in the Indus valley. Since the forests are major adobe of tribal people, they have developed emotive attachment towards forests and they treat the forests as their ancestral homes. It is because of relative physical isolation from the main stream for generations they have nurtured their own way of life depending on their ecology. The tribal communities are differentiated from non tribals, as their social affairs are to a large extent guided by mutual obligations and moral bindings. Their institutions and traditions are based on cooperation and community oriented.

IK when originally emphasizes Indigenous Technical Knowledge (ITK) of the environment, it goes beyond the narrow interpretation and considered to be cultural knowledge in it's broadest sense, including all of the social, political, economic and spiritual aspects of a local way of life.

The term indigenous technical knowledge is used synonymously with 'traditional' and 'local knowledge' to differentiate the knowledge developed by a given community from the international knowledge system, some times also called as western system generated through universities, government research centers and private industries. Further, ITK is dynamic and not static, as the word 'traditional' commonly implies. This is supported by the inference of Berkes (1999) that 'traditional' does not mean an inflexible adherence to the past, it simply means time tested and wise.

Indigenous technical knowledge (ITK) is the knowledge that people in a community have developed over time, based on common experiences, tested over centuries of use endowed with highest possible adaptability to local culture and environment (Das and Das,2000).

Hence, ITK is the product of centuries of trial and error, natural selection and keen observations that can form a knowledge base on which researchers and extension workers can plan their research strategy and experimental procedure. ITKs are not primitive left over from the past but are, on the contrary, systems finally turned and adopted, both biologically and socially, to counter the processes of what are often harsh and inimical environments and often represent hundreds some times thousands of years of adaptive evolution in which the vagaries of climate, the availability of land and water, the basic needs of the people and their animals for food, shelter and health have been amalgamated in a system which has allowed society to exist and develop in the face of tremendous odds' (Haskall *et al.*, 1981).

Indigenous technologies in agriculture are organic in nature. They don't cause any damage to the air, water and soil, safe to the human beings and free from causing environmental pollution. These practices are dynamic because they are region specific, depending upon soil type, rainfall, topography etc., and are often modified by the local farmers.

However, one may doubt about the productivity of the indigenous practices and varieties. These fears could break by seeing the proven ITKs reported by few authors.

During 1973-74, a survey was made in Bichia block of Madhya Pradesh on the yields of indigenous rice varieties. It revealed that the varieties Amar Jyothi and Chattri gave an yield of 3750 kg/ha, Dubraj yielded 3750-4687 kg/ha and Rani Kajar and Luchia yielded 5625-6562 kg/ha (Dogra, 1983).

Avare (*Dolichas lablab*) and pigeon pea seeds when treated with eucalyptus seed extracts prevent damage by insects and soil born pathogens because phenol in eucalyptus seed acts as insect repellent and antifungal agent (ITK-Core group on watershed management, 1999).

The practice of shaking and manual destruction of *Heliothis sp.* is practiced traditionally in Andhra Pradesh. Adoption of this practice in pigeon pea increases the yield from 20-100%. This traditional knowledge of shaking of plants, neem seed kernel suspension, tobacco decoction, chilli garlic extract, bird perches and NPV were evaluated to control the pest complex of pigeon pea in medak district by 14 field based NGOs. The result showed that, it recorded additional yield of 500 kg/ha (Chari *et al.*, 1999).

Farmers in saurashrta produce organic manure with use shells of castor pods (800 to 1000kg) leaves of mango and castor, cowdung (2 cart loads) and other farm litter as manure after decomposition for 6 months. It was reported that this manure has increased the yield of groundnut crop by about 625 kg/ha. Farmers opine that this benefit was attributed partly to the pesticidal properties of the manure particularly against aphids and fungal diseases (Kamariya and Kamariya, 1995).

Number of similar such findings and reports have provided adequate evidence to prove the Indigenous technical knowledge and adversely brought much problems by the modern technologies or chemicalisation of agriculture.

Hence, our ancestors, though not having benefit of scientific education in the modern sense, still had adequate common sense and over the centuries had evolved many indigenous practices that might seem to us primitive and unscientific today (Vyas and Patel, 1993).

Therefore, the situation has to be changed to low risk, eco friendly and high yield by realizing the hazardous effects of modern technologies on soil and environment. A better strategy should be formulated to supplement natural resources, high level management, alternate uses and systems with due emphasis on integration of indigenous knowledge with modern knowledge. Increasing attempts to make agricultural research and technology more relevant, need based and problem solving is essential at

this junction. Farming systems research approach is an attempt to integrate the native and cumulative wisdom of the farmers with the modern understanding of agricultural science to develop relevant, acceptable and easily disseminable technologies. To derive scientific value out of the indigenous practices, critical assessment, validation and refinement is essential.

Therefore, there is a need to systematically document the Indigenous Technical Knowledge (ITK). It is one of the major sources that are not utilized to their capacity. It is an un written body of knowledge. There is no systematic record to describe what it is, what it does, how it does, means of changing it, it's operation, it's boundaries and it's application. It is held in different brains, languages and skills in as many groups, cultures and environments (Atte, 1989). Hence, there is an immense pressure on the people of India to collect, preserve and adopt Indigenous Technical Knowledge (ITK) so as reduce dependence an external inputs, to reduce the cost of cultivation and to propagate an eco friendly agriculture.

Andhra Pradesh state is also a treasure land of indigenous technical knowledge. This had been proved by number of such practices available in the form of beliefs, proverbs, and statements reported in many literature. However, a few attempts have been undertaken by social scientists to document the available ITKs and to analyse them. Rambabu (1997) made an attempt to document and analyse the ITK in Guntur district, Lakshmana (2000) made a small attempt to document and analyse Indigenous farm practices and Shahu (2002) made a small attempt to document ITK in tribal areas of vizianagaram district.

Since such amassed wealth of indigenous knowledge is not completely available for the agricultural research and extension systems, it is essential to conduct studies not only to elicit and document ITKs and blended technologies but also ascertaining the scientific rationality , farmer's

attitude and adoption, efforts of different agencies in promotion, followed by constraints and suggestions finally a suggestive strategy there in. Hence, an attempt has been made in high altitude and tribal area zone with the following specific objectives.

1. To document the Indigenous Technical Knowledge (ITKs) including blended technologies existing in high altitude and tribal area zone of Andhra Pradesh.
2. To find out the scientific rationality of identified Indigenous Technical Knowledge (ITKs) including blended technologies.
3. To know the attitude of farmers on ITKs and their blending with modern technologies.
4. To measure the extent of adoption of ITK including blended technologies by the farmers of high altitude and tribal area zone.
5. To fortify the efforts of Non-Governmental organisations (NGO's), State Agricultural University (SAU) and state department of Agriculture (SDA) for promotion of ITK in high altitude and tribal area zone.
6. To analyse the constraints and elicit suggestions for adoption of ITKs including the blended technologies.
7. To develop a strategy for promotion of ITK adoption including blended technologies.

SCOPE AND IMPORTANCE OF THE STUDY

The study presents an exhaustive list of Indigenous Technical Knowledge items (ITKs) and their blended technologies in Agriculture. Further, it provides an understanding of the scientific rationality, attitude and adoption of ITKs and blended technologies by the farmers. The study provides the efforts of different agencies in promotion of ITKs and their blended technologies. The study discloses the constraints and suggestions to overcome them. Finally, the study comes with a strategy for higher adoption of ITKs and their blended technologies.

The ITKs and blended technologies to be documented by the study may be considered by the policy makers as an alternative to modern technologies that require high external input, more risk and are reported to be hazardous. It also gives a comprehension about the different agencies involved in promotion of ITKs and their blended technologies.

The study provides a list of rational ITKs and their blended technologies in front of the scientific community for test verification and to select viable, eco-friendly and culturally compatible technologies for popularization.

In addition the study helps the extension community with a list of rational ITKs and blended technologies which are to be encouraged and a list of non rational ITKs and blended technologies which are to be discouraged during technology dissemination process.

The study encourages the farmers in technology development through participatory methods and will be provided with cheaper, viable and reliable technologies.

LIMITATIONS OF THE STUDY

Since the area of investigation is confined to high altitude and tribal area zone, the findings of the study there fore be applicable to those areas where similar conditions exists.

Although the study had taken all precautions, the chances of bias could not be completely eliminated. Yet, sincere and thoughtful attention was paid to make this study as objective, definite and systematic one to the extent possible.

Just like any other student researcher's study, this was also subject to the limitations of time, financial resources, conveyance and other physical facilities at the disposal of investigator.

*THEORETICAL
ORIENTATION*

CHAPTER II

THEORITICAL ORIENTATION

Indigenous Knowledge (IK) is the local knowledge that is unique to a given culture or society. IK contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local level decision making in agriculture, health care, food preparation, education, natural resources management and most of other activities in rural communities (Warren, 1991). It is the information base for a society, which facilitates communication and decision making. Indigenous information systems are dynamic and are continually influenced by internal creativity and experimentation as well as by contact with external systems.

The term IK and Indigenous Technical Knowledge (ITK) were interchangeably used and the concept was originated at a workshop in the Institute of Development Studies (IDS), Sussex in 1978. Firstly the concept was born out of on the one hand a search for cost effective agricultural development, on the other hand of a giving recognition by development professionals that rural people are knowledgeable on many subjects that concern their lives. In this way we may say that ITK was originally questioning the nature of the so called top down development. ITK was one of the pillars upon which the Rapid Rural Appraisal (RRA) was subsequently formed.

Indigenous knowledge is creative and experimental constantly incorporating outside influence and inside innovations to meet the new conditions. It is usually mistaken as "old fashioned", "backward",

“static” or “unchanging”. But it is dynamic, ever changing and innovative in nature.

There are several terms used to describe indigenous knowledge, ITK (Indigenous Technical Knowledge), “Local Knowledge”, “Traditional Practices” (Fals O Borda, 1980). “Successor Science” (Sander Harding, 1986) and Traditional Ecological Knowledge (TEK). It is also termed as “people’s science” as the knowledge comes from the people (Fals O Borda, 1980).

The role of indigenous knowledge has been debated with in the Trade Related Intellectual Property Rights (TRIPS) under the Uruguay-Round of the World Trade Organisation (WTO) that was closed in January, 1995. The main issue by developing countries has been that ITK now forms part of the product development process of industrialized countries e.g., the US patenting of traditional Indian herbal remedies derived from the use of turmeric or a patent related to the Ayahuasca plant used for centuries by the people of Amazon. Over the past twenty years, plenty of ITK has been collected through the use of participatory methods eg. forest community management practices in Kenya, West Africa and Nepal (Chambers, 1997), traditional watershed practices in India (Agarwal 1997). Weed Management practices in Tanzania (Reijntjes 1996), pest management for agro forestry in Zambia (1999), agroforestry in eastern and southern Africa (Rocheleau 1989), classification and identification of biological diversity (Zambia report 1999) to mention a few recent example over the globe.

IK is dynamic, and a result of continuous process of experimentation, innovation and adaptation. Some characteristics of IK are:

- It is generated with in communities
- It is location and culture specific

- It is the basis for decision making and survival strategies.
- It concerns critical issues of human and animal life, primary production, natural resource management etc.,
- It is oral and rural in nature.

2.1 SOME ISSUES OF ITK

2.1.1 Memory Banking

Memory banking is defined as the collection and documentation of indigenous knowledge and technologies from local farming communities that name. Classify and utilize a wide range of traditional varieties of crops. A memory banking project conducted in Philippines in which they collected beliefs and practices of local farmers who possess intimate knowledge of sweet potato cultivation.

2.1.2 New Research Paradigm

Gupta and Pal (1997) suggested a new research paradigm to top down approach which has been a dominant paradigm in agricultural research in developing countries. The new paradigm starts with farmers indigenous knowledge and is supplemented by objective constraint analysis, restatement of the problems, objective setting and formulation of hypothesis rather than by literature survey as in conventional approach. Solutions emerging from this model are eco-friendly, culturally compatible and low cost in nature. The need for documentation of indigenous knowledge is strongly advocated for smooth functioning of the model.

2.1.3 Participatory Technology Development

This method places the farmers in the centre of technology development in which farmers are prime researchers and they will be assisted by representatives of formal agricultural scientists (Researchers, Extensionists). The main emphasis is on linkage between farmers and researchers, therefore, joining the experiences of the farmers to learn from each other and to develop appropriate technology for themselves.

2.2 THERE ARE MANY RESOURCE CENTRES, NGOS WORKING FOR DIFFERENT ASPECTS OF INDIGENOUS KNOWLEDGE, SOME OF THEM ARE DESCRIBED BELOW

2.2.1 The Honey Bee Network

The honeybee network has collected over 10,000 examples of innovations and traditional practices in sustainable management of available resources. These are shared with farmers and scientists through the Honeybee newsletter. The newsletter is published in eight different languages viz., English, Spanish, Hindi, Gujarati, Tamil, Kannada, Pahari and Telugu (Teneteega). The society for research and initiatives for sustainable technologies and institutions (SRISTI), a global NGO based in India was setup to provide support to the honeybee network.

2.2.2 Centre for International Research and Advisory Network (CIRAN)

It is a division of Netherlands Organisation for International Cooperation in Higher Education (Nuffic). It is currently updating the database that provides a map of expertise in the areas of indigenous

knowledge and development CIRAN continuous to work with the world bank as a partner in the indigenous knowledge for development initiatives, which is aimed at collecting and disseminating information on IK and at facilitating the exchange of information among communities.

CIRAN is currently updating the database that provides a map of expertise in the area of indigenous knowledge and development. Data is now being processed which came in on questionnaires that were sent to Monitor subscribers and to the IK specialists in the CIRAN database. The IK database will now be split into two parts; one with names and addresses for the mailing list, and a second part with information describing the expertise available within the network. The second part especially will increase the benefit of network membership, making it easier for members to contact each other for specific purposes. CIRAN will also search the database any time specific expertise is sought for consultancy purposes, or when help is needed with the presentation and/or assessment of an IK best practice. The monitor editor uses the database to find experts to referee articles or write book reviews.

CIRAN continues to work with the World Bank as a partner in the indigenous knowledge for development initiative, which is aimed at collecting and disseminating information on IK and at facilitating the exchange of information among communities. This world bank initiative has funded the efforts of three African IK resource centres to conduct research on IK practices and to prepare syntheses. In order to facilitate exchanges of information through the global IK network, five more IK resource centres in Africa were given funds for improving their capacity for electronic communication and networking. The world bank initiative will also support the organization of a conference on IK in Africa during 1999.

CIRAN's cooperation with UNESCO resulted in the presentation of IK best practices for inclusion in the UNESCO-MOST database, and in a joint UNESCO-CIRAN publication.

Future cooperation with the ILO-INDISCO programme will focus mainly on the establishment of community-based IK resource centres. The concept of community-based IK resource centres was discussed during the ILO-INDISCO donor meeting and planning workshop which took place in November 1998 in Davao City, the Philippines.

In December 1998 CIRAN held an internal brainstorm session on the post Silang phase of the IK network. As many readers know, the global IK network was first set up at an IDRC funded international conference on indigenous knowledge and development which was held in 1992 in Silang, a town near Manila, in the Philippines. This conference was the birthplace of what is now a worldwide IK network, and there the first steps were taken to establish IK resource centres in Africa, Asia, Latin America, Europe, Canada and the US. Participating in the December 1998 brainstorm session were three visitors from Venezuela, Zimbabwe and Germany. A number of key issues were discussed, including the process of collecting, storing and disseminating information related to IK; the process of networking and identifying the actors involved; measures to promote active networking; the role of CIRAN as a clearing house for IK; and the role of Information and Communication Technologies (ICT).

2.2.3 The Farm Level Applied Research Methods for Eastern and Southern Africa (FARMESA)

It is a regional collaborative initiative operating in five countries, including Kenya, Tanzania, Uganda, Zambia and Zimbabwe and with associate countries including Botswana, Mozambique and South Africa.

The FARMESA initiative aims at improving food security, incomes and resource management of farm families in the region. This is done through the promotion, consolidation and integration of participatory, holistic, inter-disciplinary, gender sensitive, environmentally friendly and farmer focused methods with in the small holder research and development institutions.

Through it's work in participatory technology development and transfer in Eastern and Southern Africa, FARMESA collaborators have identified and documented several ITK's. These deal with a wide range of problems, such as fertility management, soil and water management, weed management, pest and disease control (both in crops and livestock), post harvest storage and weather forecasting. Inventories of traditional practices are also being made, motivated by the search for alternatives to costly external inputs.

2.2.4 The Centre for Indigenous Knowledge for Agriculture and Rural Development (CIKARD)

The centre for indigenous knowledge for agriculture and rural development (CIKARD) was established in 1987 at Iowa State University. CIKARD dedicated to interdisciplinary research, training and extension activities to assist various developmental agencies which will work to reduce poverty, enhance equity, help rural areas work towards self-sufficiency and self-reliance. CIKARD focuses it's activities on documenting the indigenous knowledge of farmers and other rural people around the Globe and making this knowledge available to developmental professionals and scientists.

2.2.5 The Information Centre for Low External Input and Sustainable Agriculture (ILEIA)

The Information Centre for Low External Input and Sustainable Agriculture (ILEIA) was established in 1982 and funded by the Netherlands Ministry of Development and Cooperation. ILEIA's long term objective is to promote LEISA (Low External Input and Sustainable Agriculture). LEISA has a documentation centre, publishes a quarterly news magazine, bibliographies. LEISA is characterized by its three sources of knowledge viz., traditional agricultural practices, indigenous knowledge and scientific insights as developed agro-ecology.

2.2.6 Indigenous Knowledge System for Sustainable Agriculture in Developing Countries (INDAKS)

Indigenous Knowledge system for Sustainable Agriculture in Developing Countries (INDAKS) focuses specifically on indigenous knowledge and practice in agriculture and food production. Its primary objective is to provide a contribution to both for theoretical and methodological development of the study of indigenous agricultural knowledge systems and its applicable principles in sustainable agriculture and rural development.

2.2.7 There are Certain Other IK Resource Centres

Aranya vikasa	House for Social and Environmental Research and Transformation, 5 th stage, 5 th cross, Veeranna layout, Vinobha nagar, Shimoga, Karnataka 577204, India.
BARCIK	Bangladesh Resource Centre for Indigenous Knowledge, Sukanta Sen Coordinator, Prof. M.I.Zuberi, Correspondent, 3/7, Block D, Lalmatri, Dhaka-1207, Bangladesh.

- BRARCIK Brazilian Resource Centre for Indigenous Knowledge, Jaboticabal, SP, Brazil.
- BURCIK Burkina Faso Resource Centre for Indigenous Knowledge. INNS, BP 5154, Ouagadougou, Burkina Faso.
- CARIKS Centre for Advanced Research on Indigenous Knowledge systems, P.O.Box 1, Saraswathipuram, Mysore 570 009, India.
- CIKIB Centre for Indigenous Knowledge on Indian Bioresources. National Botanical Research Institute P.O.Box 436, Lucknow – 226001, India.
- CIKIHR Centre for Indigenous Knowledge of Indian Herbal Resources. Lucknow 226024.
- CIKO Cameroon Indigenous Knowledge Organisation. CIKO contribute to UNESCO-MOST database of best practices related to indigenous knowledge.
- CIRAN Centre for International Research and Advisory Network, Nuffic-CIRAN, P.O.Box 24777, The Hague, The Netherlands.
- CTK Centre for Traditional Knowledge, Box 3443 Stn D', Othawa, Ontario, Canada, K1P6P4.
- ELLRIK Elliniko Resource Centre for Indigenous Knowledge. Medical School, Department of Social Medicine, University of Crete P.O.Box 1393, Heraklion, Crete, Greece.
- GERCIK Georgia Resource Center for Indigenous Knowledge. Institute of Botany, Georgian Academy of Sciences, Kodjorl Schosse, #1, 380007 Tbilisi, Georgia.
- INRIK Indonesian Resource Centre for Indigenous Knowledge. Bandung 40132, West Gova, Indonesia.

- KENRIK Kenya Resource Centre for Indigenous Knowledge. The National Museums of Kenya, P.O.Box 40658, Nairobi, Kenya.
- LEAD Leiden Ethnosystems and Development Programme. Institute of Cultural and Social Studies University of Leiden; P.O.Box 9555, 2300 RB Leiden, The Netherlands.
- NIRCIK Nigerian Centre for Indigenous Knowledge Institute of Agricultural Research, Ahmadu Bello University, PMB 1044, Zaria, Nigeria.
- PHIRCSDIK Philippine Resource Centre for Sustainable Development and Indigenous Knowledge, P.O.Box 425, Los Bonas, Laguna, The Philippines.
- REPPIKA Regional Program for the Promotion of indigenous knowledge in Asia. International Institute of Rural Reconstruction, Silang, Cavite 4118., The Philippines.
- RIDSCA Mexican Research, Teaching and Service Network on Indigenous Knowledge. (Red de Investigacion, Docencia Y Servicio en conocimientos Auto/ctonos) Norjcen, Colegio de Postgraduados, Campus Puebla Apartado Postal 1-12 C.P. 72130 Col, La Libertad, Puebla, Pue, Mexico.
- RRC Rural Research Centre (P.O.) 14155-6197, Teheran, Iran.
- RURCIK Russian Resource Centre for Indigenous Knowledge. EkoNiva P.O.Box 1, Nemchinovka-1, Moscow Region Russia 143-13.
- SARCIK South Africa Resource Centre for Indigenous Knowledge. The Institute for Indigenous Theory and Practice, P.O.Box 2355, Somerset West 7129, South Africa.

- SEWAK Society for employment welfare and agricultural knowledge. 236139 Haldwani, Nainital, UP, India.
- SLARICK Sri Lanka Resource Centre for Indigenous Knowledge. University of Sri Jayawardenapura, Forest Building, Nugegoda, Sri Lanka.
- TNRM Task force for natural resource management, centre for development cooperation services, Vrije University, Amsterdam, Debolelean, 1115, 1081 HV Amsterdam. The Netherlands.

2.2.8 Certain Newsletters Published for the Promotion of ITK and Related Aspects

1. GATE, German Appropriate Technology Exchange, GTZ, Eschborn, a quarterly newsletter, with changing topical focus themes that include local technology contributed by local practioners and scientists.
2. Artisans and Horticulturists Centre for Management in Agriculture, IIM, Vastrapur, Ahmedabad, India.
3. IFPP Newsletter, Indigenous Food Plants Programme, Nairobi, Kenya.
4. International Traditional Medicine Newsletter. Programme for Collaborative Research in Pharmaceutical Sciences, University of Illinois, USA.
5. Le Grenier, Service Inter Africaine de Technologies Appropriées (SIATA), Burkina Faso.
6. Seedling Genetic Resources Action International (GRAIN), Apartado, Spain.
7. IWGIA Newsletter International Work Group for Indigenous Affairs, Fiolstraede, Denmark.
8. TEK Tlak: A newsletter on Traditional Ecological Knowledge, Canada.

2.3 BLENDING OF ITK WITH SCIENTIFIC KNOWLEDGE

Blending of ITK with scientific knowledge system is vital for sustainable intensification of agriculture. Available resistance for pests and diseases of the local germ plasm can be effectively integrated in to the improved varieties through biotechnology, similarly, the efficiency and efficacy of locally available treatments can also be improved significantly through modern science. Scientific procedures can identify the active ingredients and could come up with appropriate recommendations in terms of effective application rates. The knowledge systems of farmers are highly dynamic and co-evolve as their circumstances change. Farmers constantly learn and unlearn choosing the appropriate knowledge in their struggle for a sustainable livelihood. While scientists often rely on averages, the knowledge of local people is more dynamic and up to date, continually revised as conditions change (Chambers, 1997:173). The farmers in the Nazret valley of Ethiopia have fine tuned a set of alternatives if rains arrive at late, if rains stop after initial rains and sowing, and/or if any crop fails to establish; and they sow a range of crops and cultivars suited to different land, soil, moisture conditions as the growing season unfolds.

2.3.1 Relative Advantages of Scientific Versus Farmers Knowledge

Scientist's comparative competence vis-à-vis farmers usually includes:

1. Processes where reductionism and precise measurement work well
2. Breeding (but not always) and biotechnology
3. Minute and microscopic phenomena

4. Developing package of technology for uniform and widespread conditions.
5. Access to knowledge and genetic material from other environments.

Farmers comparative competence vis-à-vis scientists often includes:

1. The experience and discipline of having to live in and survive through an actual farming system and its physical, social, and economic environment.
2. The creation and exploitation of microenvironments made up of soil, water and nutrients.
3. Continuous observation of processes.
4. Freedom to make progressive changes, managing and adopting sequences, unrestricted by rigid experimental design.
5. The development and adaptation of technology for diverse local conditions.
6. The understanding, development and management of technology with many elements and linkages.
7. A long time horizon (unless insecure and desperate).

Against this background it could be said that ITK provides solutions for low external input but intensive agricultural production. A systematic documentation and blending of available ITK facilitate the process in which researchers and farmers learn from one another.

2.4 THE ROLE OF INDIGENOUS KNOWLEDGE IN DEVELOPMENT

It is encouraging to observe that, over the past ten years, there has been a dramatic increase in interest in the role that indigenous knowledge can play in truly participatory approaches for sustainable development. This interest is reflected in a myriad of activities

generated within communities, which are recording their knowledge for use in their school systems and for planning purposes within national institutions, where indigenous knowledge systems are now being regarded as an invaluable national resource; and within the development community, where IK provides opportunities for designing development projects that emerge from priority problems identified within a community, and which build upon and strengthen community-level knowledge systems and organizations.

It may not be accidental that the growing interest in the potential contribution of indigenous knowledge to development is becoming manifest at a time when current development models have proven not too successful. Today, hundreds of millions of marginalized people all over the world are still being excluded from the mainstream of development. These people have not benefited from development efforts which have mostly been based on top-down development model, with the maximization of productivity as its major target. The agricultural sector provides a prime example. The objective of the Green Revolution was to maximize yields through the introduction of new crops. These crops depended on the optimal availability of fertilizers and water to achieve high yields. From a production point of view the Green Revolution was a success, but its potential could only be fully realized in areas with good soil and a secure water supply and by farmers with access to financial inputs. However, for people without good land, no adequate access to irrigation facilities and lack of financial means, the results have been of little use.

Many case studies and research projects have shown that there are no simple technical Western solutions that can be easily diffused and adopted by people on the margins. New insights reveal that development interventions have failed to induce people to participate because of the

absence of instruments and mechanisms that enable them to use their own knowledge. Recent research has given valuable insights into how people use their own locally generated knowledge to change and to improve, for example, natural resource management. Greater efforts therefore should be undertaken to strengthen the capacity of local people to develop their own knowledge base and to develop methodologies to promote activities at the interface of scientific disciplines and indigenous knowledge.

Indigenous knowledge is relevant on three levels for the developmental process.

- At first and basic level land is most important for the local community in which the bearers of such knowledge live and produce.
- At second level, development agents (NGOs, Government, donors etc.) need to recognise it, value it and appreciate it in their incorporation with the local communities. Before incorporating in their approaches, they need to understand it and critically validate it against the usefulness for the intended objectives.
- Lastly Indigenous Technical Knowledge (ITK) forms part of the global knowledge. In their content, it has a value and relevance in itself. ITK can be preserved, transferred, adopted and adapted elsewhere.

2.5 OPERATIONAL DEFINITION OF THE CONCEPTS

1. Attitude was operationalised as positive or negative affect towards the indigenous technical knowledge and their blending with modern technology
2. Blended technology : This was operationalised as the integrated technology of the indigenous technical knowledge and modern technologies to possible extent in it's principle and use.

3. Complete adoption was operationalised as the adoption of ITK in whole of his farm or to the possible extent.
4. Documentation was operationalised as scientific recording of the existing ITK.
5. ITK was operationalized as the traditional farm practice or knowledge practiced by the farmers from the generation with the use of indigenously available inputs, methods and processes.
6. Not rational ITK was operationalized as the ITK which lacks scientific evidence or background.
7. Partial adoption was operationalised as the adoption of the ITK on part of his farm as against to the maximum possible extent.
8. Rational ITK was operationalized as the ITK, which have scientific evidence or background or less deviation from the package of practices.
9. Scientific rationality was operationalised as the scientific evidence or background behind the ITK.

*REVIEW OF
LITERATURE*

CHAPTER III

REVIEW OF LITERATURE

The conduct of any research requires an insight in to the previous literature pertaining to the area under study. Though various institutions and scientists are showing considerable interest on Indigenous Technical Knowledge (ITK) in the recent years, there are limited research studies available and even those studies do not cover comprehensively the various aspects of ITKs. However, an attempt has been made to review the research works undertaken on this topic and they have been presented under the following subheads.

- 3.1 ITK in Agriculture - Concept and importance
- 3.2 Documentation of ITK in agriculture
- 3.3 Examples of ITK in agriculture
- 3.4 Rationality of ITK in agriculture
- 3.5 Attitude of farmers on ITK and their blended technologies
- 3.6 Adoption of ITK including blended technologies
- 3.7 Efforts of Non Governmental Organisations (NGOs), State Agricultural University (SAU) and State Department of Agriculture (SDA) in promotion of ITK.
- 3.8 Constraints and suggestions in adoption of ITK and blended technologies.

3.1 ITK IN AGRICULTURE – CONCEPTS AND IMPORTANCE

Proper understanding about the concept of Indigenous Technical Knowledge (ITK) in agriculture and its importance is very essential in the ever changing and dynamic universe which serves in formulation of future research programmes and their implementation. Hence, a few research findings in this regard are presented here.

Egger (1990) viewed that indigenous knowledge and culture can be combined with judicious use of external inputs into forms of land use which are productive and sustainable. He opined the indigenous farming system is not just a set of techniques, it is an integral part of the people's lives, embedded in their culture. It is an entire agriculture.

Altieri (1991) defined local knowledge as the accumulated knowledge, skills and technology of the local people, derived from the direct interaction of human beings and their environment.

Gill (1991) concluded that a remarkable degree of institutional and organisational development lies behind the success of indigenous systems. He added that the so called 'uneducated' farmers are capable of creating and maintaining large and complex multimember systems to achieve mutually beneficial results.

Sanghi and Kerr (1991) in their paper on soil and water conservation practices concluded that researchers and extensionists have much to learn from farmers regarding cost effective and relevant methods of soil and water conservation.

Kalaivani (1992) in her study on "Techno-cultural profile of garden land farmers" stated that, the farmers indigenous knowledge is the product of centuries of trials and error, natural selection and keen observations that can form a knowledge based on which researchers, extension workers can plan their research and extension plans.

Roling and Engel (1992) warned that to look at farmers only as users neglects the important fact that farmers are experimenters and that farmers have developed most of the technology used on the farm today.

Kalyanasundaram (1993) expressed that recognition of farmer's ideas, innovations is equal to the contribution of agricultural scientists,

educational experts and extensionists. He emphasized the need of viewing farmer force as integral part of agricultural development system.

Kanagasabapathi (1993) said that indigenous practices play a vital role in sustainable agriculture. He added that certain practices shatter the belief that recommendations made by agricultural scientists are always superior.

Venkataramaiah and Ramaraju (1993) viewed that identification of indigenous technologies enhanced the research activity and it can be included as a part of a total technology to reorient the functioning of formal research system for national agriculture development.

Vidyasagarreddy and Sinha (1993) stated that a number of risk management practices introduced in dry land agriculture under watershed programme. The farmers adopted only a few practices which were improvised and reintroduced as new ones. Interestingly, the constraints revealed that technology itself acted as a limitation in the process of transfer mainly because it did not fit in to local conditions and resource frame work of farmers. The farmer's response clearly indicated that modern technology alone is inadequate in mitigating risk in rainfed agriculture.

Ulluwishewa (1993) stated that indigenous knowledge is the knowledge that people have gained through inheritance from their ancestors. It is a people derived science and it represents people's creativity, innovations and skills.

Ahmed and Stoll (1994) confirmed that scientists first learned of the pest control properties of plants observing the practices of traditional farming societies. Many examples of pest control using plants are found

in ancient literature. They stated that when agriculture began, a further specialisation developed the art of using certain plants or plant parts to protect food crops from pests and diseases. This accumulated knowledge was transmitted from generation to generation.

Fernandez (1994) indicated that the terms 'indigenous' and 'local' knowledge are used to refer to that knowledge which is generated and transmitted by communities, overtime, in an effort to cope with their own agro ecological and socioeconomic environments.

Mathias (1994) stated that indigenous knowledge includes information, practices and technologies, beliefs, tools, experimentation, human resources (eg. Traditional healers) biological and materials.

Somasundaram (1995) used the term 'indigenous knowledge' synonymously with 'traditional' and 'local knowledge' to differentiate the knowledge developed by given community from the International knowledge system, some times also called as 'western system' generated through Universities, government research centers and private industries.

Rambabu (1997) defined the indigenous technologies as the technologies developed by the local farmers based on the topography, local agro climatic conditions available resources through nonformal experiments.

In the terms of Emadi (1998) the context of indigenous knowledge is the local environment, in all its cultural, social, economic and physical aspects. To meet the demands of ever changing nature of local conditions, people have had to be creative and resourceful.

Grenier (1998) defines indigenous knowledge as the unique, traditional, local knowledge existing with in and developed around the

specific conditions of women and men indigenous to particular geographic area.

He listed the following characteristics of Indigenous Knowledge (IK)

1. IK is generated with in communities
2. IK is location and culture specific
3. IK is the basis for decision making and survival strategies
4. IK is not systematically documented
5. IK concerns critical issues of human and animal life, primary production, human and animal life, natural resource management.
6. IK is dynamic and based on innovation, adaptation, and experimentation.
7. IK is oral and rural in nature.

Berkes (1999) reported that the term Traditional Ecological Knowledge (TEK) and indigenous knowledge are some times used interchangeably. Implied in TEK is a component of local knowledge of species and land. There is also a component of practice in the way people carryout their agriculture, hunting, fishing and other livelihood activities.

Green *et al.* (1999) stated that indigenous knowledge systems (Iks) are local, community based systems of knowledge, which are unique to a given culture or society and have developed as that culture has evolved over many generations of inhabiting particular ecosystems. Indigenous knowledge is a general term which refers broadly to the collective knowledge of indigenous people about relationships between people, habitat and nature.

Mendoza (1999) recorded that when faced with difficulties in implementing their activities, farmers try to innovate or adopt existing innovations, depending on the available resources.

Kashyap *et al.* (2000) have revealed that indigenous practices neither simply existed nor divinely revealed, they were researched and developed by the practitioners themselves which is an important factor for sustainable system.

Kumari (2000) reported that there is need for ensuring people's participation in terms of their choices and preferences. They could be brought into decision making process from the stages of research to technology diffusion and its adaptation or we can say that scientific technology should be blended with people's knowledge, their expectations and their existing infrastructural and farming resources.

Lakshmanan (2000) has revealed that indigenous knowledge portrays the wisdom embodies in observations, interpretation and predictions shaped over ages. Blend of modern technological means and traditional experiences will give rise to nationalistic programmes which can help in increasing the annual food production.

Eyzaguirre (2001), indicated that, indigenous knowledge is the form of local know-how and cultural practices is a set of tools that communities used to manage their natural resources, which include genetic resources, the building blocks of biodiversity and agriculture.

In brief the above findings reflect the list of prominent characteristics, its origin, importance and utilization of indigenous technical knowledge in agriculture, which gives proper idea to the researcher.

3.2 DOCUMENTATION OF ITK IN AGRICULTURE

It is essential to know various sources and methods of documentation and few proven rational Indigenous Technical Knowledge (ITK) in agriculture. Hence some of the sources and methods for collection and documentation of ITK's and proven rational ITK suggested by some authors are presented here.

Gupta (1990a) mentioned that the following are the reasons to document farmer's innovations:

- Science underlying many of these practices still remains to be properly understood.
- It is possible to generate lateral learning among farmers by sharing innovative practices found suitable in one region with the farmers in another similar region after trials, if necessary.
- Some of these knowledge will help to extend the frontiers of knowledge by providing basis of developing new concepts or adding value to the formal knowledge.
- Inclusion of these innovative practices in the graduate and post-graduate curriculum will help in instill pride among youth minds.
- When we share the so accumulated knowledge with farmers, it will help to restore pride among farmers and it will also help to reveal the innovative potential of farmer's knowledge.
- Scientists and development agencies have an opportunity for recasting their research and action agenda whenever felt necessary.

Maurya (1991) documented that the farmers of Eastern Uttar Pradesh noticed a severe abnormality in the paddy crop which responded well to pyrites being used for reclamation of saline and alkali soils.

Dubey *et al.* (1993) several techniques like case study method, oral history method, key informant means, making diagrams, case histories, critical incidents, preference ranking and inventory of farmers indicators could be used for eliciting and documenting the knowledge from local people.

Friedman *et al.* (1993) used a naval method for documentation on edible and medicinal indigenous plant species in equator. They collected information regarding those plants and raised four nurseries in sample area and distributed plantlets to all the farmers raised those plants. Then they documented ITKs from farmers. This method has been excellent for documentation and also increased cultivation of little known useful plants.

Karter (1993) pointed out that verbal style of investigation does not yield satisfactory results always. He argued that observation becomes more important. He asserted further that real insight could be obtained only by prolonged observation.

Lodha (1993) identified and documented the below given different indigenous practices followed by tribal farmers in Udaipur district of Southern Rajasthan.

- Feeding the common ants castles with flour and sugar, these act as a biological control against termites.
- Farmers dust ash to control the fungal disease on their crops.
- Farmers sow maize and paddy in the same field at the ratio of 1:2 or 3.

Mane and Sutaria (1993) reported different traditional practices followed by the tribal farmers in different crops.

1. Trying the 4-5 matured plants of jowar and bajra at the first leaf juncture to avoid the lodging.
2. Hanging of matured fruits of lady's finger, brinjal, pumpkin, maize, sorghum etc., to preserve the seed material with in the fruits/ear-heads for the next season.
3. Germination test will be conducted in Bamboo baskets under shade before sowing of cotton and paddy.
4. In cotton crop gap filling was done with the castor, which has acted as an alternative host for pest attack on cotton and increases the economic benefit.
5. Using of ash particularly for the crops like onion and garlic to make the soil more friable, improve the nutrient status and reduces the incidence of pests like thrips and diseases.
6. Use of castor seed cake by mixing with urea.
7. Skeleton of fish species like Bombay buck in the crushed form is used in the fields where crops like chillies are grown.

They used the methods like dialogues, field observations and joint interpretations to arrive at conclusions to document the indigenous practices.

Massaquoi (1993) reported that the method of obtaining information on the indigenous technology would depend on the particular technology and could include two or more of the following:

- i) Observation of the technology in operation
- ii) Interviews with users, and
- iii) Controlled trials of the traditional technology

Patel *et al.* (1993) collected some of the traditional practices through interactions with the tribals individually and groups as given below:

- a) Use of local maize variety due to its short duration or early maturity character.
- b) Use of higher seed rate (150 to 160 kg/ha) in wheat crop in order to maintain population.
- c) Broadcasting seeds of greengram/blackgram in wheat fields after harvest of the crop without primary tillage.
- d) Preparing Kothi (storage bin) from santhi, locally available material from forest, for storage of grains.
- e) Sundrying grains for 3-4 days during moonless period before storage, which prevents from infestation of stored-grain pests.

Sharma and Sinha (1993) have identified and documented several traditional practices developed by the hill of Uttarakashi to face the adverse farming conditions of the hills.

- a) Growing mustard in wheat crop along the shady areas of 'pusta,' mustard crop perform better than wheat in shady area.
- b) Growing soybean crop on 'pusta'-utilised unused area of 'pusta' and checking soil erosion due to rain.
- c) Minimum irrigation in wheat crop to avoid late maturity so that following paddy crop is not delayed.
- d) Ploughing land along the slope in parallel straight lines rather than circular for better balance depth of ploughing.
- e) Size of fields is kept small measuring about 200 m² to check the run off water.

Singh *et al.* (1993) reported some of the strong indigenous technical knowledge of tribal farmers of plateau region of chotanagpur and Santhal paraganas in the state of Bihar, where predominantly rainfed agriculture is practiced in highly complex, diverse and risk-prone situations.

Vivekanandan (1993) mentioned that conducting village level workshops, group discussions with farmers, artisans, publications of

news letters in local languages for exclusive communication of traditional farm technologies and traveling to interior regions were some of the effective means in identification, documentation and discrimination of traditional technology and also a means of getting feed-back from the people.

Mandappa (1994) mentions about green manuring of poongi (*Pongamia sp.*) These twigs with leaves are made to mix thoroughly in puddling which upon subsequent decay fetches nutrients. He also mentions that the leaves of same species have got some insecticidal properties.

Mundy and Compton (1995) stated that sources of indigenous information could be categorised as:

- i) Indigenous experts (such as a farmer particularly skilled in raising goats)
- ii) Indigenous professional (such as healers and irrigation specialists)
- iii) Innovators (people who experiment with and develop new techniques)
- iv) Intermediaries (those who pass on messages such as town criers and messengers) and
- v) Recipient discriminators (all those who receive information, modify it and pass it on).

Vasoya (1996) mentioned that a strange practice for rodent control. A little quantity of Sindhur (vermillion) is mixed either in water or milk. The mixture is poured on one or two rats caught in the cage. The coloured rats are left at the place where rats do damage. When the others see the coloured rats they get scared and run away. This is a traditional practice.

Karthikeyan and Chandrakanthan (1997) in their descriptive type of research on 6 primitive tribal groups in Nilgiris district of Tamil Nadu – listed out 66 ITKs. Some of which are :

- To kill leaf hopper, the Toda farmers spray the mixture of ash and cattle urine on vegetable crops like cabbage, carrot etc.,
- Polyculture – cultivation of more than one species of crop plants in the same piece of land to take the advantage of both time and space. Kurumbas cultivated ragi, samai, thenai and amaranthus sp. simultaneously.
- Suckers selected for planting were removed and sundried for 20 days. These were planted before the onset of monsoon during April-may to encourage profuse growth of the suckers quickly.
- The onset of flowering on the kurunji plants (*Strobilanthus* sp.) was taken as an indication for collection of honey.
- Use of external inorganic input like clay, silt as well as soils were used to manipulate the texture and structure of soil.
- To control stem borer in fruit trees, trula farmers use kerosine oil. Whenever stem borer damage was seen the kerosine soaked soap was placed. This method was perceived to be very effective.
- Neem cakes were filled in gunny bags and immersed in the irrigation channels, thereby it checks the attack of stem borer and gall flies in the paddy field.
- Flowers of wild cactus, sanramboo (*Cycas cersainalis*) was tied in a wet cloth and placed in the field was found to serve as a repellent against earhead bugs in rice fields.
- Neem fruits were soaked in water for 2 months and the pulp is separated from kernels, mixed with water and sprayed on coconut palms and paddy fields to control pests.

- To enhance the germination of bottle gourd, the seeds were soaked in water and wrapped in moist cotton cloth. This is taken in a vessel and buried in FYM for a day.
- Decoction of *asafotida indica* is used for seed treatment of sorghum against smut disease.

Chittiraichelvan *et al.* (1998) discussed about the special emphasis on utilization and application of indigenous knowledge in agricultural research scientists training programme. They also opined that to derive scientific value from indigenous practices, critical observation is essential and suggested farmers participatory research as the most convenient and cost effective ways of gathering indigenous knowledge.

Sundaramari (2002) reported that 19.95 % of the IAPs were related to pest and disease management followed by seeds, sowing and planting (13.71 %). Post harvest aspects (12.47 %), other (9.81 %), soil and water management (8.73 %), manuring (7.90%), inter cultivation (6.90 %), harvest aspects (5.73 %), seasons (4.74%), preparatory cultivation (4.74 %), varieties (2.99%) and weed management aspects (2.33%).

In precise, the above findings reflected the list of different successful methods for documentation of ITK, which includes observation, interviews participatory methods etc and the existing rational ITK in India and abroad which guides the research in proper direction.

3.3 EXAMPLES OF ITK IN AGRICULTURE

To have an over view of the Indigenous Technical Knowledge items (ITK) available in agriculture, some related indigenous technical knowledge (ITKs) reported by few authors of India and abroad are presented here under.

Table 1 : Examples of ITK in Agriculture

S. No.	Example of ITK	Adopted in	Reported by
1) General Agriculture			
a) Soil and Water Management			
1	For soil improvement in 'their' lands of Tuticorin district, 200 tonnes of tank silt is applied per acre followed by 50 tonnes per year for the next few years	Farmers of Tuticorin dt. in Tamil Nadu	Manoharan and Kombairaju (1995)
2	Crop residues and tree branches are burnt on the soil surface at the summer end to improve the structure of clayey soil and to make ploughing easy	Farmers of Konkan Region in Maharashtra	Rahudkar (1998)
3	Terracing is a traditional conservation method employed to prevent soil erosion particularly in step areas	Farmers in Philippines	Mendoza (1999)
b) Rainfall			
4	Large number of fireflies seen at night on the forest trees is a sign that the monsoon will start early	Farmers in Maharashtra	Rahudkar (1998)
5	If there is rain, accompanied with lightening and milk thunder on the second day of Jayastha month (May-June), there will be no rain for the next 72 days.	Farmers in Gujarat	Pastakia (2000)
c) Preparatory cultivation			
6	During the summer season itself, the soil is prepared well and applied powdered FYM	Farmers in Kerala	Anonymous (1999)
7	Farmers use a multipurpose tool called 'Santi' which consists of a shaft to which some 17 parts can be attached for different purposes. The tool is used for breaking up the soil, sowing, hoeing etc.,	Saurashtra zone of Gujarat	Kanani (2000)
d) Seeds and sowing			
8	Seeds soaked in 'Kumkum' (Vermilion) water or milk for a day before sowing germinate faster and grow in to healthy plants.	Farmers in Karnataka	Prakash (1997)

e) Manures and manuring

9	Tank silt is applied to increase soil texture	Farmers in Guntur district of AP	Rambabu (1997)
10	About 10 kg of neem cake is soaked in 10 lit. of cow urine along with ½ kg of waste <i>Asafoetida</i> Sp. and left over night. In the next day, it is sprayed for 1 ac after dilution as liquid manure	Farmers in Tamil Nadu	Vivekanandan (1997)
11	About 20-25 kg of common salt is mixed with 10 cartloads of natural manure and applied during May to increase crop yields.	Farmers in Gujarat	Gupta and Shah (1998 a)
12	After the death of domestic animals, their carcass is buried at a depth of 4 feet and at a distance of 15 feet from its base for the trees like coconut, banana etc.,	Farmers in Tamil Nadu	Karunanidhi (2000)

f) Weed management

13	Manure made with mango leaves is applied in the fields to control <i>Cyperus rotundus</i>	Farmers in Uttar Pradesh	Ambedkar (1998)
14	Outer-shells of tamarind fruits are applied in the field to control <i>Cyperus rotundus</i>	Farmers in Tamil Nadu	Ganesan (2000)

g) Pest and Disease Management

15	To control pod borer (<i>Leucinodes orbonalis</i>) in vegetables, <i>Anethum sowa</i> plants are sown in rows along with the vegetables. The strong odour of the plant repels the insects	Farmers in Karnataka	Prakash (1997)
16	Crops grown in saline alkaline soils are prone to disease attack	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
17	Leaves of <i>Calotropis gigantea</i> and neem are ground with fruits of <i>Datura metal</i> . It is soaked in water for more than 15 days and is filtered and sprayed to control all the pests.	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)

18	Seed materials are kept in earthen pots which are kept on the 'roof' directly above the furnace in the kitchen. The smoke acts as repellent to the insects.	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
19	Neem leaf extract is sprayed on crops to repel moths, hoppers and larvae of many insects	Farmers in Nigeria	Apantaku (1998)
20	Mint and marigold are planted in the farm to repel insects	Farmers in Nigeria	Apantaku (1998)
21	About 10kg of dried cow dung is ground into fine powder and mixed with ash (obtained from brick kiln) and dusted in the early morning, to control pests and diseases	Farmers in Tamil Nadu	Vivekanandan (2000 b)
22	Garlic acts on a wide spectrum of organisms in unrelated crop plants singly or in combination with neem products, chilli, asafoetida etc., besides garlic is effective against bacteria, fungi and nematodes	Farmers in Tamil Nadu	Lakshmanan (2001)

h) Storage Pest Management

23	Dried and powdered leaves of banyan tree (<i>Ficus benghalensis</i>) are mixed with the grains for keeping them safe from pests	Farmers in Gujarat	Gupta and Patel (1997 b)
24	A handful of rock salt kept at the base of storage place helps preventing pests in pulses and grains	Farmers in Andhra Pradesh	Balajirao (1998)
25	Grains are stored in a drum like container called 'dole' which is made of thin bamboo strips with inner and outer walls plastered with mud	Farmers in Andaman	Bandyopadhyay and Saha (1998)

i) Termite control

26	A bundle of green grass (<i>Heteropogon contortus</i>) is kept near the termite hill, which soon attacks the grass, and the bundle is fully covered with termites. Then the bundle is fed to hens along with termites	Farmers in Kenya	Anandakumar (2001)

j) Water Source Identification

27	Perennial sweet water source can be seen at a depth of 5-10m in places where the 'nirgundi' tree (<i>Vitex negundo</i>) is found	Ancient literature	Hemamalini (1997)
28	Wells should be dug near crab holes, near sultan champa trees (<i>Calophyllum nophyllum</i>) or umbar (<i>Ficus glomerata</i>) or jamun (<i>Eugenia jambolona</i>) trees	Farmers in Maharashtra	Rahudkar (1998)

2. PODU CULTIVATION

29	After clearing vegetation setting of fire is practiced in podu cultivation which adds fertility, kills insects and control weeds to a certain extent.	Tribals in Vizianagaram district	Shahu (2002)

3. CEREALS

a) Paddy (*Oryza sativa*)

Sl. No.	Indigenous Technical Knowledge Items	Followed by	Reported by
30	Green twigs of <i>Calotropis gigantea</i> plants are planted in the paddy fields to control aphids and they are replaced once in 10 days.	Farmers in Gujarat, India	Gupta and Patel (1997b)
31	Treatment of paddy seeds in diluted bio gas slurry for 12 hours increases resistance of seedlings to pests and diseases	Farmers in Tamil Nadu, India	Iyyappan (1997)
32	Sheep penning is practiced during summer which improves the fertility status of the soil	Farmers in Guntur district	Rambabu (1997)
33	The place with higher elevation in the field is selected for raising the nursery	Farmers in Guntur district	Rambabu (1997)
34	Guava leaf powder has a toxic effect on rice weevil (<i>Sitophilus oryzae</i>) and granary weevil (<i>S.granarius</i>)	Farmers in Egypt	Roeth (1997)
35	Paddy seeds are mixed with the leaves of either neem (<i>Azadirachta indica</i>) or local <i>samalu</i> plant (<i>Vitex trifolia</i>) to preserve them	Farmers of Andaman, India	Bandyopadhyay and Saha (1998)

36	To control stem borer in paddy fields, branches of <i>Erythrina indica</i> plants are put in the fields	Farmers of Tripura, India	Chowdhury, (1998)
37	Rice grains are stored in mats tied above the fireplace	Farmers in Philippines	Lumdang and M Villar (1998)
38	About 30 kg of common salt is applied for 1 ha paddy crop to protect it from stem borer	Farmers in Tripura, India	Pradhan (1998)
39	Leaf extract of <i>Lasiosiphon eriocephalus</i> is effective in controlling BPH in rice	Farmers in Karnataka, India	Prakash (1998 a)
40	During panicle formation in paddy, the flowers of <i>Cycas circinalis</i> are placed on sticks in paddy fields @ 4/ac. Its unpleasant odour repels earhead bugs.	Farmers in Tamil Nadu, India	Vivekanandan (1998)
41	To protect the paddy crop from grass hoppers, <i>Sesbania aegyptiaca</i> is grown as a hedge all around the paddy fields	Farmers in Uttar Pradesh, India	Sharma (1999)
42	About 30 kg of tamarind seeds are applied for an acre of paddy field 10 days after transplanting to boost up the crop growth and yield	Farmers in Tamil Nadu, India	Vivekanandan (1999)
43	Soaking the paddy seeds in diluted cow's urine before sowing, considerably reduces the incidence of leaf spot and rice blast	Farmers in Tamil Nadu	Balasubramanian <i>et al.</i> (2000)
44	Cut branches of 'Kodisa' plant (<i>Cleistanthus collinus</i>) are put in rice fields to control rice hispa pest (<i>Dicladispa armigera</i>)	Farmers in Andhra Pradesh	Chandra (2000)
45	To save paddy crop from mealy bugs farmers take a discarded cycle tyre and burn it. They drag it around the field and put it on windward direction. The smoke and smell are assumed to repel the pest	Farmers in Srikakulam and Vizianagaram districts	Lakshmana (2000)

4. MILLETS

a) Sorghum (*Sorghum vulgare*)

49	Sorghum seeds are treated with leaf extract of <i>Clerodendron multiflorum</i> to control black smut	Farmers in Gujarat	Gupta and Patel (1997 b)
50	Coriander is grown as mixed crop with sorghum to control witch weed (<i>Striga lutea</i>)	Farmers in Karnataka	Prakash (1997)
51	Sorghum + red gram is a traditional inter cropping as it encourages the birds to act as natural predators of pests	Farmers in Andhra Pradesh	Kasyapa (1998)
52	Sorghum earheads are sun dried for two days and stored without seed separation by building a storage structure called 'Pattarai'. This structure is opened and threshed when needed.	Farmers in Tamil Nadu	Ganesamoorthi (2000)
53	One kg of sorghum seed is soaked in a diluted mixture of extracts from 250g roots of 'aswangandha' (<i>Withania samnifera</i>) and 50g leaves of <i>Datura metal</i> and shade dried before sowing to produce vigorous seedlings free from pests	Farmers in Karnataka	Vivekanandan (2000 a)
54	'Irungu cholam' is a country variety, tolerant to drought preferred for its straw as cattle feed	Farmers in Tamil Nadu	Sundaramari (2002)
55	Audio cassette ribbons are tied in the field to scare the birds	Farmers in Telangana region of A.P.	Anil (2001)
56	For threshing sorghum, earheads are spread over on the roads to allow vehicles to pass on it	Farmers in Telangana region of A.P.	Anil (2001)

b) Finger millet (*Eleusine coracana*)

65	Long duration varieties are adopted in dry lands to avoid the rainy days coinciding with the harvesting stage	Farmers in Tamil Nadu	Somasundaram (1995)
66	Finger millet earheads are spread on the threshing floor and beaten with wooden sticks to separate the grains	Farmers in Tamil Nadu	Ganesamoorthi (2000)

46	'T' shaped bamboo stands are placed in many places in the paddy fields so that birds can sit on them and feed on the larvae and adults of rice pests	Farmers in Tamil Nadu	Velmurugan (2001)
47	The paddy variety 'baal chaudi' having 90 days duration yields about 2500 kg/ac gives coarse grain and tolerates many pests and diseases	Farmers in Tamil Nadu	Sundaramari (2002)
48	'White ponni' is a medium duration variety, yielding 1500 – 2000 kg/ac producing fine grain	Farmers in Tamil Nadu	Sundaramari (2002)

b) Maize (*Zea mays*)

57	If the sheaths on maize cobs are not removed, they can be stored for more than three months	Farmers in Tamil Nadu	Somasundaram (1995)
58	Developing maize cobs are protected by enclosing them in a large breadfruit leaf	Farmers in Maldives	Hunter (1996)
59	Juice of 2-3 kg of peeled onions (after dilution) is sprayed on maize crop to control painted grass hopper, striga and leaf curl virus	Farmers in Gujarat	Gupta and Patel (1997 a)
60	Maize seeds are soaked in cow urine for 12 hours before sowing	Farmers in Tamil Nadu	Iyyapan (1997)
61	Gram leaves can be used for safe storage of maize seeds for long time	Farmers in Gujarat	Gupta and Shah (1998 b)
62	In order to retain moisture in the fields and to induce quick germination of maize seeds, leaves of <i>Butea monosperma</i> are spread in the maize sown fields	Farmers in Gujarat	Gupta and Patel (1999 a)
63	Maize cobs are burnt and its ash is mixed with maize grains @ 20kg for 100kg of grains while storing in a bag	Farmers in Tanzania	Kitange (1999)
64	Before sowing, maize seeds are soaked in warm water for 3-6 hours and shade dried to induce better germination and to control shoot borer.	Farmers in Tamil Nadu	Sundaramari (2002)

67	When a sample of dry finger millet grains are chewed, metallic sound indicates its dryness	Farmers in Tamil Nadu	Ganesamoorthi (2000)
68	'Chinna chodi' is a traditional finger millet variety grown by the tribals which is short duration bearing small fingers.	Tribals in Visakhapatna m district	Anonymous (2002)
69	A combined operation of weeding and earthing up is practiced by the farmers	Tribals in Vizianagaram district	Shahu (2002)

c) Pearl millet (*Pennisetum typhoides*)

70	For bird scaring, the carcass of a crow is hung on a long pole in the center of the pearl millet field	Farmers in Tamil Nadu	Somasundaram (1995)
71	Pearl millet is stored by building a structure called 'Pattarai' before threshing	Farmers in Tamil Nadu	Ganesamoorthi (2000)
72	Pearl millet earheads are spread circularly to 1 foot height and cattle threshed	Farmers in Tamil Nadu	Ganesamoorthi (2000)

d) Little millet (*Sama*)

73	'Chinna samalu' is a early duration (90 days) little millet variety grown by the tribals	Tribal areas of Visakhapatna m district	Anonymous (2002)
74	'Pedda samalu' is a late duration (120 days) little millet variety cultivated by the tribals	Tribal areas of Visakhapatna m district	Anonymous (2002)
75	Seeds for consumption purpose are stored in bamboo baskets and for seed purpose are stored in gunny bags	Tribal areas of Visakhapatna m district	Anonymous (2002)

e) Kodo Millet (*Phospholum Serobiculatum*)

76	Arika grain is placed on the dung coated floor on which the upper wheel of the wooden roller or stone roller is rotated with pressure to dehusk the grain. A fresh coat of dung is applied for every 2-3 kg of dehusking of arika grain.	Tribals in Visakhapatna m district	Anonymous (2002)

5. PULSES

a) Black gram and Green gram (*Phaseolus sp.*)

77	Seeds are soaked in water for 10 hrs before sowing black gram crop in less soil moisture field	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
78	Spraying of diammonium phosphate (DAP) on the pulse crop for higher growth	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
79	Ash is manually dusted on the black gram leaves during early hours to control pests and diseases	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
80	The best time for sowing pulses is the last four days of Bhadra (August) and first four days of Aswin.	Farmers in Srikakulam and Vizianagaram districts.	Lakshmana (2000)
81	When a wooden plank is moved with pressing over the drying gram, splitting of gram indicates optimal drying	Farmers in Tamil Nadu	Ganesamoorthi (2000)
82	Bullocks pulling a heavy stone roller are allowed to trample over the harvested black gram crop spread out in the threshing yard so as to separate the grain	Farmers in Tamil Nadu	Parvathi <i>et al.</i> (2000)
83	Collecting the black gram seeds from the plants which were free from pests and diseases and having higher yields	Farmers in Tamil Nadu	Sundaramari (2002)

b) Redgram (*Cajanus cajan*)

84	Deep summer ploughing is done to control <i>Helicoverpa armigera</i> in red gram	Farmers in Andhra Pradesh	Kasyapa (1998)
85	Marigold acts as a trap crop for red gram pod borer	Farmers in Andhra Pradesh	Kasyapa (1998)

86	To control gram pod borer, 3-5 lit of cow urine is mixed with equal quantity of cow dung and allowed to ferment for four days. Then it is filtered, to which 250g, of quick lime is added, diluted with 50-80 lit of water and sprayed for 1 ac.	Farmers in Tamil Nadu	Parvathi <i>et al.</i> (2000)
87	For control of pod borer spraying of neem seed kernel extract is used	Farmers in Telangana region	Anil (2002)
88	'Donikandulu' is a resistant variety to pests and diseases cultivated by the farmers	Tribals in Vizianagaram district	Shahu (2002)
89	Castor seeds are fried, powdered and mixed with redgram seeds to reduce pest attack during storage.	Farmers in Tamil Nadu	Sundaramari (2002)
90	Mixing the dried leaves of nochi (<i>Vitex negundo</i>) or neem with red gram seeds before storage.	Farmers in Tamil Nadu	Sundaramari (2002)

6. OILSEEDS

a) Groundnut (*Arachis hypogaea*)

91	Cowpea grown as an intercrop in groundnut fields acts as a trap crop to control red hairy cater pillar	Farmers in Tamil Nadu	Somasundaram (1995)
92	Just after groundnut is sown, stems of black coloured <i>Colacasia</i> sp. are scattered at various spots in the field. These stems look like snakes and scare the birds away	Farmers in Assam	Barua (1999)
93	Groundnut pods are threshed by spreading on a threshing floor and beating with wooden sticks (for oil extraction)	Farmers in Tamil Nadu	Ganesamoorthi (2000)
94	Rice bran + jaggery are mixed with chemical and sprayed on groundnut crop to control pests and diseases. Jaggery acts as wetting agent.	Farmers in Srikakulam and Vizianagaram districts	Lakshmana (2000)
95	Well dried seeds with pink seed coat are selected for sowing	Tribals in Vizianagaram district	Shahu (2002)

b) Sesamum (*Sesamum indicum*)

96	After the harvest of pearl millet in summer, gingelly is sown during the monsoon. Crop residues of pearl millet provide ample organic manure for gingelly	Farmers in Gujarat	Gupta and Patel (1999 a)
97	A sample of drying gingelly is pressed and twisted between palms. Presence of oil on palms indicates optimal dryness	Farmers in Tamil Nadu	Ganesamoorthi (2000)

7) Vegetables

98	To control flower shedding in pumpkin, fermented rice is tied in the branches near the flower buds in early morning	Farmers in Andhra Pradesh	Balajirao (1998)
99	Seeds of snake gourd are stored by mixing them with ash	Farmers in Andhra Pradesh	Balajirao (1998)
100	To control bacterial blight in tomato, diluted cowdung is applied to the root zone of the affected plants	Farmers in Tripura	Chowdhury (1998)
101	<i>Chrysanthemum coronarium</i> is grown as a border crop in brinjal to control fruit borers	Farmers in Tamil Nadu	Vivekanandan (2001)
102	Neem oil is sprayed to control white flies in vegetables	Farmers in Tamil Nadu	Sundaramari (2002)
103	Tomato seeds are sown in small hills on raised nursery bed and covered with a layer of ash and coconut fronds.	Farmers in Tamil Nadu	Sundaramari (2002)
104	About 10 kg of groundnut cake is soaked over night and in the next morning this solution is poured @ 200 ml/hill on cucumber to get more yields.	Farmers in Tamil Nadu	Sundaramari (2002)



a) Cowpea (*Vigna anguiculata*)

105	Poultry manure is applied for better yield in cowpea	Farmers in Tamil Nadu	Sundaramari (2002)

b) Cabbage (*Brassica oleracea* var. *capitata*)

106	Fresh cow urine is collected in an earthen pot whose mouth is covered with polythene and kept underground for a few days. Then every glass of fermented urine is mixed with 1 or 2 lit. of water and sprayed to control cabbage moth	Farmers in Tripura	Chowdhury (1998)
107	Cabbage seeds are sown in raised nursery beds prepared by mixing FYM and soil at 1 : 5 ratio	Farmers in Tamil Nadu	Sundaramari (2002)

c) Rice bean (*Thimmarlu*)

108	Ash obtained from burning trees in podu is added to the soil during ploughing.	Tribal areas of Visakhapatna district	Anonymous (2002)
109	Ash is dusted on the rice bean crop in the early morning (6-8 AM) so that the ash sticks to the dew on the leaves and controls insect activity	Tribal areas of Visakhapatna district	Anonymous (2002)

d) Tapioca (*Manihot esculanta*)

110	To induce early sprouting in Tapioca, a pit is dug to 1 foot depth and to required length and breadth, and the base of which dried leaves and branches are spread to ½ foot height. Water is sprinkled on the heap and the previously cut sets are spread on this layer to 1 foot and covered again with dried leaves followed by sprinkling of cowdung solution. The heap is kept always wet. The sets will sprout earlier.	Farmers in Tamil Nadu	Sundaramari (2002)

8. SPICES AND CONDIMENTS

a) Chillies (*Capsicum annum*)

111	Chilli seeds are immersed in biogas slurry for 1½ hours for vigorous growth and disease resistance	Farmers in Tamil Nadu	Iyyappan (1997)
112	'Sindhur' is a less pungent variety and useful for green and dry chillies	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)

113	The seed preserved as pod for two seasons had significantly higher germination capacity than that of extracted seed stored only used for two seasons.	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
114	Neem cake is dissolved in water and sprayed to control tip drying	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
115	Coriander or garlic is intercropped with chillies to avoid attack by thrips or wood worms	Farmers in Tamil Nadu	Vivekanandan (1997)
116	Marigold is grown as an intercrop in chillies to control mosaic disease	Farmers in Uttar Pradesh	Ambedkar (1998)

b) Ginger (*Zingiber officinale*)

117	<i>Calotropis</i> spp. are planted randomly in the field of ginger to act as a repellent for insect pests	Farmers in Gujarat	Anonymous (2000)
118	Mulching is done with green leaves at the time of planting ginger	Farmers in Tamil Nadu	Sundaramari (2002)

c) Turmeric (*Curcuma longa*)

119	A country plough is worked in between rows to control weed growth and facilitate earthing up of the plants	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)
120	Leaf blotch disease is controlled by planting dried palmyrah leaves	Farmers in Guntur district in Andhra Pradesh	Rambabu (1997)

9. FRUIT CROPS

a) Banana (*Musa* sp.)

121	Unripened banana bunches are piled in a vessel and incense sticks are lit inside the vessel. Then the lid is closed and the bunches ripen in about 12 hours	Farmers in Tamil Nadu	Iyyappan (1997)
122	Application of FYM and oil cakes reduces the incidence of panama wilt disease.	Farmers in Guntur district of Andhra Pradesh	Rambabu (1997)

123	For quick ripening of banana fruits, lime solution is sprinkled over the bunches	Farmers in Tamil Nadu	Ganesamoorthi (2000)
124	For easy ripening of banana, neem leaves are inserted in between the bunches	Farmers in Tamil Nadu	Ganesamoorthi (2000)
125	About 25g of mixture of neem oil cake and castor oil cake is applied around each banana sucker 60 days after planting to control nematodes	Farmers in Tamil Nadu	Vivekanandan (2000 b)
126	Diluted tobacco leaf extract is sprayed on banana crop to control leaf spot diseases	Farmers in Tamil Nadu	Anandakumar (2001)
127	Banana suckers are trimmed and roots are removed before planting in order to induce fresh roots	Farmers in Tamil Nadu	Sundaramari (2002)

b) Pine apple (*Ananas sativus*)

128	Rocky place is best suited for growing pine apple	Farmers in Tamil Nadu	Somasundaram (1995)
129	Mulching is done with crop wastes to retain soil moisture	Farmers in Tamil Nadu	Sundaramari (2002)

10. FIBRE CROP

a) Mesta (*Hibiscus subdirifa*)

130	Sowing of mesta seed before Telugu new year (Ugadhi) gives high fibre yield	Farmers in Srikakulam and Vizianagaram districts	Lakshmana (2000)
131	Removal of bunchy tops along with the masses of mealy bugs (<i>Meconellicoccus hirsutus</i>) and their destruction to prevent the spread of the pest to adjacent plants	Farmers in Srikakulam and Vizianagaram districts	Lakshmana (2000)
132	Mesta is cultivated as mixed crop either with red gram or sesamum	Tribals in Vizianagaram district	Shahu (2002)

11. NARCOTICS

a) Tobacco (*Nicotiana tabacum*)

133	Suitable season for tobacco sowing is Aavani-Purattasi months (August – September)	Farmers in Tamil Nadu	Sundaramari (2002)

The above listed documented ITK in different crops by various authors gives a comprehensive understanding about the ITK in different crops.

3.4 RATIONALITY OF ITK IN AGRICULTURE

Any practice or technology, considered as valid and fruitful will have scientific background for its successful results. Though the farmers are not able to explain such scientific rationale behind those ITK, scientists are responsible for test verifying those practices and find out their rationality. Studies reporting the rationality of ITK have been reviewed and presented below:

Padaria and Singh (1990) assessed scientific rationality of dry farming practices of Ranchi district of Bihar on a five point scale. Some of the practices with more scientific rationality were listed below:

- Plot to plot bunding and terracing of sloppy lands.
- Ploughing the field in March-April.
- Sowing of paddy and ragi are normally done in line on the occurrence of first effective shower.
- Low land paddy sowing is done in June-July.
- Number of seedlings transplanted per hill in transplanted rice is generally 3-4 and that of ragi is 2.
- Leaves of neem are kept along with seeds for protection against storage pests.

Kalaivani (1992) differentiated that rational belief is a belief which can be explained with empirical evidence where as irrational belief lack the empirical evidence, and she listed some rational garden land farming practices which are indigenous.

- ❖ Apply *Cissus quadrangularis* to correct alkalinity
- ❖ Apply neem leaves to correct alkalinity, neem cake to correct salinity.
- ❖ New garden lands and old wet lands yields better.
- ❖ Red soils are amenable for continuous cropping.
- ❖ Plough garden land four times, where as wet land seven times.
- ❖ Apply goat manure for first crop and green manure for second crop.
- ❖ Cattle manure provides nutrients for succeeding crops where as goat manure provides manure for crops grown in same season.

Pulmate and Babu (1993) studied scientific rationale of certain existing traditional practices in shifting cultivation in Manipur state. They concluded that two-thirds of practices were scientifically rational.

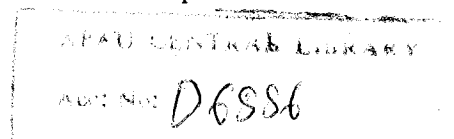
Ramaraju (1993) reported that the practices, considered rational by the scientists were selection of big sized earheads of millets for seed purpose, erecting the bamboo sticks tied with bird feathers to avoid bird attack, keeping maize cobs without remaining husk and tassel for seed purpose, red gram seeds were mixed with ash and covered with red earth, paddy seed stored in ball shaped puri, pulse seeds were mixed with ash for storage, practices of store bunch, terracing in steep hill slopes, practices of stone bunding across the slope, earthen check dam constructed for storage of stream water, short duration paddy varieties suitable to rainfed area were used in a mixed cropping, the dropped leaves provide nutrients to the crops, pineapple grown under shade in banana, mango and cashew orchards, ratooning of pineapple after eighteen months and one to two suckers are allowed to grow and others removed in a ratoon crop.

Talawar and Singh (1993) found that the scientific rationale of indigenous practices should be tested based on knowing the context of practice and composing with the findings of formal agricultural sciences.

Gupta (1994) voiced his concern over continued negligence of scientific community regarding large number of useful plants like Calotropis, Ipomea, custard apple etc., for possible development of herbal pesticides. He stressed the need for research and acquiring patents in this area before western scientists do it.

As reported by Somasundaram (1995) in his study, out of the total Indigenous Knowledge Items (IKs) related to crops and general agriculture, 59.87 per cent of them were judged as rational and 40.13 per cent were judged as irrational IKs. More than 70 per cent of IKs on red gram, pearl millet and sugarcane, more than 60 per cent general agriculture and more than 50 per cent in rice were rated as rational. Rational items were less in the case of finger millet and gingelly 25 per cent each. Under general agriculture, all items related to preparatory cultivation, sowing and economics were judged as rational. In manures and manuring, the rational items were 83.33 per cent followed by 75 per cent in storage pest management, 71.43 per cent in weed management and 68.42 per cent in soil and water management. More number of items related to crop production aspects in rice, sorghum, blackgram, groundnut and general agriculture were found to be rational.

Prasad *et al.* (1996) in their study on rationale of indigenous post harvest practices in Ranchi district concluded that scientists favoured the continuation of 9 of the 11 indigenous post harvest practices on



threshing, dehushing and storage activities for rice, wheat and grain legumes by a sample of 200 farmers.

Rambabu (1997) stated that out of 340 ITKs considered for testing scientific rationality in his study, 78.53 per cent were judged rational while 21.47 per cent were rated irrational by the judges.

Ganesamoorthi (2000) in his study on indigenous post harvest practices observed that the scientists rated more than 80 per cent of the indigenous post harvest practices as rational.

Lakshmana (2000) reported that out of 96 indigenous farm practices (IFP) in his study, 80.21 per cent of IFP were rated rational by the scientists.

Sundaramari (2002) stated that 85.49 per cent of the total of 356 Indigenous Agricultural Practices (IAPs) were judged rational while 14.51 per cent were rated irrational by the scientists.

He further reported that all the IAPs on blackgram, hill banana and coffee (100%) were rated as rational. Rational IAPs were found to be 90% and more in the case of sorghum, cowpea, cotton and mango and more than 80% for the crops like rice, groundnut, sugarcane and chillies. The rational IAPs were found less than 80% in respect of coconut and general agriculture and it was relatively very low in tomato (68.75%).

Different rational ITK in agriculture, it's importance given by few author was useful to guide the research.

3.5 ATTITUDE OF FARMERS ON ITK AND THEIR BLENDING WITH MODERN TECHNOLOGIES

The attitude on Indigenous Technical Knowledge (ITK) and their blending with modern technologies is essential requirement for effective

discrimination of information related to ITK. Hence, a few research findings in this regard are presented here under.

Somasundaram (1995) concluded that 61.26 per cent of scientists, 62.05 per cent of the extension workers and 55.61 per cent of the farmers were found to have favourable to more favourable attitude towards indigenous knowledge on agriculture.

Ramabu (1997) reported that majority of the respondents (70.00%) had favourable attitude towards indigenous technology items in wet cropping systems followed by neutral attitude (13.34%), unfavourable attitude (8.33%) highly favourable attitude (5.00%) and highly unfavourable attitude (3.33%). In dry cropping systems majority of the respondents (66.67%) had favourable attitude followed by unfavourable attitude (11.67%), neutral attitude (10.00%), highly favourable attitude (6.66%) and highly unfavourable attitude (5.00%). Where as in garden cropping system, majority of the respondents (73.34%) had favourable attitude followed by 10.00% each of highly favourable and highly unfavourable attitude.

A few relevant studies undertaken in this regard were presented which depicts the attitude of farmers on indigenous technologies.

3.6 ADOPTION OF ITK INCLUDING BLENDED TECHNOLOGIES

It is essential to know the extent of adoption of ITK and their blended technologies by the farmers which is useful for the technology dissemination. Some of the previous research findings are presented here for reference.

Balasubramanian (1992) in his study on 'Indigenous knowledge use in dry lands' concluded that 18 practices were adopted both by small and big farmers at varying degrees.

Dialla (1994) conducted a study on the adoption of soil conservation practices in two rural communities at Burkina Faso. He identified four indigenous soil conservation techniques i.e., application of manure, mulching, stone lining and fallow. Of them manuring and stone lining were used most. He reported that the level of utilization of these two practices was between 96.70 and 100 per cent in the rural communities.

Parrish (1994) reported that 11.70 per cent of the farmers were using indigenous practices for rodent control and less than one fourth (23.30%) were using traditional insect control methods.

Parvathi (1995) revealed that more than half of the farm women (56.88%) had medium level of adoption of both traditional and modern post harvest practices, followed by 25.62 per cent at high level and 17.5 per cent at low level.

Somasundaram (1995) revealed that 43.85 per cent of farmers were low adopters followed by 31.55 per cent under medium adoption category and 24.60 per cent were high adopters in case of over all adoption of IKs on agriculture.

Kanagasabapathi (1996) had concluded in his study that more than eighty per cent of the identified indigenous agricultural practices followed by the tribal farmers.

The study conducted by Sivasankaran (1996) revealed that, indigenous agricultural practices such as summer ploughing, manuring after the first shower of rainfall, adding organic waste and farm yard manure to the soil, mulching for soil conservation, crop ploughing for weed eradication were found adopted by more than 80 per cent of the respondents.

Rambabu (1997) in his study concluded that majority of the farmers were medium adopters in rice (76.66%), rice fallow black gram (76.66 %), cotton (63.34%), chillies (63.34%), banana (70.00%) and turmeric (76.67%) in all the cropping systems followed by low and high adoption. Practice wise adoption was also higher in the above crops and general agriculture.

Ganesamoorthi (2000) reported that 37.50 per cent of the respondents had medium level of adoption followed by each 31.25 per cent of low and high levels of adoption. Regarding the practice wise adoption in individual crops, it was found to be higher in the case of rice while the same was lower in the case of sorghum, blackgram and groundnut.

Lakshmana (2000) concluded that 44.34% of rational IFP were adopted at high level by the farmers followed by 32.22% were adopted at medium level and 24.44% were adopted at low level. Where as 13.33% of irrational IFP were adopted at high level by the farmers

followed by 26.67% at medium level and 60.00% of irrational IFP at low level. These results clearly indicate that most of the rational IFP were adopted by the farmers and less of irrational IFP.

Torkelssan and Anandajayasekaram (2000) highlighted that integration of ITK with the scientific knowledge system is vital for sustainable intensification of agriculture. Available resistance for pests and diseases of the local germ plasm can be effectively integrated in to the improved varieties through biotechnology.

Vijayalayan (2001) in his study on 'ecofriendly agricultural practices in rice' revealed that rice growers were found to have low (41.66%) adoption level followed by medium (32.50%) and high (25.84%) levels.

Anil (2001) reported that the adoption of blended technologies was more in medium category i.e., 64 and 70% followed by high 24 and 18% and low 12 and 12% in sorghum and red gram respectively.

He revealed that 'Mrugasira Karthe' is last date for sowings of Jowar in IT, but farmers blending this practice when rains are late (after Mrugasira Karthe), they sow the jowar with the high seed rate 15 kg/ha as against the recommendation as 10 kg/ha to compensate the mortality of plants with shootfly attack.

The authors listed the extent of adoption ITK and their blended technologies in various parts of the centers, the need for adoption of ITK and their adoptability. This guides the researcher in proper methodology of conduct of research.

3.7 EFFORTS OF NON GOVERNMENTAL ORGANISATIONS (NGO's), STATE AGRICULTURAL UNIVERSITY (SAU) AND STATE DEPARTMENT OF AGRICULTURE (SDA) IN PROMOTION OF ITK IN AGRICULTURE

The efforts of different organisations and agencies promoting any activity or technology is crucial for its development. Hence, the efforts of non governmental organisations, state agricultural university and state department of agriculture were felt crucial in promotion of ITK in agriculture. A few supporting research findings on efforts of different agriculture in promotion of ITK in India and abroad were presented in brief.

Critchely *et al.* (1992) stated that the first step in the design process of a new soil and water conservation programme should be the identification of indigenous farming systems, and the next step should be to determine whether and how these conservation techniques can be used as starting points or building blocks for a new programme, and learn their efficiency can be improved.

Green *et al.* (1999) stated that independent non profit organization founded by Shaman Pharmaceuticals Inc, which helped to launch the Fund for Integrated Rural Development and Traditional Medicine (FIRD-TM) in October 1997 (see IK & DM 5(3) PP 19-20). The pilot Project was designed to promote the conservation of biodiversity, drug development, and the socio-economic well being of local people, and at the same time to test the benefit sharing process.

Anonymous (2000) reported that Centre for International Research and Advisory Networks (CIRAN) is a division of Nuffic (Netherlands organisation for International cooperation in higher education). Its activities include promotion of the use of indigenous

knowledge enterprise. The centre provides the secretariat for the global indigenous knowledge and development network.

Torkelsson and Anandajayasekaram (2000) stated that the farm-level applied research methods for eastern and southern Africa (FARMESA) is a regional collaborative initiative operating in five countries, including Kenya, Tanzania, Uganda, Zambia and Zimbabwe and with associate countries including Botswana, Malawi, Mozambique and South Africa. Through its work in participatory technology development and transfer in eastern and southern Africa have identified and documented several ITK. Further they stated that the systematic collection of ITK may enhance the process of mutual learning.

The effects different organization over the Globe presented above give the nutshell of the objective of the study.

3.8 CONSTRAINTS AND SUGGESTIONS IN ADOPTION OF ITK AND BLENDED TECHNOLOGIES IN AGRICULTURE

It is essential to know the constraints faced by the farmers in adoption of indigenous technologies and their blended technologies so that the effective practically possible solutions can be suggested. Hence, a few important research findings in this regard were presented.

Balasubramanian (1992) reported that high cost of preparatory cultivation (12.50%), time consuming and too difficult to follow sowing procedure during rainy season and the pest problem were the main constraints.

Ahmed and Stoll (1994) listed the following constraints in adoption of indigenous practices by the farmers.

1. Farmers using modern inputs are considered as 'Model farmers' by the government, research and extension systems.
2. Some non users were unsure of neem's efficacy, others feared being thought 'backward' for using such a traditional practice.
3. Lack of official or extension agency recommendation is one of the constraints for adoption of traditional practices. Many farmers follow recommendations made by the extension service, the use of such traditional practices is however not among those recommendations.

Joseph and Charles (1994) reported that development policy that undermines or contradicts viable indigenous resource management strategies is unlikely to be sustainable.

Rambabu (1997) reported the constraints in adoption of ITK and a few of them are:

- High cost of neem related products
- Appearance of periodic drought spells during cultivation
- Lack of technology on green manure or green leaf manure
- Lack of organised extension machinery to disseminate the proven technology.
- Lack of publications on proven indigenous technologies.

Lakshmana (2000) reported that the following constraints in adoption of IFP as important were expressed by the farmers in North coastal Andhra Pradesh.

- Requirement of more labour and time
- Bulky nature of indigenous 'inputs'
- Treated 'back ward' by the fellow farmers
- No place for IFP in scientific recommendations

- Lack of sufficient knowledge on IFP for younger generations.
- Need of clear plan unlike modern technologies which are ready made.
- Competition from the modern technologies

The suggested a figurative model for effective harnessing of IFP which encourages documentation, testing rationality, integration of IFP into scientific recommendation, technology dissemination and evaluation.

Shahu (2002) reported the following constraints as the most important in adoption of ITK.

- Labour intensive nature of ITK
- Non availability of inputs
- Attractive nature of modern practices
- Fear of getting labeled as backward
- Farmers hold a view that the ITK as inferior to modern practices

The reported the following suggestions to preserve ITKs some of they are:

- To make ITK more compatible with modern technologies
- To recommend ITK through formal organisations
- To develop ITK packages to suit to particular localities.
- To convince younger generations the advantages and importance of ITK.

The constraints and suggestions in adoption of ITK and their blended technologies given by few authors provides comprehensive understanding on the constraints and suggestion in adoption of ITK and their blended technologies.

The research findings presented above in various subheads provide the comprehensive understanding on the objectives of the study and its findings.

*MATERIALS AND
METHODS*

CHAPTER IV

MATERIALS AND METHODS

This chapter enlightens on the details of methodology adopted in undertaking the present investigation and they are presented here under the following subheads.

- 4.1 Research design
- 4.2 Locale of the study
- 4.3 Sample and sampling procedure
- 4.4 Documentation and classification of Indigenous Technical Knowledge (ITK) in agriculture
- 4.5 Rationality of Indigenous Technical Knowledge (ITK) in agriculture
- 4.6 Profile of the respondents
- 4.7 Attitude of the farmers on Indigenous Technical Knowledge (ITK) and their blending with modern technologies
- 4.8 Extent of adoption of Indigenous Technical Knowledge (ITK) and their blended technologies in agriculture
- 4.9 Efforts of state agricultural university, state department of agriculture and Non governmental organizations in promotion of ITK and their blended technologies in agriculture
- 4.10 Constraints and suggestions in adoption of ITK and their blended technologies in agriculture
- 4.11 Tools and techniques of data collection
- 4.12 Statistical tools used

4.1 RESEARCH DESIGN

The descriptive research design was used for the study with an objective to unearth or diagnose as many Indigenous Technical Knowledge

items (ITKs) as possible in agriculture in the high altitude and tribal areas and to describe their characteristic features in detail.

4.2 LOCALE OF THE STUDY

The high altitude and tribal area zone of Andhra Pradesh comprising parts of Srikakulam, Vizianagaram, Visakhapatnam, East Godavari and Khammam districts was selected purposively for the present study because of the following reasons.

1. Since the researcher hails from Andhra Pradesh state, he was familiar with local language, which facilitates establishing quick rapport and carryout in depth study coupled with personal observation.
2. Since the ANGRAU has provided financial assistance to the researcher for doing Ph.D. course, it was obligatory on the part of the researcher to carryout research work in the state so that the results of the study could benefit the state.
3. High altitude and tribal area zone of Andhra Pradesh occupied mostly by the tribal people and they have rich source of indigenous knowledge
4. There was amid diversity of crops grown in the zone because of varied environmental conditions.
5. The schedule tribe's population in Andhra Pradesh (41.99 lakhs) constitutes 6.31 per cent of the total population and stands in seventh position in the country.

4.2.1 Description of the Study Area

To give a better understanding and perception about the findings of the study and to relate them for similar situations else where, it was felt appropriate to know the general conditions of the selected area. Hence, the description of the study area has been detailed below.

4.2.1.1 General description of the state

Andhra Pradesh covering an area of 2,74,4000 sq. km, which extends from 12° to 19° 54' north latitudes and 76° 50' to 84° 50' east longitudes. The state comprises of three main geographical regions, namely coastal Andhra, Rayalaseema and Telangana regions comprising of 23 districts. Approximately 77 per cent of the state population is dependent on agriculture (including allied sectors), which contributes over 60 % of the states income. About 42 per cent of the geographical area is under cultivated crops.

Andhra Pradesh is endowed with a wide variety of soils ranging from less fertile coastal sands to highly fertile dialytic alluviums. Red soils occupying 65 % of the states land area. 25 % of the land area was occupied by black soils and minor patches of alluvial soils, laterite and lateritic soils are found. The state has a smooth coastal line of 972 km facing the Bay of Bengal in the east. The mean monthly maximum and minimum temperatures in the state vary between 38.0 to 45.4° C and 7.8 to 18.3° C, respectively. The annual average rainfall of the state ranges from 950 - 1100 mm with main contribution from south west monsoon.

4.2.1.2 General description of high altitude and tribal area zone

The high altitude and tribal area zone spreads over 17996 km accounting for 6.56 per cent of the total area of the state. The zone lies between 17° 13' to 19° 09' North latitudes and 80° 22' to 84° 33' East longitudes. The zone is surrounded by Chattishgarh and Orissa states on the northern side, coastal plains of Srikakulam, Vizianagaram, Visakhapatnam and East Godavari districts on its eastern side, plains of West Godavari and Khammam districts on its southern side and plains of Warangal and Karimnagar districts on its western side.

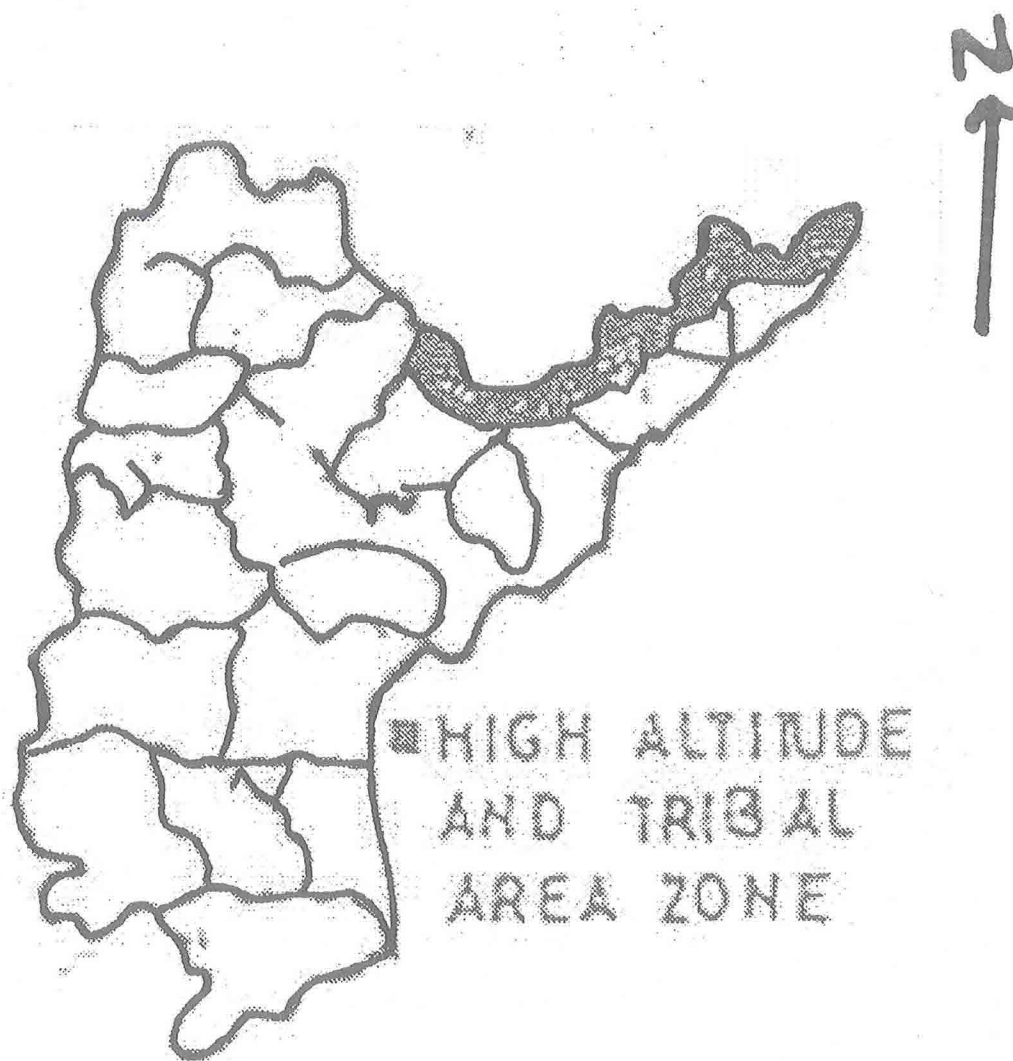


Fig. 1 : Map of Andhra Pradesh indicating high altitude and tribal area zone

Table 2 : Number of mandals and number of high altitude mandals in each district fall under high altitude and tribal area zone

Districts	Total number of mandals	Number of mandals fall under the high altitude and tribal area zone
Srikakulam	38	7
Vizianagaram	38	7
Visakhapatnam	43	11
East Godavari	57	7
Khammam	46	8
Total	222	40

4.2.1.3 Physiography

The high altitude and tribal area zone is situated in the extreme eastern end of Andhra Pradesh. The area lies between 50 to 1680 m contours in the eastern ghats of Andhra Pradesh extending from Srikakulam district in the North to Khammam district in the South West.

4.2.1.4 Soils

Red soils are the most predominant soils in the zone and it has four varieties of soils. Poor textured and well drained red sandy loams occupy 51.58 per cent of net area sown, red loams with clay base occupy about 43.20 per cent, a small area covered under alluvial soils (4.30%) and coastal sands are present to a very limited extent (0.92%). In addition, small pockets of acidic soils are present in certain places of Visakhapatnam and Khammam districts.

4.2.1.5 Climate

4.2.1.5.1 Rainfall

Generally the South West monsoon establishes during first fortnight of June. The zone receives an annual rainfall of 1200-1300 mm. The mean (normal) rainfall varies from 1145 to 1288 mm in different district with a mean of 1220 mm for the zone. The south west monsoon contributes 70% to the total rainfall of the zone, which the remaining 30% is received during North East monsoon.

4.2.1.5.2 Temperature

The mean monthly maximum and minimum temperatures of the zone ranges between 29.5°C to 34°C and 13.5°C to 27.0°C during South West monsoon, 27.5°C to 31.4°C and 3.0° C 25.6° C during north east monsoon and 29.1° C to 40.0°C and 5.5°C to 28.7°C during non monsoon periods, respectively. The temperature touch 3 to 5°C during the winter in December. The relative humidity is high (upto 95% or more) during the monsoon period.

4.2.1.6 Land utilization pattern of the study area (high altitude and tribal area zone)

Of the total geographical area of 17.996 lakh ha in the zone, the area sown is 3.463 lakh ha which accounts for 19.24 % of the geographical area. The balance of 80% (approx.) is occupied by forests (58.86%), barren and uncultivable land (12.41%), land put to non-agricultural use (4.9%), culturable waste (1.3%), current fallows (1.11%), permanent pastures (1.05 %). Gross cropped area of zone is 4.14 lakh ha against net area sown of 3.46 lakhs ha with a cropping intensity of 120%.

4.3 SAMPLE AND SAMPLING PROCEDURE

The study constitutes different categories of respondents viz., farmers, Agricultural Scientists, Assistant Director of Agriculture, Agricultural Officers and Non Governmental Organisations (NGO's).

4.3.1 Selection of Districts

All the districts i.e., Srikakulam, Vizianagaram, Visakhapatnam, East Godavari and Khammam come under high altitude and tribal area zone were purposively selected for the study.

4.3.2 Selection of Mandals

One mandal from each district was selected by using simple random sampling for documentation of ITK during first phase of the study. Thus, the study in first phase comprises of total of five mandals.

Two high altitude mandals from each district were selected for study in the second phase, which were not included during first phase by using simple random sampling. Thus, the study comprised of 10 mandals during the 2nd phase and a total of 15 mandals for both the phases.

4.3.3 Selection of Villages

One village from each mandal was selected randomly. Thus, the study comprises of 15 villages of 15 selected mandals from the five districts.

The selected mandals and villages were listed below :

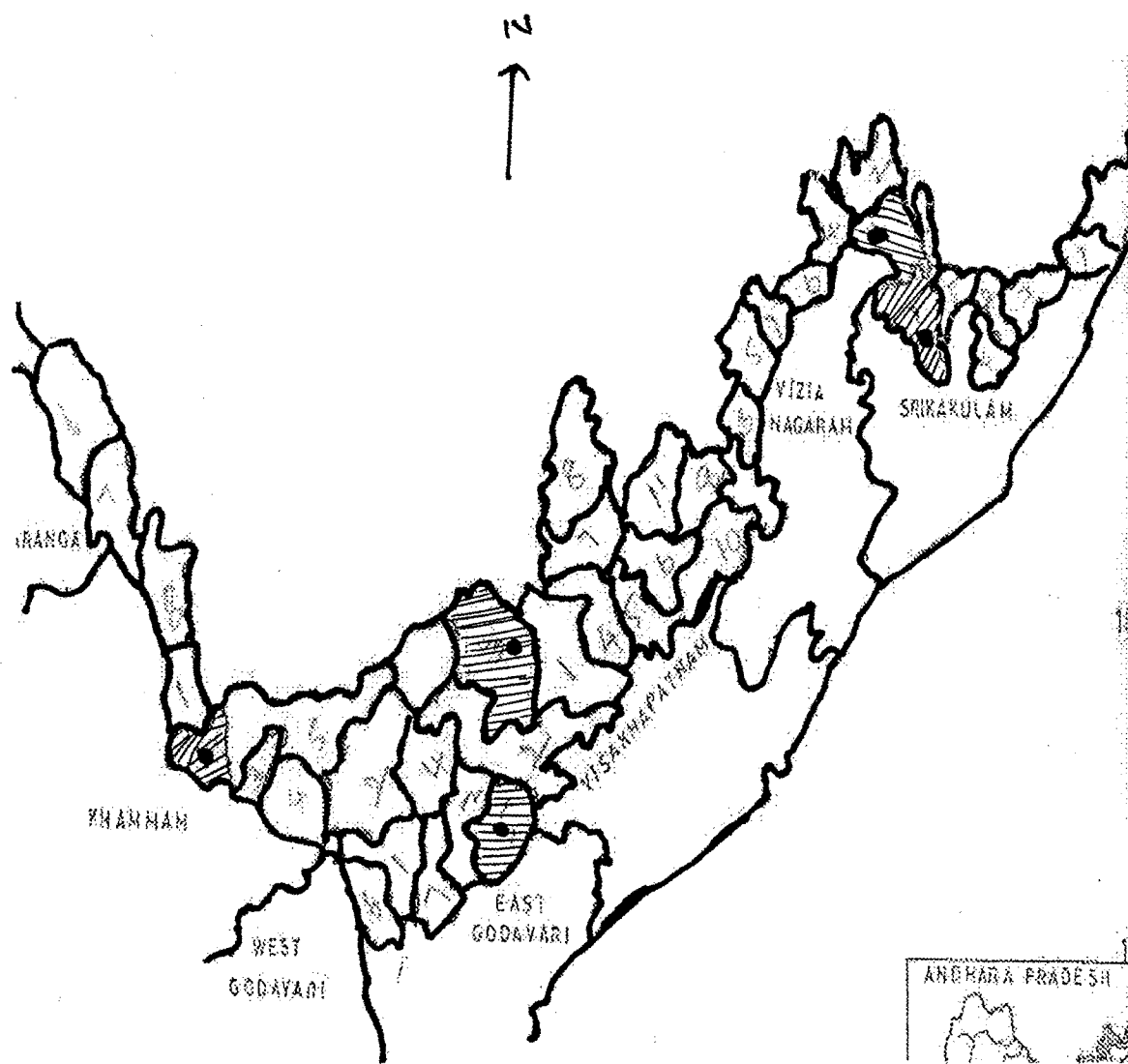


Fig. 2: Map of high altitude and tribal area zone indicating selected mandals for first phase of data collection

Table 3 : Selected mandals and villages during two phases of study

S. No.	District	Mandal	Villages
Data collection during First Phase			
1	Srikakulam	Seethampeta	Jaggaduguda
2	Vizianagaram	Kurupam	Jangampadu
3	Visakhapatnam	Gudem Kotha Veedhi	Kodisingi
4	East godavari	Rajavommangi	Boya padu
5	Khammam	Bhadrachalam	Yeti Koppaka
Data Collection during Second Phase			
6	Srikakulam	a. Kothuru	Karlemma
		b. Bhamini	Nallaraiguda
7	Vizianagaram	a. Gummalaxmipuram	Vanjarapuguda
		b. Jiyyamma Valasa	Nidagalluguda
8	Visakhapatnam	a. Chintapalle	Kolipara
		b. Paderu	Kindangi
9	East Godavari	a. Rampachodavaram	Devarapalli
		b. Maredumilli	Pandirimamidi
10	Khammam	a. Wazedu	Dharmaram
		b. Vara Ramachandrapuram	Jeedi Kuppa

4.3.4 Selection of Respondents

4.3.4.1 First phase

A sample of 90 elderly farmers was fixed for documentation of indigenous technical knowledge in agriculture in high altitude and tribal area zone of Andhra Pradesh considering the time and resources available for the student researcher. A list of farmers with more than 50 years of chronological age was obtained from the village secretary and eighteen farmers were selected randomly from each village.

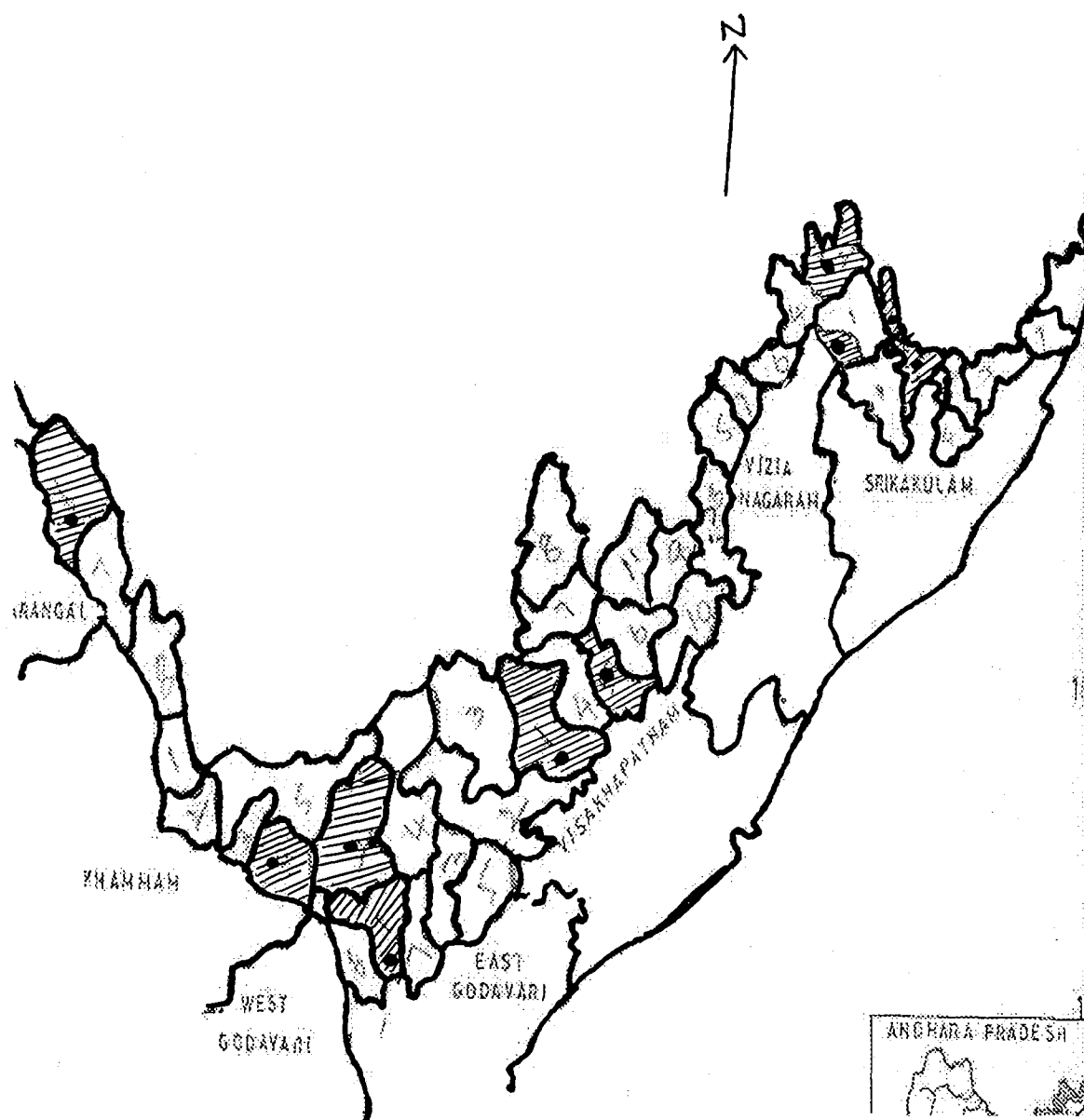


Fig. 3: Map of high altitude and tribal area zone indicating selected mandals for second phase of data collection

4.3.4.2 Second phase

4.3.4.2.1 Farmers

A sample of 180 farmers was fixed considering the time and resources available to the researcher. A list of farmers was obtained from the concerned village secretaries of the selected villages and 18 farmers from each villages were selected by simple random sampling method.

4.3.4.2.2 Scientists

A sample of 92 agricultural scientists was fixed for study which comprises of 32 agricultural scientists from crop production (Agronomy, Plant Breeding and Soil Science), 30 each from plant protection (Entomology and Plant Pathology) and horticulture. All the scientists working under the high altitude and tribal area zone and the adjoining zones of Acharya N.G. Ranga Agricultural University were considered for sampling. As far horticulture and plant protection was concerned the scientists working in the Department of Horticulture, Entomology and Plant Pathology, College of Agriculture, Rajendranagar were also considered for sampling because of difficulty in getting the required sample in the study area.

The sample of scientists was selected from the following institutions.

1. Regional Agricultural Research Station, Chintapalle, Visakhapatnam district.
2. Agricultural Research Station, Seethampeta, Srikakulam district
3. Krishi Vigyan Kendra, Rastakuntu bai, Vizianagaram district.
4. Horticultural Research Station, Maredumilli, East Godavari district.
5. Regional Agricultural Research Station, Anakapalle, Visakhapatnam district.

6. Agricultural College, Naira, Srikakulam, district
7. Agricultural Research Station, Ragolu, Srikakulam district
8. Agricultural Research Station, Amadalavalasa, Srikakulam district
9. Krishi Vigyan Kendra, Amadalavalasa, Srikakulam district
10. Agricultural Research Station, Vizianagaram
11. DAATTC, Srikakulam district
12. DAATTC, Vizianagaram district
13. DAATTC, Visakhapatnam district
14. DAATTC, East Godavari district
15. DAATTC, Khammam district
16. College of Agriculture, Rajendranagar

4.3.4.2.3 Assistant directors of agriculture and agricultural officers

Five Assistant Directors of Agriculture and ten Agricultural Officers of concerned mandals in the study were purposively selected to know the efforts of State Department of Agriculture in promotion of indigenous technical knowledge in agriculture.

4.3.4.2.4 Non governmental organisation

Two non governmental organisations working in the zone were selected purposively to study the efforts of non governmental organisations in promotion of indigenous technical knowledge in agriculture.

The NGO's selected for study were

1. Good Samritans Rural Development Society (GSRD)
Gummalaxmipuram, Vizianagaram district.
2. Gramina Punarnirmana Kendra (GPK) Kurupam, Vizianagaram district.

4.3.4.2.5 Agricultural research stations

Regional Agricultural Research Station and Krishi Vigyan Kendra working in the zone were purposively selected to know the efforts of state agricultural university in promotion of indigenous technical knowledge in agriculture. The head of the institution was interviewed with open ended interview schedule.

The Research Stations selected for study were :

1. Regional Agricultural Research Station, Chintapalle, Visakhapatnam district.
2. Krishi Vigyan Kendra, Rastakuntabai, Vizianagaram district.

4.4 DOCUMENTATION AND CLASSIFICATION OF INDIGENOUS TECHNICAL KNOWLEDGE IN AGRICULTURE

Action research method followed by Somasundaram (1995), Rambabu (1997) was used in this study to document the indigenous technical knowledge in agriculture in high altitude and tribal area zone of Andhra Pradesh. Ninety elderly and experienced farmers were interviewed informally and secondary sources like unpublished booklets on ITK also used to document the ITK in agriculture. Besides these, the ITK were documented with the help of group discussions and field visits with an objective to dugout more ITK covering all the agricultural activities of existing crops.

The collected ITK were classified according to the crops grown and nature of the practice.

4.5 RATIONALITY OF INDIGENOUS TECHNICAL KNOWLEDGE IN AGRICULTURE

It is essential to analyse the rationality of indigenous technical knowledge in agriculture as it was proposed to study the adoption and constraints and suggestions in adoption of ITK as perceived by the farmers in the later phase of the study.

For testing the rationality, the ITKs were classified into three groups namely crop production, plant protection and aspects related to horticultural crops. Three questionnaires containing the three different lists of ITKs, as mentioned above, were prepared and exposed to the scientists for judging their rationality.

Table 6 : Discipline wise scientists referred for rationality study

S. No.	Type of questionnaire	Discipline of Scientist	No. Referred	No. Returned
1	Crop production	Agronomy, Plant Breeding and Soil Science	40	32
2	Plant protection	Entomology and Plant Pathology	40	30
3	Horticulture	Horticulture	40	30

Response categories and scoring pattern

Category	Score
Rational	3
Un-decided	2
Not rational	1

The mean score was calculated by summing all the scores for a given item and if the mean score of the item is more than two was considered as rational and less than two was considered as not rational.

4.6 PROFILE OF THE RESPONDENTS

1. Age

Age was operationalised as the number of completed years of the respondent at the time of inquiry and chronological age was taken as the measure. They were classified in to three groups as young, middle and old age.

S.No.	Category	Age in Completed years
1	Young	<35
2	Middle	35-45
3	Old	> 45

2. Educational Status

Educational status in this study was operationalised as the ability of the respondent to read and write or the extent of formal education possessed at the time of interview. The scoring procedure followed by Somasundaram (1995) and Anandaraja (1999) was used with modifications.

S. No.	Level of education	Score
1	Illiterate	1
2	Can read only	2
3	Can read and write	3
4	Primary School Education	4
5	Secondary School Education	5
6	College Education	6
7	University Education	7

The respondents were classified in to low, medium and high using cumulative frequency method.

3. Farm Size

Farm size referred to the total extent of land owned as well as operated by the respondent at the time of enquiry. The farm size of the respondent was classified in to four categories as adopted by Anandaraja (1999) and Lakshmana (2000).

S. No.	Area of land	Category	Score
1	< 2.5 acres	Marginal farmer	1
2	2.51 to 5.00 acres	Small farmer	2
3	5.01 to 10.00 acres	Medium farmer	3
4	> 10.00 acres	Big farmer	4

The respondents were classified according to farm size as marginal, small, medium and big farmers.

4. Farming experience

Farming experience referred to the respondents completed years of experience in farming. The respondents were classified in to the following categories.

S. No.	Farming experience in years	Scores
1	< 10	1
2	11 – 20	2
3	21 – 30	3
4	> 30	4

The respondents were classified in to low, medium and high using cumulative frequency method.

5. Contact with extension agency

This refers to the degree to which the respondent had contacted with extension personnel for obtaining information. This was measured in terms of awareness, frequency of contact, purpose of contact with extension personnel contacted by the respondent. The scale adopted by Lakshmana (2000) was followed.

S. No.	Awareness about the extension agency	Frequency of contact	Purpose	Score
1	Not aware	Never	Non agriculture	1
2	Aware	Occasionally	Agriculture	2
3		Often	Both	3

The respondents were classified as low, medium and high by using cumulative frequency method.

6. Cosmopoliteness

This was operationalised as frequency and purpose of visits by the respondents to the near by towns and cities. The scoring procedure adopted by Gnana deepa (1991) was used.

A. Visit to towns/cities	Score
Yes	2
No	1
B. Frequency of visits	Score
Weekly more than once	5
Weekly once	4
Monthly once	3
Occasionally	2
Rarely	1
C. Purpose of visit	Score
Agricultural	2
Non agricultural	1
Both	3

The respondents were classified as low, medium and high by using cumulative frequency method.

The findings regarding the profile of respondents were provided in the annexure. Because the profile of the respondents was studied to get comprehensive understanding of the respondents though it was not an objective of the study.

4.7 ATTITUDE OF FARMERS ON INDIGENOUS TECHNICAL KNOWLEDGE AND THEIR BLENDING WITH MODERN TECHNOLOGIES

Rogers and Shoemaker (1971) explained attitude as a relatively enduring organisation of individual's belief about an objective that

predisposes his action. The attitude is defined as the degree of positive or negative affect associated with some psychological objective (Thurstone, 1946). By a psychological object, Thurstone means any symbol, phrase, slogan, person, institution, ideal or idea toward which, people can differ with respect to positive or negative effect. The attitudes of an individual play an important role in determining the behaviour with respect to a particular object. Similarly, the farmer's attitude on indigenous technical knowledge and their blending with modern technologies will largely determine the nature and extent of their involvement and participation in developmental activities. This participation of the people in developmental activities is crucial for utilization of services and further development. Thus, it is essential to study the attitude of farmers on indigenous technical knowledge and their blending with modern technologies.

Hence, it was decided to keep the objective to know the attitude of farmers towards indigenous technical knowledge and their blending with modern technologies in agriculture, attitude was operationalised as the degree of positive or negative feeling of farmers towards indigenous technical knowledge and their blending with modern technologies.

4.7.1 Attitude Scale Construction

For measuring the attitudes, different types of scales developed by Thurstone, Likert, Thurstone and Chave, Edwards, Kilpatrick, Bogardus and several others differ markedly in type and method of construction, but the objective in every case was to assign an individual a position along a quantitative scale.

4.7.1.1 The Likert method of summated ratings for measuring the attitude

Measurement of attitude of respondents towards indigenous technical knowledge and their blending with modern technologies in high altitude and

tribal area zone of Andhra Pradesh was done by using Likert method of summated rating for the following reasons.

1. Attitude scale with greater reliability can be developed by this technique. Likert, Roslaw and Murphy (1934) have shown that more satisfactory reliability coefficients could be obtained when each item in a Thurstone type scale was assigned five alternative choices and the points were checked in all items to obtain a total score. Hall (1934) indicated that the Likert type scales with even fewer statements will give high reliability coefficients. The reliability coefficients for his scale of 10 statements measuring attitude towards religion ranged from 0.91 to 0.93.
2. Each item was judged on a five point continuum rather than mere rejection of the items as in Thurstone scale. By this method, we get more information about the items than Thurstone scales.
3. No judges are required to rank the items as in the case of Thurstone's scale. This saves time, labour, money and also simplifies the procedure.
4. The items on Likert scale provide data on the individual attitude about the specific issue covered by the single item as well as a total score on the attitude dimension being studied.
5. By using the scale with a new group, the internal consistency and split half reliability of Likert scale could be quickly checked. Non discriminating items could be eliminated and scores calculated from the remaining items. New items could also be added and tested with care.

3.7.2.1 Collection of statements

A list of 70 statements was collected based on the review of previous relevant research findings and experience of the advisory committee. The structured statements were sent for judges to know the relevancy of statements to measure attitude. The questionnaire was supplied to the thirty agricultural extension specialists on three point continuum viz., most relevant, relevant and least relevant. The mean of the scores was calculated and 48 statements were selected for the second stage of scale construction.

The attitude statements thus edited were exposed to 80 farmers (non sample on five point continuum viz., strongly agree, agree, undecided, disagree and strongly disagree. The respondents were arranged in descending order of their total scores of attitude and 25 per cent of respondents with high and low scores were selected for calculation of t-values

3.7.2.2 Calculation of t-values

Response category	Low group				High group			
	X	f	fX	fX ²	X	f	fX	fX ²
Strongly agree								
Agree								
Undecided								
Disagree								
Strongly disagree								
	$n_L \quad \Sigma X_L \quad \Sigma X_L^2$				$n_H \quad \Sigma X_H \quad \Sigma X_H^2$			

$$t = \frac{X_H - X_L}{\sqrt{\frac{S_H^2}{n_H} + \frac{S_L^2}{n_L}}}$$

$$= \frac{X_H - X_L}{\frac{\sum (X_H - X_H)^2 + \sum (X_L - X_L)^2}{n(n-1)}}$$

Where,

$$\sum (X_H - X_H)^2 = \sum X_H^2 - \frac{\sum (X_H)^2}{n}$$

$$\sum (X_L - X_L)^2 = \sum X_L^2 - \frac{\sum (X_L)^2}{n}$$

$$X_L = \frac{\sum X_L}{n}$$

$$X_H = \frac{\sum X_H}{n}$$

X_H = The mean score on a given statement for the high group.

X_L = The mean score on the given statement of the low group

S_H^2 = The variances of the distribution of the responses of the high group to the statements

S_L^2 = The variances of the distribution of the responses of the low group to the statements

X_H = The number of respondents in the high group.

X_L = The number of respondent in the low group

The t-values were calculated and the statements were arranged in descending order of their 't' values. Out of 48 statements 24 statements with higher t-values were selected and included in the final scale to measure the attitude of farmers on indigenous technical knowledge and their blending with modern technologies.

4.7.2.3 Reliability

4.7.2.3.1 Test-retest method

The final set of the 24 statements which represent the attitude of respondents towards indigenous technical knowledge and their blending with modern technologies was administered on five point continuum to a fresh group of 60 farmers which were not included in the actual sample.

After a period of 20 days the scale was again administered to the same respondents and thus two sets of scores were obtained. The correlation coefficient for both the sets was worked out. The 'r' value (0.853) was significant at 0.01 level of probability indicating that the attitude scale was highly suitable for administration to the farmers as the scale was stable and dependable in its measurement.

4.7.2.4 Validity of the scale

4.7.2.4.1 Content validation

One method for determining validity of a scale is to judge what it is that the scale does measure. This method was used in the present scale to determine the content validity of the scale. As the scale value differences for almost all the statements included lead a very high discriminating value, it seemed reasonable to accept the scale as a valid measure of the attitude.

4.7.2 Administration of the Scale

The final attitude scale so constructed by following all required norms with 24 statements was administered to the respondents to study their attitude towards indigenous technical knowledge and their blending with modern technologies.

4.7.2.1 Scoring techniques

Each item of the scale was provided with five point continuum i.e., strongly agree, agree, undecided, disagree, and strongly disagree with scores of 5, 4, 3, 2, and 1 respectively for positive statement and 1, 2, 3, 4, and 5 respectively for the negative statement. The total score of the respondent on the scale was obtained by adding the scores of all the items in the scale. The score range was from 24 to 120.

4.7.3 Categorisation of the Respondents Based on their Attitude Scores

The respondents were categorised based on score range as below:

S. No.	Category	Score
1	Highly favourable attitude	81-100
2	Favourable attitude	61-80
3	Neutral attitude	41-60
4	Unfavourable attitude	21-40
5	Highly unfavourable attitude	≤ 20

The individual total score was arrived by summing of scores of all the statements and attitude quotient was calculated by use of the following formula

$$A Q = \frac{\text{Total score of the individual}}{120} \times 100$$

4.8 EXTENT OF ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK) AND THEIR BLENDED TECHNOLOGIES IN AGRICULTURE

Rogers (1983) stated that adoption is the decision to make full use of new idea or an innovation as the best course of action available. Adoption in this study has been operationalised as, whether an individual practiced each of the selected ITK in agriculture.

The adoption of ITK by the respondents was assessed by asking them whether they adopted completely or partially or not adopted during previous year. Each respondent was asked for his adoption in the crops grown by him. A single farmer was assessed for 6 to 7 crops on an average for his adoption.

The scoring pattern followed in this study was

S. No.	Response category	Score
1	Complete adoption	3
2	Partial adoption	2
3	Non adoption	1

The scores of all the ITKs were added up for each respondent to arrive at adoption score and the adoption quotient for each individual was worked out by using the following formula

$$\text{Adoption quotient} = \frac{\text{Score obtained by the individual respondent}}{\text{Total maximum score of all items applicable}} \times 100$$

4.9 EFFORTS OF STATE AGRICULTURAL UNIVERSITY, STATE DEPARTMENT OF AGRICULTURE AND NON GOVERNMENTAL ORGANISATIONS IN PROMOTION OF ITK IN AGRICULTURE

Heads of agricultural research stations existing in the study area, Assistant Directors of Agriculture, Agricultural officers in State Department of Agriculture and Head of the Two NGO's working in the zone were interviewed to findout the efforts of their organisations in promotion of Indigenous Technical Knowledge (ITK) in agriculture and their blending with modern technologies. The case study method was used for this objective.

4.10 CONSTRAINTS AND SUGGESTIONS IN ADOPTION OF ITK AND THEIR BLENDED TECHNOLOGIES IN AGRICULTURE

Constraints in adoption of ITK and suggestions for promotion of ITK adoption were unearthed by open ended questions used at the end of the interview schedule from the 180 farmer respondents during second phase of study.

4.11 TOOLS AND TECHNIQUES OF DATA COLLECTION

4.11.1 Techniques of Data Collection

The data required for this study were collected in two phases.

First phase

During the first phase of data collection the indigenous technical knowledge items and their blended technologies in agriculture were documented through informal interview with 90 elderly and experienced farmers. Besides this the group discussions and field visits were organised to document the ITKs and their blended technologies by direct observation.

Group Discussions

Group discussions were organized at the end of personal informal interviews with the selected elderly and experience farmers in all the villages. Thus, a total of five group discussion were organized one in each village.

Field Visits

Field visit was arranged at the end of the group discussion with few farmers to document the ITK directly by observations.

Second Phase

In phase II, well structured interview schedules and questionnaires were prepared for farmers and scientists to collect required data. The open ended questionnaire in case study method was used to findout the efforts of non-governmental organisations, state agricultural university and state Department of agriculture in promotion of ITK and their blended technologies. The Heads of the RARS, KVK and Non Governmental Organisations and Agricultural Officers and Assistant Director of Agricultures were interviewed with open ended questionnaire.

The list of interview schedules and questionnaire their purposes and respondents contacted was presented in table 5.

The interview schedules were prepared keeping in view of the objectives of the study. Before finalising the schedules, many discussions were held with experienced people and experts in the field, on different aspects of the present study.

Table 5 : Tools of Data Collection

S. N o.	Purpose	Device	Respondents	Number of Respondents contacted
A	Rationality of Indigenous Technical Knowledge (ITK) in agriculture			
1	Rationality of ITK on crop production	Questionnaire	Agronomists, plant breeders and soil scientists	32
2.	Rationality of ITK on plant protection	Questionnaire	Entomologists and pathologists	30
3	Rationality of ITK related to Horticultural crops	Questionnaire	Horticulturists	30
B.	Extent of Adoption ITK in Agriculture			
4	General schedule consists profile of the respondents	Interview schedule	Farmers	180
5	ITK on General agriculture	Interview schedule	Farmers	40
6	ITK on Podu cultivation	Interview schedule	Farmers	23
7	ITK on Paddy	Interview schedule	Farmers	40
8	ITK on Maize	Interview schedule	Farmers	30
9	ITK on Sorghum	Interview schedule	Farmers	30
10	ITK on Fingermillet	Interview schedule	Farmers	35
11	ITK on Little millet	Interview schedule	Farmers	30
12	ITK on Foxtail millet	Interview schedule	Farmers	30
13	ITK on Bajra	Interview schedule	Farmers	27
14	ITK on Kodo millet	Interview schedule	Farmers	26
15	ITK on Pulses	Interview schedule	Farmers	30
16	ITK on Redgram	Interview schedule	Farmers	35
17	ITK on Horse gram	Interview schedule	Farmers	29
18	ITK on Sesamum	Interview schedule	Farmers	27
19	ITK on Groundnut	Interview schedule	Farmers	30
20	ITK on Mesta	Interview schedule	Farmers	30
21	ITK on Vegetables	Interview schedule	Farmers	30
22	ITK on Cauliflower	Interview schedule	Farmers	25
23	ITK on Coriander	Interview schedule	Farmers	25
24	ITK on Tapioca	Interview schedule	Farmers	25
25	ITK on Cowpea	Interview schedule	Farmers	30
26	ITK on Rice bean	Interview schedule	Farmers	29
27	ITK on Ginger	Interview schedule	Farmers	26
28	ITK on Turmeric	Interview schedule	Farmers	29
29	ITK on Chillies	Interview schedule	Farmers	30
30	ITK on Cashew	Interview schedule	Farmers	30

S. No	Purpose	Device	Respondents	Number of Respondents contacted
31	ITK on Banana	Interview schedule	Farmers	35
32	ITK on Pineapple	Interview schedule	Farmers	30
33	ITK on Tobacco	Interview schedule	Farmers	23
C	Attitude on ITK and their Blending with modern technologies	Attitude scale	Farmers	180
34	Constraints and suggestions	Open ended questionnaire	Farmers	180
35	Efforts of NGO, SAU and state dept. of agriculture	Interview schedule	NGO's (Head of the organization) RARS KVK ADA AO	2 1 1 5 10

4.12 STATISTICAL TOOLS

1. Mean
2. Standard deviation
3. Cumulative frequency
4. Percentage analysis
5. Correlation analysis for reliability
6. Likert method of scale construction
(Calculation of t-values)

*FINDINGS AND
DISCUSSION*

CHAPTER V

FINDINGS AND DISCUSSION

Since the research study was conducted by following descriptive design, the findings of the study along with relevant and appropriate discussion were presented simultaneously to give better understanding of the findings under the following seven subheads.

- 5.1 Classification of Indigenous Technical Knowledge items (ITKs) in agriculture
- 5.2 Rationality of Indigenous Technical Knowledge items (ITKs) in agriculture
- 5.3 Attitude of farmers on Indigenous Technical Knowledge (ITK) and their blending with modern technologies
- 5.4 Extent of adoption of Indigenous Technical Knowledge (ITK) and their blended technologies
- 5.5 Efforts of Non-Governmental Organisations (NGOs), State Agricultural University (SAU), and state Department of Agriculture (SDA) in promotion of indigenous technical knowledge and their blended technologies
- 5.6 Constraints and suggestions in adoption of Indigenous Technical Knowledge (ITK) and their blended technologies
- 5.7 Strategy for promotion of Indigenous Technical Knowledge (ITK) and their blended technologies

5.1 CLASSIFICATION OF INDIGENOUS TECHNICAL KNOWLEDGE ITEMS (ITKS) IN AGRICULTURE

Over generations of farming, farmers have been experimenting several indigenous alternatives to solve their problems in the farm and home. The in built “*trail and error*” mechanism of the farmers was the basis of the amassed wealth of indigenous knowledge.

Although, this precious wisdom has been left untouched for the past few decades as a result of green revolution, many farmers still possess and adopt indigenous technical knowledge in carrying out their farm activities.

In this study, 518 Indigenous Technical Knowledge items (ITKs) were documented in high altitude and tribal area zone of Andhra Pradesh. The classification of ITKs are enunciated here under.

5.1.1 Classification of ITKs in Agriculture Based on Nature Of Practice

Table 6 : Classification of ITK in agriculture based on nature of practice

(n=518)

S. No.	Type of ITK	Number	Percentage
1	Rain forecasting	15	2.89
2	Preparatory cultivation	23	4.44
3	Seasons	28	5.40
4	Seeds, sowing and planting	67	12.93
5	Varieties	95	18.34
6	Crop rotation and mixed cropping	52	10.04
7	Soil and water management	10	1.93
8	Intercultivation and weed management	25	4.83
9	Manures and soil fertility management	31	5.98
10	Pest and disease management	66	12.74
11	Harvest aspects	32	6.18
12	Post harvest management	63	12.16
13	Others	11	2.12
	Total	518	100.00

It could be observed from the table 6, that among the 518 ITKs documented, 95 ITKs (18.34 %) belong to indigenous varieties, 67 (12.93 %) were related to seeds, sowing and planting, 66 (12.74 %) related to pest and disease management, 63 (12.16 %) corresponding to post harvest management and 52 (10.04 %) concerned with crop rotation and mixed cropping. A minor portion of ITKs belongs harvest aspects (6.18 %), seasons (5.40%), inter cultivation and weed management (4.83%), preparatory cultivation (4.44%), rain forecasting (2.89%), others (2.12%) and soil and water management (1.93%). The results are in line with Sundaramari (2002) in case of seeds, sowing and planting, manuring and preparatory cultivation.

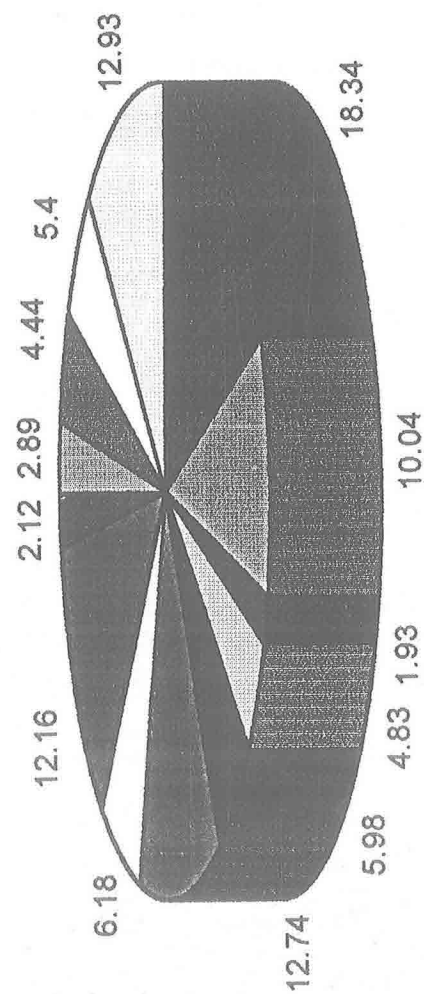


Fig.4: Classification of ITK in agriculture based on nature of practice

The existence of more ITKs on varieties, indicate that farmers had taken very much care to preserve indigenous germplasm. The ITKs were also more on seeds, sowing and planting, pest and disease management and post harvest management. This was an indication for the farmers care on seed selection, sowing at appropriate time and method was effective means of preservation of germ plasm and maintaining biodiversity, Pest and disease management and storage and post harvest care of food grains and other crops. A significant number of ITKs were in existence on crop rotation and mixed cropping systems, which clearly indicate that the farmers had tried for mixed crops in different combinations to arrive at appropriate combination of crops.

5.1.2 Classification of ITKs in Agriculture Based on Crop Economic

Botanical Classification

Table 7 : Classification of ITKs in agriculture based on crop economic botanical classification

(n=518)

S. No.	Crop economic family	Number	Percentage
1	Cereals	97	18.72
2	Millets	85	16.41
3	Pulses	57	11.00
4	Oil seeds	24	4.63
5	Vegetables	58	11.20
6	Spices and condiments	33	6.37
7	Fruits crops	38	7.33
8	Fibre crop (mesta)	17	3.28
9	Narcotics (tobacco)	14	2.70
10	General agriculture	72	13.90
11	Podu cultivation	23	4.44
	Total	518	100.00

It could be noticed from the table 7, that among the 518 ITKs documented, 97 (18.72 %) were belong to cereals ,85 (16.41 %) were belong to millets and 72 (13.90 %) were related to general agriculture followed by vegetables (11.20%), pulses (11.00%), fruit crops (7.33%), spices and condiments (6.37%), oil seeds (4.63%), podu cultivation (4.44%), fibre crop (3.28%) and narcotics (2.70%). The findings were in tune with the

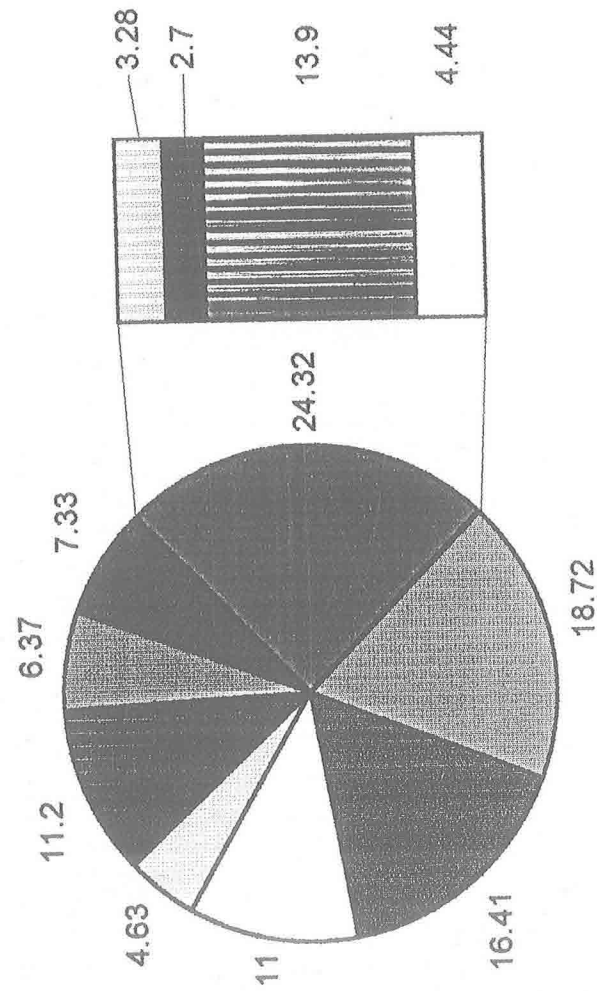


Fig.5 : Classification of ITK in agriculture based on crop economic botanical classification

total area of land under each crop in the study area and the data were provided in annexure for reference. These findings indicate that more ITKs existed on cereals, millets and general agriculture. The existence of more ITKs was an indicator for the importance of crops under cultivation in the sampled area. To give a brief understanding about the different crops in the economic botanical family and number of ITKs documented related to each crop and their percentages were presented in the table 8.

Table 8 : Number of ITK related to different crops

(n=518)

S. No.	Crop	Number of ITKs	Percentage
1	Paddy	75	14.48
2	Maize	22	4.25
3	Sorghum	20	3.86
4	Ragi	26	5.02
5	Sama	14	2.70
6	Korra	9	1.74
7	Arika	7	1.35
8	Bajra	9	1.74
9	Black gram and Green gram	15	2.89
10	Red gram	32	6.18
11	Horse gram	10	1.93
12	Sesamum	9	1.74
13	Groundnut	15	2.89
14	Vegetables	18	3.47
15	Cowpea	9	1.74
16	Rice bean	12	2.32
17	Coriander	6	1.16
18	Cauliflower	8	1.54
19	Tapioca	5	0.96
20	Chillies	14	2.70
21	Turmeric	14	2.70
22	Ginger	5	0.96
23	Pineapple	11	2.12
24	Banana	19	3.67
25	Cashew	08	1.54
26	Mesta	17	3.28
27	Tobacco	14	2.70
28	General agriculture	72	13.90
29	Podu cultivation	23	4.44
	Total	518	100.00

It could be inferred from the above table that, more number of ITK were existed on paddy (14.48 %) followed by general agriculture (13.90 %), red gram (6.18 %) and ragi (5.02 %). A considerable number of ITK also existed on maize (4.25 %), sorghum (3.86 %), banana (3.67 %), vegetables (3.47 %), mesta (3.28 %), black and green gram (2.89 %), groundnut (2.89 %) and sama, chillies, turmeric (2.70 %). A few number of ITKs also existed on rice bean, pineapple, horse gram, korra, bajra, sesamum, cahew, cowpea, cauliflower, coriander, tapioca and ginger. These findings are confirmation with crop acreage in study area. The findings indicate the importance of crops in the high altitude and tribal area zone.

5.2 RATIONALITY OF INDIGENOUS TECHNICAL KNOWLEDGE ITEMS (ITKs) IN AGRICULTURE

Farmers have been continuously undertaking a variety of experiments with nature over centuries, the results of which have accumulated as the Indigenous Technical Knowledge (ITK). Though they followed and passed on over generations, it becomes necessary to understand the scientific rationale underlying each of the ITKs so as to validate and disseminate them through various extension programmes. Hence, the 518 ITKs were subjected for rationality analysis.

5.2.1 Rationality of ITKs in Agriculture According to Nature of Practice

Table 9: Rationality of ITK in agriculture according to nature of practice

(n=518)

S. No.	Nature of Practice	Rational ITK		Not rational ITK		Total
		Number	Per cent	Number	Per cent	
1	Rain forecasting	3	20.00	12	80.00	15
2	Preparatory cultivation	21	91.30	2	8.70	23
3	Seasons	26	92.86	2	7.14	28
4	Seeds, sowing, planting	57	85.07	10	14.93	67
5	Varieties	87	91.58	8	8.42	95
6	Crop rotation and mixed cropping	39	75.00	13	25.00	52

7	Soil and water management	9	90.00	1	10.00	10
8	Inter cultivation and weed management	21	84.00	4	16.00	25
9	Manures and soil fertility	26	83.87	5	16.13	31
10	Pest and disease management	57	86.36	9	13.64	66
11	Harvest aspects	31	96.87	1	3.13	32
12	Post harvest management	60	95.24	3	4.76	63
13	Others	7	63.64	4	36.36	11
Total		444	85.71	74	14.29	518

It could be construed from the table 9, that among the 518 ITKs on agriculture, 444 (85.71%) of the ITKs were adjudged as rational by the scientists and remaining 74 (14.29%) were judged as not rational. This result was in line with Ganesamoorthi (2000), Lakshmana (2000), Sundaramari (2002).

It is quite interesting to note here that more than 90 per cent of the ITKs were judged rational in case of harvest aspects (96.87%), post harvest management (95.24%), seasons (92.86%), varieties (91.58%) and preparatory cultivation (91.30%). More than 80.00% rational ITKs were found in the case of soil and water management (90.00%), seeds, sowings and planting (85.07%), pest and disease management (86.36%), intercultivation and weed management (84.00%) and manures and soil fertility (83.87%). A majority of ITKs found rational in the case of crop rotation and mixed cropping (75.00%) and others (63.64%) but less than overall average of 85.71%. Very few ITKs were found rational in the case of rain forecasting (20.00%), a total of 15 ITKs were documented on rain forecasting most of them were found not rational but farmers perceived the occurrence of rain with their prediction.

A handful number of ITKs were found rational in the case of harvest aspects (96.87%) and post harvest management (95.24%), this indicate that

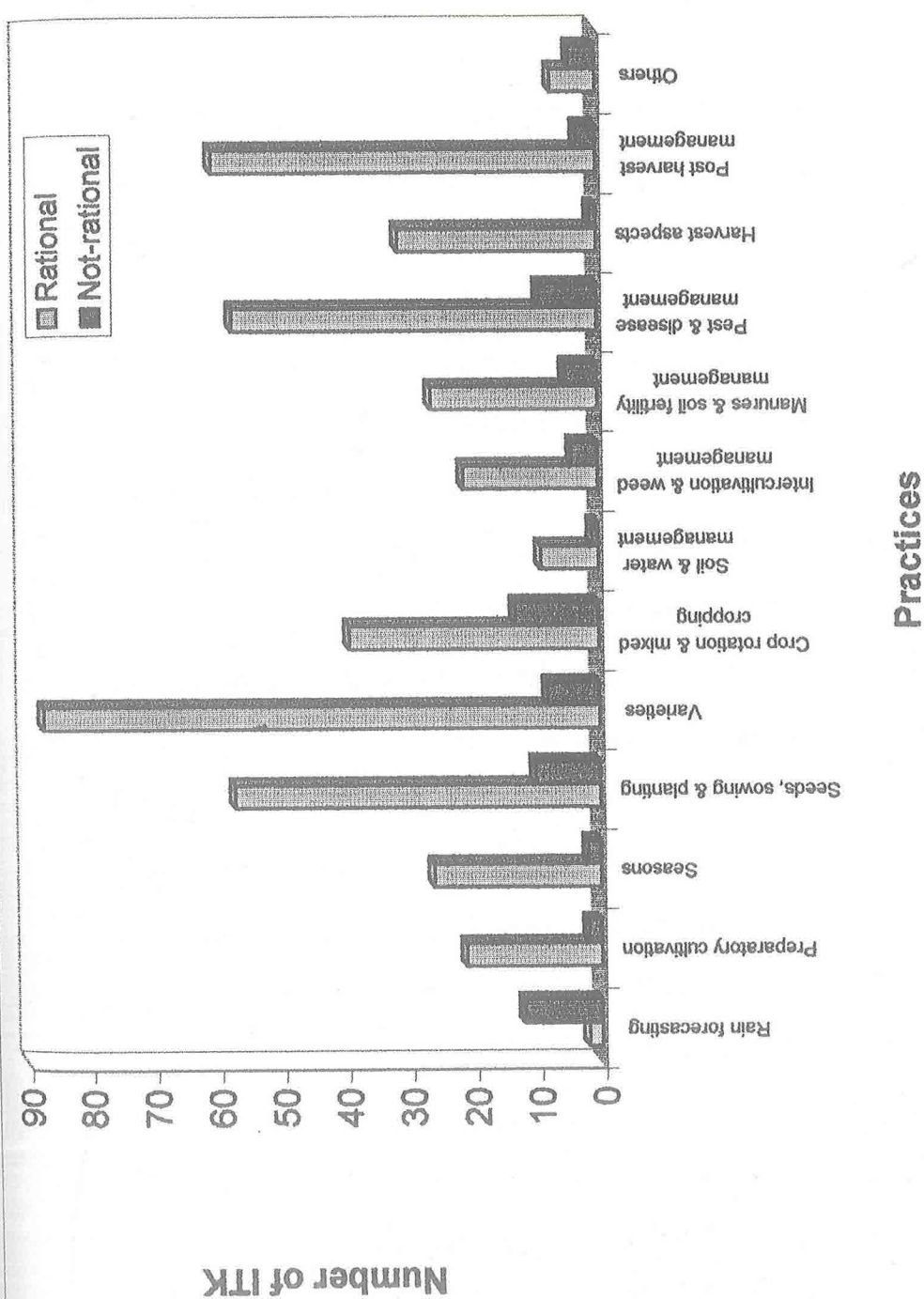


Fig.6 : Rationility of ITK in agriculture according to nature of practice

farmers had taken utmost care at the end of the crop period i.e., from harvesting to post harvest management because this was found crucial period for them to get the yield and keep it safe for future consumption. Farmers developed rational harvest indicators and post harvest methods through their 'trial and error' method. They evolved a number of post harvest structures and methods for safe and longer storage of their crop yield with an aim to keep the crop yield away from the infestation of post harvest pests.

A plenty of ITKs were also found rational in the case of seasons (92.86%), varieties (91.18%) and preparatory cultivation (91.30). The documented rational ITKs shows that farmers had concentrated mostly on seasons i.e., right crop operation at right time. Through this approach farmers arrived in developing rational ITKs on seasons in cultivation. In addition to this, farmers preserved germplasm of indigenous varieties with good characteristics. The results indicate that farmers had also taken much care in preparatory cultivation which gives fine tilth to the crop growth through the use rational ITKs. It could be concluded that farmers also developed considerable rational ITKs in the case of soil and water management, seeds, sowing and planting. Pest and disease management, intercultivation and weed management and manures and soil fertility. This shows the farmers interest on these activities in their crop husbandry.

In the case of crop rotation and mixed cropping, farmers had tried a number of combination (see previous table. 52 practices existing related to crop rotation and inter cropping) but they arrived at a success of 76.92% of the rational combinations through their experimentation. A few ITKs found rational in the case of rain forecasting (20.00%), this might because farmers held beliefs and predictions about incidence of rain through observation of

synchronous occurrence with same activities such as frogs croaking, changing ant's wings etc.

5.2.2 Rationality of ITKs in Agriculture According to Crop Economic Botanical Classification

Table 10: Rationality of ITKs in agriculture according to crop economic botanical classification

(n=518)						
S. No.	Crop	Rational ITK		Not rational ITK		Total
		Number	Per cent	Number	Per cent	
1	Cereals	86	88.66	11	11.34	97
2	Milletts	81	95.29	4	4.71	85
3	Pulses	51	89.47	6	10.53	57
4	Oilseeds	23	95.83	1	4.17	24
5	Vegetables	48	92.30	4	7.70	52
6	Spices and condiments	26	66.67	13	33.33	33
7	Fruit crops	36	94.74	2	5.26	38
8	Fibre crop	13	76.47	4	23.53	17
9	Narcotics	13	92.86	1	7.14	14
10	General agriculture	54	75.00	18	25.00	72
11	Podu cultivation	13	56.52	10	43.48	23
	Overall average	444	85.71	74	14.29	518
	(%)					

It could be concluded from that table 10, that most of the ITKs were rated rational by the scientists in the case of oil seeds (95.83%), fruit crops (94.74%), millets (95.29%), vegetables (92.30%) narcotics (92.86%), pulses (89.47%) and cereals (88.66%). Among the crops, 75-85% of ITKs were found rational in the case of fibre crop (76.47%) and general agriculture (75.00%). A few majority of ITKs were found rational in case of spices and condiments (66.67%) and podu cultivation (56.52%). The results are in conformity with Prasad *et al.* (1996), Rambabu (1997) and Sundaramari (2002).

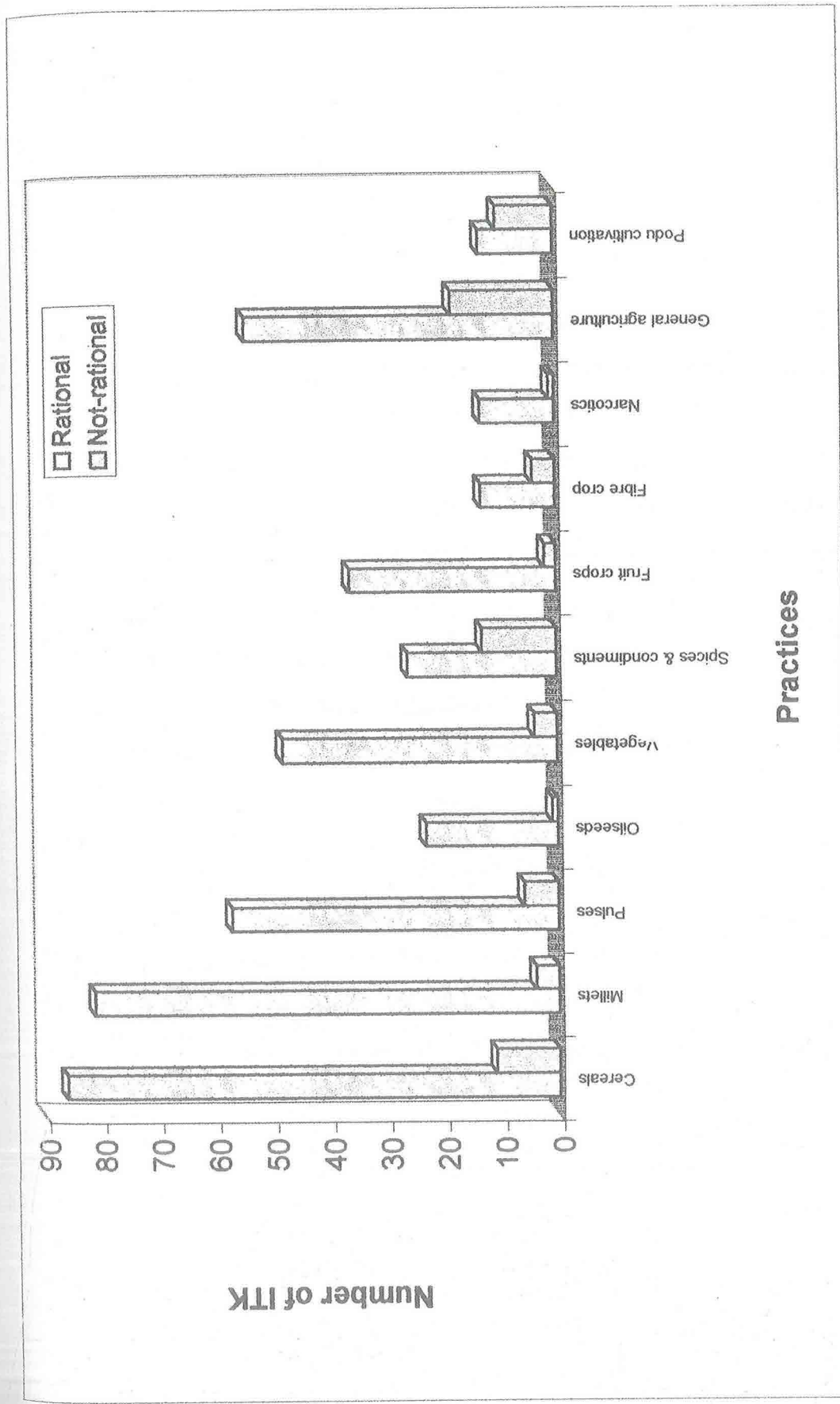


Fig.7 : Rationility of ITK in agriculture according to crop economic botanical classification

The rational ITKs related to oil seeds (95.83%), fruit crops (94.74%), millets (94.39%), vegetables (92.30%), narcotics (92.86%), pulses (89.47%) and cereals (88.00%) were very high, this shows the skill and expertise of tribal farmers in cultivation of such crops from generations. It was also found considerable number of rational ITKs related to fibre crop (76.47%) and general agriculture (75.00%) which were evolved by the tribals.

In case of spices and condiments rational ITKs (66.07 %) were less, this might be because lack of expertise in cultivation of such crops because of their recent origin in to the region. There were 56.52% of rational ITKs were found in the case of podu cultivation, this might be because, scientists rated the practices on podu cultivation as not rational because of its hazardous effects on over all rainfall pattern and other considerations.

5.2.3 Rationality of ITKs on Crop Production

5.2.3.1 Rationality of Indigenous Technical Knowledge (ITKs) on crop production in general agriculture

Table 11: Rationality of ITKs on crop production in general agriculture (n=32)

ITK No.	ITK	Mean score	Rationality
1	Summer ploughing is practiced by the farmers during April-May which exposes the soil to hot sun so that the soil borne insects will be killed by heat.	2.87	R
2	Sheep penning and cattle penning are practiced during summer for 2-3 days in each field to improve soil fertility.	2.87	R
3	Farm Yard Manure (FYM) is applied to the soil every year during summer without fail to improve soil fertility.	2.93	R
4	The pooled household garbage is used as manure after it's putrifaction which enhances the fertility of the soil.	2.53	R
5	Tribals incorporate ash in to the soil which believed to reclaim the soil gradually and improves fertility.	2.23	R
6	Three ploughings for cultivation of ragi, and two ploughings for cultivation of Sama, Korra and Ganti are sufficient.	2.72	R

7	Ploughing after shower during the pre-sowing season to conserve enough moisture for the crop, remove weeds and ensure good crop.	2.82	R
8	Application of sand from river beds during summer is practiced to increase the infiltration rate of black soil.	2.18	R
9	'Bali' (Butchering) is practiced by the tribal farmers during nursery preparation, transplantation, grain formation and harvesting of major crop like paddy, ragi and red gram.	1.59	NR
10	Application of gypsum to the soil is practiced to correct alkalinity (BT)	2.93	R
11	Tuvvatam (digging) with use of 'Kanka' along the slope is done before sowing the crop.	1.88	NR
12	Deep ploughing is practiced during summer to improve water holding capacity of soil and to conserve enough soil moisture.	2.72	R
13	Laying stone bunds around the fields across the slope for preventing soil erosion and for conserving moisture is practiced.	2.93	R
14	Excessive application of farm yard manure (FYM) is practiced to improve the soil texture.	2.29	R
15	Application of soil from hill base (Konda mannu) is practiced to increase the water holding capacity of red soils.	2.12	R
16	Repeated ploughing is practiced to reduce weed population in dry lands.	2.65	R
17	Profuse weed growth after rain is an indication for high soil fertility.	2.06	R
18	Fowls stretch their feathers in hot summery days which indicates the incidence of rain.	1.71	NR
19	Ants change their eggs from one place to another which indicates initiation of rains.	1.71	NR
20	Hallow around the moon indicates occurrence of rains	1.76	NR
21	Hallow near to moon indicates rains far away.	1.59	NR
22	It will rain if termite fly in large number in the air at 10 – 20 fts height	1.88	NR
23	If a rainbow appears in the east in the evening or West in the morning, it will rain.	1.65	NR
24	Streaks of lightening in the east with rainbow in the West would lead to rain.	1.88	NR
25	If the sky becomes dark near the horizon, there will be instant rain.	2.12	R
26	If the North wind blows, it will surely rain.	1.94	NR

27	Ants raising mounds is an indicator of rains.	2.23	R
28	Rain can be forecasted by looking at the sight of burrow of ants.	1.71	NR
29	If white ant take wing in the evening, it will rain exclusively.	1.76	NR
30	Flying dragon flies indicates rain fall	1.88	NR
31	Rain follows the frogs croaking.	2.18	R
32	Even if the seeds are of good quality, they must be sown in the right season to get higher yields.	2.72	R
33	New moon day or days before new moon day is better for sowing or harvesting any crop.	1.65	NR
34	It is better to avoid sowing on Ashtami (eighth) and Navami (ninth) days from full moon and new moon days.	1.53	NR
35	Ragi, red gram and black gram seeds are mixed and broadcasted in field and harvested each separately in parts of tribal area zone.	2.23	R
36	Seed stored from the previous year is taken out only after celebrating 'Itukula Panduga' which comes during April to May months.	1.87	NR
37	If rains are delayed beyond the season (too late) niger is cultivated for subsidiary income.	2.47	R
38	Farmers practiced to change seeds once in two years to get good seed vigour (BT)	2.35	R
39	Red gram is mixed with sorghum + korra + ganti + cowpea. The seeds of sorghum, korra, ganti and cowpea are mixed and broadcasted in the field. Red gram is sown by digging holes using an indigenous implement called 'Kanka' (indigenous implement) at 1 meter spacing after broad casting the mixed seed.	2.47	R
40	Intercultural operations and timely weeding are essential for rainfed agriculture thus followed to possible extent.	2.87	R
41	In mixed crop, korra yields first followed by junuvulu (sub sp. of cowpea), sorghum, ganti and finally farmers harvest red gram.	2.65	R
42	Continous submergence of the field for some time is practiced if water is available which controls the weeds.	2.53	R
43	Konda Puja (prayer to hill) is practiced by the farmers collectively before harvesting the major crops such as paddy, red gram, ragi etc.	1.59	NR
44	Mesta or sesamum is grown as summer crop preceding to paddy which give additional income which in turn useful as investment for paddy crop.	2.65	R

It could be observed from the above table that out of 44 ITKs on crop production in general, 27 ITKs (61.36%) were judged rational by the scientists and 17 ITKs (38.64%) were judged not rational.

The ITK No. 1, 6, 7, 11, 12, and 16 indicates ploughing during presowing season for land preparation. All these ITKs were judged rational by the scientists except ITK No.11 which was judged not rational.

The ITK No.1 was judged rational it might be because high temperatures during April - May kills the insects which expose after ploughing thus reducing pest attack during crop period. The ITK No.12 was judged rational by the scientists, it might be because of its scientific evidence in conservation of soil moisture and increasing water holding capacity of the soil. The ITK No.6, was judged rational it might be because of its low deviation from the scientific recommendations on number of ploughings for each crop viz., ragi, sama, korra and ganti. The ITK No.7, was found rational due to the plausible reason that ploughing after shower during presowing season conserves moisture and simultaneously checks weed growth by uprooting them. The ITK No.16 was found rational because of scientific base behind the practice.

The ITK No.11 was judged not rational by the scientists, this might be because digging with 'Kanka' (indigenous implement) takes more time for unit area of land because its shaft is a shallow iron plate and requires more labour for working.

The ITK No.2, 3, 4, 5, 8, 10, 14 and 15 suggested application of indigenous manures for soil fertility and all the ITKs were found rational. The cause behind the rationality of all these ITKs was due to their scientific

backup in improving soil fertility (FYM, pooled household garbage, and sheep and cattle penning), reclamation of the soil (Kitchen ash), infiltration rate of black soil (Sand application), correct alkalinity (gypsum), and water holding capacity of black soil (soil from hill base).

The ITK No.9 and 43 indicate the religious customs of tribal people performed in agricultural operations and both were found not rational because they don't have any scientific evidence behind them.

The ITKs No.18 to 31 related to predictions about rainfall by the tribals and all the ITKs were judged not rational by the scientists except ITK No. 25, 27 and 31. Most of the ITKs were not rational because they don't have any scientific background. The ITK No. 25, 27 and 31 were found rational, this might be because of frequent occurrence of rain with these beliefs.

The ITK No. 13 suggested soil and water management in sloppy lands and it was found rational. This was because the stone bunds check the flow of rainwater from top to bottom efficiently, thus controlling soil erosion and also conserve moisture.

The ITK No.17, 40 and 42 indicate weed growth in relation to soil fertility and all the three ITK were found rational. The ITK No.17 was found rational, this might be because of plant biomass growth after rain indicates soil fertility status. The ITK No. 40 was found rational because in rainfed agriculture water is in scarce. Hence, to utilize the available water efficiently it is necessary to check weed growth through intercultural operations.

The ITK No. 32, 33, 34, 36 and 37 suggest seasons in crop operations and two of which viz., 32 and 37 were found rational and remaining three were found not rational. The ITK No.32 was found rational because it indicates the importance of right season in crop growth. The ITK No.37 was found rational because if rains are delayed too late, long duration crops cannot be cultivated and hence it is appropriate to cultivate niger. The ITK No.33, 34 and 36 were found not rational because there will not be any effect of those particular days indicated in the ITKs scientifically on any crop operation.

The ITK No.38 suggest the use of seed and it was found rational. The possible reason behind the rationality of the ITK was that, there may be a chance of losing seed vigour if it is continued for more than two years and hence farmers used to change the seed once in two years.

The ITK No.35, 39 and 41 indicate the mixed cropping followed by the tribals and all the three ITKs were judged rational by the scientists. The possible cause behind the rationality of these ITKs was due to their appropriate mixed crop combinations followed by the farmers and also they are economically feasible because one crop substantiates income loss from another crop.

The ITK No.44 indicate the crop rotation by the tribals and it was found rational. This might be due to cultivation of sesamum or mesta during summer gives additional income and supports the farmer for next crop instead of keeping it fallow. Another advantage of cultivation of crops during summer is that, it is useful to improve soil fertility if they are ploughed as such in the field.

5.2.3.2 Rationality of ITKs on crop production related to podu cultivation

Table 12: Rationality of ITK on crop production related to podu cultivation
(n=32)

ITK No.	ITK	Mean score	Rationality
45	Tribals practiced shifting cultivation locally known as 'podu'. There are two types of podu practiced by the tribals i.e., 'chelaka podu' (plain forest clearance) and konda podu (podu in steep hills).	2.00	NR
46	Podu is used to start by the farmers during summer (after celebrating Nandi panduga festival) by clearing the bushes with use of knife, sickle, axe etc. and burning them. They allow it for some days and with onset of monsoon they start sowing seeds, after working with spades.	2.12	R
47	April – May is found to be the optimum season to start the process of podu cultivation.	2.23	R
48	Bushes are cleared during November, December and keep it to sundry up to kotha Amavasya (March) than burn it and ploughed to make it ready for cultivation in some parts of high altitude and tribal area zone.	2.18	R
49	Podu cultivation improves fertility of native soil because more number of crops are grown on the same piece of land.	1.23	NR
50	Farmers used to cultivate the podu for three years and then they shift the cultivation in search of new land.	1.88	NR
51	In konda podu (podu on steep hills) digging with spades (Tuvvuta) is practiced instead of ploughing as in the case of 'banda podu' (podu at hill bases)	2.12	R
52	Tribals believe that podu cultivation has no harmful effects an overall rainfall pattern and even on infiltration of rain water.	1.71	NR
53	During the first year of podu cultivation (Kotha bhumi) red gram and paddy (konda danyam) mixed crop is grown. Farmers use 20 kg paddy+ 3 kg of red gram per acre of podu land.	2.12	R
54	Korra +sorghum+red gram+junuvulu are cultivated as mixed crop in konda podu during second year.	2.00	NR

55	3-4 kg of mix of all available seeds are broadcasted per acre of soil in podu cultivation during 3rd year.	1.81	NR
56	Sorghum +cowpea in grown as mixed crop during the first year of podu in some parts of high altitude and tribal area zone.	2.18	R
57	Budamalu (Mettu danyam) and red gram are mixed cropped during second year by the tribals in some parts of high altitude and tribal area zone.	2.18	R
58	'Ganti' followed by Black gram or green gram are cultivated during third year of podu in some parts of high altitude tribal area zone.	2.00	NR
59	Farmers mix the seeds of korra and sorghum and broadcast in field. After this by use of a kanka, they dig the soil at 2-3 feet distance and drop two seeds of red gram in each hole and than closes the hole with soil..	2.23	R
60	In some areas of high altitude and tribal area zone ganti + sorghum + korra + sama mixed cropping is followed in podu.	2.00	NR
61	Weeding is practiced once by the farmers in podu cultivation without fail because in podu lands weed problem is more.	1.94	NR
62	Weeding twice is practiced in new podu land (kotha podu) and once in old podu land (patha podu) because weed problem is more in new podu land.	2.00	NR
63	Weed problem is more in podu cultivation compared to plain cultivation because some weeds could survive by means of rhizomes, corms etc. where weeding is practiced regularly.	2.23	R
64	Difference in maturity period for crops gives opportunity to harvest each crop separately, farmers harvest first korra followed by sama, junuvulu, ganti, sorghum and finally red gram.	2.47	R
65	Tribals followed Karthe to initiate every farm operations in podu cultivation.	2.18	R

It could be concluded from the table 12, that among the 21 ITKs on crop production aspects related to podu cultivation, 11 ITKs (52.18%) were found rational and 10 ITKs (47.62%) were found not rational.

The ITK No.45 indicates the major types in podu cultivation and it was judged not rational by the scientists. This is because the podu cultivation itself is not a recommended practice by the agricultural scientists in realisation of its hazardous effects.

The ITK No.46 and 51 indicate the preparatory cultivation in podu lands and both were found rational, this might be because of the appropriate methods used in the ITKs.

The ITK No.47, 48 and 65 suggest season to start podu cultivation and they were found rational. This might be because of their suitable season and farmers also leisure during that period to take part actively in such operations.

The ITK No.49 indicate soil fertility in podu lands and it was found not rational because of the reduced per capita forest area in that particular locality and hence rainfall leading to numerous social and economic problems.

The ITK No.50, 53, 54, 55, 56, 57, 58, 59, 60 and 64 indicate cropping pattern in podu cultivation and the ITK No.53, 56, 57, 59 and 64 were judged rational by the scientists. The rationality of ITK No.53, 56 and 57 might be because in these ITKs the crop combinations are appropriate. The possible reason behind the rationality of ITK No.59 was because of its economic feasibility of sowing three crops in a single operation. The ITK No.64 was found rational because of the farmers technique in use of combination of crops for mixed cropping which yield at different periods which gives opportunity to harvest each crop separately and to carryout their post harvest operations.

The ITK No. 50, 54, 55, 58 and 60 were found not rational. The ITK No.50 was judged not rational by the scientists because of hazardous effects of podu cultivation on rainfall pattern and soil fertility.

The ITK No.54 and 60 were found not rational. The possible reason behind the non rationality of the ITK No. 54 and 60 might be due to more number of crops in mixed cropping used by the tribals (4 crops in each combination). There is no scientific reason in broadcasting all the available seeds regardless of crop and hence ITK No.55 was found not rational. The ITK No.58 was found not rational because the bajra and black gram crops in a year does not yield sufficient income to the farmer to support his family financial needs.

The ITK No.52 indicate rainfall pattern and podu cultivation and it was found not rational. This might be because of its hazardous effect on rainfall as against to the belief of tribals.

The ITK No.61, 62 and 63 indicate weed growth in podu cultivation. The ITK No.63 was found rational because of the scientific validity behind the ITK. The ITK No.61 and 62 were found not rational because the farmers for less practicing less number of weedings than the actual recommendation.

5.2.3.3 Rationality of ITK on crop production in paddy (*Oryza sativa*)

Table 13 : Rationality of ITK on crop production in paddy

(n=32)

ITK No.	ITK	Mean score	Rationality
66	'Arudhra Karthe' (June – July) is suitable season for sowing 'mettudanyam' (paddy variety-light) which is an early matured variety(short duration).	2.72	R
67	'Mrugasira Karthe' (June) is suitable season for sowing late maturing (long duration) varieties of paddy.	2.82	R
68	'Mrugasira karthe' (June) is the optimum season for growing paddy nursery.	2.82	R
69	'Punarvasa karthe' (July) is suitable season for transplantation of paddy seedlings into mainfield.	2.47	R
70	If nursery is sown in 'Arudhra karthe' (June – July) the seedlings will not grow well because of Arudhra dosham.	2.00	NR
71	If paddy is sown in 'Arudhra karthe' requires more seed	1.88	NR

72	Transplanting paddy during punarvasa to ashlisha (July – August) period gives higher crop yields and hence practiced by the tribal farmers.	2.18	R
73	Before sowing paddy in nursery, hundred seeds will be sown as sample and irrigated to check the percentage of germination.	2.82	R
74	Direct sown paddy is cultivated on podu land (sloppy hills) called 'Yada panta'	2.59	R
75	Dense planting of paddy gives higher crop yields, hence farmers adopt more seed rate.	1.59	NR
76	In some parts of the high altitude and tribal area zone, farmers used to broadcast paddy seed with ash to overcome dry spells (Mostly in red and black soils).	2.12	R
77	Groundnut cake (40-50 kg/ac) mixed with cow dung is incorporated in to the soil during puddling to improve soil fertility.	2.59	R
78	Indigenous spade is used to trim the bunds and to level the puddled field.	2.35	R
79	Transplanting is done along the wind direction and not against the wind direction.	2.18	R
80	Paddy seed for next season is selected based on seed weight (by use of their discretion power on seed characters)	2.12	R
81	For seed collection, the field is identified during growth stage (uniform and better growth) and harvested separately.	2.82	R
82	'Konda danyam' (paddy) is cultivated as mixed crop with red gram in which paddy is harvested early and red gram will be retained up to 6 months for maturity.	2.29	R
83	'Karavakkulu' is a traditional paddy variety cultivated by the farmers in high altitude and tribal areas.	2.23	R
84	'Garika sannalu' is a traditional early maturing variety with good taste is cultivated by the tribal farmers.	2.35	R
85	'Budamalu' (Mettudanyam) is a traditional paddy variety used to cultivate as mixed crop with red gram.	2.18	R
86	'Bobbili ganti' is a traditional high yielding paddy variety with 90-100 days duration and the seed is red in colour.	2.23	R

87	'Kichidi' is a traditional late maturing variety (110-130 days) which is suitable for making 'pulav' (good taste)	2.12	R
88	'Pedamaipala' is a traditional tall early maturing variety of paddy with small grains.	2.29	R
89	'Potti basangi' is a traditional early maturing (90 days) paddy variety with small seeds cultivated by the tribal farmers.	2.35	R
90	'Krishna Kathikalu' is a traditional medium maturing variety (100-120 days) of paddy with good taste is cultivated by the tribals.	2.12	R
91	'Kampu sannalu' is an indigenous scented paddy variety with 6 months crop duration and the grain is medium to big in size.	2.18	R
92	'Isuka ravvalu' is an indigenous scented paddy variety with 6 months crop duration and seed is small in size.	2.23	R
93	'Pantulu danyam' is an indigenous paddy variety with a duration of 120 days with brown shiny seed coat.	2.06	R
94	'Ooda sannalu' is a indigenous short duration (100 days) variety of paddy bearing one or two tillers and the seed coat is reddish brown.	2.29	R
95	'Yerra danyam' is an indigenous tall paddy variety which used to give higher yields without any fertilizer application.	1.88	NR
96	'Daniyalu' is traditional (Sanna Danyam) paddy variety which is tasty and suitable for Biriyanis making.	2.06	R
97	'Konda Danyam' is a traditional variety which is late maturing with good taste.	2.35	R
98	Srikakulam sannalu (RGL-2537) is never cultivated in podu or as a dry crop (BT).	2.18	R
99	MTU-1001 is cultivated as dry crop by the tribals which gives tasty rice (BT).	1.76	NR
100	Chemical fertilizers are applied to the field in combination with neem cake (20 kg / acre) to get better crop yields (BT).	2.59	R
101	Five cart loads FYM per acre (2.5 tons approximately) is applied to the field during summer in which the paddy will be sown in coming season.	2.87	R
102	Four to five ploughings are desirable for paddy cultivation are practiced.	2.82	R

103	Indigenous country plough is used for preparatory cultivation, forming ridges and furrows.	2.47	R
104	The place with higher elevation in the field is selected for raising the nursery.	2.72	R
105	Dry paddy ploughed once after sowing to give better yields. (care is taken so that crop is not damaged)	2.12	R
106	'Katte seed' (<i>Sesbania</i> Sp.) is sown in field during summer and incorporated in paddy field at the time of puddling at good vegetative growth stage.	2.41	R
107	Tentemu leaf (<i>Cassia tora</i>) and jeelugu (Fish tail palm - <i>Caryota urens</i>) twigs are incorporated during second ploughing for better decomposition and utilization to improve soil fertility.	2.65	R
108	Tentum (<i>Cassia tora</i>) leaves are collected and broadcast in the field before puddling. During puddling the leaves get decomposed thus improves the soil fertility.	2.72	R
109	Weeding is done twice in paddy first at 15 days after transplanting and second at active tillering stage, which gives good vegetative growth.	2.82	R
110	Panicle is an indicator for healthy status of paddy crop.	2.47	R
111	Alternate wetting and drying results in good paddy crop (BT).	2.00	NR

It could be observed from the table 13, that among the 46 ITKs on crop production of paddy, 40 ITKs (86.96%) were found rational and 6 ITKs (13.04%) were found not rational.

The ITK No.66 to 72 suggested seasons in crop cultivation and all the ITKs were judged rational except ITK No.70 and 71. The possible reason behind the rationality of these practices might be due to the coincidence of the seasons in the ITKs and the recommended practice for the particular crop operation. The ITK No.70 and 71 were found not rational because there might not be any effect of 'Arudra Karthe' on crop growth if all the resources like water, fertilizers etc are available at required rate.

The ITK No.73, 74, 75, 76, 79, 80, 81 and 104 indicate seeds, sowing and planting and all the ITKs except ITK No.75 were found rational. The ITK No.73 was found rational because of its similarity with modern practice and the principle in the modern practice was indigenously used in the blended technology. The ITK No.74 was found rational because the water is scarce on podu lands and hence transplantation is a difficult task. So, it is recommended to cultivate direct sown paddy. The ITK No.76 was judged rational because of its similarity with scientific recommendations. The ITK No. 79 was found rational it might be because of convenience of the practice along the wind direction rather than against to it.

The ITK No.80 and 81 indicate the seed selection for paddy cultivation and both were found rational, possible reason might be because the farmers followed ITK which effectively use the opportunity to select a good seed with appropriate method with decretory power and creativity of the farmers.

The ITK No.104 indicate the nursery selection for paddy and found rational, which might be due to availability of required drainage facilities.

The ITK No.75 indicates the plant population in paddy cultivation and found not rational because optimum spacing is needed for higher yields rather than dense planting.

The ITK No. 78, 102 and 103 indicate the preparatory cultivation in paddy and all the ITKs were found rational. It might be because of their appropriateness in giving required tilth to the crop.

The ITK No.77, 100, 101, 106, 107 and 108 suggested manures and soil fertility and all the ITKs were judged rational by the scientists. The ITK No.77 indicates groundnut cake (40-50kg/ac) incorporation in to the

soil during puddling and it was found rational because of its nutrient status. The ITK No.100 is a blended technology and it was found rational because neem cake contains enough nutrients to substantiate fertilizer requirement. The ITK No.101 indicates application of farm yard manure (FYM) and the possible reason behind the rationality of the ITK might be because of the nutrient status of FYM applied during summer. The ITK No.106, 107 and 108 indicate the green manuring and found rational. This might be because green manures might provide enough nutrients to the paddy crop.

The ITK No.82 to 99 indicate the indigenous varieties of paddy and all the ITK except ITK No.95 and 99 were found rational. The possible reason behind the rationality of the ITKs might be the suitability of the indigenous varieties to the climatic conditions of the zone. The ITK No.95 was found not rational, it might be because of its low yields when fertilizers are not applied. The ITK No.99 was found not rational because tribals cultivate MTU-1001 as dry crop against to its recommendation for the areas where water is available abundantly.

The ITK No.105 was found rational and the possible reason behind the rationality might be because the practice conserves enough moisture in dry regions and provides good tilth for crop growth.

The ITK No.109 indicate the weed management in paddy and it was found rational because of its known similarity with recommended practice. The ITK No.110 indicates yield index and found rational because of the correct judgment about the prediction of crop yield. The ITK No.111 was found not rational because paddy requires continuous submergence of water for 2 to 5cm but the ITK is against to the scientific recommendations.

5.2.3.4 Rationality of ITKs on crop production of maize and sorghum

Table 14 : Rationality of ITK on crop production of maize and sorghum
(n=32)

ITK No.	ITK	Mean score	Rationality
Maize (<i>Zea mays</i>)			
112	Two to three cart loads of farm yard manure per acre is applied to the soil during summer in which maize is to be cultivated.	2.65	R
113	Neem cake is applied to the soil at the time of sowing maize @ 20-25 kg/acre	2.29	R
114	'Konda moka jonna' is traditional maize variety which is tasty(sweet) cultivated by tribals.	2.59	R
115	'Pedda moka jonna' is a traditional maize variety with big size cobs.	2.53	R
116	Gada moka jonna' is a traditional tall maize variety which is resistant to foxes because of its height.	2.29	R
117	'Korra moka jonna' is a traditional short maize variety which is mostly damaged by the wild animals like foxes.	2.29	R
118	After getting good tilth maize is sown by use of 'kanka' (indigenous implement) to dig the soil at 2 feet spacing.	2.59	R
119	5 kg/ac of seed rate is followed traditionally by the farmers to get higher yields in maize.	2.29	R
120	2 kg/ acre of Maize seed is used if it is cultivated in lines i.e in mixed crop.	2.06	R
121	Maize seeds are dibbled along the ridges in small holes formed with fingers or small sticks and covered with soil.	2.41	R
122	Cucumber, Ridge gourd, Brinjal etc. are cultivated as boarder crop around the Maize field.(BT)	2.29	R
123	Maize is mostly cultivated as mixed crop.	1.81	NR
124	Maize is cultivated as mixed crop with red gram since two crops belongs to different families.	2.23	R
125	Maize is cultivated as mixed crop with korra to get two yields from a single plot at different periods because of different maturing period.	2.35	R
126	Maize is cultivated as mixed crop with budamalu (mettu danyam) to get additional yields from single plot.	2.23	R
127	Maize is cultivated as mixed crop with cow pea (alasandalu) which creeps on maize. (BT)	2.23	R

128	Maize is cultivated as mixed crop with sesamum because they yield at different periods.	1.76	NR
129	Stage of harvest in maize is indicated by sheaths covering the cobs turning to yellow and seeds become fairly hard and dried.	2.72	R
130	When a sample of maize grains are chewed, metallic sound indicates their optimal dryness.	2.53	R
131	Maize cobs only are harvested when it grown as mixed crop with cowpea leaving the plant to give support for creeping.	2.41	R
Sorghum (<i>Sorghum bicolor</i>)			
132	'Rohini karthe' is optimum season for sowing sorghum.	2.41	R
133	Three ploughings are required for sorghum cultivation.	2.65	R
134	'Pedda jonna' is a traditional sorghum variety grown by tribal farmers which is a late maturing variety.	2.53	R
135	'Dassera jonna' is a traditional early maturing variety, it's harvesting coincides with dassera festival.	2.47	R
136	'Karthika jonna' is an indigenous early maturing variety gives more yield.	2.35	R
137	Konda jonna is an indigenous variety cultivated in konda podu by the tribal farmers.	2.29	R
138	'Biyyapujonna' is an indigenous sorghum variety with good taste of grains is cultivated by the tribals.	2.18	R
139	'Yenugu matta jonna' (Tella jonna) is an indigenously cultivated sorghum variety with big size spike lets. The big size spikes are congenial for birds to sit on it and eat, hence bird damage is observed.	2.23	R
140	'Pidaka jonna' is an indigenously cultivated sorghum variety by the tribals, its small spikes used to escape from birds.	2.35	R
141	'Patcha jonna' is an indigenous sorghum variety cultivated by the tribal farmers.	2.35	R
142	'Kaki jonna' is a traditional sorghum variety cultivated as mixed crop with ragi by tribal farmers	2.23	R

143	For high yielding varieties, seeds are collected from well to do farmers in the village who store grain and sell it as seed and for hybrids seed is purchased from private dealers or government agencies supplied by Integrated Tribal Development Agency (ITDA).	2.35	R
144	Soaking the sorghum seeds in common salt solution before sowing to secure good germination under adverse conditions.	2.23	R
145	If rains are late, sowing of early duration varieties are taken up even after 'mrugasira karthe' with high seed rate.	2.59	R
146	Sorghum is cultivated as mixed crop with cowpea (alasandalu or bobbaru).	2.59	R
147	Cowpea (bobbaru) seed is broadcasted in the field at the time of transplantation of sorghum seedlings.	2.18	R
148	Less cultural operations are required for cultivating the sorghum crop, since it does not require fine tilth.	2.23	R

It could be concluded from the table 14, that among 37 ITKs on crop production of coarse cereals, 35 ITKs (94.59%) were found rational and remaining 2 ITKs (5.41%) were found not rational.

The ITK No.112 and 113 suggested application of indigenous manures in crop production and both were found rational. The possible reason behind the rationality of these ITKs might be due to the nutrient status of FYM and neem cake which are applied to improve the soil fertility.

The ITK No.114 to 117 and 134 to 142 indicate the indigenous varieties of maize and sorghum respectively and all the ITKs were found rational. The desirable characteristics and suitability of the varieties to the climatic conditions of the zone were the possible causes behind the rationality of these ITKs.

The ITK No.118 to 121, 143 and 144 indicate the seeds and sowing and all the ITKs were judged rational by the scientists. The ITK No.118 and 121 were found rational, this might be due to the suitability of the ITK to the

small scale farming which is prevalent in the study area. The ITK No.119 and 120 were found rational, and the possible reason behind the rationality might be because of correct seed rate used by the tribals. The ITK No. 143 was found rational, it might be because of maintenance of the good storage structures by the well to do farmers for HYV as well as it is in line with the scientific recommendation as in the case of hybrid seeds. The ITK No. 144 was found rational, it might be due to soaking of seed in common salt solution generally increases seed germination and also farmers removes the weed seeds like 'striga' because they float in the common salt solution.

The ITK No.122 to 128, 146 and 147 indicate the mixed crop combinations and all most all the ITKs except ITK No.123 and 128 were found rational. The possible reason behind the rationality of ITK was might be due to their appropriate combinations of mixed crops. The ITK No.123 was found not rational because maize crop can also be cultivated as sole crop with higher yields as against to the ITK. The ITK No.128 was found not rational, this might be because of their unsuitable combination of mixed crops.

The ITK No.129, 130 and 131 indicate harvest aspects of maize and all the three were found rational. The possible reason behind the rationality of ITK No.129 and 130 might be because of the farmers appropriate decision making power. The ITK No.131 was found rational because of the maize crops provide support for cowpea to creep on and substantiate the cost of physical support to be provided for cowpea.

The ITK No.132 and 145 indicate season for sowing and both were found rational. This might be because of the season in ITK coincidence with the scientific recommendations.

The ITK No.133 and 148 indicate the preparatory cultivation in sorghum and found rational because of their similarity with scientific recommendations.

5.2.3.5 Rationality of ITKs on crop production of millets

Table 15 : Rationality of ITK on crop production of millets

(n = 32)

ITK No.	ITK	Mean score	Rationality
	Finger Millet (Ragi) <i>Eleusina coricana</i>		
149	20 days after sowing ragi is transplanted which is optimum time for transplantation in to main field.	2.82	R
150	Ragi seedlings are sown behind country plough furrow in main field, generally farm women used to perform the transplantation of seedlings.	2.35	R
151	'Bharani karthe' is suitable season for sowing ragi.	2.12	R
152	3 kg per acre seed rate is followed by the farmers in ragi cultivation.	2.12	R
153	Transplantation of ragi seedlings is done by using indigenous implement called 'borigi' (hand hoe). The farmers used to dig soil with the help of borigi and seedlings are sown in the digged place.	2.12	R
154	Chillies, Brinjal, Bhendi, ridge gourd, beans etc are randomly sown here and there in the ragi field. (BT)	2.18	R
155	'Punasa cholu' is an indigenous ragi variety which gives higher yields among such varieties.	2.29	R
156	'Gotti cholu' is a traditional ragi variety which is cultivated as direct sown crop by the tribals.	2.12	R
157	'Korra cholu' is an indigenous ragi variety cultivated by the tribal farmers which is an early mature variety, give yields with in 70-80 days.	2.12	R
158	'Budi chodi' is a traditional high yielding early mature ragi variety, seeds are small in size with small fingers.	2.18	R
159	'Reka chodi' is an indigenous long duration ragi variety bearing 6 – 8 fingers protruding outwards with greater length.	2.23	R
160	'Burada chodi' is a short duration (110 days) indigenous ragi variety bearing 5 – 6 finger in panicle.	2.41	R
161	'Pedda chodi' is a traditional long duration ragi variety cultivated by tribal farmers.	2.23	R

162	'Selaga chodi' is a traditional ragi variety sown behind country plough furrow.	2.12	R
163	'Budi chodi' is cultivated as mixed crop with Black gram or bobbarlu (cowpea).	2.29	R
164	'Budi chodi' is used to give ratoon crop after harvesting thus giving two yields in a year.	2.23	R
165	'Dassera budelu' is a long duration indigenous ragi variety cultivated by the tribals.	2.12	R
166	'Chindi mundiya' is a early mature indigenous ragi variety cultivated by the tribal farmers.	2.29	R
167	3-4 cart loads / acre of farm yard manure is applied by the farmers during summer in which ragi is to be cultivated during next season.	2.76	R
168	A combined operation of earthing up and weeding (goppulu tavvuta) is practiced by the farmers twice in ragi cultivation which enhances crop growth.	2.59	R
169	Remainings of ragi seed and broken ragi seeds are broad casted in field to partially substantiate the fertilizer requirement.	1.81	NR
170	Five kuncha (15 kg) seed for nursery will ultimately fetch 9 puttulu (180 kunchas) yield.	2.41	R
171	Red colouration of ragi seed is taken as indices for harvesting.	2.72	R
172	Panicles alone are picked and sun dried for 3-4 days. Then the panicles are beaten with sticks to separate grain.	2.59	R
	Little Millet (Sama) <i>Panicum miliare</i>		
173	Single ploughing is sufficient to sow sama seed.	2.35	R
174	Sama is cultivated Yada (direct sown crop) without transplantation, thus reducing the cost of cultivation.	2.47	R
175	5 kg / ac seed rate is maintained by the tribals if sama is grown as sole crop.	2.29	R
176	Sama is completely cultivated as rainfed crop for subsidiary income.	2.59	R
177	Seeds of ragi (2kg) and pedda samalu (1/2 kg) is mixed and broad casted. The transplantation also done as mixed seedlings. Because of differential maturity periods sama is harvested earlier than ragi.	2.53	R
178	'Korra samalu' is the mostly cultivated traditional variety of sama gives more yield.	2.29	R
179	'Magha samalu' is a traditional sama variety which is used to sow in magha karthe	2.35	R
180	'Mandi sama' is a traditional short duration (60 – 70 days) sama variety the seed is round and flat.	2.23	R

181	'Bontha sama' is a traditional sama variety with big size round seeds.	2.29	R
182	'Nalla sama' is a traditional short duration sama variety with black small seeds.	2.29	R
183	'Pedda sama' is a traditional long duration sama variety of which the seeds are small with big size spikelets grown as mixed crop with ragi.	2.35	R
184	'Mai sama' is a short duration (60 – 70 days) indigenous sama variety grown up to a height of 1 m to 1.25 mt.	2.41	R
185	Black (dark) coloration of sama seeds is taken as index to harvest the crop.	2.35	R
	Foxtail Millet (Korra) <i>Sataria italica</i>		
186	Local varieties of korra are preferred because they are more tasty and keeping quality of their straw is high.	2.35	R
187	'Pedda korra' is an indigenous korra variety with big spikelets and it gives very soft food when cooked.	2.41	R
188	'Bula nemadam' is an indigenous korra variety with small hairy structures on seeds which gives rough (not soft) food on cooking.	2.23	R
189	'Pedda korra' spikes alone are harvested and trampled with animals after sun drying for 3 – 4 days.	2.06	R
190	Korra is sown during May – June (Kartharlu time) to facilitate the cultivation of next crop.	2.76	R
191	Maturity of korra crop is indicated by the leaves turning yellow, the earheads turning greenish and the grains getting hard to chew.	2.76	
192	After harvest, earheads are dried for 3-4 days in the field and beaten with sticks for grain separation, followed by traditional winnowing along the wind direction.	2.72	R
	Bajra (Ganti) <i>Pennisetum americanum</i>		
193	'Arudhra karthe' (month of June) is suitable season for sowing bajra seeds.	2.72	R
194	'Pala poda ganti' is an indigenous bajra variety with big size spikes and grains.	2.47	R
195	'Pitta ganti' is an indigenous bajra variety with small spikes and grains.	2.53	R
196	'Pedda ganti' (badi ganti) is an indigenous bajra variety mostly cultivated as mixed crop with sorghum.	2.35	R
197	'Mrugasira' (June) is optimum season for sowing bajra as mixed crop and punarvasa (July) is for transplantation.	2.47	R

198	20 days after sowing is the optimum season for transplantation of ganti seedlings.	2.76	R
199	Horse gram or black gram is cultivated after ganti harvest to get additional income.	2.47	R
200	No weeding is required for ganti because it is highly competitive with weeds.	1.88	NR
201	Ganti is harvested with 2 – 3 feet long sticks, sun dried and trampled with animals to separate grains followed by winnowing.	2.76	R
	Kodo Millet (Arika /Alu) <i>Paspalum scrobiculatum</i>		
202	‘Korra alu’ and ‘Pedda alu’ are the two indigenous kodo millet varieties grown by the tribals.	2.41	R
203	‘Madda alu’ is an indigenous kodo millet variety with big size spikes and grains.	2.18	R
204	‘Kodi arika’ is an indigenously cultivated kodo millet variety with small spikes and grains.	2.29	R
205	Kodo millet is grown as mixed crop with red gram	2.47	R
206	Two ploughings are done perpendicular to one another and seed of kodo millet is broad casted in the field. Third time is ploughed perpendicular to the second ploughing, so that, the seed will be covered with soil.	2.47	R
207	Kodo millet is cultivated as mixed crop with mesta to gain additional income from it.	2.00	NR

It could be concluded from the table 15, that out of the 59 ITKs on crop production of millets, 56 ITKs (94.91%) were judged rational by the scientists and remaining 3 ITKs (5.09%) were judged not rational.

The ITK No.149, 150, 152, 153, 174, 175 and 198 indicate seeds and sowing of millets and all the ITK were judged rational by the scientists. The ITK No. 149 and 198 indicate time of transplantation of seedlings of finger millet and bajra and they were found rational. The optimum time of transplantation was the possible reason behind the rationality of the ITK. The ITK No. 150 and 152 indicate two methods of transplantation of ragi seedlings by the tribals and both were found rational because of their suitability to the farming situation in the zone. The ITK No. 152 and 175 indicate seed rate of finger millet and little millet respectively and the

possible reason behind the rationality of the ITK might be because of less deviation of the ITK from the scientific recommendations.

The ITK No. 174 indicate sama cultivation and found rational. This might be due to the suitability of the ITK to the dry farming situation where transplantation is not possible.

The ITK No. 151, 190, 193 and 197 indicate seasons in cultivation of millets and all the ITK were found rational. The possible reason behind the rationality of the ITK might be because of less deviation of seasons in ITK with scientific recommendations.

The ITK No. 154, 177, 199, 205 and 207 indicate crop rotations and mixed cropping systems and all the ITKs, except ITK No. 207 were judged rational by the scientists. The ITK No. 154 was found rational this might be because the ITK utilizes the soil completely by gap filling with different seeds. The ITK No. 177, 205 and 207 indicate mixed cropping in millets and ITK No. 177 and 205 were found rational while the ITK No. 207 was found not rational. The possible reason behind the rationality of ITK might be because of their appropriate combination and *vice-versa*. The ITK No. 199 indicate crop rotations with millets and it was found rational. The possible reason behind the rationality of the ITK might be because the crops substantiate the income during lean period.

The ITK No. 155, 166, 178 to 184, 186, 187, 188, 194, 195, 196, 202, 203 and 204 indicate indigenous varieties of millets and all the ITKs were found rational. The possible reason behind the rationality of the ITKs might be because of the acclimatization of these indigenous varieties in the zone.

The ITK No. 167 and 169 indicate application of manures in ragi cultivation. The ITK No. 167 was found rational and the ITK No. 169 was found not rational. The nutrient status of farm yard manure and other its

physical characteristics were the possible causes for the rationality of the ITK No. 167. The ITK No. 169 was found not rational, this might be because of the inability of remaining of ragi seedlings to supply nutrients to the crop growth.

The ITK No. 168 indicate inter cultivation in finger millet and it was found rational because it loosens the soil and provides good tilth for crop growth.

The ITK No. 170 indicate a prediction about the seed rate and yield in finger millet and it was found rational. The reason can be attributed as the right prediction in the ITK. The ITK No. 176 indicate little millet cultivation and it was found rational because little millet is drought tolerant and dryland crop.

The ITK No.171, 185 and 191 indicate harvest indices in finger millet, little millet and foxtail millet respectively and all the ITKs were found rational. The possible reason behind the rationality of the ITK might be because of the appropriate judgment in the ITK about the maturity and harvest of the crops.

The ITK No.173 and 206 indicate number of ploughings required for little millet and kodo millet and both were found rational because of less deviation of the ITK from the scientific recommendations.

The ITK No.172, 189, 192 and 201 indicate post harvest management in millets and all the ITKs were found rational. This might be because of the appropriate post harvest methods indicated in the ITKs.

The ITK No.200 indicate weed management in bajra and it was found not rational because bajra gives good yields if weeding is practiced.

5.2.3.6 Rationality of ITKs on crop production of pulses

Table 16 : Rationality of ITK on crop production of pulses

(n=32)			
ITK No.	ITK	Mean score	Rationality
	Black gram and Green gram (<i>Phaseolous sp.</i>)		
208	'Nalla Pesalu' is a traditional green gram variety cultivated as sole crop in dry lands.	2.53	R
209	'Pacha pesalu' is a traditional green gram variety grown as relay crop in paddy. 10 – 15 days before harvesting paddy, the seed is broadcasted in the field.	2.59	R
210	'Nalla minumulu' and 'Tella minumulu' are the traditional black gram varieties grown by the tribals.	2.59	R
211	Black gram is mostly cultivated as boarder crop on field bunds.	2.00	NR
212	Growing of black gram after paddy enhances the soil fertility and soil structure.	2.65	R
213	'Magha karthe' is optimum season for sowing pulses (black gram and green gram).	2.35	R
214	Seeds of black gram are soaked in water for 10 hours before sowing in paddy fallow black gram crop in less soil moisture fields.	2.82	R
215	Pulses are highly competitive with weeds. This belief makes farmers not to adopt weed management practices in pulses.	1.94	NR
216	One to two percent urea solution is sprayed on the crop which suffered due to severe adverse weather conditions to improve growth and yield of pulse crop (BT)	2.53	R
217	Yellowing of leaves with dried pods are the maturity symptoms for harvesting the crop.	2.65	R
218	Threshing of black gram is done by trampling under the feet of cattle.	2.18	R
219	Black gram seeds are separated from sand and dust particles through locally manufactured and graded sieves (Jalleda).	2.41	R
	Red Gram <i>Cajanas cajan</i>		
220	'Bharani Karthe' is suitable season for sowing red gram seeds.	2.47	R
221	'Doni kandulu' is an indigenous red gram variety resistant to pests and diseases with less flower drop.	2.12	R
222	'Binnisa' is an indigenous red gram variety cultivated by the tribals	2.18	R
223	'Gotcha Kandulu' is an indigenous red gram variety with big size grains with random spots.	2.23	R

224	'Billa Kandulu' is an indigenous red gram variety bears single pods (without clusters), seeds are big in size and white in colour.	2.29	R
225	Red gram is grown during first year of three years podu (shifting) cultivation to reduce weed infestation.	2.35	R
226	Black soils are found to be the best to cultivate red gram by the farmers.	2.18	R
227	Short duration and high yielding varieties are cultivated to escape from risk due to dry spells.	2.47	R
228	Farmers maintain spacing of 3 1/2 X 4 feet for cultivation of 'Pedda Kandulu (traditional varieties of red gram).	2.41	R
229	Farmers maintain spacing of 2 x 2 feet for cultivation of 'China Kandulu (improved varieties of red gram) (BT)	2.35	R
230	Red gram seeds are sown with the sue of 'Kanka' a traditional farm implement. Half a feet deep holes are digged with use of 'Kanka' and two seeds are dropped in each hole maintaining optimum spacing.	2.35	R
231	Ten kg per acre of seed rate is used by the farmers in the case of sole crop and 2-3 kg / acre in the case of mixed crop.	2.00	NR
232	Farmers waits for a week after sowing red gram for seed germination and otherwise they consider as the crop failure.	2.18	R
233	Red gram is mostly cultivated as mixed crop by the tribal farmers.	2.65	R
234	Red gram is mostly cultivated as mixed crop with budamalu (Mettu danyam) on podu lands.	2.41	R
235	Red gram is cultivated as mixed crop with sesamum to get additional income	2.23	R
236	Cloudiness induces flower drop in red gram and hence it is not desired by the farmers during flowering stage.	2.53	R
237	Farmers never apply fertilizer to red gram. They believe that the deep root system of red gram can absorb sufficient nutrients from the soil.	2.00	NR
238	In some areas of high altitude and tribal area zone, red gram is harvested early in the morning at full maturity stage. Farm women used to separate pods from the cutted stems of red gram and beaten with sticks to separate grain from the pods. The total operation lasts for a day.	2.47	R

	Horse Gram <i>Macrotylam uniflorum</i>		
239	'Nalla vulavalu' is a traditional horse gram variety grown by the tribals.	2.41	R
240	'Tella vulavalu' (pedda ulavalu) is a traditional horse gram variety gives more yield and more price.	2.41	R
241	'Nalla Vulavalu' is used as cattle feed and household consumption where as 'Tella vulavalu' is used exclusively for household consumption.	2.12	R
242	Dassera (Uttara karthe) is optimum season for sowing horse gram.	2.72	R
243	Horse gram is mostly cultivated as subsidiary crop without depending on it.	2.72	R
244	15 – 20 Kg / acre seed rate in followed by the farmers in sole crop of horse gram traditionally.	2.65	R
245	Horse gram is cultivated in dry lands after harvesting ragi crop in rabi season.	2.53	R
246	No inter cultivation operation is practiced between sowing and harvesting of horse gram.	2.35	R
247	Tella vulavalu is cultivated as mixed crop with black gram in dry lands (Garuvu) by the tribals.	2.23	R
248	Matured horse gram is uprooted and sun dried for 4 – 5 days to trample under the feet of animals to separate grain.	2.72	R

The findings from the table 16 indicate that among the 41 ITKs on crop production of pulses, 37 ITKs (90.24%) were found rational and remaining 4 ITKs (9.76%) were found not rational.

The ITK No.208, to 210, 221-224, 227, 239 to 241 indicate the traditional varieties of pulses and all the ITK were found rational. It might be because of the good economic returns from these varieties to the farmer.

The ITK No.211, 212, 225, 233, 234, 235, 243, 245 and 247 indicate mixed cropping and crop rotation and all the ITK were judged rational except the ITK No.211. the possible reason behind the rationality of the ITKs might be due to their appropriate mixed crop combinations. The

ITK No.211 was found not rational because black gram also can be cultivated as sole crop profitably.

The ITK No.213, 220 and 242 indicate seasons in pulses cultivation and all the three ITKs were found rational. The coincidence of the seasons in ITKs was in concurrence with the actual scientific recommendation was the possible reason behind the rationality of the ITKs.

The ITK No.214, 228 to 232 and 244 indicate the seeds and sowing in pulses and all the ITK except the ITK No. 231 were found rational. The ITK No.214 was found rational, it might be similarity because of suitability of the ITK with the scientific recommendation. The ITK No.228 and 229 indicate spacing for traditional and high yielding varieties of red gram respectively. The possible reason behind the rationality of ITK might be due to the maintenance of optimum spacing suggested in the ITK. The possible reason behind the rationality of the ITK No.230 might be due to the appropriateness of the practice in obtaining required depth of sowing.

The ITK No.231 and 244 indicate seed rate in pulses and the possible reason behind the rationality might be because of less deviation of the seed rate from the scientific recommendations.

The ITK No.232 indicates seed germination in red gram and it was found rational. The possible reason behind the rationality of ITK might be that in the dry regions the seed germination was uncertain and depends upon the moisture content in the soil, hence farmers wait for a week for the germination of red gram seed.

The ITK No.215 concerned with weed management in pulses was found to be not rational. This might be because any crop gives good yields in weed-free plots and the ITK was found against to this fact.

The ITK No.216 and 237 suggest application of fertilizers in pulses. The possible reason behind the rationality of the ITK No.216 might be because urea solution closes the stomata thus reduces the transpiration rate and hence the pulses can resist severe drought conditions. The ITK No.237 was found not rational because the red gram crop significantly give higher yields if fertilizers are applied but the ITK was found against to the scientific recommendation.

The ITK No.217 and 238 indicate harvesting aspects of pulses and both were found rational. The ITK No.217 was found rational because of appropriateness of the decision by the farmers on harvest index of black gram and green gram in the ITK. The ITK No.238 was found rational because of the suitability of the harvest operation for small size farms to complete the whole operation with in a day with available family labour.

The ITK No.218, 219 and 248 suggest post harvest management in pulses and all the three ITK were found rational. The possible reason behind the rationality of the ITKs might be due to their appropriateness in the zone with available resources.

The ITK No.226 concerned with soil management for red gram cultivation and it was found rational as farmers right judgment on effect of cloudiness on flower drop indicated in the ITK.

The ITK No.236 suggests effect of cloudiness on flower drop in red gram and it was found rational because of its appropriateness.

The ITK No.246 indicate inter cultivation in horse gram and it was judged rational by the scientists. It might be because farmers cultivate horse gram substantially without depending on it and hence they were not willing to adopt any inter cultivation operation.

5.2.3.7 Rationality of ITK on crop production in oil seeds

Table 17 : Rationality of ITK on crop production in oil seeds

(n = 32)

ITK No.	ITK	Mean score	Rationality
	Groundnut (<i>Arachis hypogea</i>)		
249	'Gutti senaga' is an indigenous groundnut variety grows like a bush and gives more yield.	2.41	R
250	Groundnut is mostly cultivated for rabi because farmers believes that rabi groundnut yields more than kharif.	2.53	R
251	Groundnut seeds from plants which are grown in dry lands gives good crop stand compared to other fields.	2.29	R
252	When groundnut is grown in wet lands, crop grows luxuriantly but fails to set seed.	2.82	R
253	Dropping of basal leaves is taken as indication to harvest groundnut and this is observed by the frequent visits of crows to the groundnut field for pods.	2.53	R
254	Well dried seeds with pink seed coat without wrinkles are selected for sowing.	2.71	R
255	Good quality, unbroken kernels free from insect shriveling, insect damage are alone used for sowing.	2.82	R
256	Light red soils are best for cultivation of groundnut.	2.65	R
257	Groundnut kernels are dibbled by making a small dig in the field with 'Kanka' and covered with soil.	2.35	R
258	Sowing the kernels behind the country plough called as 'Bongaram salu' and farming beds and channels later.	2.12	R
259	Weeding is practiced twice in groundnut once is at fortnight after sowing and second is at the time of flowering.	2.72	R
260	Gypsum is essential for groundnut and hence farmers apply gypsum to the soil before sowing.(BT)	2.00	NR
261	If the soil is dry, groundnut field is irrigated or other wise wait for a rain prior to harvest to facilitate easy and complete harvesting.	2.82	R

	Sesamum (<i>Sesamum Indicum</i>)		
262	'Yerra nuvvulu' is a traditional sesamum variety which is mixed with sand at 4:1 ratio and broadcasted (1 kg seed + ¼ kg sand) for sowing to get uniform distribution of seed in the field.	2.72	R
263	'Nalla Nuvvulu' is a traditional sesamum variety, 2.5 to 3 kg seed is broadcasted for one acre.	2.72	R
264	Farmers used to sow sesamum by observing fruit initiation of Thummi tree (<i>Acacia</i> sp) which they believe optimum season for sowing.	2.06	R
265	Soil fertility is depleted by sesamum cultivation.	2.23	R
266	Rain is not desired at the time of flowering sesamum by the farmers.	2.23	R
267	Sesamum is harvested when its stem, leaves and capsules turn yellow and seed in middle capsule turn black.	2.82	R
268	After harvest, sesamum plants along with capsules are stalked in the field in upright position. Top portion is covered with straw and kept for 3-5 days after which seeds are separated by shaking the plants.	2.72	R

It could be observed from the above table that among 20 ITKs on crop production of oil seeds, 19 ITKs (95.00%) were found rational and remaining one ITK (5.00%) was found not rational.

The ITK No.249, 262 and 263 indicate indigenous varieties of groundnut and sesamum and all the three ITKs were found rational. The suitability of the varieties to climatic conditions of zone might be the possible reason for the rationality of the ITK.

The ITK No.250 and 264 indicate seasons in cultivation of oil seeds and both were found rational. The possible reason behind the rationality of the ITK might be because less deviation of seasons in ITK with scientific recommendation.

The ITK No.251 concerned with cultivation of groundnut in drylands and it was found rational. The possible reason behind the rationality of the ITK might be because of the crop stand obtained it grown in dry lands.

The ITK No.252 and 256 indicate suitability of the soil to groundnut cultivation and both were found rational. The possible reason might be that the ITK was on line with the scientific recommendations.

The ITK No. 253, 261 and 267 concerned with harvesting of oil seeds and all the ITK were found rational. The ITK No.253 and 267 were found rational, this might be due to the right judgment in the ITK about the harvest indices of groundnut and sesamum respectively. The ITK No.261 was found rational, this might be because the complete harvesting is possible in dry lands only if crop is irrigated prior to harvest otherwise most of the kernels cut inside the soil thus resulting in lower yields.

The ITK No. 254, 255, 257 and 258 suggested seeds and sowing in groundnut and all the ITK were found rational. The ITK No. 254 and 255 were found rational and the possible reason behind the rationality of the ITK might be due to the appropriate seed selection in the ITK. The ITK No. 257 and 258 indicate method of sowing groundnut and both were found rational. The possible reason behind the rationality might be due to the suitability of the ITK to the small scale farming.

The ITK No. 259 indicates weed management in groundnut and it was found rational. The possible reason behind the rationality of the ITK might be because of less deviation of the ITK with scientific recommendations.

The ITK No. 260 and 265 suggests about the manures and soil fertility in oil seeds. The ITK No. 260 was found not rational where as ITK No. 265 was found rational. The ITK No. 260 was found not rational because the application of gypsum is essential at flowering stage as against the application of gypsum before sowing groundnut in the case of ITK. The ITK No. 265 was found rational, it might be because of high requirement of nutrients by the sesamum crop.

The ITK No.266 indicates rain in relation to flowering in sesamum and it was found rational. The possible reason behind the rationality of the ITK might be because the rain at the time of flower leads to the flower drop and hence it was not desired.

The ITK No. 268 concerned with post harvest management in sesamum and it was found rational. The possible reason behind the rationality of the ITK might be because of less deviation of ITK from the scientific recommendations.

5.2.3.8 Rationality of ITK on crops production in mesta

Table 18 : Rationality of ITK on crops production in mesta

(n=32)

ITK No.	ITK	Mean score	Rationality
	Mesta (<i>Hibiscus subdarifa</i>)		
269	Just three ploughing are sufficient for mesta cultivation.	2.53	R
270	Dense planting is desired by the farmers in mesta because they believe that more plant population gives more yield in mesta.	2.00	NR
271	Sowing of mesta before Telugu new year (Ugadi) fetches higher fibre yield.	2.41	R
272	Sowing of mesta is practiced during the month of August in some parts of high altitude and tribal area zone.	1.71	NR
273	Mesta is cultivated for consumptive uses only such as to stitch tobacco leaves, make ropes etc. not as commercial crop.	1.81	NR
274	Mesta is cultivated as mixed crop with horse gram and harvesting horse gram after three months thus allowing mesta for maturity upto 6 months is practiced.	2.18	R
275	Mesta is cultivated as mixed crop either with sesamum or red gram.	1.76	NR
276	Hand hoeing (Goppulu tavvuta) is the only intercultivation operation practiced by the farmers at early stages of mesta to control weeds.	2.72	R
277	Mesta is harvested at the time of flowering for fibre and for seed purpose cultivate upto full maturity.	2.72	R
278	Sprouting of buds in the axils of leaf is the indication for last stage of harvesting mesta. If harvest mesta beyond this stage fibre quality is poor.	2.41	R

It could be observed from the table 18, that out of the 10 ITKs on crop production of mesta, 7 ITKs (70.0%) were found rational and 3 ITKs (30.0%) were found not rational.

The ITK No.269 indicate number of ploughings for mesta cultivation and it was found rational. The possible reason behind the rationality of the ITK might be because of less deviation of the ITK with scientific recommendations.

The ITK No.270 concerned with plant population in mesta and it was found not rational, as the optimum population for mesta requirement for higher yields rather than dense planting but the ITK was against to the recommendation.

The ITK No.271 and 272 suggest seasons in mesta cultivation and the first one was found rational while the other was found not rational. The reason behind the rationality of the ITK No. 271 might be that sowing mesta before Telugu new year is suitable and time of harvest coincides with availability of water so that post harvest operation can be performed easily. The ITK No. 272 was found not rational, it is assumed as the crop comes to harvest during the month of January when the water was not available and also the season is suitable for cultivation of water intensive crops like paddy.

The ITK No. 273 indicate mesta cultivation and it was found not rational because the mesta not only cultivated for consumptive use but also for commercial purpose.

The ITK No. 274 and 275 suggest mixed cropping with mesta and it (ITK No. 274) was found rational while the other (ITK No. 275) was found not rational. The possible reason behind the rationality and non rationality might be due to their appropriate and inappropriate crop combinations, respectively.

The ITK No. 276 suggest intercultivation in mesta and it was judged rational by the scientists. The possible reason behind the rationality of the ITK might be because the hand hoeing makes the soil loose and provides good tilth.

The ITK No. 277 and 278 suggested harvest indices in mesta and both were found rational, this might be due to the right judgment in the ITK i.e., about the harvest of mesta.

5.2.3.9 Rationality of ITK on crop production of tobacco (*Nicotiana glauca*)

Table 19 : Rationality of ITK on crop production of tobacco

ITK No.	ITK	(n=32)	
		Mean score	Rationality
279	Punarvasha to Ashlisha is the best season for sowing tobacco in nursery beds.	2.53	R
280	Tobacco seedlings are grown in raised nursery beds with adequate drainage facility.	2.76	R
281	Tobacco seeds are mixed with dry sand and broadcast on nursery bed to get uniform distribution and covered with available farm wastes as mulch.	2.72	R
282	Diammonium phosphate (DAP) + calcium ammonium nitrate (CAN) + sulphate of potash + Farm Yard Manure is applied as basal after 15 days of sowing tobacco seedlings by digging at the roots of tobacco (BT).	2.35	R
283	Sheep penning is practiced during summer in tobacco field for getting higher yields.	2.59	R
284	Weeding is practiced after 15-20 days of basal application of fertilizers.	2.65	R

It could be concluded from the table 19, that all the 6 ITKs (100%) on crop production of tobacco were found rational.

The ITK No.279 indicate season for sowing tobacco and it was found rational. The possible reason behind the rationality of the ITK might be because of less deviation of season in ITK from the scientific recommendations.

The ITK No.280 and 281 suggested nursery management in tobacco and both were found rational. The possible reason behind the rationality of ITK might be due to the requirement of adequate drainage facilities by tobacco. The ITK No.281 was found rational, this might be because the ITK was deviated less from the scientific recommendations.

The ITK No.282 and 283 indicate about manuring and soil fertility and both were found rational. The possible reason behind the rationality of the ITKs might be because of less deviation of the ITK from the scientific recommendations.

The ITK No.284 suggests weed management in tobacco and it was found rational, it might be because tobacco is susceptible to weeds and hence it was recommended to weed frequently as adopted in the ITK.

5.2.4.1 Rationality of ITK on plant protection in general agriculture

Table 20 : Rationality of ITK on plant protection in general agriculture

(n=30)

ITK No.	ITK	Mean score	Ration-aility
285	Collection and burning of insects is practiced by the farmers in initial stages of pest attack. (BT)	2.75	R
286	Stones are kept in a leather pouch tied with string thus releasing the stones with lured to a greater distance chasing away the birds.(BT)	2.62	R
287	Jatropha is planted as fence around the crop which repels goats and can serve as a strong fence against animals.	2.56	R
288	A man like effigy made up of straw wearing a dress is used to keep at the centre of the field. The birds fly away because of human appearance in the field.	2.75	R
289	A man like effigy made up rice straw wearing a dress and head is covered with a earthen wear made like a human head is used to keep in the centre of the field. The birds fly away because of human appearance in the field.	2.75	R
290	Continuous drizzling encourages the spread of pests and disease.	2.75	R

291	There will be no incidence of pest and diseases if neem leaves are applied as basal manure.	2.06	R
292	Burning the dry stalks in the field and dusting the ash on the field to control diseases is practiced by the tribals.(BT)	2.56	R
293	Digging rat burrows and killing rats after each harvest is practiced to reduce the rat population in the field.	2.75	R
294	Rat damage is reduced by throwing fresh cow dung on both the bunds and field.	1.62	NR
295	Tribals now and then beats empty iron tin with a stick to scare away the animals and birds which destroy the crop.	2.87	R
296	Guns are used by the tribals to kill wild animals which destructs the crops like maize, sorghm etc. in some parts of high attitude and tribal area zone.(BT)	2.56	R
297	Indigenous arrows (Banalu) are used to ward off wild animals which damage food crops by the tribals.	2.87	R
298	'Adapa' is stone trap used to kill wild animals. A flat heavy stone made like a hut opening onside placing a trap support called mita inside the stone hut. When the animal touches the mita the whole structure falls on the animals thus killing it.	2.44	R
299	Farmers used to stay in the field during nights to ward of wild animals and farm women watches the field during day times.	2.81	R
300	Neem leaves are mixed with seeds and stored for long time which prevents pest attack.	2.62	R
301	For maximum storage period, grains must be dried to greatest possible extent.	3.00	R
302	Cup shaped structure knitted with Buhenia leaves called as 'Burudi' (Telugu) in which grains are stored.	2.12	R
303	A whole is made to a big size bottle gourd and pour hot water and ash in it and allowed for 2 days. The hallow bottle gourd is cleaned with water and dried for 5-10 days. This indigenous storage structure is known as 'Anapa tumba' which is used to store seeds like red gram, black gram, green gram etc. It is sufficient to store 4-6 kg of seed up to ten years which prevents the attack of insects and rodents.	2.18	R
304	Farmers used to store paddy and pulses in earthen pots or gunny bags kept on planks suspended in the kitchen. They believe that the smoke emitted from chulahs during cooking prevents storage pest attack.	2.37	R

305	Storing food grains in big drums made up of clay and pasted with cow dung outside the drum.	2.44	R
306	Farmers used to apply fresh mud mixed with cow dung to the granaries before each new crop is stored.	2.56	R
307	Seeds are stored in indigenously made storage structure called 'butti' (vernacular name) which is made up of bamboo in different sizes.	2.56	R
308	Seed are stored in gunny bags in mix with malathion to prevent storage pest attack.	2.06	R
309	De husking and crushing of millets and pulses is done by use of indigenously made stone crusher called Thiragali (Vernacular name). This is a modification of wooden crusher.	2.56	R
310	Harvested produce of millets is threshed by keeping the crop on roads and allowing the vehicles to pass on it to separate the grain is practiced (BT).	2.18	R
311	Seed material is stored in earthen pots which is kept on the roof inside the houses directly above the furnace in the kitchen. The smoke acts as repellent to the insects.	2.31	R
312	The seeds are generally stored along with the leaves of neem, thulasi, in gunny bags.	2.44	R

It could be concluded from the above table that out of 28 ITKs on plant protection in general agriculture, 27 ITKs (96.43%) were found rational and one ITK (3.57%) was found not rational.

The ITK No.285, 290, 291 and 292 suggested pest and disease management and all the four ITKs were found rational. The possible reason behind the rationality of the ITK No.285 might be because, it checks the pest population effectively. The ITK No.290 was found rational because continuous drizzling creates congenial atmosphere for multiplication of pest. The pesticidal property of neem cake might be the possible reason for the rationality of the ITK No.291. Burning the dry stalks makes the soil hot and kills the insects which perpetuate through soil and hence the ITK No.292 was found rational.

The ITK No.286 to 289 and 295 to 299 suggested indigenous bird and animal pest management by the tribals and all the ITKs were found rational. The ITK No.286 was found rational, it might be because of effective control of birds by the ITK. The ITK No. 288 and 289 indicate pest management with an effigy and both were found rational. The skill in preparation of a man like effigy was creatively used in control of bird pests. The ITK No.295 indicate bird and animal pest management with empty iron tin and it was found rational because it might control the bird and animal efficiently by making huge sound. The ITK No. 287 was found rational and the possible reason behind the rationality might be because the jatropa repels the goats and acts as strong fence against the animals as in the ITK. The ITK No. 296, 297, 298 and 299 indicate management of wild animals and all the four ITK were found rational, it might be because the ITK controls the wild animals which damages food crops.

The ITK No.293 and 294 indicate rodent management. The ITK No.293 was found rational and the other was found not rational. The possible reason behind the rationality of the ITK might be because the ITK effectively controls rodents by physical killing thus reducing the rodent population. The ITK No.294 was found not rational, it might be because simple broadcasting of cowdung might not control rodent because it do not have repellent properties against them.

The ITK No. 300 to 312 representing post harvest management of food grains and all the ITK were found rational. The ITK No.300 and 312 indicate storage of food grains with leaves of neem, thulsi etc., the possible reason behind the rationality of the ITK might be because of pesticidal properties of these leaves. The possible reason behind the rationality of the ITK No.301 might be because sun drying reduces the moisture content in the seed thus reduces the pest surveillance. The ITK No. 302, 303, 304, 305, 306, 307, 308 and 311 indicate indigenous storage structures and all the ITK

were found rational. The ITK No.302 found rational, it might be because of observation of storage of seeds in the safe structure by the farmers. The ITK No. 303 was found rational, it might be because of aseptic conditions maintained in the storage structure. The ITK No. 304 and 311 indicate storage of grain in kitchen directly above the furnace and the possible reason behind the rationality of ITK might be because the furnace keeps the grain away from the pest incidence. The ITK No. 305 and 306 were found rational, it might be because cowdung and clay acts as physical barrier against insect attack. The possible reason behind the rationality of the ITK No. 307 was due to the durability of the storage structure. The ITK No. 308 identified as a blended technology and it was found rational, it might be because malathion acts against pests. The ITK No. 309 and 310 found rational, it might be because of suitability of the practice to the farming situation in the zone.

5.2.4.2 Rationality of the ITK on plant protection in podu cultivation

Table 21 : Rationality of the ITK on plant protection in podu cultivation
(n=30)

ITK No.	ITK	Mean score	Rationality
313	After clearing vegetation setting of fire is practiced in podu cultivation which improves soil fertility, kills insects and reduces weed problem	2.62	R
314	The operation of thuvvatam (digging) is practiced with 'kanka' indigenous implements after burning the bushes with this crop sowing operation initiates, which kills the soil borne insects.	2.31	R

It is vivid from the table 21, that all the 2 ITKs (100%) were judged as rational by the scientists and the reason attributed was that the heat from burning bushes was useful to kill the soil borne insects.

5.2.4.3 Rationality of ITK on plant protection in paddy (*Oryza sativa*)

Table 22 : Rationality of ITK on plant protection in paddy

ITK No.	ITK	(n=30)	
		Mean score	Rationality
315	Fifty kg of neem cake is broadcasted in the field to control insect pests in paddy, during puddling in some parts of high attitude and tribal areas	2.68	R
316	Tribals use plant material like, fish tail palm leaves (<i>Caryota urens</i>) for the control of leaf folder and stem borer in paddy. They erect 25-30 leaves per acre scatterly in the paddy field. This fish tail palm leaves exudes alkaloids, which prevents pests.	2.56	R
317	Farmers used to mix the powder of stem of yegisa manu (<i>Pterocarpus marsupium</i>) in irrigation channels to control tip burn (Etchi tegulu) in paddy.	2.06	R
318	Thummika (<i>Acacia nelotica</i>) and Nakkide (<i>Cardia myxa</i>) plant branches are erected around paddy field and paddy grain is broadcasted on field bunds at the time of grain formation.	2.18	R
319	Leaves of vadisa plant (<i>Cleistanthus hook</i>) and cow dung are broadcast around field bund if leaf folder infestation is observed.	2.31	R
320	Wood apple (Velaga fruit) is made in to powder and used to broadcast in field to reduce tella chitta (leaf turns white) in paddy.	2.37	R
321	'Musidi' leaves (<i>Nux vomica</i>) are used to broadcast in the field (Mettu danyam) if termite attack in observed in paddy.	2.18	R
322	Neem cake (40 kg) + Kagu cake (5 kg) + Kosam pindi (5 kg) per acre applied during puddling which prevents pest attack in paddy and improves soil fertility.	2.62	R
323	Paddy seed is stored for next year in gunny bags which are hanged to the roof of the house there fore pest attack can be reduced because there will be less physical access to insects to attack the seed.	2.31	R
324	When paddy is infested with leaf flower and gall midge farmers drag thorny bushes in field.	2.50	R
325	Neem cake (50 kg) + gypsum (25 kg) is used to apply to the field at the time of puddling which prevents pest attack in paddy and improves soil fertility (BT).	2.60	R
326	For any problem in paddy nursery, the malathion and kerosene is sprayed (BT).	1.25	NR
327	Farmers used to broadcast 15-20 kg of common salt / acre of paddy field to control leaf spot disease in paddy.	1.12	NR

328	Neem cake (20 kg/ac) is applied as basal manure which helps to protect paddy crop from BPH and improves soil fertility.	2.62	R
329	Uprooting gallmidge effected seedlings and burning in the nursery before transplantation is practiced.	2.12	R
330	To prevent termite problem 'musidi' leaves (<i>Nux vomica</i>) are applied as green manure in the direct sown paddy.	2.06	R
331	Farmers believes that presence of the Gaviribethi snake improves crop yields because it predates on rodents.	2.37	R
332	'Bali' is practiced at the time of grain formation stage in paddy which believe to fetch more yields.	1.75	NR
333	Paddy harvesting is started after a fortnight of change in leaf colour from yellow to pink	2.62	R
334	Harvesting in paddy is done by leaving ½ feet height stubbles which improves soil fertility after decomposition in the soil.	2.68	R
335	Before harvesting the crop a few rice spikelets are hanged in the houses and temples to be eaten by sparrows.	2.25	R
336	If the paddy is stored in room the floor is coated with fermented cow dung solution to avoid insect multiplication.	2.81	R
337	Paddy seed is sun dried for 2-3 days continuously and than stored in gunny bags on indigenously made 4-5 feet stand to prevent pest infestation.	3.00	R
338	Paddy seed is stored in small containers knitted with bamboo called as 'butta' (in telugu) . The container is filled with paddy seed and covered with straw and than closed with cow dung paste.	2.62	R
339	Harvested crop is allowed for sundrying for 3-4 days in the field it self to reduce the level of moisture in grains before bundling.	3.00	R
340	Threshing is done by trampling under the feet of cattle on a threshing floor.	2.87	R
341	Winnowing and clearing of rice produce is done by the use of winnowing baskets called (chetalu in Telugu)	2.87	R
342	Seeds are stored in indigenously constructed storage structures called 'jaadi'. The storage structure constructed with burned clay with a capacity of 60 – 80 kunchas (180 – 200 kg) paddy seed.	2.75	R
343	Seed for consumption purpose are stored in big size Jaadi called 'Gadhi' with a capacity of 100 – 150 kunchas (300 – 450 kg) paddy seed.	2.87	R

As seen from the table 22, that out of the 29 ITK on plant protection in paddy, 26 ITK (89.65%) were found rational and remaining 3 ITK (10.35%) were found not rational.

The ITK No. 315, 322, 325 and 328 represents application of bio pesticides for pest control were judged as rational by the scientists. The pesticidal property of neem cake, kagu cake (ITK No. 322) and kosampindi (ITK No. 322) could be attributed to their rationality. The ITK No. 316 to 321, and 330 suggested use of plant parts in pest and disease management and all the ITK were found rational. The possible reason behind the rationality of the ITK might be because of pesticidal and fungicidal properties of plant parts viz., fish tail palm leaves in control of leaf folder (ITK No. 316), stem of yegisa manu in control of tip burn (ITK No. 317), thummika and nakkide plant branches (ITK No. 318), leaves of vadisa in control of leaf folder (ITK No. 319), wood apple in control of leaf spot (ITK No. 320) and musidi leaves in control of termites (ITK No. 321 and 330). The ITK No. 324 was found rational, it might be because thorny bushes physically displaces the gall midge and thus checks the pest population. The ITK No. 326 and 327 indicate application of malathion and common salt for pest and disease management and both were found not rational. The possible reason behind the ITK No. 326 might be because farmers applied malathion for any pest in ITK as against to the specific recommended pesticide. The ITK No. 327 was found not rational, it might be because common salt does not posses any fungicidal properties. The ITK No. 329 indicate gall midge control in paddy and it was found rational. The possible reason behind the rationality of the ITK might be because uprooting of gallmidge effected seedlings checks the spread of pest thus reduces the pest incidence in the main field.

The ITK No. 323, 336 to 343 concerned with post harvest management of paddy grain and all the ITK were found rational. The ITK

No. 323, 336 and 337 indicate post harvest pest management and the possible reason behind the rationality of the ITK No. 323 and 337 might be because of less physical access of grain to the insects. The possible reason behind the rationality of the ITK No. 336 might be because of pesticidal properties of fermented cowdung which believed to check pest multiplication. The ITK No. 338, 342 and 343 indicate indigenous storage structures and possible reason behind the rationality of the ITK might be due to the capacity and durability of the indigenously made storage structures. The ITK No. 339 to 341 indicate post harvest processing of paddy and the possible reason behind the ITK might be because of the suitability and appropriateness of the ITK to the farming situation in the zone.

The ITK No. 331 suggest rodent control in paddy fields and it was found rational. The possible reason behind the rationality of the ITK might be due to the snake predate on rodents as mentioned in the ITK thus reducing the problem. The ITK No. 332 indicates practice of 'bali' (butchering) and it was found not rational because it was an established fact that the practice doesn't have any scientific reason.

The ITK No. 333, 334 and 335 representing harvest aspects of paddy and were found rational. The ITK No. 333 was found rational, it might be because of right judgment about the harvest index in ITK. The possible reason behind the rationality of the ITK No. 334 might be because the left over stubbles improve soil fertility after decomposition. The ITK No. 335 was judged rational by the scientists, because before harvesting if paddy grain is hanged the birds eat on the hanged at entrance of the house, grain thus reducing the attack on crop.

5.2.4.4 Rationality of ITK on plant protection in maize and sorghum

Table 23 : Rationality of ITK on plant protection in maize and sorghum

(n=30)

ITK No.	ITK	Mean score	Rationality
Maize (<i>Zea mays</i>)			
344	Before sowing maize, seeds are soaked in warm water for 3-6 hours and shade dried to induce better germination and to control shoot borer which is seed borne. (BT)	2.50	R
345	Cobs covered with sheaths are stored as such for more than four months when they store the maize for consumption purpose.	2.31	R
Sorghum (<i>Sorghum bicolor</i>)			
346	To scare away the birds colored polythene carry bags are tied to a few tall sorghum plants.	2.75	R
347	For threshing sorghum, ear heads are spread over on the roads to allow vehicles to pass on it (BT).	2.18	R
348	Frequent sun drying of seed to protect from stored grain pest irrespective of Amavasya (BT).	2.62	R

It could be concluded from the above table that all the 5 ITKs on plant protection related to maize and sorghum coarse cereals were judged rational by the scientists.

The ITK No. 344 indicate pest control in maize and it was found rational, this might be because the hot water kills the pupae of shoot borer which perpetuate through seed. The ITK No. 345 found rational, because the sheaths of cobs protects the cobs from sun stroke thus keeps the cobs fresh. The possible reason behind the rationality of the ITK No. 347 might be because, the ITK reduces the cost of threshing thus increases the total benefits. The ITK No. 348 found rational because the seed sun dried irrespective of amavasya reduces moisture content thus reducing the pest incidence and there is no effect of amavasya on sun drying of seed.

The ITK No. 346 suggest the bird scaring practice and it was found rational, it might be because of coloured polythene carry bags makes the birds to fly away because of uncertain appearance.

5.2.4.5 Rationality of ITK on plant protection in millets

Table 24 : Rationality of ITK on plant protection in millets

(n=30)

ITK No.	ITK	Mean score	Rationality
	Finger millet Ragi (<i>Eleusina coricana</i>)		
349	Farmers sprinkle (sodipindi) Ragi seed powder mixing in water for control of pests and diseases in ragi.	1.75	NR
350	Matakara ginjalu (chaffy grains) is a problem observed at the time grain filling in ragi.	2.44	R
	Kodo millet (<i>Paspalum scrobiculatum</i>)		
351	Processing of kodo millet seed is laborious consists of dehusking twice with indigenous wooden crusher called 'Thiragali' and third time is crushed with stone crusher to get 'Arika powder' for consumption. (BT)	2.25	R
	Sama Little millet (<i>Panicum miliare</i>)		
352	Dehusking of little millet grain is done with the help of wooden grinding machine called 'Tiragali' (Vernacular name) locally made with mango or terminalia (maddi).	2.68	R
	Korra Foxtail millet (<i>Setaria italica</i>)		
353	Korra seeds are put in water and the floating and disease affected seeds are removed.	3.00	R
354	If sowing of korra is delayed beyond the June, it becomes more susceptible for pest attack.	2.87	R

It could be concluded from the above table that out of the 6 ITKs on plant protection in millets, 5 ITKs (83.33%) were found rational and one ITK (16.67%) was found not rational.

The ITK No. 349 and 353 represent pest and disease management in pulses. The ITK No. 349 was found not rational, this might be because ragi seed powder might not show any pest control properties. The ITK No. 353 was found rational because it prevents further spread of pest and ensures good germination.

The ITK No. 350 indicate a physiological problem in millets at the time of grain filling and it was found rational, it might be because of right judgment about the identification of the problem.

The ITK No. 351 and 352 suggest post harvest management in millets and they were found rational. The appropriateness of the ITKs in processing of kodo millet and little millet respectively was the possible reason behind the rationality of these ITKs.

The ITK No. 354 indicate seasons in relation to pest attack and it was found rational. This might be due to less deviation of the season in ITK with scientifically recommended season.

5.2.4.6 Rationality of ITK on plant protection in pulses

Table 25 : Rationality of ITK on plant protection in pulses

(n=30)

ITK No.	ITK	Mean score	Rationality
Black gram and Green gram (<i>Phaseolous sp.</i>)			
355	Ill filled and diseased seeds are eliminated by removing the floated seeds during soaking in water before sowing. (BT)	2.93	R
356	Farmers store pulses in earthen containers in mix with kitchen ash @ 5 kg seed + 1 kg ash to prevent insect attack during storage.	2.75	R
357	Pulse seeds are well dried and mixed with the dried leaves of neem and stored in airtight gunny bags by keeping on 2 – 3 feet height locally made stands.	2.87	R
Red gram (<i>Cajanas cajan</i>)			
358	Alu (kodo millet) straw smoking is practiced by the farmers to reduce tea mosquito pod fly attack in red gram. Alu straw is smoked around the red gram field which believes to reduce tea mosquito pod fly attack in red gram.	1.87	NR
359	Pods which are not infested with any pest and disease are selected for seed purpose for next year.	3.00	R
360	To control the pod borer in red gram, neem seed kernel extract is sprayed on crop.	2.87	R
361	Harvested sticks of red gram along with pods are sundried for 5-6 days in the field keeping upward down.	2.75	R
362	The powdered red gram leaf is used as feed for animals which got high nutritive value.	2.81	R
363	The sticks are used as fuel for cooking after separation of red gram seeds.	2.87	R
364	If red gram is sundried during Amavasya day the storage pests cannot attack the seed.	1.75	NR

365	Red gram is mixed with ash and stored in gunny bags in hanging position from the roof of the house.	2.57	R
366	Red gram seeds are stored in mix with ash, 30 kg of red gram is mixed with 1 kg of ash which acts as physical barrier for insect pests.	2.93	R
367	Frequent sundrying of seeds is practiced to protect red gram from stored grain pests.	2.81	R
368	Red gram seed is stored in earthen pots in mix with malathion to protect it from storage pests (BT).	2.50	R
369	Red gram is stored in earthen pots in mix with layers of sand to protect it from insect pests during storage.	2.31	R
370	Red gram is stored after adding wet red clay and sundrying it for 2-3 days to increase shelf life.	2.56	R

It could be observed from the table 25, that among the 16 ITKs in plant protection of pulses, 14 ITKs (87.5%) were found rational while 2 ITKs (12.50%) were found not rational.

The ITK No. 355, 358, 359 and 360 indicate pest and disease management in pulses. Among these four ITKs, ITK No. 358 was found not rational and possible reason behind this might be because kodomillet straw does not possess any pesticidal properties. The ITK No. 355, 359 and 360 were judged rational by the scientists. The ITK No. 355 and 359 indicate seed selection to check pest incidence on the crop and both were found rational, this might be because of appropriate seed selection indicated in these ITKs. The pest control properties of neem seed kernel extract might be the possible reason behind the rationality of ITK No. 360.

The ITK No. 356, 365 and 366 indicate storage of pulses in mix with ash and all the three ITK were found rational. The possible reason behind the rationality of the ITK might be because the ash acts as physical barrier against insect pests thus reducing the pest incidence. The ITK No. 357 indicate storage of pulses in mix with dried leaves of neem and the possible reason behind the rationality of ITK might be because of pesticidal properties of neem leaves.

The ITK No. 361, 364 and 367 suggest seed drying of red gram and the ITK No. 361 and 367 were found rational. The possible reason behind the rationality might be because sun drying is helpful in reducing moisture content and thus reduces pest attack in future. The ITK No. 364 found not rational, it might be because the day of amavasya don't have any effect on seed drying.

The ITK No. 362 and 363 indicate uses of bi-products of red gram and they were found rational. The possible reason behind the rationality of the ITK might be due to the nutritive value of red gram leaf and energy status of the sticks.

The ITK No. 368 indicate storage of red gram in mix with malathion dust, this was particularly used for storage of red gram when stored for seed purpose but not for consumption. The possible reason behind the rationality of the ITK might be because malathion control insect attack on the seed. The ITK No. 369 and 370 indicate storage of red gram in mix with sand and wet clay respectively and these were found rational. The possible reason behind the rationality of the ITK might be because sand and wet clay acts as physical barrier against insect pests.

5.2.4.7 Rationality of ITK on plant protection in oil seeds

Table 26 : Rationality of ITK on plant protection in oil seeds

ITK No.	ITK	Mean score	Rationality
	Ground nut (<i>Arachis hypogea</i>)		
371	Farmers grow Jatropa plants around the groundnut field, which acts as catch crop against red hairy caterpillar	2.68	R
372	Farmers used to burn thrash adjacent to the groundnut fields during nights to attract nymphs and adults of insect (BT)	2.81	R
	Sesamum (<i>Sesamum indicum</i>)		
373	Storing sesammum oil in earthen pots in practiced to increase its keeping quality.	2.44	R
374	Sesamum seeds are stored in earthen pots in mix with stand in 9:1 ratio.	2.25	R

It could be observed from the table 26, that all the 4 ITKs (100.00%) on plant protection in oil seeds were judged rational by the scientists.

The ITK No.371 and 372 indicate pest and disease management in groundnut and both the ITK were judged rational by the scientists. The ITK No.371 was found rational, because jatropa acts as catch crop as in the ITK. The ITK No. 372 was found rational and possible reason behind the rationality of the ITK might be because the light from burning flame during night attracts insects and insect falls in the burning flame thus reducing the insect population.

The ITK No.373 and 374 indicate storage of sesamum oil and seed and both were found rational, it might be because of durability of the storage container.

5.2.4.8 Rationality of ITK on plant protection in mesta (*Hibiscus subdarifa*)

Table 27 : Rationality of ITK on plant protection in mesta

ITK No.	ITK	(n=30)	
		Mean score	Rationality
375	Farmers uses light traps i.e. setting of fire on field bunds to control insect pests (BT)	2.62	R
376	Removal of bunchy tops along with masses of mealybugs (<i>Meconellicoccus hirsutus</i>) and their destruction to prevent the spread of pest to adjacent plants.	2.93	R
377	Farmers produce mesta seed for next crop by keeping the part of the crop up to full maturity stage which is identified by brown colouration of pods. The seeds are extracted after sundrying the mesta for 15-20 days in the field in upright position.	3.00	R
378	Farmers used to sundry the seeds of mesta for 3-4 days and store in earthen pots to prevent storage pests.	2.93	R
379	After harvesting mesta crop farmers keep the crop in field for 7-10 days. Meanwhile crop dries and leaves and twigs fall down in the field. It improves the soil fertility.	2.87	R
380	Farmers keep the mesta sticks for 10 to 15 days in the farm ponds to soak them in water. Meanwhile the fibre become soft and easy to separate fibre from the sticks.	3.00	R
381	Mesta seed is stored after sun drying in mix with malathion (<i>Cheemala mandu</i>) to prevent storage pest attack	2.87	R

It could be observed from the table 27, that all the 7 ITKs on plant protection in mesta were judged rational by the scientists.

The ITK No. 375 and 376 indicate pest and disease management in mesta and both were found rational. The possible reason behind the rationality of the ITK No. 375 might be because light attracts insects thus reduces pest population. The ITK No. 376 indicate mealy bug control in mesta and the possible reason behind the rationality of the ITK might be because of physical destruction during early stages checks the pest population.

The ITK No. 377 and 380 were related to post harvest processing of mesta and were found rational. The possible reason behind the rationality might be due to the appropriateness of the practice and suitability to the available resources. The ITK No. 378 and 381 indicate storage of mesta seed and were found rational. The possible reason behind the rationality of the ITK might be because sun drying (ITK No. 378) and sun drying and store in mix with malathion (ITK No. 381) check the pest incidence.

The ITK No. 379 indicate manuring the next crop with leaves of mesta and it was found rational. The possible reason behind the rationality of the ITK might be because it supplies additional nutrients to the next crop without any investment.

5.2.4.9 Rationality of ITK on plant protection in tobacco

(*Nicotiana tabacum*)

Table 28 : Rationality of ITK on plant protection in tobacco

ITK No.	ITK	(n=30)	
		Mean score	Rationality
382	Tobacco crop is rotated with maize or sorghum to reduce pest problem in tobacco.	2.93	R
383	Tobacco plant is uprooted and burned or thrown out if Manukullu (Stem rot) is observed.	2.81	R
384	Monocrotophos or Endosulfon is sprayed if akuchitta (leaf spot) is observed (BT).	1.69	NR

385	Neem seed kernel extract (2%) is sprayed on the crop if leaf curl disease is observed in tobacco.	2.31	R
386	Orabanche is manually removed as and when it appears before its flowering and seed set.	3.00	R
387	Sorghum is cultivated as trap crop in tobacco which controls orabanche.	2.62	R
388	A small piece of neem trunk is cutted and soaked in water for 2-3 months. An extract is prepared from this solution and sprayed on tobacco crop if Aku mudatha (leaf curl/leaf webber) is observed.	2.31	R
389	Harvested leaves of tobacco are stitched with mesta fibre and sundried by tying both ends to two poles on open sun and allowing it for 15 – 20 days.	2.93	R

It could be seen from the table 28, that out of the 8 ITKs on plant protection in tobacco, 7 ITKs (87.50%) were found rational and one ITK (12.50%) was found not rational.

The ITK No.382, 383, 386 and 387 suggest cultural methods of pest control and all the ITK were found rational. The possible reason behind the rationality of the ITK might be because of less deviation of the ITK from the scientific recommendations. The ITK No. 384 indicate disease management with chemicals and it was found not rational. It might be because the ITK indicates the spray of monocrotophos (insecticide) for control of leaf spot (a fungal disease). The ITK No. 385 and 388 indicate spray of neem seed kernel extract and neem trunk extract for pest and disease management and both were found rational. The pesticidal and fungicidal properties of neem products might be the possible reason behind the rationality of the ITK.

5.2.5.1 Rationality of ITK related to vegetables

Table 29 : Rationality of ITK related to vegetables

(n=30)			
ITK No.	ITK	Mean score	Rationality
Vegetables			
390	'Pacha vanga' is an indigenous variety of brinjal bear fruits with broad green strips.	2.25	R
391	About 40-45 days old brinjal seedlings are used for transplantation in to main field.	2.30	R
392	Suitable season for sowing ladies finger is Chaitram (March)	2.72	R
393	About 3 or 4 ladies finger seeds are sown in each hole and later thinned to two plants per hill at two weeks after sowing.	2.93	R
394	Cucumber seeds are sown as one side of the long channels formed 5 feet apart.	2.40	R
395	Three or four seeds of cucumber are planted in each hole with the use of hand hoe to dig the soil.	2.50	R
396	Cow dung is diluted with cow urine and applied near the base of transplanted seedlings of vegetables such as chilly, tomato etc. to improve soil fertility and to enhance crop growth.	2.00	NR
397	Bottle gourd is cultivated as boarder crop around the groundnut field to get additional income.	2.10	R
398	Bottle gourd is harvested, when it turns from pale green to dark green and finger nails get pierced in to it, while pressing.	2.60	R
399	Cucumbers are mostly cultivated in kitchen garden allowing them to creep on the huts.	2.60	R
400	Ash is dusted on vegetables which acts as physical barrier against pests.	2.60	R
401	Ash and turmeric powder are mixed in equal proportion and sprinkled to control aphids which attacks vegetables.	2.21	R
402	Ash in mix with water is sprinkled on cucumber crop to control aphids and powdery mildew.	2.10	R
403	Cucumber seeds are extracted from fully ripened fruits, washed well with water, mixed with ash, dried and stored up to one year (Also for Bottle gourd).	3.00	R
404	Sundrying the seeds of bottle gourd, along with outer shell of the fruit which acts as a storage container and protect from pests.	2.72	R
405	Cucumber seeds are pasted to wall when they are wet, to store for 4-6 months.	2.44	R

406	Cucumber seeds are mixed with ash when they are wet and sun dried on houses for a week and than stored inside the houses in polythene covers (BT)	2.50	R
407	Bottle gourd and ridge gourd seeds are stored as such in fruits, after sundrying for a week. Whenever they need seeds for sowing they break the gourds and extract the seed.	2.50	R
	Cowpea (<i>Vigna anguiculata</i>) (Alasandalu / Bobbarlu)		
408	Farmers sow the cowpea during July – August which they believe suitable season.	2.72	R
409	‘Tella alasandalu’ is an indigenous cow pea variety cultivated by the tribals (pods are light in colour).	1.88	NR
410	‘Nalla alasandalu’ is an indigenous cow pea variety cultivated by the tribals (pods are dark in colour).	2.10	R
411	Pods of cowpea are harvested when they start drying and turn to brown in colour.	2.60	R
412	Cowpea pods are sun dried until they become brittle to make the seed separation easy.	2.72	R
413	For safe storage of cowpea, seeds are filled in earthen pots in mix with kitchen ash.	2.20	R
414	Cow pea seed is stored as such in pods and tied with paddy straw so that the rats confused it as paddy straw and leaves it.	2.44	R
415	Cowpea is mostly cultivated as mixed crop with sorghum, ganti and red gram.	2.44	R
416	In some tracks of high altitude and tribal area zone cowpea seed is mixed with red gram and planted by digging with ‘Kanka’ and covering with soil, after dropping the seed in it.	2.40	R
	Rice Bean (<i>Thimmerlu</i>)		
417	‘Chinna Timmerlu’ is an indigenous short duration variety (60 days) with indeterminate growth habit. Seeds are small in size with light yellow coloured seed coat.	2.20	R
418	‘Pedda timmerlu’ is an indigenous long duration rice bean variety (90 days) with indeterminate viny growth. Seeds are larger in size with green seed coat.	2.44	R
419	‘Nalla timmerlu’ is an indigenous short duration rice bean variety with determinate growth and bushy habit with black seed coat.	2.10	R
420	‘Machcha timmerlu’ is a short duration indigenous rice bean variety with indeterminate viny growth with black spot on green seed coat.	2.00	NR

421	'Yerupu timmerlu' is a long duration indigenous rice bean variety with indeterminate growth and red seed coat.	2.72	R
422	During ploughing ash obtained after burning trees in podu is applied to improve soil fertility.	2.72	R
423	Rice bean is cultivated only on sloppy hills	2.30	R
424	Rice bean sown during the month of July, which is found to be the mum season.	2.40	R
425	Kitchen ash is dusted on rice bean leaves during 6 – 8 AM early in the morning to control aphids by acting as physical barrier.	2.30	R
426	Rice bean is harvested at ground level with sickles when bottom leaves turn yellow and most of the pods turn brown.	2.44	R
427	Rice bean seeds are stored in bamboo baskets in mix with ash and common salt of 10 : 1 ratio. (BT)	2.30	R
428	Farmers store the seeds of rice bean in kitchens at 6 – 7 feet height in buhenia leaves.	2.13	R
	Cauliflower (<i>Brassica oleracea</i> Var. <i>botrytis</i>)		
429	Water is sprinkled on raised beds after sowing cauliflower seed to get quick germination.	2.10	R
430	'Hemanthula' is an indigenously cultivated cauliflower variety by farmers in some parts of high altitude tribal area zone.	2.10	R
431	'Hemagiri' is an indigenous cauliflower variety cultivated by the tribals, which bears the small size curds.	2.10	R
432	'Kushi kalyani' is a traditional early matured cauliflower variety cultivated by the tribals.	1.90	NR
433	Maize is cultivated as boarder crop and Ginger is cultivated as mixed crop with cauliflower to substantiate income from one another thus growing three crops on single piece of land.	2.40	R
434	Farmyard manure is abundantly applied to the cauliflower for better yields.	2.60	R
435	To control diamond backmoth in cauliflower neem oil is mixed with water and sprayed on the crop.	2.80	R
441	Thrash is burned and mixed with soil in prepared raised beds of 1m x 4.5 m with height of 30 – 60 cm to prevent soil born insects, and also to improve soil fertility. (BT)	3.00	R

	Tapioca (<i>Manihot esculenta</i>):		
442	Tapioca stem only with shorter internodes are selected for planting.	2.80	R
443	Sets are planted vertically on the sides of ridges with their buds pointing upwards at a spacing of 3 – 4 feet on either side.	2.72	R
444	Planting tapioca throughout the year is practiced by the farmers without any season.	2.10	R
445	Yellowing and withering of bottom leaves indicate right time of harvest.	2.72	R
446	Tapioca is harvested by digging the soil with hand hoe after irrigating it to get complete crop.	2.80	R

It could be inferred from the table 29, that among the 52 ITKs on vegetables, 48 ITKs (92.31%) were found rational and 4 ITKs (7.69%) were found not rational.

The ITK No. 390, 409, 410, 417 to 421 and 430 to 432 representing indigenous crop varieties related to vegetables. The ITK No. 390, 410, 417, 418, 419, 421, 430 and 431 were found rational, it might be because of the performance of the varieties. The ITK No. 409, 420 and 432 were found not rational, this might be because of their unsuitability to the climatic conditions in the zone.

The ITK No. 391, 393, 394, 395, 429, 437 and 438 suggest seeds and sowing of vegetables and all the ITKs were found rational. The possible reason behind the rationality of the ITK No. 391 might be because of less deviation of transplantation period of brinjal in ITK from the scientific recommendation. The ITK No. 393 indicate sowing ladies finger seeds and it was found rational, it might be because ladies finger needs 24 hours presoaking for good germination, but farmers sow the seeds without presoaking and hence farmers sow more seeds to compensate germination loss. The ITK No. 394 indicates sowing of cucumber and the possible reason behind the rationality of the ITK might be because, this method avoids crowding of vines and provide efficient irrigation. The ITK No. 395

and 438 indicate sowing of cucumber and tapioca respectively and less deviation of the ITK from the scientific recommendation might be the possible reason behind the rationality of these ITKs. The ITK No. 429 indicate nursery management of cauliflower and the possible reason behind the rationality of the ITK was because water might enhance the seed germination. The ITK No. 437 indicate seed material selection in tapioca and was found rational, it might be because of the appropriate method of selection in the ITK.

The ITK No. 392, 408, 424 and 439 concerned with seasons for cultivation of different vegetables and all the ITKs were found rational. The possible reason behind the rationality of these ITKs might be because of less deviation of seasons in ITKs with scientific recommendations.

The ITK No. 396, 422 and 434 indicate manures to improve soil fertility and the ITK No. 396 was found not rational while the other 2 ITK were found rational. The ITK No. 396 was found not rational, it might be because of inappropriate time and site of application of cowdung and urine mix. Because this mix cannot supply instant nutrients as like chemical fertilizers. The possible reason behind the rationality of the ITK No. 422 and 434 might be because of nutrient status of kitchen ash and FYM respectively.

The ITK No. 397, 399, 415, 416, 423 and 433 suggested crop rotation and mixed crops and all the 6 ITK were found rational. The ITK No. 397 and 399 indicate cultivation of bottle gourd and cucumber for additional income as boarder crop and kitchen garden respectively and the possible reason behind the rationality of the ITK might be due to their additional financial support to the farmers. The ITK No. 415, and 416 indicate mixed crop combinations and the possible reason behind the rationality might be because of their suitable combinations. The ITK No. 423 indicate cultivation of rice bean on sloppy hills and the possible reason behind the

rationality might be because rice bean cannot tolerate water logging and sloppy hills provides soil free from such condition. The maize might attract birds which predates on cabbage caterpillar thus reducing pest population was the possible reason behind the rationality of the ITK No. 433.

The ITK No. 398, 411, 426, 440 and 441 suggest harvest aspects of different vegetables and all the ITK were found rational. The ITK No. 398, 411, 426 and 440 suggest harvest indices of bottle gourd, cowpea, rice bean, and tapioca respectively and possible cause behind the rationality might be due to the right judgment about the harvest indices in the ITKs. The ITK No. 441 was found rational, it might be because irrigation makes the soil loose to make the harvest comfortable and complete.

The ITK No. 400, 401, 402, 425 and 435 suggest pest management in vegetables and all the ITK were judged rational by the scientists. The ITK No. 400, 402 and 425 suggest use of kitchen ash for pest control and possible reason behind the rationality of the ITK might be because kitchen ash acts as physical barrier against insect pests and also absorbs water from leaf surface which is essential for spore germination. The ITK No. 401 suggest use of kitchen ash and turmeric powder for pest control and the possible reason attributed was due to pesticidal properties of turmeric powder in addition to the kitchen ash. The ITK No. 435 suggest use of neem oil for control diamond backmoth in cauliflower and pesticidal properties of neem oil might be the possible cause for its rationality.

The ITK No. 403 to 407, 412 to 414, 427 and 428 representing post harvest storage of vegetables and all the ITK were found rational. The ITK No. 403, 406, 413 and 427 indicate storage of vegetable seeds in mix with kitchen ash and the possible cause behind the rationality might be because, the kitchen ash reduces the moisture content in the seed and also acts as physical barrier against insect pests ITK No. 404 and 407 indicate storage

of seed along with fruits as such after sun drying and it was found rational. This might be because the outer shells of fruit acts as physical barrier against insect pests. The ITK No. 405 indicate storage of cucumber seeds on walls of house and the possible reason behind the rationality might be because the seed completely in sun thus reducing moisture content in the seed to prevent insect attack. The less deviation of ITK from the scientific recommendations was the possible reason behind the rationality of the ITK. The ITK No. 414 was found rational, it might be because of the logical technique used in the ITK which makes the rats gets confused. The possible reason behind the rationality of the ITK No. 428 might be because the heat generated in the kitchen repels the insects.

The ITK No. 436 indicate nursery management to control soil borne insects in cauliflower and it was found rational. This might be because the heat generated by burning thrash kills the soil borne insects.

5.2.5.2 Rationality of ITK related to spices and condiments

Table 30 : Rationality of ITK related to spices and condiments

(n=30)

ITK No.	ITK	Mean score	Rationality
Chillies (<i>Capsicum annum</i>)			
442	'Rangan mirapa' is an indigenous variety of chillies with medium size capsules and plant is bush like with more odour.	1.90	NR
443	'Chitti mirapa' is an indigenous variety of chillies, capsule is little and plant is medium in size.	1.90	NR
444	'Amengme' (tribal dialect) is an indigenous green chili cultivated by tribals in drylands (Garuvu) specifically.	2.44	R
445	After two weeks of sowing seeds in nursery, the nursery is protected from hot sun by construction of 3 – 4 feet height roof with use of available sticks and leaves called 'pandiri'.	2.10	R
446	Chilly seeds are broadcasted on the raised nursery beds, covered with a layer of ash and finally covered with adda leaves.	2.72	R
447	15 – 20 days period is optimum for transplantation of chilly seedlings from nursery to the main field.	1.90	NR

448	For green chillies, well farmed intact and dark green fruits are alone picked.	2.93	R
449	Well ripened, red coloured fruits alone are harvested for dry chillies.	2.93	R
450	Thrash is burned on prepared raised nursery bed of 30 – 60 cm and well mixed with the top soil to control soil born insects. (BT)	3.00	R
451	Two rows of maize or sorghum are grown for every five rows of chillies which control mosaic disease.	2.10	R
452	Malathion is dusted on chilli plants to reduce insect problem.	1.90	NR
453	5 – 10 Kg of Kagu pindi is broadcasted in field during transplanting seedlings from nursery to protect the crop from insect pests mostly termites.	2.00	NR
454	If the seed is required for the next season, well dried fruits as such are stored for one year.	3.00	R
455	The red chillies are sun dried for 10-15 days continuously to reduce the moisture level to zero and stored in gunny bags.	2.72	R
	Coriander:		
456	'Sada dhanja' is the local variety cultivated by the tribals with the crop duration of 30 – 40 days.	1.77	NR
457	Raised beds of 1m x 10m with a height of 50 – 60 cm are prepared to grow nursery of coriander. (BT)	1.84	NR
458	10 – 20 Kg of farm yard manure is broadcasted on the nursery bed before sowing seed and water is sprinkled on it after sowing coriander seed to get quick germination.	2.50	R
459	20-25 Kg/ac of seed is used by the tribals indigenously for coriander cultivation.	1.90	NR
460	'Regara' is an indigenous implement used for intercultivation in coriander. The regara is worked immediately after broadcasting the coriander seed to get even distribution of seed in nursery. (BT)	2.20	R
461	Roots of coriander are thoroughly washed in steam and made into small packets to make it ready for sale.	2.10	R
	Turmeric (<i>Curcuma longa</i>)		
462	Turmeric is mostly cultivated as podu by the tribals.	2.00	NR
463	Farmers used to sow turmeric rhizomes by digging soil with hand hoe and covering rhizomes with soil at 3 ½ x 2 feet spacing.	2.30	R
464	Farmers believes that more number of rhizomes per plant can obtain by adopting more spacing between the plants.	2.44	R

465	Finger rhizomes are more popular as a seed material and giving good yields.	2.65	R
466	Groundnut cake is applied as manure after 15 – 20 days of sowing turmeric rhizomes.	2.30	R
467	Mulching is practiced by the farmers with farm wastes to conserve soil moisture, and to increase water holding capacity of the soils. (BT)	2.80	R
468	'Kanka' (an indigenous implement) is worked in between rows of turmeric to control weed growth and facilitate earthing up.	2.30	R
469	Harvesting of turmeric rhizomes is done by working by digging with the crow bar or spade after irrigating the field.	2.80	R
470	Turmeric is harvested 2 years continuously from the ratoon crop.	2.10	R
471	Leaf blotch disease can be controlled by planting dried palmyrah leaves in the turmeric field.	1.50	NR
472	Ash along with FYM improves the quality of turmeric and reduces the rhizome rot which is transmitted by carlbatofly.	1.90	NR
473	Harvested turmeric is boiled in water and sun dried for 15 – 20 days and rubbed on soil to make it ready for sale.	2.72	R
474	Instead of using the recommended sodium carbonate for curing the turmeric fingers, the farmers boil the turmeric fingers in cow dung solution because cow dung slurry promotes colour development.	2.10	R
475	The graded turmeric is stored in gunny bags and kept on a long benches to reduce storage pest attack.	2.44	R
	Ginger (<i>Gingiber officinale</i>):		
476	After obtaining yield from ginger the stem portion is planted for ratoon, thus getting two crops in a year.	2.00	NR
477	Ginger rhizomes having one eye are planted on ridges at a spacing of 1 x 1 feet to get maximum yields.	2.50	R
478	Mulching is done with green leaves at the time of planting ginger, to conserve soil moisture. (BT)	3.00	R
479	Frequent earthing up is practiced in ginger to enhance crop growth.	2.93	R
480	Time of harvest is indicated by the yellowing and drying of ginger leaves.	3.00	R

It could be observed from the table 30, that out of the 39 ITKs related to spices and condiments, 26 ITKs (66.69%) were found rational and 13 ITKs (33.33%) were found not rational.

The ITK No. 442, 443, 444 and 456 represent indigenous varieties of chillies and coriander and except ITK No. 444 all the three ITKs were found not rational. The possible reason behind the rationality of the ITK No.444 might be because of its higher yields. The ITK No. 442, 443 and 456 were found not rational, this might be because of availability of high yielding varieties of chillies and coriander.

The ITK No. 445, 446, 460 and 479 suggest inter cultivation in chillies (445, 446), coriander (460) and ginger (479) and all the ITK were found rational. The ITK No. 445 and 446 were found rational, it might be because chilly nursery is susceptible to hot sun and hence it was being in practice. The ITK No. 460 was found rational, it might be because the ITK gives uniform distribution of seed in nursery. The ITK No. 479 was found rational because earthing up makes the soil loose giving good tilth for crop growth.

The ITK No. 447, 459, 463, 464, 465 and 477 indicate seeds, sowing and planting and the ITK No. 447 and 459 found not rational while the remaining 4 ITK were found rational. The ITK No. 447 was found not rational, this might be because of deviation of transplantation period from the scientific recommendation. The ITK No.459 was found not rational, this might be due to the deviation of the ITK from the scientific recommendations (i.e., use of seed rate of 20-25 kg as against the recommendation of 10-15 kg /ac).

The ITK No. 463 and 477 suggest sowing of turmeric and ginger respectively and the possible reason behind the rationality of the ITK might be because of the use of appropriate method for sowing. The ITK No. 464

was found rational, it might be because adoption of more spacing gives enough space for each plant to spread their rhizomes in the soil. The ITK No. 465 was found rational, it might be because of appropriate selection of seed material in the ITK.

The ITK No.448, 449, 469 and 480 indicate harvest aspects of chillies, turmeric and gingers and all the 4 ITK were found rational. The ITK No. 448, 449 and 480 suggest harvest indices of chillies and ginger, and possible reason behind the rationality of the ITK might be because of right judgment about harvest indices in the ITK. The ITK No. 469 indicate method of harvest of turmeric and the possible reason behind the rationality of ITK might be because irrigation before harvest facilities easy and complete harvest of turmeric rhizomes.

The ITK No. 450 and 457 indicate nursery preparation of chillies and coriander respectively and the first was found rational and later was found not rational. The ITK No. 450 was found rational, it might be because the heat generated from burning trash kills soil borne insects. The ITK No. 457 was found not rational, it might be because, raised nursery beds are not essential for coriander and the preparation of the raised nursery beds in the ITK was found to be expensive.

The ITK No. 451, 462, 470 and 476 represent crop rotation and mixed cropping and the ITK No.451 and 470 were found rational while the other two were found not rational. The ITK No. 451 indicate mixed cropping of chillies with maize or sorghum and it was found rational, it cut worm and mosaic disease respectively, might be because, the maize and sorghum controls by acting as trap crop. The ITK No. 462 was found not rational, it might be because turmeric can also grow in plain soils as against the tribal's cultivation mostly on podu lands. The ITK No. 470 was found rational, it might be because the farmer gets income without any expenditure from the ratoon crop. The ITK No. 476 indicate ratooning in ginger and it

was found rational, it might be because the ratoon crop fetches additional income to the farmer.

The ITK No. 452, 453, 471 and 472 refer to pest and disease management in chillies and turmeric, and all the ITK were found not rational. The ITK No. 452 was found not rational, it might be because malathion cannot control all the insect pests which attack on chillies. The ITK No. 453 was found not rational and possible reason behind this might be that kagu powder might not show any pesticidal properties. The ITK No. 471 was found not rational and possible reason behind this might be because palmyrah leaves does not have any fungicidal properties. The possible reason behind the non rationality of ITK No. 472 might be because, ash along with FYM might not have any insecticidal properties.

The ITK No. 454, 455, 461, 473, 474 and 475 indicate post harvest management of chillies (454, and 455), coriander (461) and turmeric (473, 474 and 475) and all the 6 ITK were found rational. The ITK No. 454 and 455 emphasis sun drying of chillies for better storage and possible reason behind the rationality of the ITK might be because sun drying reduces moisture content and thus reducing pest attack. The possible reason behind the rationality of the ITK No. 461 and 473 might be because of less deviation of the ITK from the scientific recommendations. The ITK No. 474 was found rational and possible reason behind this might be because, the indigenous input (cow dung) used in the ITK substantiate the recommended sodium carbonate. The ITK No. 475 was found rational, it might be because the place of storage reduces the physical contact from the soil and useful enough to reduce pest attack.

The ITK No. 458 and 466 suggest application of indigenous manures and both were found rational. The possible reason behind their rationality might be because of nutrient status of farm yard manure and groundnut cake respectively.

The ITK No. 467 and 478 indicate mulching in turmeric and ginger for moisture conservation and both were found rational. This might be because, use of available resources to conserve enough moisture.

The ITK No. 468 indicate intercultivation and weed management in turmeric and it was found rational. The possible reason behind the rationality might be because of suitability of the farm implement for inter cultivation and to check weed growth.

5.2.5.3 Rationality of ITK related to fruit crops

Table 31 : Rationality of ITK related to fruit crops

(n=30)			
ITK No.	ITK	Mean score	Rationality
Pine apple (<i>Anona sqamosa</i>)			
481	'Panasa kaya' is the traditional Pine apple variety which is mostly cultivated by the tribals.	2.10	R
482	'Sada Anasa Panasa' is an indigenous pine apple variety with small fruits which are more juicy in nature.	2.20	R
183	July – August is the optimum season for sowing Pine apple hence it is practiced.	2.65	R
184	Six inches long suckers collected from mother plant weighed for 200 – 300 gm are perceived to be suitable for planting.	2.50	R
185	Farmers used to maintain 2 x 2 feet spacing in Pine apple cultivation.	2.44	R
186	Weeding is practiced along rows in Pine apple in early stages of crop growth i.e., before 2 months age.	2.93	R
187	Pine apple yields within 18-24 months after which two ratoons are allowed.	2.80	R
188	Mulching is practiced with crop wastes to retain soil moisture and to improve water holding capacity of the soil in pine apple field. (BT)	2.80	R
480	Growing tip of pine apple is nipped to obtain fruits with more size and weight.	2.20	R
490	Yellow colouration and size of the fruit is the indication of harvest time in pine apple.	2.80	R
491	The sucker bearing fruit is desuckered after harvesting the fruit thus allowing the other suckers to grow.	3.00	R

	Banana (<i>Musa paradisiaca</i>):		
492	'Konda arati' is a traditional banana variety cultivated by tribal farmers which requires less water.	2.44	R
493	'Yerra arati' is an indigenous high yielding banana variety which is grown where more water is available.	2.30	R
494	'Bathadigela' is a traditional banana variety grown by tribals for culinary purpose.	2.10	R
495	'Komma arati' is an indigenous banana variety bearing big long slender green fruits is cultivated.	2.72	R
496	'Konda mukhiri' is an indigenous banana variety bearing small yellow colour fruits is cultivated by the tribals.	2.44	R
497	6 – 8 feet spacing is maintained by the tribals in banana cultivation.	2.30	R
498	The suckers with 2 – 3 kg weight and 1 feet length are selected for planting.	2.00	NR
499	Before planting the suckers, 10 kg of FYM and 1 Kg Urea is applied as basal manure. (BT)	2.65	R
500	Before selecting banana suckers from a field the bunches of the mother suckers are seen for bunch weight and healthiness.	2.72	R
501	Tribals used to desucker the main sucker after harvesting thus allowing other suckers to grow.	3.00	R
502	For banana neem cake is applied @ 250 gms/sucker during 4 – 8 months age.	2.30	R
503	Banana is ratooned upto three years by the tribal farmers on podu, to get additional income from the same crop.	2.80	R
504	Inter cropping in banana with tuber crops like tapioca is practiced during first year.	3.00	R
505	Desuckering is done from 3 months after planting upto flowering.	2.80	R
506	Earthing up is practiced once in 2 to 3 months to prevent soil erosion and to conserve soil moisture.	3.00	R
507	Drying of the top leaves, change of skin colour to light green, brittleness of the floral ends are the symptoms for harvesting.	3.00	R
508	Banana flag leaf is tied at the top of the bunch which prevents sun stroke and ensure healthy bunch.	2.65	R
509	Periodical search to identify the bunchy top diseased plants and destroying them along with the suckers is practiced to eliminate the source of the disease.	3.00	R
510	Banana bunches are tied with the banana leaves to protect it from hot sun and to increase keeping quality.	2.72	R

	Cashew (<i>Anacardium occidentale</i>)		
511	Cashew nuts are collected by the farmers by watching the yields of particular plants regularly.	2.44	R
512	Farmers sow cashew nuts in polythene covers filled with soil and farm yard manure and grow nursery for their plantations by their own.	2.72	R
513	Farmyard manure (2 kg) and urea (0-50 kg) is used to apply at base if the plant immediately after transplanting cashew seedlings to give nutrients to transplanted seedlings (BT).	2.44	R
514	Cashew is inter cropped with sesamum, black gram or green gram upto five years age of cashew to substantiate income during prebearing period.	3.00	R
515	The cashew orchard is ploughed regularly to reduce weed problem and to give good tilth.	3.00	R
516	Debudding of cashew flowers is done upto the age of five years to enhance vegetative growth during the period.	2.65	R
517	Cloth is hanged on top of the cashew plant to scar away the birds.	1.90	NR
518	'Vadisa' is an indigenously made rope like pouch, in center of it a net will be there to host a small stone. The stone is thrown on birds by making rounds in air and thus realising stone lured to greater distance chasing away the birds.	2.20	R

The findings from the table 31, shows that among the 38 ITKs related to fruit crops, 36 ITKs (94.74%) were judged rational and 2 ITKs (5.26%) were judged not rational by the scientists.

The ITK No. 481, 482 and 492 to 496 represent indigenous varieties of pineapple and banana and all the ITKs were judged rational. The possible reason behind the rationality of the ITK might be because of the performance of indigenous varieties.

The ITK No. 483 indicate seasons in pineapple cultivation and it was found rational. The possible reason behind the rationality of the ITK a

might be because of less deviation of season in ITK from scientific recommendation.

The ITK No. 484, 485, 497, 498, 500, 511 and 512 indicate seeds and planting and except the ITK No. 498 all the ITK were found rational. The ITK No. 484 and 497 indicate spacing in pineapple and banana respectively and possible reason behind the rationality of ITK might be because of less deviation from the optimum spacing. The ITK No. 485, 498, 500 and 511 indicate selection of seed material of pineapple (485), banana (498 and 500) and cashew (511) and the ITK No. 498 was found not rational while the other 3 ITK were found rational. The possible reason behind the rationality of the ITK No. 485, 500 and 511 might be because of their less deviation and right judgment in selection of seed material. The ITK No. 498 was found not rational, this might be because of more deviation of ITK from the scientific recommendations. The ITK No. 512 indicate nursery management for cashew plantation and it was found rational. The possible reason behind the rationality of the ITK might be because of the appropriateness of the practice and its suitability to farming situation in the zone.

The ITK No. 486 and 515 indicate weed management in pineapple and cashew respectively and both the ITK were found rational. The possible reason behind the rationality of the ITK No. 486 might be because of requirement of regular weeding during early stages of crop growth. The ITK No. 515 was found rational, it might be because of less deviation of ITK from the scientific recommendation.

The ITK No. 487, 491, 501, 503, 504 and 514 refers to crop rotations and inter cropping in fruit crops and all the ITKs were found rational. The ITK No. 487 and 503 refer to ratooning in pineapple and banana and the possible reason behind the rationality might be because the ratoons substantiate enough income to the farmers without investment. The

ITK No. 491 and 501 indicate desuckering in pineapple and banana and the possible reason behind the rationality might be because of its less deviation from the scientific recommendations. The ITK No. 504 and 514 indicate inter cropping in banana and cashew and the possible reason behind the rationality of the ITK might be because, during prebearing period these inter crops supports the farmer financially.

The ITK No.488 and 506 suggest soil and water management practices in pineapple and banana and both were found rational. The ITK No. 488 suggest mulching with crop wastes to conserve moisture and possible reason behind the rationality of the ITK might be because the ITK utilizes the available resources affectively for conservation of moisture. The ITK No. 506 suggest earthing up in banana and the possible reason behind the rationality of the ITK might be because of its less deviation from the scientific recommendation.

The ITK No. 489 concerned with crop management of pineapple and it was found rational. The possible reason behind the rationality of the ITK might be because of less deviation of ITK from the scientific recommendation. The ITK No. 490 and 507 suggest harvest indices in pineapple and banana and both were found rational. The right judgment about the harvest indices in the ITK might be the possible reason for the rationality of these ITKs.

The ITK No. 499, 502 and 513 indicate application of indigenous manures and all the 3 ITK were found rational. The possible reason behind the rationality of these ITK might be due to their nutrient status and method of application.

The ITK No.505, 508, 510 and 516 indicate inter cultivation practices in banana and cashew and all the 4 ITK were found rational. The possible

reason behind the rationality of the ITK might be because of their less deviation from the scientific recommendations.

The ITK No.509, 517 and 518 indicate pest and disease management in banana and cashew. The ITK No. 509 and 518 were found rational while the other was found not rational. The possible reason behind the rationality of the ITK No. 509 might be because, the ITK reduces the disease by checking spread of the disease from one plant to the other. The ITK No.518 indicate bird control in cashew and the possible reason behind the rationality of the ITK might be because, this method scares away the birds physically. The ITK No.517 indicate bird management in cashew and it was found not rational. This might be because of its inefficiency to scare away the birds.

5.3 ATTITUDE OF FARMERS TOWARDS INDIGENOUS TECHNICAL KNOWLEDGE (ITK) AND THEIR BLENDING WITH MODERN TECHNOLOGIES

Indigenous Technical Knowledge (ITK), since it is based on accumulated experience, much fitted to the local situation and social system, effective and environment friendly so there is a need to blend such indigenous technical knowledge with modern technology to improve competence of the practice. Hence, it is essential to find out the attitude of farmers towards Indigenous Technical Knowledge (ITK) and their blending with modern technologies. The constructed attitude scale consists of 24 statements and was referred to sample farmers to know their attitude towards Indigenous Technical Knowledge (ITK) and their blending with modern technologies.

Based on the collected data, the respondents were classified in to five groups as highly favourable, favourable, neutral, unfavourable and highly unfavourable by using score range and the results are given in the table 32.

Table 32 : Attitude of farmers on ITK and their blending with modern technologies

(n=180)			
S. No.	Attitude category	Frequency	Percentage
1	Highly favourable	10	5.55
2	Favourable	118	65.56
3	Neutral	32	17.78
4	Unfavourable	14	7.78
5	Highly unfavourable	6	3.33
	Total	180	100.00

It was evident from the table 32, that majority of the respondents (65.56%) had favourable attitude followed by neutral attitude (17.78%), unfavourable attitude (7.78%), highly favourable attitude (5.55%) and highly unfavourable attitude (3.33%) towards Indigenous technical knowledge and their blending with modern technologies. These finding shows that the higher favourable attitude of farmers towards indigenous technical knowledge and their blending with modern technologies.

These findings clearly indicate that the farmers were very much aware about the existence of ITK and their blended technologies and also convened on their effectiveness as alternative to modern technologies. The higher favourable attitude might be because of more attachment of tribals towards their culture and traditions because of less urbanization and cosmopolitaness. It was suggested that concerted effort should be taken to identify and test verify the widely prevalent ITKs and their blended technologies so that the location specific items could be popularized to supplement or replace the modern technologies where ever possible. The results are in concordance with Somasundaram (1995) and Rambabu (1997).

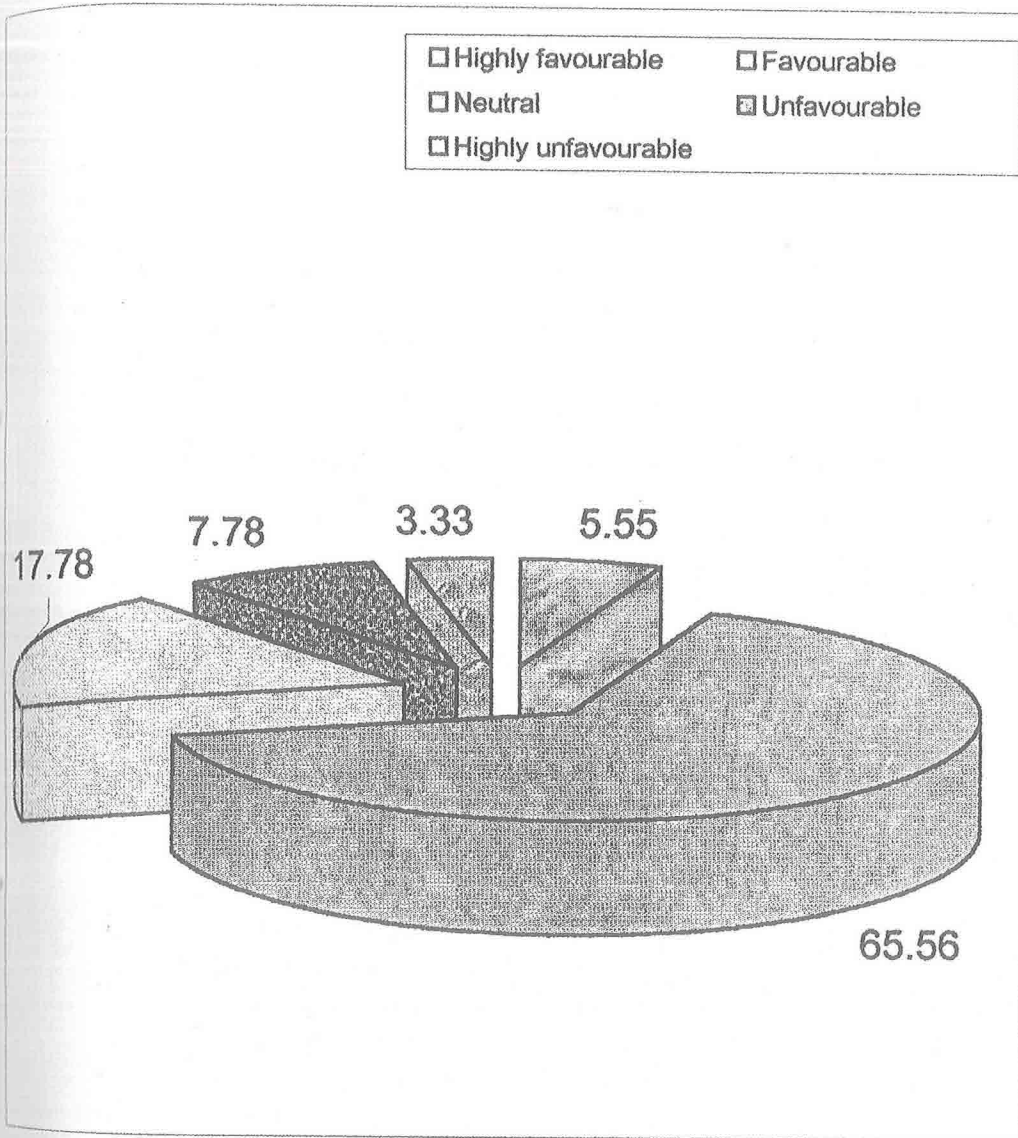


Fig.8 Attitude of the farmers on ITK and their blending with modern technologies

5.4.2 Item Wise Extent of Adoption of ITK in Agriculture

Item wise extent of adoption of ITK in agriculture was studied to know the extent of adoption of all the documented ITKs in the study. This gives a comprehensive idea about the adoption of ITK in agriculture and hence it was presented in the forthcoming pages. In this study complete adoption by more than 50.00 percent of the respondents was considered as higher complete adoption and non-adoption by more than 50.00 percent of the respondents was considered as lower adoption.

5.4.2.1 Itemwise extent of adoption of ITK on general agriculture

Table 33: Extent of adoption ITK on general agriculture

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
1	Summer ploughing is practiced by the farmers during April-May which exposes the soil to hot sun so that the soil born insects will be killed by heat.	30	75.00	6	15.00	4	10.00
2	Sheep penning and cattle penning are practiced during summer for 2-3 days in each field to improve soil fertility.	19	47.50	16	40.00	5	12.50
3	Farmyard manure (FYM) is applied to the soil every year during summer without fail to improve soil fertility.	29	72.50	7	17.50	4	10.00
4	The pooled household garbage is used as manure after its putrification which enhances the fertility of the soil.	19	47.50	8	20.00	13	32.50
5	Tribals incorporate ash in to the soil which believed to reclaim the soil gradually and improves fertility.	04	10.00	19	47.50	17	42.50
6	Three ploughings for cultivation of ragi, and 2 ploughings for cultivation of Sama, Korra, ganti are sufficient.	16	40.00	17	42.50	7	17.50

7	Ploughing after shower during the pre-sowing season to conserve enough moisture for the crop, remove weeds and ensure good crop.	24	60.00	14	35.00	2	5.00
8	Application of sand from river beds during summer is practiced to increase the fertility and infiltration rate of black soil.	10	25.00	10	25.00	20	50.00
9	'Bali' is practiced by the tribal farmers during nursery preparation, transplantation, grain formation and harvesting of major crops like paddy, ragi and red gram.	28	70.00	6	15.00	6	15.00
10	Application of gypsum to the soil is practiced to correct alkalinity.(BT)	14	35.00	15	37.50	11	27.50
11	Tuvvatam (digging) with use of 'Kanka' along the slope is done before sowing the crop.	20	50.00	13	32.50	7	17.50
12	Deep ploughing is practiced during summer to improve water holding capacity of soil and to conserve enough soil moisture.	27	67.50	13	32.50	0	0
13	Laying stone bunds around the fields across the slope for preventing soil erosion and for conserving moisture is practiced.	09	22.50	18	45.00	13	32.50
14	Excessive application of farm yard manure (FYM) is practiced to improve the soil texture.	13	32.50	17	42.50	10	25.00
15	Application of hill soil (Konda mannu) is practiced to increase the water holding capacity of red soils.	15	37.50	9	22.50	16	40.00
16	Repeated ploughing during summer is practiced to reduce weed population in dry lands.	24	60.00	16	40.00	0	0
17	Profuse weed growth after rain is an indication for high soil fertility.	15	37.50	20	50.00	5	12.50

18	Fouls stretch their feathers in hot summery days which indicates the rain incidence of rain.	6	15.00	28	70.00	6	15.00
19	Ants changes their eggs from one place to another which indicates initiation of rains.	12	30.00	20	50.00	8	20.00
20	Hallow around the moon indicates occurrence of rains.	3	7.50	36	90.00	1	2.50
21	Hallow near to moon indicates rains far away.	7	17.50	28	70.00	5	12.50
22	It will rain if termite fly in large number in the air at 10 – 20 fts height	9	22.50	26	65.00	5	12.50
23	If a rainbow appears in the east in the evening or West in the morning, it will rain.	8	20.00	30	75.00	2	5.00
24	Streaks of lightening in the east with rainbow in the West would lead to rain.	3	7.50	31	77.50	6	15.00
25	If the sky becomes dark near the horizon, there will be instant rain.	3	7.50	37	92.50	0	0
26	If the North wind blows, it will surely rain.	10	25.00	30	75.00	0	0
27	Ants raising mounds is an indicator of rains.	9	22.50	27	67.50	4	10
28	Rain can be forecasted by looking at the sight of burrow of ants.	4	10.00	32	80.00	4	10
29	If white ant take wing in the evening, it will rain exclusively.	3	7.50	33	82.50	4	10
30	Flying dragon flies indicates rain fall	8	20.00	32	80.00	0	0
31	Rain follows the frogs crocking.	6	15.00	30	75.00	4	10
32	Even if the seeds are of good quality, they must be sown in the right season to get higher yields.	4	10.00	36	90.00	0	0
33	New moon day or days before new moon day is better for sowing or harvesting any crop.	4	10.00	26	65.00	10	25
34	It is better to avoid sowing on Ashtami (eighth) and Navami (ninth) days from full moon and new moon days.	11	27.50	18	45.00	11	27.50

35	Ragi, red gram and black gram seeds are mixed and broadcasted in field and harvested each separately in parts of tribal area zone.	7	17.50	12	30.00	21	52.50
36	Seed stored from the previous year is taken out only after celebrating 'Itukula Panduga' which comes during April to May months.	8	20.00	6	15.00	26	65.00
37	If rains are delayed beyond the season (too late) niger is cultivated for subsidiary income.	19	47.50	14	35.00	7	17.50
38	Farmers practiced to change seeds once in two years to get good seed vigour.(BT)	26	65.00	9	22.50	5	12.50
39	Red gram is mixed cropped with sorghum + korra + ganti + junuvulu. The seeds of sorghum, korra, ganti and junnuvulu are mixed and broadcasted in the field. Red gram is sown by digging holes using an indigenous implement called 'Kanka' at 1 meter spacing after broad casting the mixed seed.	8	20.00	16	40.00	16	40.00
40	Intercultural operations and timely weeding are essential for rainfed agriculture thus followed to possible extent.	14	35.00	19	47.50	7	17.50
41	In mixed crop, korra yields first followed by junuvulu, sorghum, ganti and finally farmers harvest red gram.	12	30.00	13	32.50	15	37.50
42	Continuous submergence of the field for some time is practiced if water is available which controls the weeds.	7	17.50	29	72.50	4	10.00
43	Konda Puja (prayer to hill) is practiced by the farmers collectively before harvesting the major crops such as paddy, red gram, ragi etc.	17	42.50	10	25.00	13	32.50
44	Mesta or sesamum is grown as summer crop preceding to paddy which give additional income which inturn useful as investment for paddy crop.	14	35.00	24	60.00	2	5.00

	Plant protection						
45	Collection and burning of insects is practiced by the farmers in initial stages of pest attack. (BT)	28	70.00	10	25.00	2	5.00
46	Stones are kept in a leather pouch tied with string thus releasing the stones with lured to a greater distance chasing away the birds.(BT)	18	45.00	15	37.50	7	17.50
47	Jatropha is planted as fence around the crop which repels goats and can serve as a strong fence against animals.	4	10.00	10	25.00	26	65.00
48	A man like effigy made up of straw wearing a dress is used to keep at the centre of the field. The birds fly away because of human appearance in the field.	13	32.50	23	57.50	4	10.00
49	A man like effigy made up rice straw wearing a dress and head is covered with a earthen wear made like a human head is used to keep in the centre of the field. The birds fly away because of human appearance in the field.	4	10.00	19	47.50	17	42.50
50	Continous drizzling encourages the spread of pests and disease.	14	35.00	22	55.00	4	10.00
51	There will be no incidence of pest and diseases if neem leaves are applied as basal manure.	16	40.00	21	52.50	3	7.50
52	Burning the dry stalks in the field and dusting the ash on the field to control diseases is practiced by the tribals.(BT)	20	50.00	18	45.00	2	5.00
53	Digging rat burrows and killing rats after each harvest is practiced to reduce the rat population in the field.	7	17.50	16	40.00	17	42.50
54	Rat damage is reduced by throwing fresh cow dung on both the bunds and field.	7	17.50	13	32.50	20	50.00

55	Tribals now and than beats empty iron tin with a stick to scare away the animals and birds which destroy the crop.	9	22.50	16	40.00	13	32.50
56	Guns are used by the tribals to kill wild animals which destructs the crops like maize, sorghm etc. in some parts of high attitude and tribal area zone.(BT)	3	7.50	8	20.00	29	72.50
57	Indigenous arrows (Banalu) are used to ward off wild animals which damage food crops by the tribals.	3	7.50	12	30.00	25	62.50
58	'Adapa' is stone trap used to kill wild animals. A flat heavy stone made like a hut opening onside placing a trap support called mita inside the stone hut. When the animal touches the mita the whole structure falls on the animals thus killing it.	6	15.00	2	5.00	32	80.00
59	Farmers used to stay in the field during nights to ward of wild animals and farm women watches the field during day times.	14	35.00	18	45.00	8	20.00
	Post harvest technology						
60	Neem leaves are mixed with seeds and stored for long time which prevents pest attack.	29	72.50	7	17.50	4	10.00
61	For maximum storage period, grains must be dried to greatest possible extent.	20	50.00	18	45.00	2	5.00
62	Cup shaped structure knitted with Buhenia leaves called as Burudi (Vernacular name) in which grains are stored.	17	42.50	20	50.00	3	7.50

63	A whole is made to a big size bottle gourd and pour hot water and ash in it and allowed for 2 days. The hallow bottle gourd is cleaned with water and dried for 5-10 days. This indigenous storage structure is known as 'Anapatumba' which is used to store seeds like red gram, black gram, green gram etc. It is sufficient to store 4-6 kg of seed up to ten years which prevents the attack of insects and rodents.	14	35.00	23	57.50	3	7.50
64	Farmers used to store paddy and pulses in earthen pots or gunny bags kept on planks suspended in the kitchen. They believe that the smoke emitted from chulahs during cooking prevents storage pest attack.	14	35.00	12	30.00	14	35.00
65	Storing food grains in big drums made up of clay and pasted with cow dung outside the drum.	15	37.50	19	47.50	6	15.00
66	Farmers used to apply fresh mud mixed with cow dung to the granaries before each new crop is stored.	19	47.50	18	45.00	3	7.50
67	Seeds are stored in indigenously made storage structure called 'butti' (Telugu) which is made up of bamboo in different sizes	19	47.50	14	35.00	7	17.50
68	Seed are stored in gunny bags in mix with malathion to prevent storage pest attack (BT).	4	10.00	26	65.00	10	25.00
69	De husking and crushing of millets and pulses is done by use of indigenously made stone crusher called Thiragali (Telugu name). This is a modification of wooden crusher.	18	45.00	13	32.50	9	22.50

70	Harvested produce of millets is threshed by keeping the crop on roads and allowing the vehicles to pass on it to separate the grain is practiced.	24	60.00	15	37.50	1	2.50
71	Seed material is stored in earthen pots which is kept on the roof inside the houses directly above the furnace in the kitchen. The smoke acts as repellent to the insects.	20	50.00	12	30.00	8	20.00
72	The seeds are generally stored along with the leaves of neem, thulasi, in gunny bags.	16	40.00	17	42.50	7	17.50

The findings from the table 33, show, that out of the 72 ITKs on general agriculture, more than 50% of the respondents were adopted 14 ITKs (19.44%) completely, 25 ITKs (34.72%) partially and 7 ITKs (9.72%) were not adopted by more than 50% of the respondents.

The 14 ITKs (19.44%) completely adopted by more than 50% of the respondents were ITK No. 1, 3, 7, 9, 11, 12, 16, 38, 45, 52, 60, 61, 70 and 71. The higher complete adoption of the ITK No. 1 (summer ploughing). ITK No. 12 (Deep ploughing during summer) and ITK No. 16 (Repeated ploughing during summer) was because farmers are free from farm operations during summer and hence adopt the ITKs. The higher complete adoption of the ITK No. 7 (ploughing after shower) was due to the farmers perceived importance to the practice in conservation of moisture and removal of weeds. The ITK No.11 (Tuvvatam with the use of 'kanka') was adopted completely by more than 50% of farmers though it was a not rational practice. The higher adoption was because of non availability of alternative practice for this, because it is not possible to plough with the use of animals or tractor on slope.

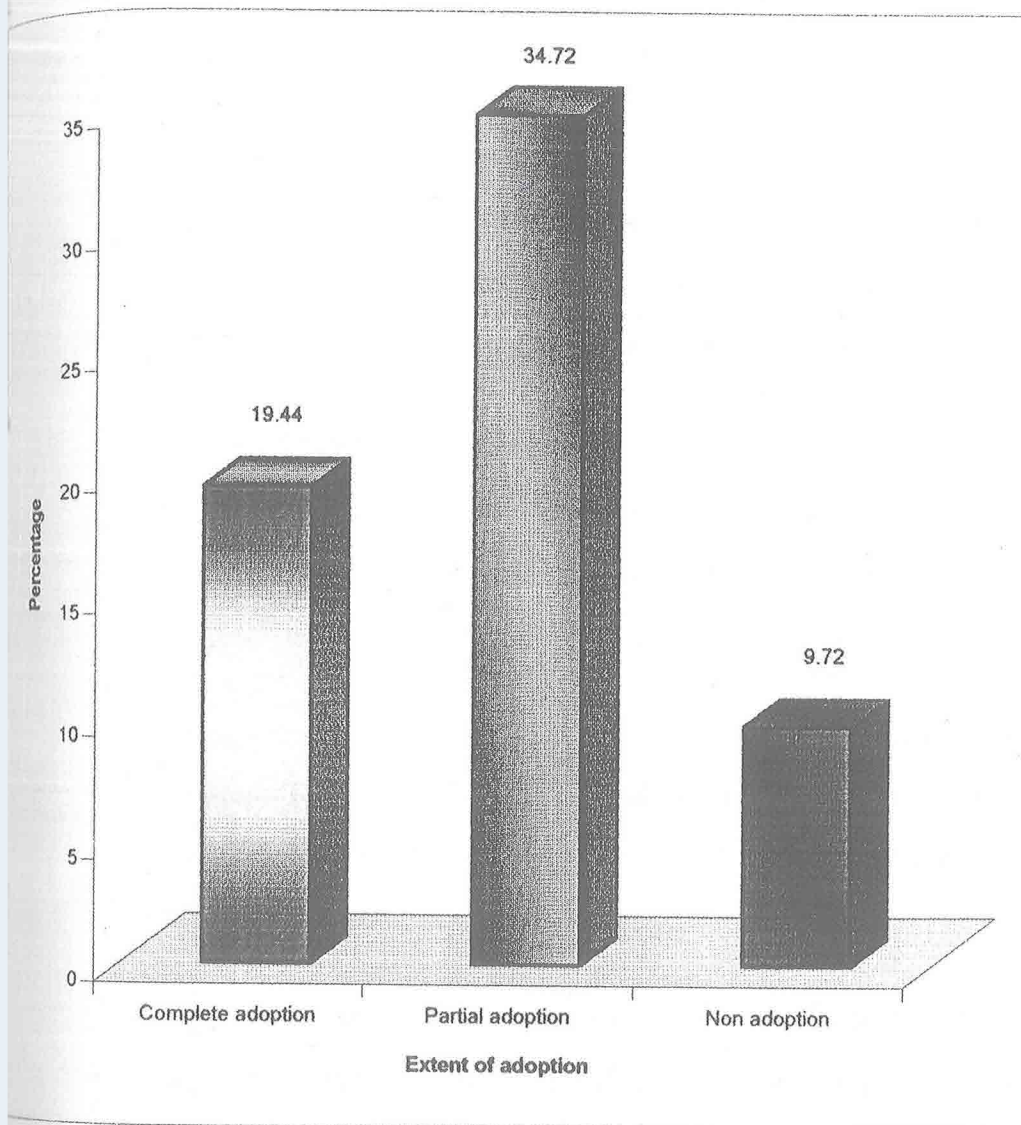


Fig.9: Extent of adoption of ITK on general agriculture

Easy availability of the farmyard manure and its perceived importance in enhancement of soil fertility were the possible cause behind the higher complete adoption the ITK No.3 (Farm yard manure is applied to the soil).

The ITK No. 9 ('bali' is practiced by the tribals) was adopted completely by more than 50% of the respondents although the ITK was found not rational. The traditions and mores of the tribals were the possible causes behind the higher complete adoption of the ITK.

The possible reason behind the higher complete adoption of the ITK No.38 (Farmers practiced to change seeds) was due to its rationality and farmers knowledge on loss of seed vigour over the years.

The ITK No.45 (collection and burning of insects) and ITK No.52 (burning the dry stalks in the field) suggest pest and disease management. The complete higher adoption of both the ITK was due to the observed benefits by the adoption of these ITK and cost effective means of pest management.

The higher complete adoption of the ITK No.60 (Neem leaves are mixed with seeds) was due to knowledge of farmers on pesticidal properties of neem and hence they store the seed in mix with neem leaves. The higher complete adoption of the ITK No.61 (for maximum storage period) was because it involves no cost and also simple to adopt. The higher adoption of the ITK No.69 (Dehusking and crushing of millets and pulses) was because of unavailability of alternative methods, which suits to small scale processing of millets and pulses. The possible reason behind the higher complete adoption of the ITK No. 71 was because of its rationality and

farmers interest in storing the seed directly above the furnace which they perceive as a safe method.

The 26 ITK (36.11%) were adopted by more than 50% of the farmers but these ITK were adopted partially i.e., on part of the land or in patches. The ITK No. 17 to 33 which are mostly beliefs on rain forecasting were adopted partially because though they have knowledge on these beliefs they are not able to depend on them completely. The ITK viz., continuous submergence of the field, mesta or sesamum is grown as summer crop. A man like effigy, continuous drizzling, there will be no incidence of pests and diseases, cup shaped structure, a whole made to a big size bottle good were also adopted partially by more than 50% of the respondents.

The ITK (9.72%) not adopted by more than 50% of the respondents were ITK No.8, 35, 36, 54, 56, 57 and 58 which indicates the lower adoption of the ITKs. The lower adoption of the ITK No.8 (application of sand from river beds) was due to the more distance of the fields from the river and transportation problems. The lower adoption of the ITK No.35 (ragi, red gram and black gram) was due to its inappropriate combination and not rational nature of the ITK. The non rationality associated with the ITK No.36 (seed stored from the previous year) and ITK No.54 (rat damage is reduced by throwing fresh cow dung was possible cause for lower adoption) of these ITKs.

The lower adoption of the rational ITK No.56 (Guns are used by the tribals). ITK No. 57 (Indigenous arrows are used) and ITK No. 58 ('Adapa' is a stone trap used to kill wild animals) was due to reduced damage by the wild animals on field crops.

5.4.2.2 Item wise extent of adoption of ITK on podu cultivation

Table 34 : Extent of adoption of ITK on podu cultivation

(n=35)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
73	Tribals practiced shifting cultivation locally known as 'podu'. There are two types of podu practiced by the tribals i.e., 'chelaka podu' (plain forest clearance) and konda podu (podu in steep hills).	27	77.14	7	20.00	1	2.86
74	Podu is used to start by the farmers during summer (after celebrating Nandi panduga festival) by clearing the bushes with use of knife, sickle, axe etc. and burning them. They allows it for some days and with onset of monsoon they start sowing seeds, after working with spades.	24	68.57	11	31.43	0	0
75	April – May is found to be the optimum season to start the process of podu cultivation.	25	71.43	10	28.57	0	0
76	Bushes are cleared during November, December and keep it to sundry up to kotha Amavasya (March) than burn it and plough to make it ready for cultivation in some parts of high altitude and tirbal area zone.	12	34.28	3	8.57	20	51.14
77	Podu cultivation improves fertility of native soil because more number of crops are grown on the same piece of land.	16	45.71	5	14.29	14	40.00
78	Farmers used to cultivate the podu for three years and then they shift the cultivation in search of new land.	24	68.57	11	31.43	0	0
79	In konda podu (podu on steep hills) digging with spades (Tuvvuta) is practiced instead of ploughing as in the case of 'banda podu' (podu at hill bases)	27	77.14	6	17.14	2	5.71

80	Tribals believes that podu cultivation has no harmful effects an overall rainfall pattern and even on infiltration of rain water.	8	22.86	16	45.71	11	31.43
81	During the first year of podu cultivation (Kotha bhumi) red gram and paddy (konda danyam) mixed crop is grown. Farmers use 20 kg paddy+ 3 kg of red gram per acre of podu land.	24	68.57	5	14.29	3	8.57
82	Korra +sorghum+red gram+cowpea are cultivated as mixed crop in konda podu during second year.	32	91.43	1	2.86	2	5.71
83	3-4 kg of mix of all available seeds are broadcasted per acre of soil in podu cultivation during 3 rd year .	29	82.86	5	14.29	1	2.86
84	Sorghum +cowpea in grown as mixed crop during the first year of podu in some parts of high altitude and tribal area zone.	7	20.00	2	5.71	26	74.18
85	Budamalu (Mettu danyam) and red gram are mixed cropped during second year by the tribals in some parts of high altitude and tribal area zone.	12	34.28	10	28.57	13	37.14
86	'Ganti' followed by Black gram or green gram are cultivated during third year of podu in some parts of high altitude tribal area zone.	19	54.28	3	8.57	14	40.00
87	Farmers mix the seeds of korra and sorghum and broadcast in field. After this by use of a kanka, they dig the soil at 2-3 feet distance and drop two seeds of red gram in each hole and than closes the hole with soil..	28	80.00	4	11.43	3	8.57
88	In some areas of high altitude and tribal area zone ganti + sorghum + korra + sama mixed cropping is followed in podu.	8	22.86	9	25.71	18	51.43

89	Weeding is practiced by the farmers in podu cultivation without fail because in podu lands weed problem is more.	18	51.43	11	31.43	6	17.14
90	Weeding twice is practiced in new podu land (kotha podu) and once in old podu land (patha podu) because weed problem is more in new podu land.	21	60.00	10	28.57	4	11.43
91	Weed problem is more in podu cultivation compared to plain cultivation because some weeds could survive by means of rhizomes, corms etc. where weeding is practiced regularly.	11	31.43	21	60.00	3	8.57
92	Difference in maturity period for crops gives opportunity to harvest each crop separately, farmers harvest first korra followed by sama, junuvulu, ganti, sorghum and finally red gram.	16	45.71	18	51.43	1	2.86
93	Tribals followed Karthe to initiate every farm operations in podu cultivation.	9	25.71	19	54.28	7	20.00
	Plant Protection :						
94	After clearing vegetation setting of fire is practiced in podu cultivation which improves soil fertility, kills insects and reduces weed problem	19	54.28	16	45.71	0	0
95	The operation of thuvvatam (digging) is practiced with 'kanka' indigenous implement after burning the bushes, with this crop sowing operation initiates, which kills the soil borne insects.	28	80.00	7	20.00	0	0

It could be observed from the table 34, that among the 23 ITKs on podu cultivation, more than 50% of the respondents adopted 14 ITKs (60.87%) completely, 3 ITKs (21.43%) partially and 3 ITKs (21.43%) were not adopted by more than 50% of the respondents.

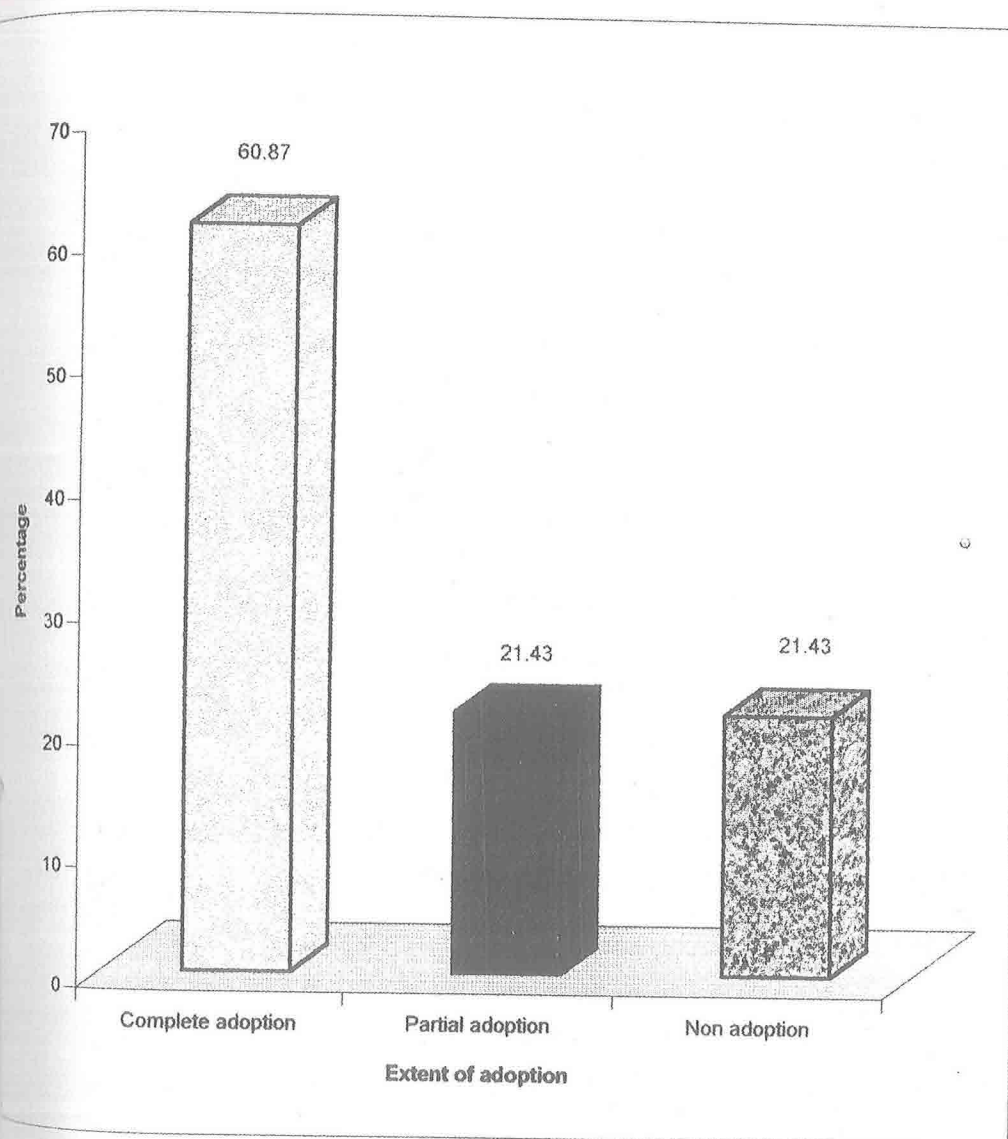


Fig.1c: Extent of adoption of ITK on podu cultivation

The 14 ITKs (60.87%) adopted completely by more than 50% of the respondents were the ITK No.73, 74, 75, 78, 79, 81, 82, 83, 86, 87, 89, 90, 94 and 95. The higher complete adoption of the ITK No.73 (Tribals practiced shifting cultivation locally) was because the ITK was so common to practice and its importance in shifting cultivation.

The ITK No. 74 (podu is used to start by the farmers during summer) and ITK No.79 (In Kondapodu, digging with spades) indicate preparatory cultivation in podu. The higher complete adoption of the ITK No.74 was because, during summer farmers are free from farm operations and hence they start the process of podu cultivation. The possible reason behind the higher complete adoption of the ITK No.79 was because there is no alternative method except digging with implements on steep hills. The cause for higher adoption of the ITK No.75 (April - May is found to be optimum) was same as the ITK No. 74.

The ITK No. 78 (Farmers used to cultivate the podu), ITK No. 81 (During the first year of podu cultivation), ITK No. 82 (Korra + sorghum + red gram and cowpea), ITK No. 83 (3-4 kg of mix of all the available seeds), ITK No. 86 (Farmers mix the seeds of korra and sorghum) indicate crop rotation and mixed cropping in podu cultivation. The higher complete adoption was due to availability of the seeds of these crops and rationality behind these ITK.

The ITK No. 89 (Weeding is practiced by the farmers in podu) and ITK No. 90 (Weeding twice is practiced) suggest weed management in podu lands and the higher complete adoption was due to simple nature of the ITK, the cost involved and the farmers perceived importance on weed management in podu lands.

The ITK No. 94 (After clearing vegetation) and the ITK No. 95 (The operation of digging) indicate test and soil fertility management in

podu cultivation and higher complete adoption was due to farmers favourable attitude towards the practice in improving soil fertility and pest management.

The ITK No. 91 (Weed problem is more in podu cultivation) ITK No. 92 (Difference in maturity periods) and the ITK No. 93 (Tribals followed karthe) were partially adopted by more than 50% of the respondents. These ITK were adopted by the farmers in part with patches in their fields rather than completely. The difficulty involved in complete adoption of these ITK was the major reason for partial adoption of these ITK.

The ITK No. 76 (Bushes are cleared during November) was not adopted by more than 50% of the respondents because during the month of November most of the farmers are busy in their crop operations and also this practice was not popular throughout the zone. The ITK No. 84 (sorghum + cowpea is grown) and ITK No.88 (In some areas of high altitude and tribal area) indicate indigenous mixed crop combinations and the lower adoption was because they are not popular through out the zone.

5.4.2.3 Item wise adoption of ITK on paddy

Table 35 : Extent of adoption of ITK on paddy

ITK No.	ITK	(n=40)					
		CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
96	'Arudhra Karthe' (June – July) is suitable season for sowing mettudanyam (paddy variety-light) which is an early matured variety(short duration).	4	10.00	23	57.50	13	32.50
97	'Mrugasira Karthe' (June) is suitable season for sowing late maturing (long duration) varieties of paddy.	4	10.00	31	77.50	5	12.50

98	'Mrugasira karthe' (June) is the optimum season for growing paddy nursery.	3	7.50	32	80.00	5	12.50
99	'Punarvasa karthe' (July) is suitable season for transplantation of paddy seedlings into mainfield.	3	7.50	31	77.50	6	15.00
100	If nursery is sown in 'Arudhra karthe' (June - July) the seedlings will not grow well because of Arudhra dosam.	4	10.00	30	75.00	10	25.00
101	If paddy is sown in 'Arudhra karthe' (June - July) requires more seed	3	7.50	24	60.0	13	32.50
102	Transplanting paddy during punarvasa to ashlisha (July - August) period gives higher crop yields and hence practiced by the tribal farmers.	7	17.50	28	70.00	6	12.50
103	Before sowing paddy in nursery, hundred seeds will be sown as sample and irrigated to check the percentage of germination. a. 70 to 80% germination is considered good. b. If germination percentage is less than 70, more seed will be sown than required quantity. The whole operation is called as 'pallemuveyuta' (BT)	11	27.50	8	20.00	21	52.50
104	Direct sown paddy is cultivated on podu land (sloppy hills) called 'Yada panta'	10	25.00	17	42.50	13	32.50
105	Dense planting of paddy gives higher crop yields, hence farmers adopt more seed rate.	12	30.00	14	35.00	14	35.00
106	In some parts of the high altitude and tribal area zone, farmers used to broadcast paddy seed with ash to over come dry spells (Mostly in red and black soils).	4	10.00	10	25.00	26	65.00

107	Groundnut cake (40-50 kg/ac) mixed with cow dung is incorporated in to the soil during puddling to improve soil fertility.	6	15.00	9	22.50	25	62.50
108	Indigenous spade is used to trim the bunds and to level the puddled field.	22	55.00	12	30.00	6	15.00
109	Transplanting is done along the wind direction and not against the wind direction.	19	47.50	17	42.50	4	10.00
110	Paddy seed for next season is selected based on seed weight (by use of their discretion power on seed characters)	22	55.00	8	20.00	10	25.00
111	For seed collection, the field is identified during growth stage (uniform and better growth) and harvested separately.	17	42.50	16	40.00	7	17.50
112	'Konda danyam' (paddy) is cultivated as mixed crop with red gram in which paddy is harvested early and red gram will be retained up to 6 months for maturity.	4	10.00	12	30.00	24	60.00
113	'Karavakkulu' is a traditional paddy variety cultivated by the farmers in high altitude and tribal areas.	4	10.00	11	27.50	25	62.50
114	'Garika sannalu' is a traditional early maturing variety with good taste is cultivated by the tribal farmers.	3	7.50	22	55.00	15	37.50
115	'Budamalu' (Mettudanyam) is a traditional paddy variety used to cultivate as mixed crop with red gram.	3	7.50	17	42.50	20	50.00
116	'Bobbili ganti' is a traditional high yielding paddy variety with 90-100 days duration and the seed is red in colour.	2	5.00	18	45.00	20	50.00
117	'Kichidi' is a traditional late maturing variety (110-130 days) which is suitable for making 'pulav'(good taste)	0	0	18	45.00	22	55.00

118	'Pedamaipala' is a traditional tall early maturing variety of paddy with small grains.	0	0	12	30.00	28	70.00
119	'Potti basangi' is a traditional early maturing (90 days) paddy variety with small seeds cultivated by the tribal farmers.	4	10.00	16	40.00	20	50.00
120	'Krishna Kathikalu' is a traditional medium maturing variety (100-120 days) of paddy with good taste is cultivated by the tribals.	1	2.50	18	45.00	21	52.50
121	'Kampu sannalu' is an indigenous scented paddy variety with 6 months crop duration and the grain is medium to big in size.	1	2.50	13	32.50	26	65.00
122	'Isuka ravvalu' is an indigenous scented paddy variety with 6 months crop duration and seed is small in size.	0	0	15	37.50	25	62.50
123	'Pantulu danyam' is an indigenous paddy variety with a duration of 120 days with brown shiny seed coat.	2	5.00	13	32.50	25	62.50
124	'Ooda sannalu' is a indigenous short duration (100 days) variety of paddy bearing one or two tillers and the seed coat is reddish brown.	2	5.00	14	35.00	24	60.00
125	'Yerra danyam' is a tall indigenous paddy variety which used to give higher yields without any fertilizer application.	4	10.00	18	45.00	18	45.00
126	'Daniyalu' is traditional (Sanna Danyam) paddy variety which is tasty and suitable for Biriyan making.	2	5.00	12	30.00	26	65.00
127	'Konda Danyam' is a traditional variety which is late maturing with good taste.	2	5.00	15	37.50	23	57.50
128	Srikakulam sannalu (RGL-2537) is never cultivated in podu or as a dry crop (BT).	9	22.50	20	50.0	11	27.50

129	MTU-1001 is cultivated as dry crop by the tribals which gives tasty rice (BT).	6	15.00	24	60.00	10	25.00
130	Chemical fertilizers are applied to the field in combination with neem cake (20 kg / acre) to get better crop yields (BT).	7	17.50	24	60.00	9	22.50
131	Five cart loads FYM per acre (2.5 tons approximately) is applied to the field during summer in which the paddy will be sown in coming season.	16	40.00	15	37.50	9	22.50
132	Four to five ploughings are desirable for paddy cultivation are practiced.	14	35.00	9	22.50	17	42.50
133	Indigenous country plough is used for preparatory cultivation, forming ridges and furrows.	28	70.00	10	25.00	2	5.00
134	The place with higher elevation in the field is selected for raising the nursery.	26	65.00	10	25.00	4	10.00
135	Dry paddy ploughed once after sowing to give better yields. (care is taken so that crop is not damaged)	14	35.00	11	27.50	15	37.50
136	'Katte seed' (<i>Sesbania</i> Sp.) is sown in field and incorporated in paddy field at the time of puddling at good vegetative growth stage.	8	20.00	20	50.00	12	30.00
137	Tentemu leaf (<i>Cassia tora</i>) and jeelugu (<i>Caryota urens</i>) twigs are incorporated during second ploughing for better decomposition and utilization to improve soil fertility.	3	7.50	13	32.50	24	60.00
138	Tentum (<i>Cassia tora</i>) leaves are collected and broadcast in the field one month before puddling. During puddling the leaves get decomposed thus improves the soil fertility.	4	10.00	17	42.50	19	47.50

139	Weeding is done twice in paddy first at 15 days after transplanting and second at active tillering stage which gives good vegetative growth.	7	17.50	25	62.50	8	20.00
140	Panicle is indicator for healthy status of paddy crop.	11	27.50	24	60.00	5	12.50
141	Alternate wetting and drying results in good paddy crop (BT).	10	25.00	21	52.50	9	22.50
	Plant Protection						
142	Fifty kg of neem cake is broadcasted in the field to control insect pests in paddy, during puddling in some parts of high attitude and tribal areas	11	27.50	21	52.50	8	20.00
143	Tribals use plant material like, fish tail palm leaves (<i>Caryota urens</i>) : Jeelugu) for the control of leaf folder and stem borer in paddy. They erect 25-30 leaves per acre scatterly in the paddy field. This fish tail palm leaves exudes alkaloids, which prevents pests.	4	10.00	23	57.50	13	32.50
144	Farmers used to mix the powder of stem of yegisa manu (<i>Pterocarpus marsupium</i>) in irrigation channels to control tip burn (Etchi tegulu) in paddy.	5	12.50	7	17.50	28	70.00
145	Thummika (<i>Acacia nelotica</i>) and Nakkide (<i>Cardia myxa</i>) plant branches (Vernacular names) are erected around paddy field and paddy grain is broadcasted on field bunds at the time of grain formation.	4	10.00	23	57.50	13	32.50
146	Leaves of vadisa plant (<i>Cleistanthis hook</i>) and cow dung are broadcast around field bund if leaf folder infestation is observed.	4	10.00	26	65.00	10	25.00

147	Wood apple (Velaga fruit) is made in to powder and used to broadcast in field to reduce tella chitta (leaf turns white) in paddy.	4	10.00	14	35.00	20	55.00
148	'Musidi' leaves (<i>Nux vomica</i>) are used to broadcast in the field (Mettu danyam) if termite attack in observed in paddy.	6	15.00	15	37.50	19	47.50
149	Neem cake (40 kg) + Kagu cake (5 kg) + Kosam pindi (5 kg) per acre applied during puddling which prevents pest attack in paddy and improves soil fertility.	15	37.50	15	37.50	10	25.00
150	Paddy seed is stored for next year in gunny bags which are hanged to the roof of the house there fore pest attack can be reduced because there will be less physical access to insects to attack the seed.	19	47.50	13	32.50	8	20.00
151	When paddy is infested with leaf flower and gall midge farmers drag thorny bushes in field.	22	55.00	15	37.50	36	7.50
152	Neem cake (50 kg) + gypsum (25 kg) is used to apply to the field at the time of puddling which prevents pest attack in paddy and improves soil fertility (BT).	15	37.50	21	52.50	4	10.00
153	For any problem in paddy nursery, the malathion and kerosene is sprayed (BT).	16	40.00	19	47.50	5	12.50
154	Farmers used to broadcast 15-20 kg of common salt / acre of paddy field to control leaf spot disease in paddy.	14	35.00	12	30.00	14	35.00
155	Neem cake (20 kg/ac) is applied as basal manure which helps to protect paddy crop from BPH and improves soil fertility.	10	25.00	23	57.50	7	17.50

156	Uprooting gallmidge effected seedlings and burning in the nursery before transplantation is practiced.	23	57.50	15	37.50	2	5.00
157	To prevent termite problem attack 'musidi' leaves (<i>Nux vomica</i>) are applied as green manure in direct sown paddy.	17	42.50	12	30.00	11	27.50
158	Farmers believes that presence of the Gaviribethi snake improves crop yields because it predares on rodents.	16	40.00	11	27.50	13	32.50
159	'Bali' is practiced at the time of grain formation stage in paddy which believe to fetch more yields.	26	65.00	14	35.00	0	0
160	Paddy harvesting is started after a fortnight of change in leaf colour from yellow to pink	22	55.00	8	20.00	10	25.00
161	Harvesting in paddy is done by leaving ½ feet height stubbles which improves soil fertility after decomposition in the soil.	23	57.50	16	40.00	1	2.50
162	Before harvesting the crop a few rice spikelets are hanged in the houses and temples to be eaten by sparrows.	23	57.50	16	40.00	1	2.50
Post Harvest Technology							
163	If the paddy is stored in room the floor is coated with fermented cow dung solution to avoid insect multiplication.	25	62.50	13	32.50	2	5.00
164	Paddy seed is sun dried for 2-3 days continuously and than stored in gunny bags on indigenously made 4-5 feet stand to prevent pest infestation.	23	57.50	13	32.50	4	10.00
165	Paddy seed is stored in small containers knitted with bamboo called as 'butta' (in telugu) . The container is filled with paddy seed and covered with straw and than closed with cow dung paste.	7	17.50	17	42.50	16	40.00

166	Harvested crop is allowed for sundrying for 3-4 days in the field it self to reduce the level of moisture in grains before bundling.	16	40.00	20	50.00	4	10.00
167	Threshing is done by trampling under the feet of cattle on a threshing floor.	34	85.00	3	7.50	3	7.50
168	Winnowing and clearing of rice produce is done by the use of winnowing baskets called (chetalu in Telugu)	26	65.00	14	35.00	0	0
169	Seeds are stored in indigenously constructed storage structures called 'jaadi'. The storage structure constructed with burned clay with a capacity of 60 – 80 kunchas (180 – 200 kg) paddy seed.	11	27.50	23	57.50	6	15.00
170	Seed for consumption purpose are stored in big size Jaadi called 'Gadhi' with a capacity of 100 – 150 kunchas (300 – 450 kg) paddy seed.	11	27.50	24	60.00	5	12.50

The findings from the above table shows that among the 75 ITKs on paddy, more than 50% of the farmers adopted 14 ITKs (18.67%) completely and 24 ITKs (32.00%) partially and 20 ITKs (26.67%) were not adopted by more than 50% of the respondents.

The 14 ITKs (18.67%) adopted completely by more than 50% of the respondents were the ITK No. 108, 110, 133, 134, 151, 156, 159 to 164, 167 and 168. The ITK No. 108 (Indigenous spade is used to trim the bunds) and 133 (Indigenous country plough is used for preparatory cultivation) indicate preparatory cultivation for paddy and the higher complete adoption of the ITK was of because non availability of suitable alternative methods for these ITK.

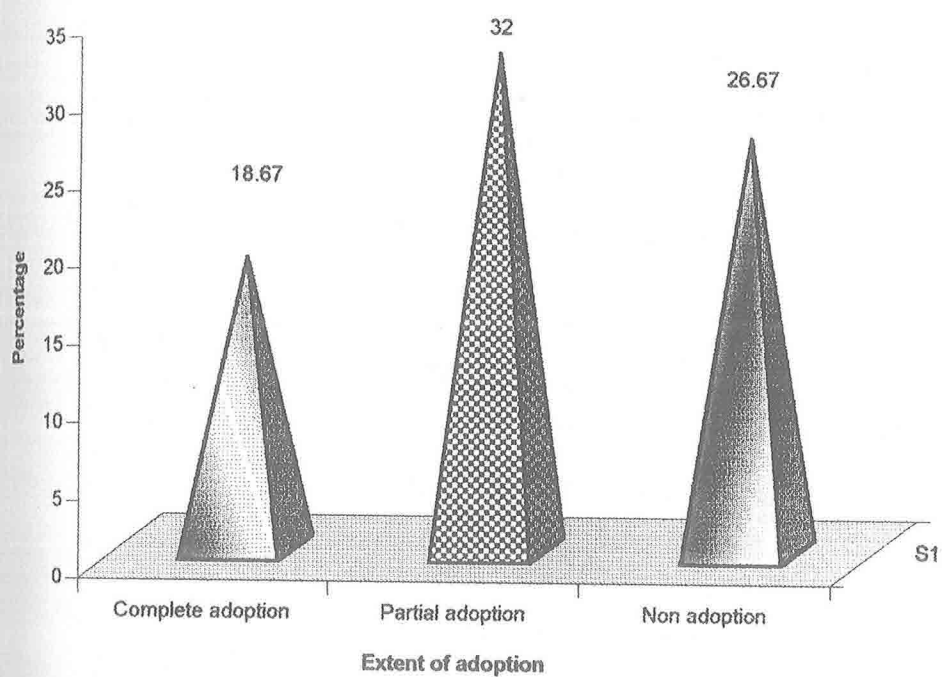


Fig.II: Extent of adoption of ITK on paddy

The ITK No.110 (Paddy seed for next season is selected) and ITK No. 134 (The place with higher elevation in the field) indicate seed and nursery selection in paddy. The higher complete adoption of the ITK No.110 was because of its rationality and easy to adopt nature. The higher complete adoption of the ITK No.134 was due to its rationality and simple to adopt nature.

The ITK No. 151 (When paddy is infested with leaf folder) and ITK No. 156 (Uprooting gall midge effected seedlings) represent pest management in paddy and the higher complete adoption of the ITK was due to the farmers alertness towards gall midge mostly and leaf folder because, the farmers experienced crop loss during last decade (1990-2000) caused by gall midge infestation.

The ITK No.159 ('Bali' is practiced at the time of grain formation), a not rational ITK adopted completely because of the farmers perceived importance towards their traditions, mores and values.

The ITK No. 160 (Paddy harvesting is started after a fortnight), ITK No. 161 (Harvesting in paddy is done) and the ITK No. 162 (before harvesting the crop) suggest harvest aspects of paddy and the higher complete adoption of these ITK was due to their established and general nature.

The ITK No. 163 (If the paddy is stored in room), ITK No. 164 (Paddy seed is sun dried for 2-3 days), ITK No. 167 (Threshing is done transplanting) and ITK No. 168 (Winnowing and cleaning harvested produce) indicate post harvest aspects of paddy. The higher complete adoption of the ITK No. 163 was due to the pesticidal properties of cow dung which perceived to reduce pest multiplication. The ITK No. 164 stress the importance of sun drying in put control and the higher complete adoption was due to it rationality simple to adopt and no cost involved in the ITK for

its adoption. The ITK No. 167 and 168 indicate threshing and winnowing of paddy respectively and the higher complete adoption of the ITK was because of non availability of suitable alternative methods of threshing and winnowing.

The 24 ITK viz., ITK No. 96 to 102, 114, 128-130, 136, 139 to 143, 145, 146, 152, 155, 166, 169 and 170 were adopted partially by more than 50% of the respondent. The difficulty in adoption of seasons due to vagaries of monsoon (ITK No. 96-102), and varieties due to competition from other indigenous and HYU (ITK No. 114, 128 and 129) completely leads to the partial adoption of these ITK. The availability of alternative methods for the ITKs was the cause for partial adoption of the ITK viz., 130, 136, 139 to 143, 145, 146, 152, 155, 166, 169 and 170.

The 20 ITK (26.67%) not adopted by more than 50% of the respondents were, the ITK No. 103, 106, 107, 112, 113, 115 to 124, 126, 127, 137, 144 and 147. The lower adoption of the ITK No. 103 (Before sowing paddy in nursery) was due to the complexity involved in the ITK though it is a rational practice. The lower adoption of the ITK No. 106 (In some parts of high altitude tribal area zone) was because the ITK was popular only in some parts of the zone. The lower adoption of the ITK No. 107 (Groundnut cake (40-50 kg/ac) mixed with cow dung) was due to the competition from the indigenous inputs like neem cake, which is perceived to be most effective for pest control.

The ITK No. 112, 113, 115 to 124, 126 and 127 indicate indigenous varieties of paddy viz., konda danyam, Karavakkulu, Budamalu, Bobbiliganti, kichidi, peda maipala, potti basangi, krishna kathikalu, kampu sannalu, isuka ravvalu, pantulu danyam, ooda sannalu and daniyalu and the lower adoption was because the variety, which is popular in one part is not popular elsewhere with in the zone resulting in lower adoption of the ITK.

The lower adoption of the ITK No. 137 (Tentemu leaf and fish tail palm twigs are incorporated) was because, farmer's less preference and importance given to the green manuring.

The ITK No. 144 (Farmers used to mix the powder) and ITK No. 147 (Wood apple is made into powder) indicate plant protection with the available plant products and the lower adoption of these ITK was because of lower incidence of the disease tip burn and leaf spot respectively.

5.4.2.4. Item wise adoption of the ITK on maize (*Zea mays*)

Table 36 : Extent of adoption of ITK on maize

ITK No.	ITK	(n=30)					
		CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
171	2 -3 Cart loads of farm yard manure per acre is applied to the soil during summer in which maize is to be cultivated.	23	76.67	6	20.00	1	3.33
172	Neem cake is applied to the soil at the time of sowing maize @ 20-25 kg/acre	14	46.67	11	36.67	5	16.66
173	'Konda moka jonna' is traditional maize variety which is tasty(sweet) cultivated by tribals.	12	40.00	11	36.67	7	23.33
174	'Pedda moka jonna' is a traditional maize variety with big size cobs.	2	6.66	20	66.67	8	26.67
175	Gada moka jonna' is a traditional tall maize variety which is resistant to foxes because of its height.	0	0	14	46.67	16	53.33
176	'Korra moka jonna' is a traditional short maize variety which is mostly damaged by the wild animals like foxes.	1	3.33	15	50.00	14	46.67
177	After getting good tilth maize is sown by use of 'kanka' (indigenous implement) to dig the soil at 2 feet spacing.	23	76.67	5	16.67	2	6.66

178	5 kg/ac of seed rate is followed traditionally by the farmers to get higher yields in maize.	18	60.00	12	40.00	0	0
179	2 kg/ acre of Maize seed is used if it is cultivated in lines i.e in mixed crop.	13	43.33	17	56.67	0	0
180	Maize seeds are dibbled along the ridges in small holes farmed with fingers or small sticks and covered with soil.	19	63.34	4	13.33	7	23.33
181	Cucumber, Ridge gourd, Brinjal etc. are cultivated as boarder crop around the Maize field (BT)	23	76.67	5	16.67	2	6.66
182	Maize is mostly cultivated as mixed crop.	20	66.67	8	26.67	2	6.66
183	Maize is cultivated as mixed crop with red gram because two crops belongs to different families.	13	43.33	16	53.34	1	3.33
184	Maize is cultivated as mixed crop with korra to get two yields from a single plot at different periods because of different maturing period.	6	20.00	20	66.67	4	13.33
185	Maize is cultivated as mixed crop with budamalu (mettu danyam) to get additional yields from single plot.	4	13.33	10	33.33	16	53.34
186	Maize is cultivated as mixed crop with cow pea (alasandalu) which creeps on maize. (BT)	12	40.00	14	46.67	4	13.33
187	Maize is cultivated as mixed crop with sesamum because they yield at different periods.	9	30.00	13	43.33	8	26.67
188	Stage of harvest in maize is indicated by sheaths covering the cobs turning to yellow and seeds become fairly hard and dried.	25	83.33	5	16.67	0	0
189	When a sample of maize grains are chewed, metallic sound indicates their optimal dryness.	25	83.33	5	16.67	0	0
190	Maize cobs only are harvested when it grown as mixed crop with cowpea leaving the plant to give support for creeping.	26	86.67	4	13.33	0	0

	Plant Protection						
191	Before sowing maize, seeds are soaked in warm water for 3-6 hours and shade dried to induce better germination and to control shoot borer which is seed borne. (BT)	24	80.00	6	20.00	0	0
	Post Harvest Technology						
192	Cobs covered with sheaths are stored as such for more than four months when they store the maize for consumption purpose.	25	83.33	5	16.67	0	0

The results from the table 36, shows that out of the 22 ITKs on maize, more than 50.00% of the respondents had adopted 11 ITKs (50%) completely, 5 ITKs (22.73%) partially and 2 ITKs (9.09%) were not adopted by more than 50% of the respondents.

The 11 ITKs (50%) adopted completely by more than 50% of the respondents were the ITK No. 171, 177, 178, 180, 181, 182, 188, 189, 190, 191 and 192. The higher complete adoption of the ITK No. 171 (2-3 cart loads of FYM per acre is applied) was because of abundant availability of FYM and the farmers perceived importance to the FYM in improving soil fertility.

The ITK No. 177 (After getting good tilth maize is sown), ITK No. 180 (Maize seeds are dibbled along the ridges) indicate traditional sowing method and the higher complete adoption was due to low cost involved in the ITK and the suitability of the ITK to the small farm conditions. The ITK No. 178 (5 kg/ac seed rate is followed traditionally) suggest seed rate of maize and the higher complete adoption of the ITK was due to its rationality.

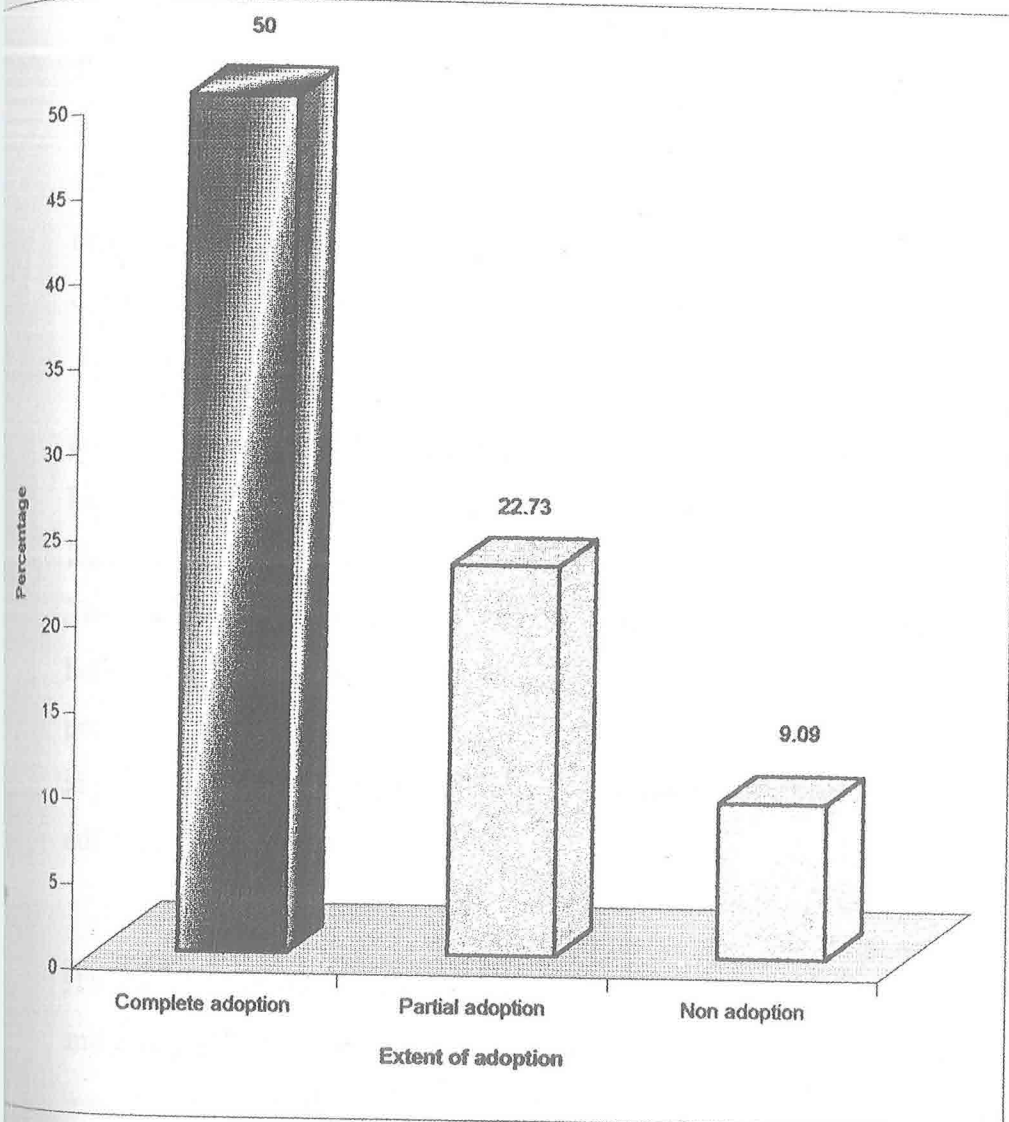


Fig.12. Extent of adoption of ITK on maize

The ITK No. 181 (cucumber, ridge gourd, brinjal etc.) and ITK No. 182 (Maize is mostly cultivated as mixed crop) indicate mixed cropping in maize. The possible reason behind the higher complete adoption of the ITK No. 181 was because, farmers cultivate different vegetables which they need for their consumption on same piece of land. The higher complete adoption of the not rational ITK No. 182 was because, farmers grow more than single crop on same piece of land with a view to get yield from one crop if the other fails.

The ITK No. 188 (Stage of harvest in maize is indicated by sheaths) and ITK No. 189 (when a sample of maize grains are chewed) refers to harvest indices of maize and the higher complete adoption was due to their learned judgment from the generations about the harvest indices in maize. The higher complete adoption of the ITK No. 190 (Maize cobs only are harvested when it grown as mixed crop) was because there is no need for provision of physical support for creeping cowpea. This ITK plays dual role in reducing the cost of special support needed for cowpea and maize gives additional income to the farmers.

The ITK No. 191 (Before sowing maize, seeds are soaked) and ITK No. 192 (Cobs covered with sheaths are stored as such) indicate pest and post harvest management respectively and the higher complete adoption was due to its simple nature to adopt besides their rationality.

The 5 ITK (22.73%) adopted partially by more than 50% of the respondents were the ITK No. 174 (pedda mokaajonna is a traditional variety), ITK No. 176 (korra mokaajonna is a traditional), ITK No. 179 (2.0 kg/acre of maize seed), ITK No. 183 (maize is cultivated as mixed crop) and ITK No. 184 (maize is cultivated as mixed crop). The partial adoption of these ITK was due to difficulty in adoption of varieties and mixed crops completely (ITK No. 174, 176, 188 and 184) due to availability of different alternatives.

The lower adoption was found in the case of ITK No. 175 and 185 which were not adopted by more than 50% of the respondents. The lower adoption of the ITK No. 175 was because the variety 'Gada mokaajonna' was not popular in the zone. The possible reason behind the lower adoption of the ITK No. 185 was because the budamalu variety of paddy was becoming unpopular slowly.

5.4.2.5 Item wise extent of adoption of ITK on sorghum (*Sorghum bicolor*)

Table 37 : Extent of adoption of ITK on sorghum

(n=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
193	'Rohini karthe' is optimum season for sowing sorghum.	4	13.33	11	36.67	15	50.00
194	Three ploughings are required for sorghum cultivation.	15	50.00	12	40.00	3	10.00
195	'Pedda jonna' is a traditional sorghum variety grown by tribal farmers which is late maturing variety.	5	16.67	23	76.67	2	6.66
196	'Dassera jonna' is a traditional early maturing variety, its harvesting coincides with dassera festival.	0	0	18	60.00	12	40.00
197	'Karthika jonna' is an indigenous early maturing variety gives more yield.	0	0	7	23.33	23	76.67
198	Konda jonna is an indigenous variety cultivated in konda podu by the tribal farmers.	4	13.33	19	63.34	7	23.33
199	'Biyyapujonna' is an indigenous sorghum variety with good taste of grains is cultivated by the tribals.	1	3.33	9	30.00	20	66.67
200	'Yenugu matta jonna' (Tella jonna) is an indigenously cultivated sorghum variety with big size spikelets. The big size spikes are congenial for birds to sit on it and eat, hence bird damage is observed.	0	0	10	33.33	20	66.67

201	'Pidaka jonna' is an indigenously cultivated sorghum variety by the tribals, its small spikes used to escape from birds.	2	6.67	7	23.33	21	70.00
202	'Pacha jonna' is an indigenous sorghum variety cultivated by the tribal farmers	2	6.67	11	36.67	17	56.66
203	'Kaki jonna' is a traditional sorghum variety cultivated as mixed crop with ragi by tribal farmers	3	10.00	9	30.00	18	60.00
204	For high yielding varieties, seeds are collected from well to do farmers in the village who store grain and sell it as seed and for hybrids seed is purchased from private dealers or government agencies supplied by integrated tribal development agency (ITDA).	22	73.33	2	6.67	6	20.00
205	Soaking the sorghum seeds in common salt solution before sowing to secure good germination under adverse conditions.	23	76.67	3	10.00	4	13.33
206	If rains are late, sowing of early duration varieties are taken up even after mrugasira karthe with high seed rate.	17	56.67	5	16.66	8	26.67
207	Sorghum is cultivated as mixed crop with cowpea (alasandalu or bobbarlu).	12	40.00	10	33.33	8	26.67
208	Cowpea (bobbarlu) seed is broadcasted in the field at the time of transplantation of sorghum seedlings.	12	40.00	10	33.33	8	26.67
209	Less cultural operations are required for cultivating the sorghum crop, since it does not require fine tilth.	18	60.00	6	20.00	6	20.00
	Plant Protection						
210	To scare away the birds colored polythene carry bags are tied to a few tall sorghum plants.	20	66.67	2	6.66	8	26.67

	Post Harvest Technology						
211	For threshing sorghum, ear heads are spread over on the roads to allow vehicles to pass on it (BT).	21	70.00	5	16.67	4	13.33
212	Frequent sun drying of seed to protect from stored grain pest irrespective of Amavasya (BT).	17	56.67	6	20.00	7	23.33

The results from the table 37 indicate that out of the 20 ITKs on sorghum, more than 50% of the respondents adopted 8 ITKs (40.00%) completely and 3 ITKs (15.00%) partially and 7 ITK (35.00%) were not adopted by more than 50% of the respondents.

The 8 ITK (40.00%) adopted by more than 50% of the respondents were ITK No. 194, 204 to 206, 209 to 212. The ITK No. 194 (There ploughings are required for sorghum cultivation) and ITK No. 209 (Less cultural operations are required) indicate preparatory cultivation in sorghum and the higher complete adoption of the ITK was due to simple nature of the ITK besides the rationality behind the ITKs.

The ITK No.204 (For high yielding varieties, seeds are collected) and ITK No.205 (soaking the sorghum seeds in common salt solution) indicate seed collection and sowing respectively and the higher complete adoption of the ITK was because of supply of hybrid seeds by the Integrated Tribal Development Agency (ITK No. 204) and easy to adopt nature of the ITK (ITK No. 209). The ITK No. 206 (If rains are late sowing of early duration varieties) suggest season in sorghum cultivation and the higher complete adoption of the ITK was due to its adaptability to changing monsoon conditions.

The ITK No. 210 (To scare away the birds, colored polythene) indicate bird management in sorghum the higher complete adoption was due to its effectiveness in checking bird damage. The ITK No. 211 (For threshing sorghum) and harvest management of sorghum and the higher

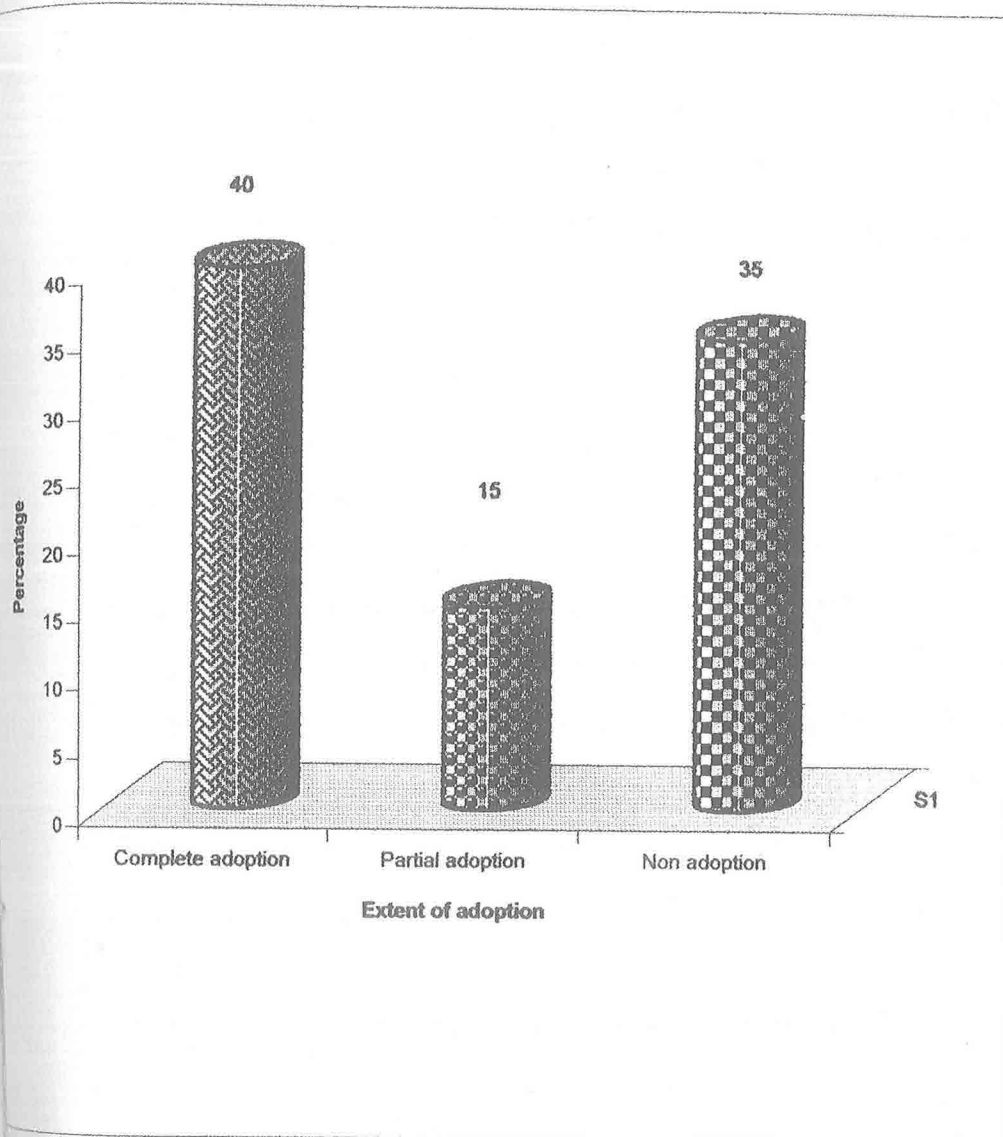


Fig. 17: Extent of adoption of ITK on sorghum

complete adoption of the ITK No. 211 was because, this involves no cost for threshing. The simple to adopt nature and low cost involvement are the causes for higher adoption of the ITK No. 212.

The 3 ITK (15.00%) adopted partially were ITK No. 195 (pedda jonna), ITK No. 196 (dassera jonna) and ITK No. 198 (konda jonna) indicate indigenous varieties and the partial adoption was because farmers cultivating more than single variety of the crop.

The ITK No. 193 ('Rohini karthe' is optimum season) concern with season for sowing sorghum and the lower adoption was due to the vagaries of monsoon though it is a rational practice. The lower adoption of the ITK No. 197 (Karthika Jonna), ITK No. 199 (Biyyapu jonna), ITK No. 200 (Yenugu metta jonna), ITK No. 201 (pidaka jonna), ITK No. 202 (Patcha jonna) and ITK No. 203 (Kaki jonna) indicate indigenous sorghum varieties and the lower adoption of the ITK was due to competitions from the high yielding varieties and supply HYV seeds by the ITDA at free of cost to the tribals.

5.4.2.6 Item wise extent of adoption of ITK on finger millet

(*Eleusina coricana*)

Table 38 : Extent of adoption of ITK on finger millet

(n=35)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
213	20 days after sowing ragi is transplanted which is optimum time for transplantation in to main field.	25	71.43	8	22.86	2	5.71
214	Ragi seedlings are sown behind country plough furrow in main field, generally farm women used to perform the transplantation of seedlings.	21	60.00	5	14.29	9	25.71
215	'Bharani karthe' is suitable season for sowing ragi.	6	17.14	25	71.43	4	11.43

216	3 kg per acre seed rate is followed by the farmers in ragi cultivation.	5	14.29	28	80.00	2	5.71
217	Transplantation of ragi seedlings is done by using indigenous implement called 'borigi' (hand hoe). The farmers used to dig soil with the help of borigi and seedlings are sown in the digged place.	10	28.57	4	11.43	21	60.00
218	Chillies, Brinjal, Bhendi, ridge gourd, beans etc are randomly sown here and there in the ragi field. (BT)	18	51.43	13	37.14	4	11.43
219	'Punasa cholu' is an indigenous ragi variety which gives higher yields among such varieties.	1	2.86	29	82.86	5	14.29
220	'Gotti cholu' is a traditional ragi variety which is cultivated as direct sown crop by the tribals.	0	0	12	34.28	23	65.71
221	'Korra cholu' is an indigenous ragi variety cultivated by the tribal farmers which is an early mature variety, give yields with in 70-80 days.	0	0	18	51.43	17	48.57
222	'Budi chodi' is a traditional high yielding early mature ragi variety, seeds are small in size with small fingers.	0	0	8	22.86	27	77.14
223	'Reka chodi' is an indigenous long duration ragi variety bearing 6 – 8 fingers protruding outwards with greater length.	2	5.71	9	25.71	24	68.57
224	'Burada chodi' is a short duration (110 days) indigenous ragi variety bearing 5 – 6 finger in panicle.	0	0	7	20.00	28	80.00
225	'Pedda chodi' is a traditional long duration ragi variety cultivated by tribal farmers.	0	0	12	34.28	23	65.71
226	'Selaga chodi' is a traditional ragi variety sown behind country plough furrow.	0	0	4	11.43	31	88.57
227	'Budi chodi' is cultivated as mixed crop with Black gram or bobbarlu (cowpea).	1	2.86	5	14.29	29	82.86

228	'Budi chodi' is used to give ratoon crop after harvesting thus giving two yields in a year.	0	0	6	17.14	29	82.86
229	'Dassera budelu' is a long duration indigenous ragi variety cultivated by the tribals.	0	0	6	17.14	29	82.86
230	'Chindi mundiya' is a early mature indigenous ragi variety cultivated by the tribal farmers.	1	2.86	2	5.71	32	91.43
231	3-4 cart loads / acre of farm yard manure is applied by the farmers during summer in which ragi is to be cultivated during next season.	28	80.00	6	17.14	1	2.86
232	A combined operation of earthing up and weeding (goppulu tattivuta) is practiced by the farmers twice in ragi cultivation which enhances crop growth.	29	82.86	6	17.74	0	0
233	Remainings of ragi seed and broken ragi seeds are broad casted in field to partially substantiate the fertilizer requirement.	20	57.14	7	20.0	8	22.86
234	Five kuncha (15 kg) seed for nursery will ultimately fetch 9 puttulu (180 kunchas) yield.	11	31.43	10	28.57	14	40.00
235	Red colouration of ragi seed is taken as indices for harvesting.	26	74.28	6	17.14	3	8.57
236	Panicles alone are picked and sundried for 3-4 days. Than the panicles are beaten with sticks to separate grain.	26	74.28	9	25.71	0	0
Plant Protection :							
237	Farmers sprinkle (sodipindi) Ragi seed powder mixing in water for control of pests and diseases in ragi.	12	34.28	8	22.86	15	42.86
238	Matakara ginjalu (chaffy grains) is a problem observed at the time grain filling in ragi.	30	85.71	2	5.71	3	8.57

The results from the table 38, shows that out of the 26 ITKs on finger millet, more than 50% of the respondents were adopted 9 ITKs (34.61%) completely, 4 ITKs (15.38%) partially and more than 50% of the farmers were not adopted 11 ITKs (42.30%).

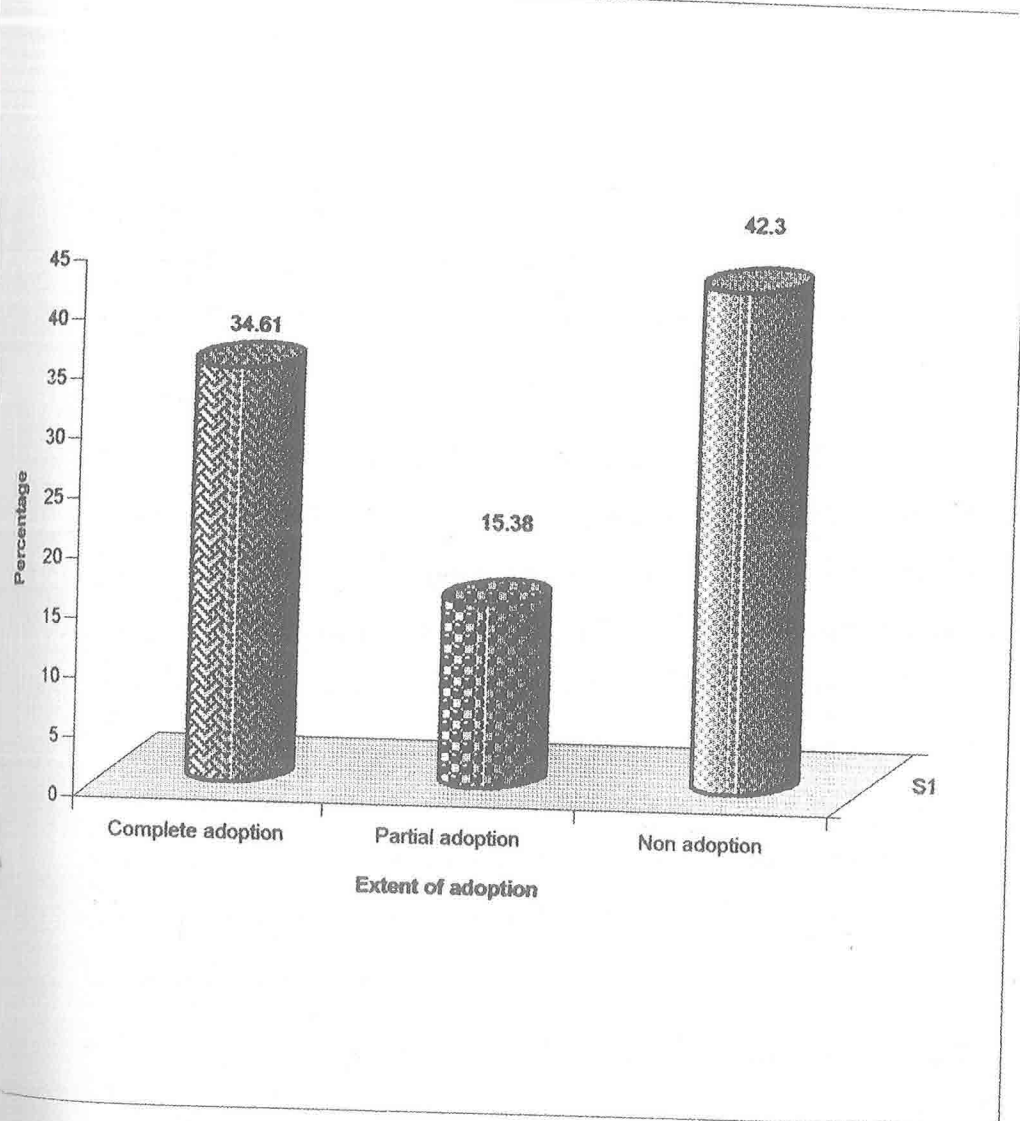


Fig.14: Extent of adoption of ITK on finger millet

The 9 ITKs adopted completely by more than 50% of the respondents were ITK No. 213, 214, 218, 231, 232, 233, 235, 236 and 238. The ITK No. 213 (20 days after sowing ragi) and ITK No. 214 (Ragi seedlings are sown behind country plough furrow) indicate time and method of sowing finger millet respectively and the higher complete adoption was due to their simple nature to adopt and the suitability to the farming situation in the zone (ITK No. 214). The ITK No. 218 (chillies, brinjal, bhendi, ridge gourd, beans etc.) indicate mixed cropping in finger millet and higher complete adoption was because farmers sow such crops to satisfy their need for consumption.

The ITK No. 231 (3-4 cart loads / acre of farm yard manure is applied) and ITK No. 233 (Remainings of ragi seeds) indicate manuring in finger millet. The higher complete adoption of the ITK No. 231 was because of abundant availability of FYM besides its rationality. The higher complete adoption of the not rational ITK (ITK No. 233) was because farmers broadcast the broken ragi seeds and remaining because there is no other use by them. The ITK No. 232 (A combined operation of earthing up and weeding) suggest inter cultivation in finger millet and the higher complete adoption was noticed because ITK was a common practice in cultivation of finger millet.

The ITK No. 235 (Red colouration of ragi seed) and ITK No. 236 (Panicles alone are picked and sundried) indicate harvest aspects of finger millet and higher complete adoption was due to their simplicity and rationality. The ITK No. 238 ('Matakara ginjalu' is a problem observed) represent physiological disorder in finger millet and the higher adoption was due to its right identification by the farmers.

The 4 ITK (15.38%) viz., ITK No. 215, 216, 219 and 221 were adopted by more than 50% of the farmers but the adoption was found partial. The partial adoption of the ITK No. 215 ('Bharani karthe' is suitable season

for sowing ragi) was because of variation in under taking sowing operation due to vagaries of monsoon. The partial adoption of the ITK No. 216 (3 kg per acre seed rate is followed) was because farmers use more seed rate if more seed is available with them (i.e., variation in use of seed rate). The ITK No. 219 and 221 indicate indigenous varieties of finger millet and the partial adoption was due to competition from their indigenous varieties and high yielding varieties.

The lower adoption of the ITK No.217 (Transplantation of ragi seedlings is done) was because of competition from the alternative method indicated in the ITK No.214 which was found adopted completely. The ITK No. 222, 223-230 indicate indigenous varieties of finger millet and the lower adoption was due to competition between one another and from high yielding varieties and one indigenous variety which is familiar in one part of the zone was not familiar in the other part.

5.4.2.7 Item wise extent of adoption of ITK on little millet (*Panicum miliare*)

Table 39: Adoption of ITK on little millet

(n=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
239	Single ploughing is sufficient to sow sama seed.	21	70.00	7	23.33	2	6.67
240	Sama is cultivated as Yada (direct sown crop) is used to cultivate for sama with out transplantation, thus reducing the cost of cultivation.	26	86.67	4	13.33	0	0
241	5 kg / ac seed rate is maintained by the tribals if sama is grown as sole crop.	16	53.33	14	46.67	0	0
242	Sama is completely cultivated as rainfed crop for subsidiary income.	23	76.67	5	16.67	2	6.66

243	Seeds of ragi (2kg) and pedda samalu (1/2 kg) is mixed and broad casted. The transplantation also done as mixed seedlings. Because of differential maturity periods sama is harvested earlier than ragi.	17	56.67	4	13.33	9	30.00
244	'Korra samalu' is the mostly cultivated traditional variety of sama gives more yield.	14	46.67	13	43.33	3	10.00
245	'Magha samalu' is a traditional sama variety which is used to sow in magha karthe	0	0	8	26.67	22	73.33
246	'Mandi sama' is a traditional short duration (60 – 70 days) sama variety the seed is round and flat.	2	6.67	6	20.00	22	73.33
247	'Bontha sama' is a traditional sama variety with big size round seeds.	1	3.33	8	26.67	21	70.00
248	'Nalla sama' is a traditional short duration sama variety with black small seeds.	7	23.33	13	43.34	10	33.33
249	'Pedda sama' is a traditional long duration sama variety of which the seeds are small with big size spikelets grown as mixed crop with ragi.	6	20.00	13	43.33	11	36.67
250	'Mai sama' is a short duration (60 – 70 days) indigenous sama variety grown up to a height of 1 m to 1.25 mt.	2	6.67	4	13.33	24	80.00
251	Black (dark) coloration of sama seeds is taken as index to harvest the crop.	17	56.67	7	23.33	6	20.00
Post Harvest Technology :							
252	Dehusking of little millet grain is done with the help of wooden grinding machine called 'Tiragali' (Vernacular name) locally made with mango or terminalia (maddi).	21	70.00	8	26.67	1	3.33

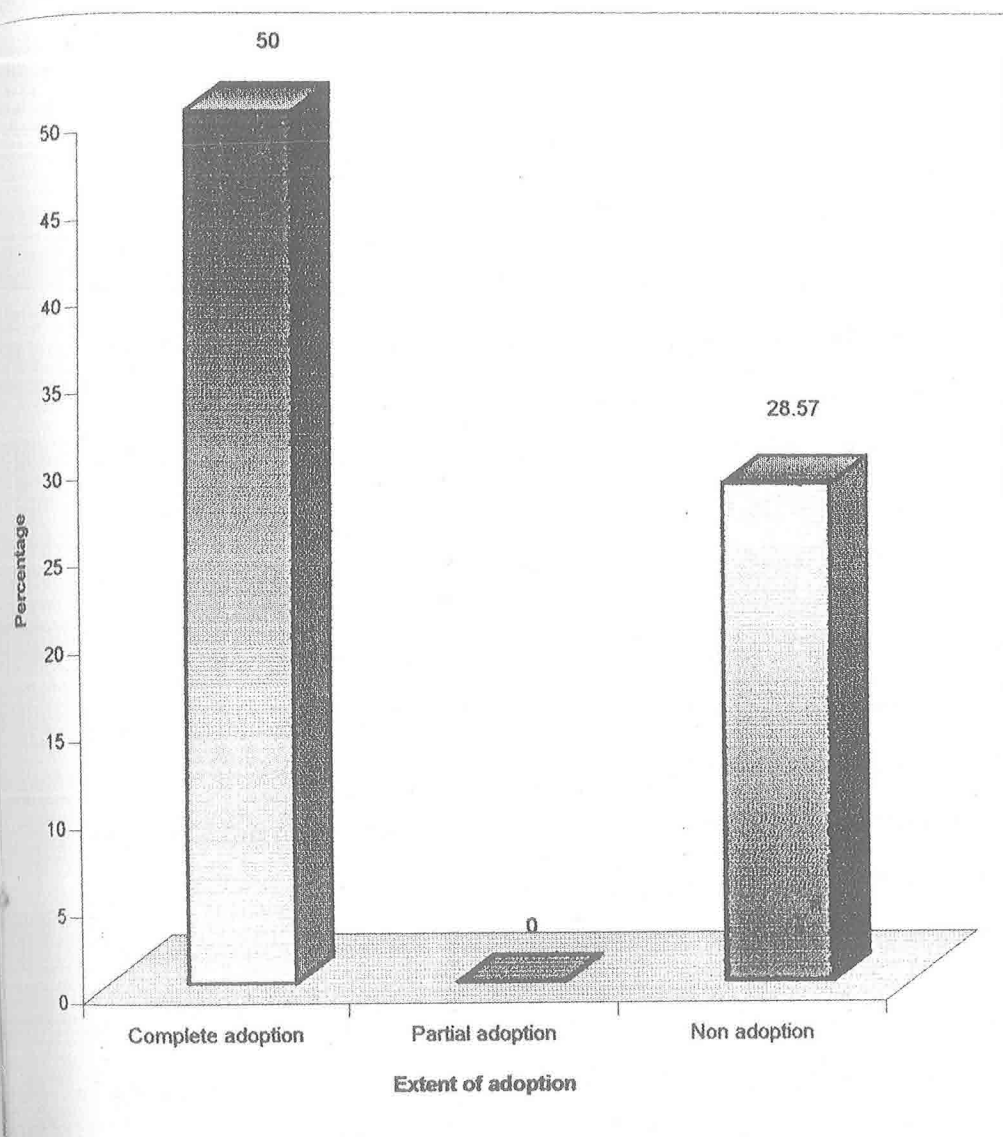


Fig.15: Extent of adoption of ITK on little millet

The results from the above table indicate that among the 14 ITKs on little millet, 7 ITKs (50.00%) were adopted completely by more than 50% of the respondents and 4 ITKs (28.57%) were not adopted by more than 50% of the respondents.

The 7 ITKs (50%) adopted completely by more than 50% of the farmers are the ITK No. 239-243, 251 and 252. The higher complete adoption of ITK No. 239 (Single ploughing is sufficient to sow sama) was because of low cost involved in the ITK and its simple nature. The ITK 240 (sama is cultivated as direct sown crop) and ITK No. 241 (5 kg/acre of seed rate is maintained) refer to cultivation of little millet and its seed rate respectively. The higher complete adoption of the ITK No. 240 was because it save cost of transplantation thus reduce cost of cultivation. The higher complete adoption of the ITK No. 241 was due to its rationality.

The higher complete adoption of the ITK No. 242 (sama is completely cultivated as rainfed crop) was because, if water is available farmers shift to water intensive crops like paddy. The sama is cultivated as rainfed crop because there was no other option. The high complete adoption of the ITK No. 243 (seeds of ragi (2kg) and pedda samalu ($\frac{1}{2}$ kg) are mixed) was due to its rationality and support of one crop if other one fails.

The ITK No. 251 (black coloration of sama seeds) and ITK No. 252 (dehusking of little millet) suggest harvest and post harvest aspects of little millet. The higher complete adoption of the ITK No. 251 was due to farmers acquired skill in judging harvest index of little millet. The high complete adoption of the ITK No. 252 was because of availability of mango and termanalia for making wooden grinder and the suitability of the ITK to the small scale processing for consumption purpose.

The 4 ITK (28.57%) not adopted by more than 50% of the respondents are ITK No. 245-247 and 250 and all the ITK represent

indigenous varieties of little millet. The competition with in the indigenous varieties was the possible cause for lower adoption of the ITKs.

5.4.2.8 Item wise extent of adoption of ITK on foxtail millet (*Sataria italica*)

Table 40: Adoption of ITKon foxtail millet (korra)

(n=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
253	Local varieties of korra are preferred because they are more tasty and keeping quality of their straw is high.	14	46.67	12	40.00	4	13.33
254	'Pedda korra' is an indigenous korra variety with big spiklets and it gives very soft food when cooked.	17	56.67	13	43.33	0	0
255	'Bula nemadam' is an indigenous korra variety with small hairy structures on seeds which gives rough (not soft) food on cooking.	3	10.00	8	26.67	19	63.33
256	'Pedda korra' spikes alone are harvested and trampled with animals after sun drying for 3 – 4 days.	16	53.34	10	33.33	4	13.33
257	Korra is sown during May – June (Kartherlu time) to facilitate the cultivation of next crop.	18	60.00	10	33.33	2	6.67
258	Maturity of korra crop is indicated by the leaves turning yellow, the earheads turning greenish and the grains getting hard to chew.	24	80.00	3	10.00	3	10.00
259	After harvest, earheads are dried for 3-4 days in the field and beaten with sticks for grain separation, followed by traditional winnowing along the wind direction.	24	80.00	4	13.33	2	6.67

	Plant Protection						
260	Korra seeds are put in water and the floating and disease affected seeds are removed.	20	66.67	9	30.00	1	3.33
261	If sowing of korra is delayed beyond the June, it becomes more susceptible for pest attack.	17	56.67	7	23.33	6	20.00

The results from the table 40, shows that out of the 9 ITK on fox tail millet, 7 ITK (77.77%) were adopted completely by more than 50% of the respondents and 1 ITK (11.11%) was not adopted by more than 50% of the respondents.

The 7 ITK (77.77%) adopted completely by more than 50% of the respondents are the ITK No. 254, 256 to 261. The ITK No. 254 (pedda korra is an indigenous korra variety) indicates indigenous fox tail millet variety and the high complete adoption was because the variety was found popular through out the zone due to its yields and big size spikelets. The ITK No. 256 (pedda korra spikes alone are harvested) and ITK No. 258 (maturity of korra crop is indicated)_ suggests post harvest and harvest aspects of fox tail millet respectively. The simple nature of the ITK No. 256 was the possible cause for higher complete adoption. The higher complete adoption of the ITK No. 258 was because of farmers skills in judging harvest index.

The ITK No. 257 (korra is sown during May-June) and ITK No. 261 (If sowing of korra is delayed beyond the June) suggest seasons for sowing foxtail millet. The rationality behind the ITK was the possible cause for higher complete adoption of both the ITKs. The ITK No. 260 indicate pest management and the higher complete adoption was due to its simple nature besides the scientific rationality of the ITK. The ITK No. 259 refer to post harvest management and the higher complete adoption was due to its

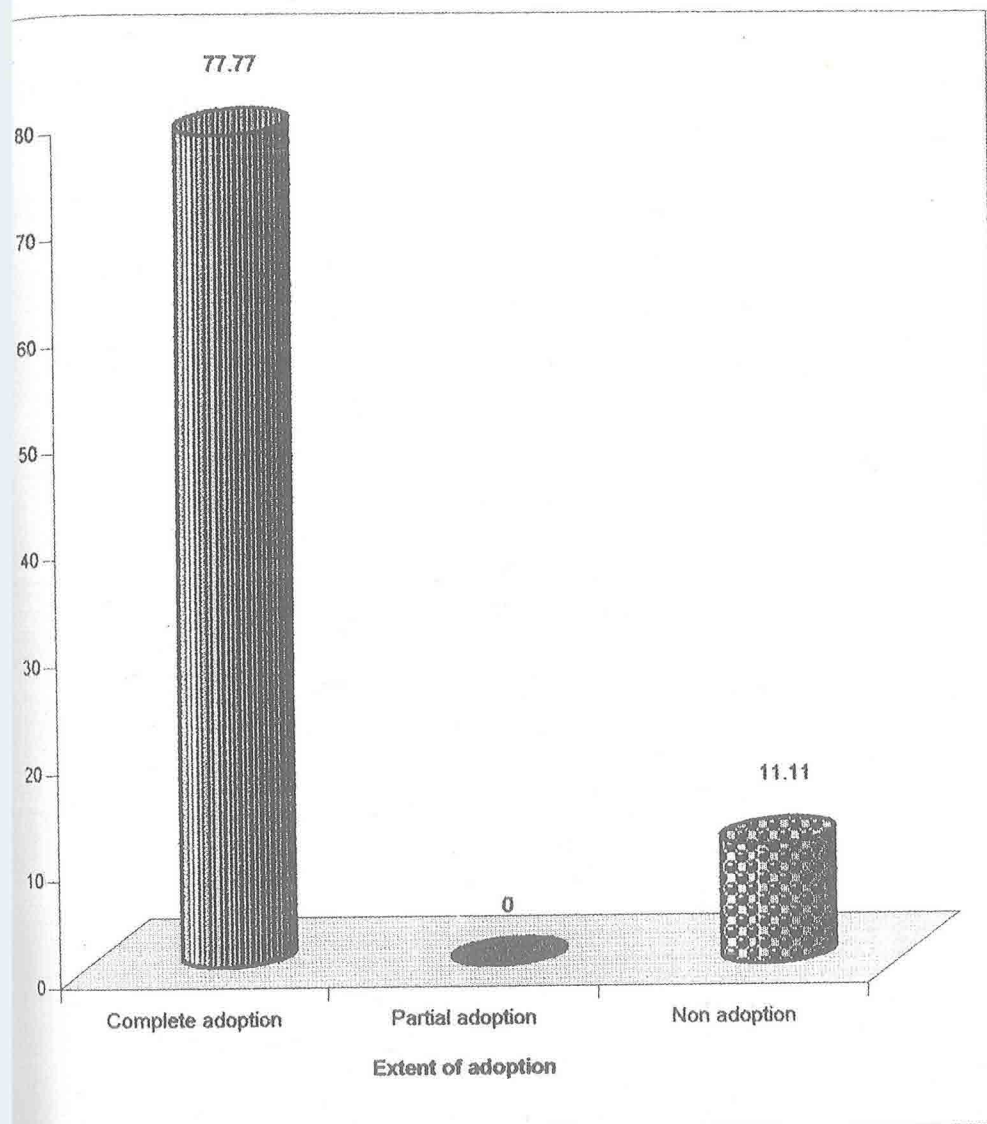


Fig.16: Extent of adoption of ITK on foxtail millet

suitability to the small scale farming that could be performed with the help of family labour.

The ITK No. 255 (Bulanemadam) indicate indigenous variety and the lower adoption was because of competition from the other indigenous varieties.

5.4.2.9 Item wise extent of adoption of ITK on bajra (*Pennisetum americanum*)

Table 41 : Extent of adoption of ITK on bajra (Ganti)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
262	'Arudhra karthe' (month of June) is suitable season for sowing bajra seeds.	5	18.52	12	44.45	10	37.03
263	'Pala poda ganti' is an indigenous bajra variety with big size spikes and grains.	2	7.42	10	37.03	15	55.55
264	'Pitta ganti' is an indigenous bajra variety with small spikes and grains.	2	7.42	21	77.78	4	14.80
265	'Pedda ganti' (badi ganti) is an indigenous bajra variety mostly cultivated as mixed crop with sorghum.	4	14.80	17	62.96	6	22.20
266	'Mrugasira' is optimum season for sowing bajra as mixed crop and punarvasa is for transplantation.	4	14.80	13	48.14	10	37.03
267	20 days after sowing is the optimum season for transplantation of ganti seedlings.	13	48.14	11	40.74	3	11.11
268	Horse gram or black gram is cultivated after ganti harvest to get additional income.	12	44.44	7	25.92	8	29.60
269	No weeding is required for ganti because it is highly competitive with seeds.	18	66.67	6	22.22	3	11.11
270	Ganti is harvested with 2 – 3 feet long sticks, sun dried and trampled with animals to separate grains followed by winnowing.	18	66.67	8	29.60	1	3.70

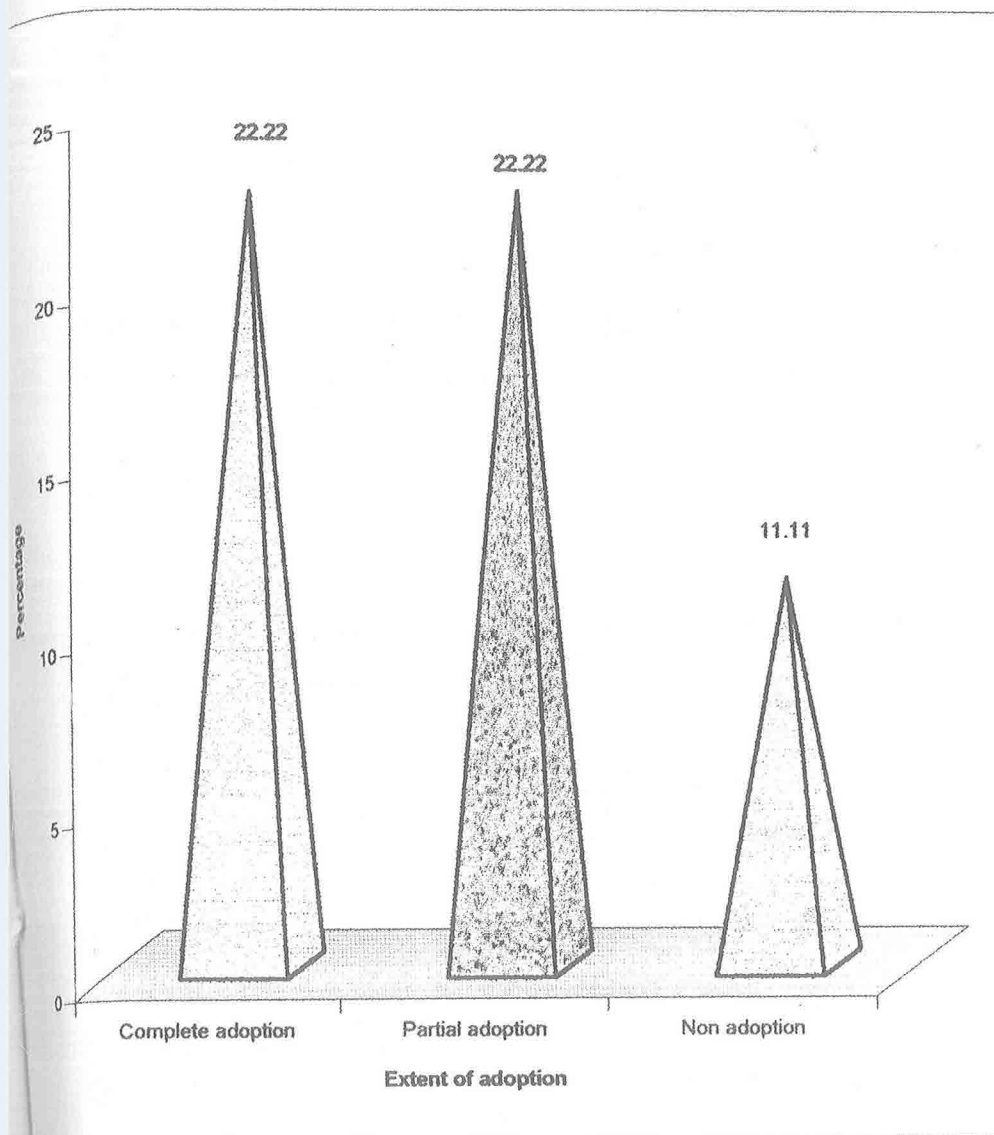


Fig.17: Extent of adoption of ITK on bajra

The results from the table 41 indicate that out of the 9 ITKs on bajra, more than 50% of the respondents were adopted 2 ITKs (22.22%) each completely and partially and one ITK (11.11%) was not adopted by more than 50% of the respondents.

The 2 ITKs adopted completely by more than 50% of the respondents are ITK No. 269 (No weeding is required for ganti) and ITK No. 270 (ganti is harvested for 2-3 feet long sticks). The higher complete adoption of the not rational ITK No. 269 was because farmers are not ready to invest more on weeding of bajra. The ITK No. 270 represent post harvest management of bajra and the rationality behind the ITK and its suitability are possible causes for its higher complete adoption.

The ITK No. 264 (Pitta ganti) and 265 (pedda ganti) concern with indigenous varieties and the partial adoption of these ITK was due to competition from one another among the indigenous varieties.

The ITK No. 263 (pala poda ganti) indicate indigenous variety and the lower adoption of the ITK was due to the competition from the other varieties and the variety was not popular through out the zone.

5.4.2.10 Itemwise extent of adoption of ITK on Kodo millet (*Paspalum scrobiculatum*)

Table 42: Extent of adoption of ITKs on kodo millet

(n=26)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
271	'Korra alu' and 'Pedda alu' are the two indigenous kodo millet varieties grown by the tribals.	12	46.15	8	30.77	6	23.08
272	'Madda alu' is an indigenous kodo millet variety with big size spikes and grains.	2	7.69	4	15.38	20	76.92

273	'Kodi arika' is an indigenously cultivated kodo millet variety with small spikes and grains.	4	15.38	5	19.23	17	65.38
274	Kodo millet is grown as mixed crop with red gram	14	53.85	9	34.61	3	11.53
275	Two ploughings are done perpendicular to one another and seed of kodo millet is broadcasted in the field. Third time is ploughed perpendicular to the second ploughing, so that, the seed will be covered with soil.	12	46.15	9	34.61	5	19.23
276	Kodo millet is cultivated as mixed crop with mesta to gain additional income from alu.	16	61.53	5	19.23	5	19.23
	Post Harvest Technology						
277	Processing of kodo millet seed is laborious consists of dehusking twice with indigenous wooden crusher called 'Thiragali' and third time is crushed with stone crusher to get 'Arika powder' for consumption. (BT)	23	88.46	3	11.53	0	0

The findings from the table 42, shows that out of the 7 ITKs on kodo millet, 3 ITKs (42.86%) were adopted completely by more than 50% of the respondents and 2 ITKs (28.57%) were not adopted by more than 50% of the respondents.

The 3 ITKs (42.86%) adopted completely by more than 50% of the respondents are ITK No. 274, 276 and 277. The ITK No. 274 (kodo millet is grown) and ITK No. 276 (kodo millet is cultivated as mixed crop) represent mixed cropping with kodo millet and the higher complete adoption of the ITK No. 274 was due to its rationality and popular combination. The higher complete adoption of the not rational ITK No. 276 was because the mesta was a popular crop in the zone and farmers mix the kodo millet with mesta though it was not recommended. The ITK No. 277 (processing of kodo millet seed is laborious) indicate post harvest processing of kodo millet and the higher complete adoption of the ITK was because the seed coat of

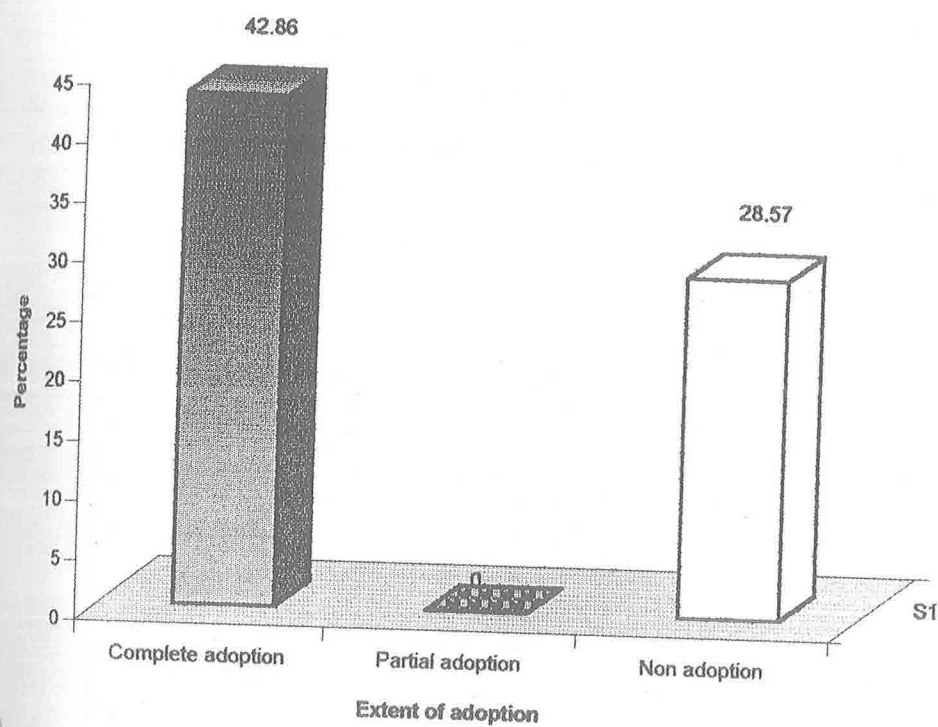


Fig.18 Extent of adoption of ITK on kodo millet

kodo millet was hard and rough hence it required a laborious process to get good quality grain for consumption.

The ITK No. 272 (madda alu) and ITK No. 273 (kodi arika) concerned with indigenous varieties and the lower adoption of the 2 ITKs was because of the competition from other indigenous varieties.

5.4.2.11 Item wise extent of adoption of ITK on black gram and green gram (*Phaseolous sp.*)

Table 43 : Extent of adoption of ITK on black gram and green gram

(n=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
278	'Nalla Pesalu' is a traditional green gram variety cultivated as sole crop in dry lands.	0	0	28	93.33	2	6.67
279	'Pacha pesalu' is a traditional green gram variety grown as relay crop in paddy. 10 – 15 days before harvesting paddy crop the seed is broadcasted in the paddy field.	2	6.67	27	90.00	1	3.33
280	'Nalla minumulu' and 'Tella minumulu' are the traditional black gram varieties grown by the tribals.	9	30.00	17	56.67	4	13.33
281	Black gram is mostly cultivated as boarder crop on field bunds.	0	0	11	36.67	19	63.33
282	Growing of black gram after paddy enhances the soil fertility and soil structure.	9	30.00	17	56.67	4	13.33
283	'Magha karthe' is optimum season for sowing pulses (black gram and green gram).	0	0	28	93.33	2	6.67
284	Seeds of black gram are soaked in water for 10 hours before sowing in paddy fallow black gram crop in less soil moisture fields.	11	36.67	8	26.66	11	36.67

285	Pulses are highly competitive with weeds. This belief makes farmers not to adopt weed management practices in pulses.	14	46.67	16	53.33	0	0
286	One to two percent urea solution is sprayed on the crop which suffered due to severe adverse weather conditions to improve growth and yield of pulse crop. (BT)	11	36.67	18	60.00	1	3.33
287	Yellowing of leaves with dried pods are the maturity symptoms for harvesting the crop.	19	63.34	4	13.33	7	23.33
288	Threshing of black gram is done by trampling under the feet of cattle.	20	66.67	6	20.00	4	13.23
289	Black gram seeds are separated from sand and dust particles through locally manufactured and graded sieves (Jalleda).	20	66.67	7	23.33	3	10.00
Plant Protection							
290	Ill filled and diseased seeds are eliminated by removing the floated seeds during soaking in water before sowing. (BT)	21	70.00	8	26.67	1	3.33
Post Harvest Technology							
291	Farmers store pulses in earthen containers in mix with kitchen ash @ 5 kg seed + 1 kg ash to prevent insect attack during storage.	22	73.33	8	26.67	0	0
292	Pulse seeds are well dried and mixed with the dried leaves of neem and stored in airtight gunny bags by keeping on 2 – 3 feet height locally made stands.	11	36.67	17	56.67	2	6.66

The findings from the table 43, shows that out of the 15 ITKs on black gram and green gram, more than 50% of the respondents adopted 5 ITKs (33.33%) completely and 8 ITK (53.33%) partially and one ITK (6.67%) was not adopted by more than 50% of the respondents.

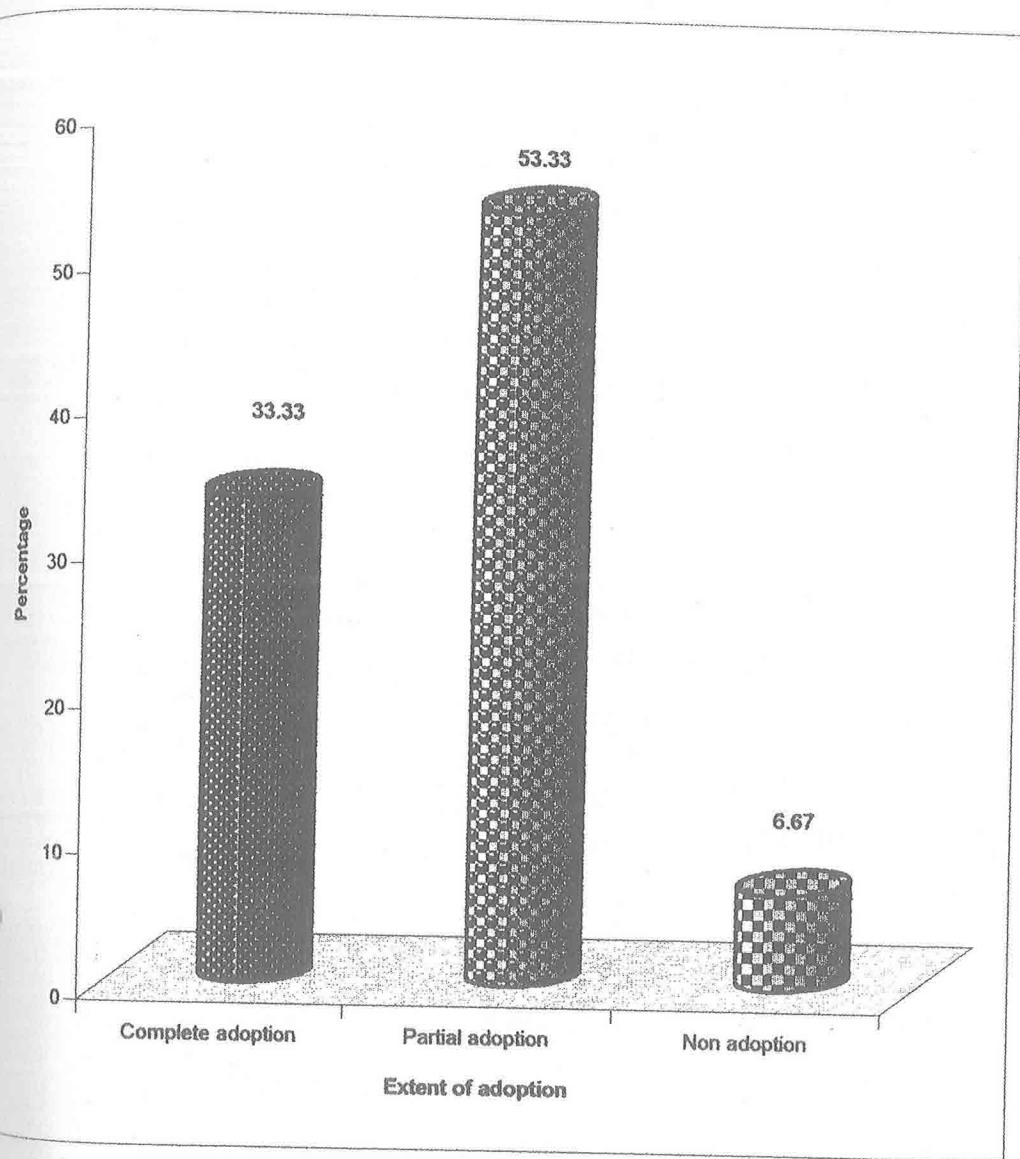


Fig.19: Extent of adoption of ITK on blackgram and green gram

The 5 ITKs adopted completely by more than 50% of the respondents are ITK No.287 to 291. The ITK No.287 (yellowing of leaves with dried pods), ITK No. 288 (Threshing of black gram is done), ITK No. 289 (black gram seeds are separated from sand) and ITK No.291 farmers store pulses in earthen containers in mix with kitchen ash) indicate harvest (287) and post harvest(288,289 & 291)of black gram and green gram. The high complete adoption of the ITK No. 287 was due to their general nature and also non availability of alternative methods which suits to the small scale farming. The ITK No. 291 represent storage of seeds with kitchen ash and the higher complete adoption was due to its rationality and availability of kitchen ash readily with them.

The ITK No. 278 (Nalla pesalu), 279 (Pacna pesalu), 280 (nalla minumulu), 282 (Growing of black gram after paddy), 283 (magha karthe is optimum season) 285 (Pulses are highly competitive), 286 (one to two per cent urea) and 292 (pulse seeds are well dried) were adopted partially by more than 50% of the respondents. The partial adoption was due to competition from the other indigenous and high yielding varieties (ITK No. 278, 279 and 280), not rational nature (ITK No 285), vagaries of monsoon (ITK No. 283) and complexities involved in adoption of the ITK (ITK No. 286 and 292).

The lower adoption of the ITK No. 281 (black gram is mostly cultivated) was due to its not rational nature and due to farmers perceived importance to the crop changed the black gram as a main crop rather than substantial crop.

5.4.2.12 Item wise extent of adoption of ITK on red gram (*Cajanas cajan*)

Table 44 : Extent of adoption of ITK on red gram

(n=35)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
293	'Bharani Karthe' is suitable season for sowing red gram seeds.	2	5.71	28	80.00	5	14.29
294	'Doni kandulu' is an indigenous red gram variety resistant to pests and diseases with less flower drop.	3	8.57	28	80.00	4	11.43
295	'Binnisa' is an indigenous red gram variety cultivated by the tribals	0	0	14	40.00	21	60.00
296	'Gotcha Kandulu' is an indigenous red gram variety with big size grains with random spots.	1	2.86	21	60.00	13	37.14
297	'Billa Kandulu' is an indigenous red gram variety bears single pods (without clusters), seeds are big in size and white in colour.	1	2.86	24	68.57	10	28.57
298	Red gram is grown during first year of three years podu (shifting) cultivation to reduce weed infestation.	17	48.57	16	45.71	2	5.71
299	Black soils are found to be the best to cultivate red gram by the farmers.	5	14.29	17	48.57	13	37.14
300	Short duration and high yielding varieties are cultivated to escape from risk due to dry spells.	5	14.29	17	48.57	13	37.14
301	Farmers maintain spacing of 3½ X 4 feet for cultivation of 'Pedda Kandulu (traditional varieties of red gram).	11	31.43	19	54.28	5	14.29
302	Farmers maintain spacing of 2 x 2 feet for cultivation of 'China Kandulu (improved varieties of red gram).(BT)	10	28.57	18	51.43	7	20.00

303	Red gram seeds are sown with the use of 'Kanka' a traditional farm implement. Half a feet deep holes are digged with use of 'Kanka' and two seeds are dropped in each hole maintaining optimum spacing.	7	20.00	17	48.57	11	31.43
304	Ten kg per acre of seed rate is used by the farmers in the case of sole crop and 2-3 kg / acre in the case of mixed crop.	7	20.00	20	57.14	3	8.57
305	Farmers waits for a week after sowing red gram for seed germination and otherwise they consider as the crop failure.	4	11.43	17	48.57	14	40.00
306	Red gram is mostly cultivated as mixed crop by the tribal farmers.	13	37.14	7	20.00	15	42.86
307	Red gram is mostly cultivated as mixed crop with budamalu (Mettu danyam) on podu lands.	4	11.43	15	42.86	16	45.71
308	Red gram is cultivated as mixed crop with sesamum to get additional income	4	11.43	18	51.43	13	37.14
309	Cloudiness induces flower drop in red gram and hence it is not desired by the farmers during flowering stage.	20	57.14	14	40.00	1	2.86
310	Farmers never apply fertilizer to red gram. They believe that the deep root system of red gram can absorb sufficient nutrients from the soil.	25	71.43	8	22.86	2	5.71
311	In some areas of high altitude and tribal area zone, red gram is harvested early in the morning at full maturity stage. Farm women used to separate pods from the cutted stems of red gram and beaten with sticks to separate grain from the pods. The total operation lasts for a day.	12	34.28	13	37.14	10	28.57

	Plant Protection						
312	Alu (kodo millet) straw smoking is practiced by the farmers to reduce tea mosquito pod fly attack in red gram. Alu straw is smoked around the red gram field which believes to reduce tea mosquito pod fly attack in red gram.	14	40.00	13	37.14	8	22.86
313	Pods which are not infested with any pest and disease are selected for seed purpose for next year.	23	65.71	6	17.14	6	17.14
314	To control the pod borer in red gram neem seed kernel extract is sprayed on crop.	20	57.14	8	22.80	7	20.00
	Post Harvest Technology						
315	Harvested sticks of red gram along with pods are sundried for 5-6 days in the field keeping upward down.	27	77.14	6	17.14	2	5.71
316	The powdered red gram leaf is used as feed for animals which got high nutritive value.	26	74.28	7	20.00	2	5.71
317	The sticks are used as fuel for cooking after separation of red gram seeds.	27	77.14	7	20.00	1	2.86
318	If red gram is sundried during Amavasya day the storage pests cannot attack the seed.	14	40.00	12	34.28	9	25.71
319	Red gram is mixed with ash and stored in gunny bags in hanging position from the roof of the house.	29	82.86	6	17.14	0	0
320	Red gram seeds are stored in mix with ash 30 kg of red gram is mixed with 1 kg of ash which acts as physical barrier for insect pests.	25	71.43	9	25.71	1	2.86
321	Frequent sundrying of seeds in practiced to protect red gram from stored grain pests.	22	62.86	10	28.57	3	8.57

322	Red gram seed is stored in earthen pots in mix with malathion to protect it from storage pests.(BT)	4	11.43	19	54.28	12	34.80
323	Red gram is stored in earthen pots in mix with layers of sand to protect it from insect pests during storage.	7	20.00	6	17.14	22	62.86
324	Red gram is stored after adding wet red clay and sundrying it for 2-3 days to increase shelf life.	8	22.86	9	25.71	18	51.43

The findings from the table 44, shows that out of the 32 ITKs on red gram, more than 50% of the respondents were adopted 10 ITKs (31.25%) completely and 9 ITKs (30%) partially and 3 ITKs (10%) were not adopted by more than 50% of the respondents.

The 10 ITKs adopted completely by more than 50% of the respondents are ITK No. 309, 310, 313 to 317 and 319 to 321. The high complete adoption of the ITK No. 309 (cloudiness induces flowering in red gram) was due to the farmers belief on flower drop in relation to the cloudiness. The possible cause for higher complete adoption of the not rational ITK No. 310 (farmers never apply) was due to farmers confidence on red gram to absorb enough nutrients from the soil directly. The higher complete adoption of the ITK No. 313 (pods which are not infested with any pest and disease) was due to farmers interest in selection of good quality seed for sowing. The ITK No. 314 (To control pod borer in red gram) indicate use of neem seed kernel extract for control of pod borer and the higher complete adoption was due to abundant availability of neem seed besides its rationality.

The ITK No. 315 to 317 and 319 to 321 suggest post harvest aspects of red gram. The ITK No. 315 (Harvested sticks of red gram) and ITK No. 321 (Frequent sundrying of seeds of red gram) emphasize the

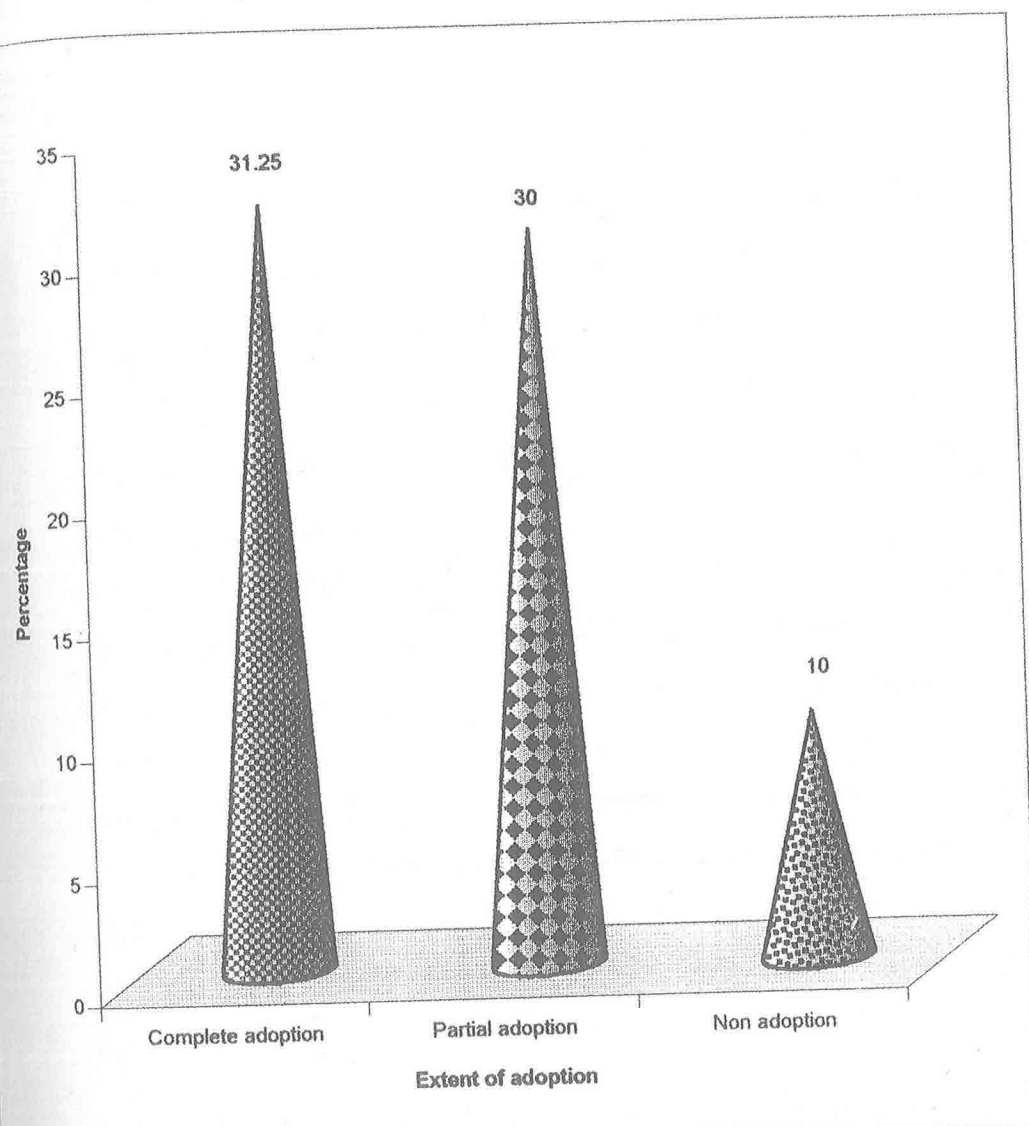


Fig. 20 Extent of adoption of ITK on red gram

importance of sundrying and the higher complete adoption was due to their simple and low cost involved in adoption of these ITK. The ITK No. 316 (The powdered red gram leaf) and ITK No. 317 (The sticks are used a fuel) represent use of by products of red gram and the higher complete adoption was due to their availability without cost and nutritious nature of red gram leaf (ITK No. 316). The ITK No. 319 (red gram is mixed with ash) and ITK No. 320 (red gram seeds are stored) refer to storage of red gram with kitchen ash and the higher complete adoption of the ITKs was due to abundance of kitchen ash besides the rationality behind the ITKs.

The 9 ITKs which were adopted partially by more than 50% of the farmers are ITK No. 293 (Bharani karthe is suitable season), ITK No. 294 (doni kandulu is an indigenous), ITK No. 296 (Gotcha kandulu), ITK No. 297 (billa kandulu), ITK No. 301 (Farmers maintain spacing), ITK No. 302 (farmers maintain spacing), ITK No. 304 (10 kg/acre of seed rate) ITK No. 308 (Red gram is cultivated) and ITK No. 322 (redgram seed is stored). The difficult in adoption of season accurately due to vagaries of monsoon (ITK No. 294), competition between the indigenous varieties (ITK No. 296 and 297), difficulties involved in maintaining spacing and seed rate (ITK No. 301, 302 and 304) and availability of alternatives for the ITKs (ITK No. 309 and 322) were major reasons attributed for partial adoption of these ITKs.

The ITK No. 295, 323 and 324 were not adopted by more than 50% of the respondents. The lower adoption of the ITK No. 295 was because the indigenous variety 'Binnisa' less competitive ability and the variety was also not popular through out the zone. The availability of alternative methods for storage was the possible cause for lower adoption of the ITK No. 323 (red gram is stored in earthen pots) and ITK No. 324 (red gram is stored after adding clay).

5.4.2.13 Itemwise extent of adoption of ITK on horse gram

(Macrotylam uniflorum)

Table 45: Extent of adoption of ITKon horse gram

(n=29)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
325	'Nalla vulavalu' is a traditional horse gram variety grown by the tribals.	18	62.04	7	24.13	4	13.79
326	'Tella vulavalu' (pedda ulavalu) is a traditional horse gram variety gives more yield and more price.	6	20.68	7	24.13	16	55.16
327	'Nalla Vulavalu' is used as cattle feed and household consumption where as 'Tella vulavalu' is used exclusively for household consumption.	5	17.24	24	82.76	0	0
328	Dassera (Uttara karthe) is optimum season for sowing horse gram.	8	27.58	15	51.72	6	20.68
329	Horse gram is mostly cultivated as subsidiary crop without depending on it.	12	41.36	14	48.26	3	10.34
330	10 – 15 kg / acre seed rate in followed by the farmers in sole crop of horse gram traditionally.	14	48.26	14	48.26	1	3.45
331	Horse gram is cultivated in dry lands after harvesting ragi crop in rabi season.	14	48.26	2	6.89	3	10.34
332	No inter cultivation operation is practiced between sowing and harvesting of horse gram.	13	44.82	3	10.34	3	10.34
333	Tella vulavalu is cultivated as mixed crop with black gram in dry lands (Garuvu) by the tribals.	9	31.02	4	13.79	16	55.16
334	Matured horse gram is uprooted and sun dried for 4 – 5 days to trample under the feet of animals to separate grain.	22	75.86	6	20.68	1	3.45

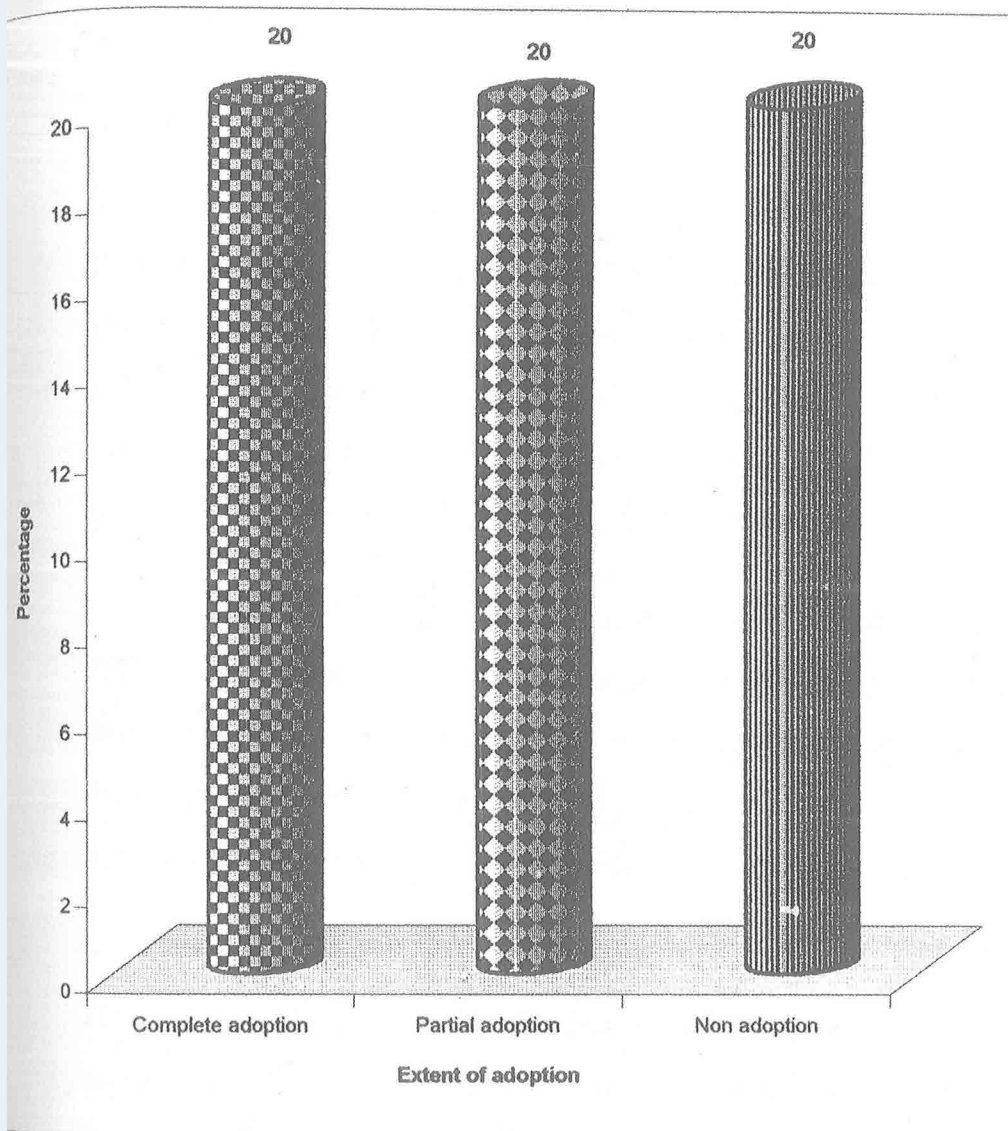


Fig.1: Extent of adoption of ITK on horse gram

The results from the table 45, shows that 2 ITKs (20.00%) each were completely adopted, partially adopted and not adopted by more than 50% of the respondents.

The 2 ITKs adopted completely by more than 50% of the respondents were ITK No. 325 (Nalla ulavalu is a traditional variety) and ITK No. 334 (Matured horse gram is uprooted). The higher complete adoption of the ITK No. 325 was due to the familiarity of the indigenous variety and its taste was preferred by the farmers and also used as feed for animals. The higher complete adoption of the ITK No. 334 were because of non availability of alternative methods for small scale threshing.

The ITK No. 327 (nalla ulavalu is used as cattle feed) and ITK No. 328 (dassera is optimum season) were adopted partially by more than 50% of the farmers. The partial adoption was due to competition from the other crop products for animal and human consumption (ITK No. 327) and vagaries of monsoon (ITK No. 328).

The ITK No. 326 (tella vulavalu is a traditional variety) and ITK No. 333 (tella vulavalu is cultivated as mixed crop) were not adopted by more than 50% of the respondents. The lower adoption of these ITKs was due to the competition from the other indigenous varieties of horse gram.

5.4.2.14 Item wise extent of adoption of ITK on groundnut
(*Arachis hypogea*)

Table 46: Extent of adoption of ITK on groundnut

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
335	'Gutti senaga' is an indigenous groundnut variety grows like a bush and gives more yield.	21	70.00	8	26.67	1	3.33
336	Groundnut is mostly cultivated for rabi because farmers believes that rabi groundnut yields more than kharif.	21	70.00	7	23.33	2	6.67
337	Groundnut seeds from plants which are grown in dry lands gives good crop stand compared to other fields.	25	83.33	5	16.67	0	0
338	When groundnut is grown in wetlands, crop grows luxuriantly but fails to set seed.	13	43.37	3	3.33	14	46.67
339	Dropping of basal leaves is taken as indication to harvest groundnut and this is observed by the frequent visits of crows to the groundnut field for pods.	25	83.33	1	33.30	4	13.33
340	Well dried seeds with pink seed coat without wrinkles are selected for sowing.	24	80.00	3	10.00	3	10.00
341	Good quality, unbroken kernels free from insects shriveling, insect damage are alone used for sowing.	21	70.00	6	20.00	3	10.00
342	Light red soils are best for cultivation of groundnut.	18	60.00	7	23.33	5	16.67
343	Groundnut kernels are dibbled by making a small dig in the field with 'Kanka' and covered with soil.	26	86.67	2	6.67	2	6.67
344	Sowing the kernels behind the country plough called as 'Bongaram salu' and farming beds and channels later.	28	93.33	2	6.67	0	0

345	Weeding is practiced twice in groundnut once is at fortnight after sowing and second is at the time of flowering.	22	73.33	6	20.00	2	6.67
346	Gypsum is essential for groundnut and hence farmers apply gypsum to the soil before sowing.(BT)	23	76.67	6	20.00	1	3.33
347	If the soil is dry, groundnut field is irrigated or other wise wait for a rain prior to harvest to facilitate easy and complete harvesting.	26	86.67	2	6.67	2	6.67
	Plant Protection						
348	Farmers grow Jatropa plants around the groundnut field, which acts as catch crop against red hairy caterpillar.	14	46.67	3	10.00	13	43.37
349	Farmers used to burn thrash adjacent to the groundnut fields during nights to attract nymphs and adults of insect (BT).	18	60.00	12	40.00	0	0

The findings from the table 46, shows that out of the 15 ITKs on groundnut, complete adoption by more than 50% of the respondents was observed in case of 13 ITKs (86.67%).

The ITK No. 335 (Gutti senaga is an indigenous variety) represents indigenous variety of groundnut and completely adopted by more than 50% of the respondents. The higher complete adoption of the ITK was due to its performance and easy availability of seed with the farmers. The ITK No. 336 (groundnut is mostly cultivated for rabi) suggest seasons in groundnut cultivation and the higher complete adoption was because of its rationality. The ITK No. 337 (groundnut seeds from plants) and ITK No.342 (light red soils are best) concerned with soils in relation to groundnut cultivation and the possible reason behind the higher complete adoption of these ITK was due to the simple nature of the practices besides their rationality.

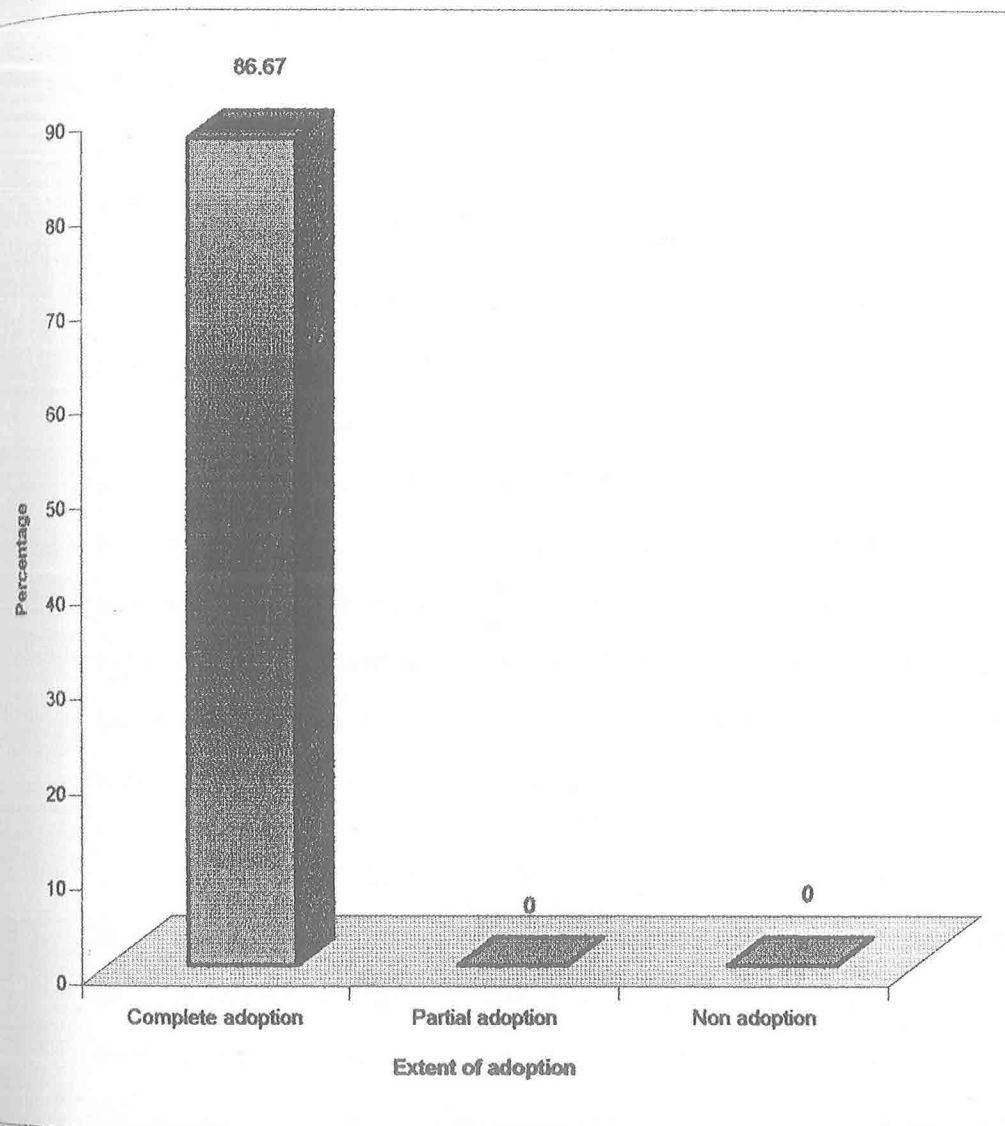


Fig. 3. Extent of adoption of ITK on groundnut

The ITK No. 339 (dropping of basal leaves is taken as indication) and ITK No. 347 (if the soil is dry, groundnut field) indicate harvest aspects of groundnut. The possible reason behind the higher complete adoption of the ITK No.339 was due to its rationality. The higher complete adoption of the ITK No.347 was because the ITK fetches more yields and makes the harvesting easy and complete.

The ITK No. 340, 341, 343 and 344 represents seed selection and sowing and all the ITK were completely adopted by more than 50% of the respondents. The higher complete adoption of the ITK No. 340 (well dried seeds with pink seed coat) and ITK No. 341 (good quality, un broken kernels) was due to the perceived importance given by the farmers for selection of good quality seed. The higher complete adoption of the ITK No. 343 (groundnut seeds are dibbled) and ITK No. 344 (sowing the kernels behind the country plough) was due to their suitability to the small scale farming existing in the zone.

The higher adoption of the ITK No. 345 (weeding is practiced twice in groundnut) was attributed to its perceived importance in growth by the farmers and less cost involved in adoption of the ITK. The higher complete adoption of the non rational ITK No. 346 attributed to its untimely supply by the Department of agriculture (Department of agriculture supplies the gypsum at the end of the season leading to the application of gypsum before sowing for the next groundnut crop). The higher complete adoption of the ITK No. 349 was due to its rationality and low cost involved in it.

5.4.2.15 Itemwise extent of adoption of ITK on sesamum

(Sesamum indicum)

Table 47 : Extent of adoption of ITK on sesamum

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
350	'Yerra nuvvulu' is a traditional sesamum variety which is mixed with sand at 4:1 ratio and broadcasted (1 kg seed + ¼ kg sand) for sowing to get uniform distribution of seed in the field.	6	22.22	3	11.11	18	16.67
351	'Nalla Nuvvulu' is a traditional sesamum variety, 2.5 to 3 kg seed is broadcasted for one acre.	15	55.56	9	33.33	3	11.11
352	Farmers used to sow sesamum by observing fruit initiation of Thummi tree (Acacia sp) which they believe optimum season for sowing.	7	25.92	8	29.60	12	44.44
353	Soil fertility is depleted by sesamum cultivation.	13	48.14	5	18.52	9	33.33
354	Rain is not desired at the time of flowering sesamum by the farmers.	12	44.44	10	37.03	5	18.52
355	Sesamum is harvested when its stem, leaves and capsules turn yellow and seed in middle capsule turn black.	20	74.06	6	22.22	1	3.70
356	After harvest, sesamum plants along with capsules are stalked in the field in upright position. Top portion is covered with straw and kept for 3-5 days after which seeds are separated by shaking the plants.	23	85.18	1	3.70	3	11.11
	Post harvest technology:						
357	Storing sesamum oil in earthen pots in practiced to increase its keeping quality.	17	62.96	2	7.40	8	29.60
358	Sesamum seeds are stored in earthen pots in mix with stand in 9 : 1 ratio.	18	66.67	4	14.80	5	18.52

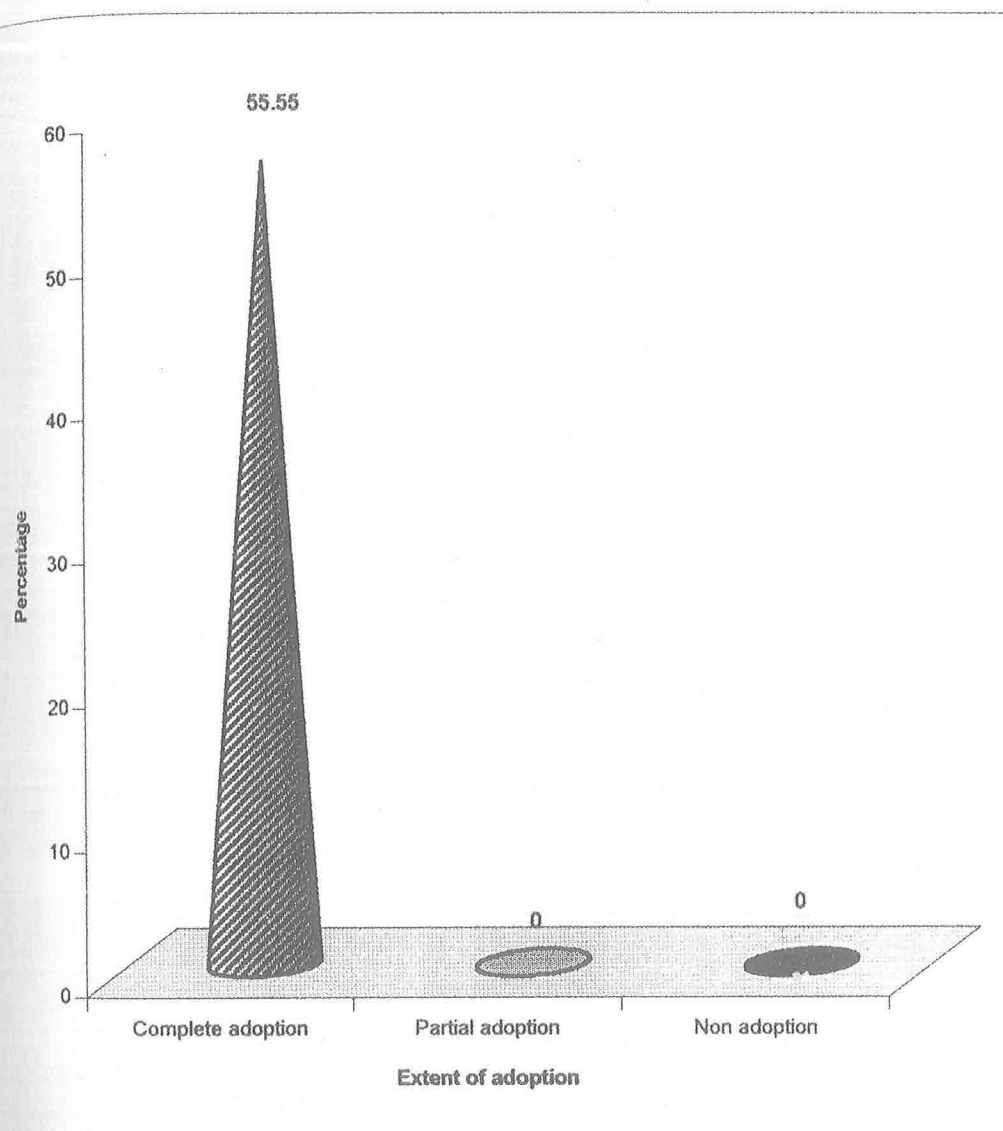


Fig. 23 Extent of adoption of ITK on sesame

It could be inferred from the above table that out of the 9 ITKs on sesamum, complete adoption by more than 50% of the respondents was found in the case of 5 ITKs (55.55%).

The 5 ITKs (55.55%) adopted completely by more than 50% of the respondents were ITK No. 351 and 355 to 358. The ITK No. 351 (Nalla nuvvulu) represent indigenous sesamum variety and the higher complete adoption was due to its performance and popularity in the zone. The ITK No. 355 (sesamum is harvested when its stem) suggest harvest index of sesamum and the higher complete adoption was attributed to its easy identification.

The ITK No. 356 (after harvest, sesamum plants), ITK No. 357 (storing sesamum oil in earthen pots) and ITK No. 358 (Sesamum seeds are stored in earthen pots) represent post harvest aspects of sesamum. The higher complete adoption of the ITK No. 356 was due to its suitability to small scale post harvest care. The ITK No. 357 and 358 indicate storing sesamum oil and seed in earthen pots respectively and the higher complete adoption was due to its low cost involvement and availability of the earthen pots in villages.

5.4.2.16 Itemwise extent of adoption of ITK on mesta

(*Hibiscus subdarifa*)

Table 48 : Extent of adoption of ITK on mesta

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
359	Just three ploughings are sufficient for mesta cultivation.	24	80.00	2	6.67	4	13.33
360	Dense planting is desired by the farmers in mesta because they believe that more plant population gives more yield in mesta.	26	86.67	4	13.33	0	0

(n=30)

361	Sowing of mesta before Telugu new year (Ugadi) fetches higher fibre yield.	22	73.33	5	16.67	3	10.00
362	Sowing of mesta is practiced during the month of August in some parts of high altitude and tribal area zone.	13	43.33	13	43.33	4	13.33
363	Mesta in cultivated for consumptive uses only such as to stitch tobacco leaves, make ropes etc. not as commercial crop.	1	3.33	1	3.33	28	93.34
364	Mesta is cultivated as mixed crop with horse gram and harvesting horse gram after three months thus allowing mesta for maturity upto 6 months is practiced.	2	6.67	2	6.67	26	86.67
365	Mesta is cultivated as mixed crop either with sesamum or red gram.	16	53.34	1	3.33	13	43.33
366	Hand hoeing (Goppulu tavyuta) is the only intercultivation operation practiced by the farmers at early stages of mesta to control weeds.	13	43.33	13	43.33	4	13.33
367	Mesta is harvested at the time of flowering for fibre and for seed purpose cultivate upto full maturity.	30	100.0	0	0	0	0
368	Sprouting of buds in the axils of leaf is the indication for last stage of harvesting mesta. If harvest mesta beyond this stage fibre quality will be poor.	30	100.0	0	0	0	0
Plant Protection							
369	Farmers uses light traps i.e. setting of fire on field bunds to control insect pests.(BT)	28	93.33	1	3.33	1	3.33
370	Removal of bunchy tops along with masses of mealybugs (Meconellicoccus hirsutus) and their destruction to prevent the spread of pest to adjacent plants.	24	80.00	4	13.33	2	6.67

	Post Harvest Technology						
371	Farmers produce mesta seed for next crop by keeping the part of the crop up to full maturity stage which is identified by brown colouration of pods. The seeds are extracted after sundrying the mesta for 15-20 days in the field in upright position.	28	93.33	2	6.67	0	0
372	Farmers used to sundry the seeds of mesta for 3-4 days and store in earthen pots to prevent storage pests.	28	93.33	2	6.67	0	0
373	After harvesting mesta crop farmers keep the crop in field for 7-10 days. Meanwhile crop dries and leaves and twigs fall down in the field. It improves the soil fertility.	29	96.67	1	3.33	0	0
374	Farmers keep the mesta sticks for 10 to 15 days in the farm ponds to soak them in water. Meanwhile the fibre become soft and easy to separate fibre from the sticks.	28	93.33	2	6.67	0	0
375	Mesta seed is stored after sun drying in mix with malathion (cheemala mandu) to prevent storage pest attack.	27	90.00	3	10.00	0	0

It could be observed from the table 48, that out of the 17 ITKs on mesta, more than 50% of the respondents completely adopted 13 ITKs (76.47%) and not adopted 2 ITKs (11.76%).

The 13 ITKs adopted completely by more than 50% of the respondents were the ITK No. 359 to 361, 365 and 367 to 375. The ITK No. 359 (Just three ploughings are sufficient) indicate land preparation in mesta and the higher complete adoption was due to the farmers perceived importance to the ITK and its easy to adopt nature. The ITK No. 360 (Dense planting is desired by the farmers) a non rational ITK represents maintenance of plant population in mesta and the higher complete adoption

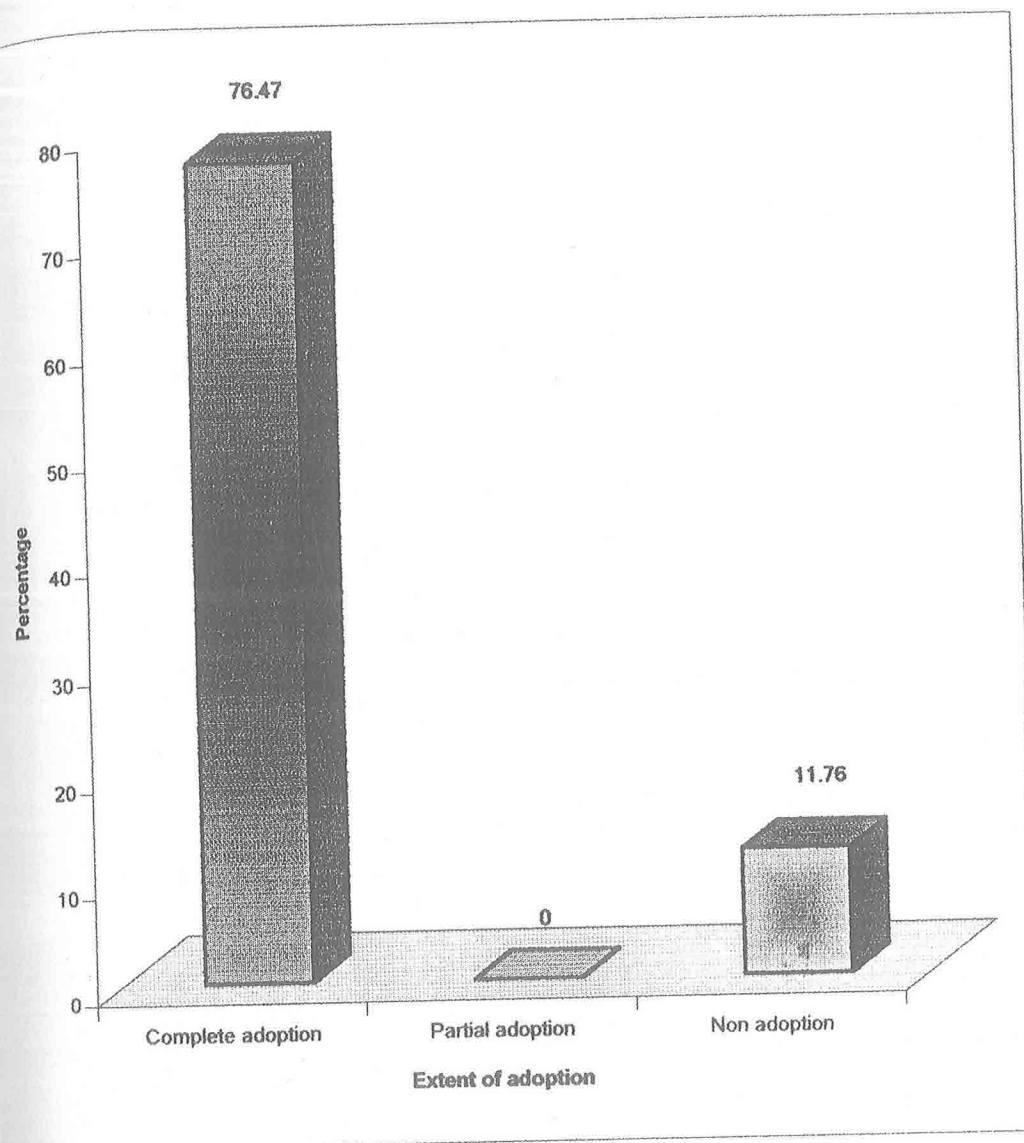


Fig. 24. Extent of adoption of ITK on mesta

was due to farmers misconception that dense plant population fetches more yields. The ITK No. 361 (sowing of mesta before telugu new year) suggests seasons in mesta cultivation and the higher complete adoption was due to its lower water requirement during crop growth period (Cultivated during summer) besides its rationality. The ITK No. 365 (Mesta in cultivated as mixed crop) a non rational ITK concerned with mixed cropping of mesta and the higher complete adoption was due to farmers need for these two crops viz., sesamum and red gram for consumption.

The ITK No. 367 (Mesta is harvested at the time of flowering) and ITK No. 368 (Sprouting of buds in the axils of leaf) suggest harvest indices of mesta and the higher complete adoption was attributed to its easy identification.

The ITK No. 369 (Farmers use light traps) and ITK No. 370 (Removal of bunchy tops along with masses of mealy bugs) suggest pest management in mesta and the higher complete adoption was due to their rationality and economic feasibility.

The ITK No. 371 to 375 refer to post harvest aspects of mesta and adopted completely by more than 50% of the respondents. The ITK No. 371 (Farmers produce mesta seed for next year), ITK No. 373 (After harvesting mesta crop) and ITK No. 374 (farmers keep the mesta sticks for 10-15 days) indicate post harvest processing of mesta and the higher complete adoption of these ITK was because of non availability of alternative methods besides their rationality. The ITK No. 372 (farmers used to sundry) and ITK No. 375 (mesta seed is stored after sundrying) emphasizes the sundrying and safe storage, and the higher complete adoption was due to the low cost involved in the ITK and the farmers perceived importance on sundrying.

5.4.2.17 Itemwise extent of adoption of ITK on tobacco (*Nicotiana tabacum*)

Table 49: Extent of adoption of ITK on tobacco

(n=23)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
376	Punarvasha to Ashlisha (July – August) is the best season for sowing tobacco in nursery beds.	3	13.04	16	69.56	4	17.39
377	Tobacco seedlings are grown in raised nursery beds with adequate drainage facility.	11	47.83	12	52.17	0	0
378	Tobacco seeds are mixed with dry sand and broadcast on nursery bed to get uniform distribution and covered with available farm wastes as mulch.	23	100.0	0	0	0	0
379	Diammonium phosphate (DAP) + calcium ammonium nitrate (CAN) + sulphate of potash + Farm Yard Manure is applied as basal after 15 days of sowing tobacco seedlings by digging at the roots of tobacco (BT).	8	34.78	9	39.13	06	26.09
380	Sheep penning is practiced during summer in tobacco for getting higher yields.	11	47.83	4	17.39	8	34.28
381	Weeding is practiced after 15-20 days of basal application of fertilizers.	17	73.91	6	26.09	0	0
	Plant Protection						
382	Tobacco crop is rotated with maize or sorghum to reduce pest problem in tobacco.	23	100.0	0	0	0	0
383	Tobacco plant is uprooted and burned or thrown out if Manukullu (Stem rot) is observed.	11	47.83	8	34.78	11	47.83
384	Monocrotophos or Endosulfon is sprayed if akuchitta (leaf spot) is observed (BT).	13	56.52	10	43.48	0	0

385	Neem seed kernel extract (2%) is sprayed on the crop if leaf curl disease is observed in tobacco.	5	21.74	6	26.09	12	52.17
386	Orabanche is manually removed as and when it appears before its flowering and seed set.	8	34.78	9	39.13	6	26.09
387	Sorghum is cultivated as trap crop in tobacco which controls orabanche.	4	17.39	10	43.48	9	39.13
388	A small piece of neem trunk is cutted and soaked in water for 2-3 months. An extract is prepared from this solution and sprayed on tobacco crop if Aku mudatha (leaf curl) is observed.	1	4.35	5	21.74	17	73.91
	Post Harvest Technology :						
389	Harvested leaves of tobacco are stitched with mesta fibre and sundried by tying both ends to two poles on open sun and allowing it for 15 – 20 days.	23	100.0	0	0	0	0

It could be inferred from the table 49, that out of the 14 ITKs on tobacco, more than 50% of the respondents were adopted 5 ITKs (35.7%) completely and 2 ITKs (14.28%) partially and one ITK (7.14%) was not adopted by more than 50% of the respondents.

The 5 ITKs adopted completely by more than 50% of the respondents were ITK No. 378, 381, 382, 384 and 389. The ITK No. 378 (Tobacco seeds are mixed with dry sand) indicate sowing of tobacco and the higher complete adoption was because, to get uniform distribution of the small seeds of tobacco on nursery bed. The ITK No. 381 (Weeding is practiced after 15-20 days) suggest weed management and the higher complete adoption was due to its perceived importance by the farmers. The possible reason behind the higher complete adoption of the ITK No. 382 (Tobacco crop is rotated with maize) was due to its rationality. The higher

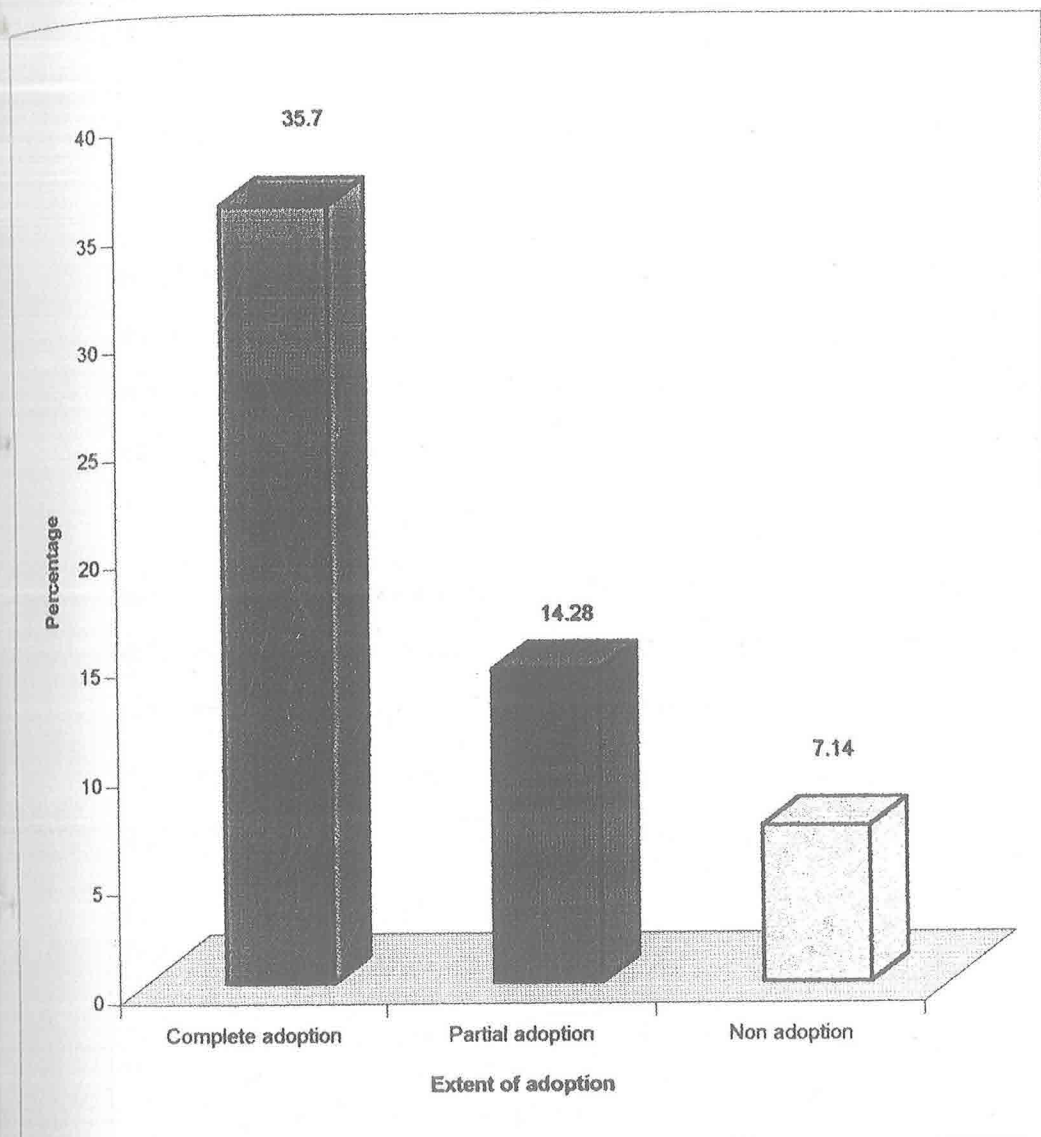


Fig. 35: Extent of adoption of ITK on tobacco

complete adoption of the ITK No. 384 (Monocrotophos or endosulfan) was attributed to the farmers orientation towards the popular chemical pesticides though it was found not rational. The possible reason behind the higher complete adoption of the ITK No. 389 (harvested leaves of tobacco) was because, it utilizes available resources for sundrying tobacco with no cost.

The ITK No. 376 (Punarvasha to Ashlisha) and ITK No. 377 (tobacco seedlings are grown) were adopted partially by more than 50.00% of the respondents the partial adoption was due to the difficult in adoption of seasons completely because of vagaries of monsoon (ITK No.376) and soil characteristics in provision of adequate drainage facilities (ITK No. 377).

The ITK No. 388 (A small piece of neem trunk in cutted) refer to pest management in tobacco and was not adopted by more than 50.00% of the respondents. The lower adoption of the ITK was attributed to the requirement of a clear plan for its adoption and its complexity.

5.4.2.18 Item wise extent of adoption of ITK on vegetables

Table 50 : Extent of adoption of ITK on vegetables

ITK No.	ITK	(n=30)					
		CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
390	'Pacha vanga' is an indigenous variety of brinjal bear fruits with broad green strips. Though it yield less, it fetches more price because the fruits are tasty.	13	43.33	12	40.00	5	16.67
391	About 40-45 days old brinjal seedlings are used for transplantation in to main field.	16	53.34	10	33.33	4	10.33
392	Suitable season for sowing ladies finger is Chaitram (March).	3	10.00	18	60.00	9	30.00

393	About 3 or 4 ladies finger seeds are sown in each hole and later thinned to two plants per hill at two weeks after sowing.	10	33.33	2	6.67	18	60.00
394	Cucumber seeds are sown as one side of the long channels formed 5 feet apart.	6	20.00	12	40.00	12	40.00
395	Three or four seeds of cucumber are planted in each hole with the use of hand hoe to dig the soil.	7	23.33	14	46.67	9	30.00
396	Cow dung is diluted with cow urine and applied near the base of transplanted seedlings of vegetables such as chilly, tomato etc. to improve soil fertility and to enhance crop growth.	5	16.67	18	60.00	7	23.33
397	Bottle gourd is cultivated as boarder crop around the groundnut field to get additional income.	5	16.67	18	60.00	7	23.33
398	Bottle gourd is harvested, when it turns from pale green to dark green and finger nails get pierced in to it, while pressing.	4	13.33	16	53.34	10	33.33
399	Cucumbers are mostly cultivated in kitchen garden allowing them to creep on the huts.	12	40.00	11	36.67	7	23.33
	Plant Protection						
400	Ash is dusted on vegetables which acts as physical barrier against pests.	18	60.00	8	26.67	4	13.33
401	Ash and turmeric powder are mixed in equal proportion and sprinkled to control aphids which attacks vegetables.	10	33.33	12	40.00	8	26.67

402	Ash in mix with water is sprinkled on cucumber crop to control aphids and powdery mildew.	4	13.33	6	20.00	20	66.67
Post Harvest Technology							
403	Cucumber seeds are extracted from fully ripened fruits, washed well with water, mixed with ash, dried and stored up to one year (Also for Bottle gourd).	20	66.67	4	13.33	6	20.00
404	Sundrying the seeds of bottle gourd, along with outer shell of the fruit which acts as a storage container and protect from pests.	21	70.00	3	10.00	6	20.00
405	Cucumber seeds are pasted to wall when they are wet to store for 4-6 months.	25	83.33	3	10.00	2	6.67
406	Cucumber seeds are mixed with ash when they are wet and sun dried on houses for a week and than stored inside the houses in polythene covers.(BT)	20	66.67	6	20.00	4	13.33
407	Bottle gourd and ridge gourd seeds are stored as such in fruits, after sundrying for a week. Whenever they need seeds for sowing they break the gourds and extract the seed.	17	56.67	5	16.66	8	26.67

The findings from the table 50 indicate that out of the 18 ITKs on vegetables, 7 ITKs (38.89%) were adopted completely, 4 ITKs (22.22%) adopted partially and the 2 ITKs (11.11%) not adopted by more than 50% of the respondents.

The 7 ITKs (38.89%) adopted completely by more than 50% of the respondents were the ITK No. 391, 400 and 403 to 407. The ITK No. 391 (About 40-50 days old brinjal) suggest transplantation period of brinjal and the higher complete adoption was due to its rationality and general nature to

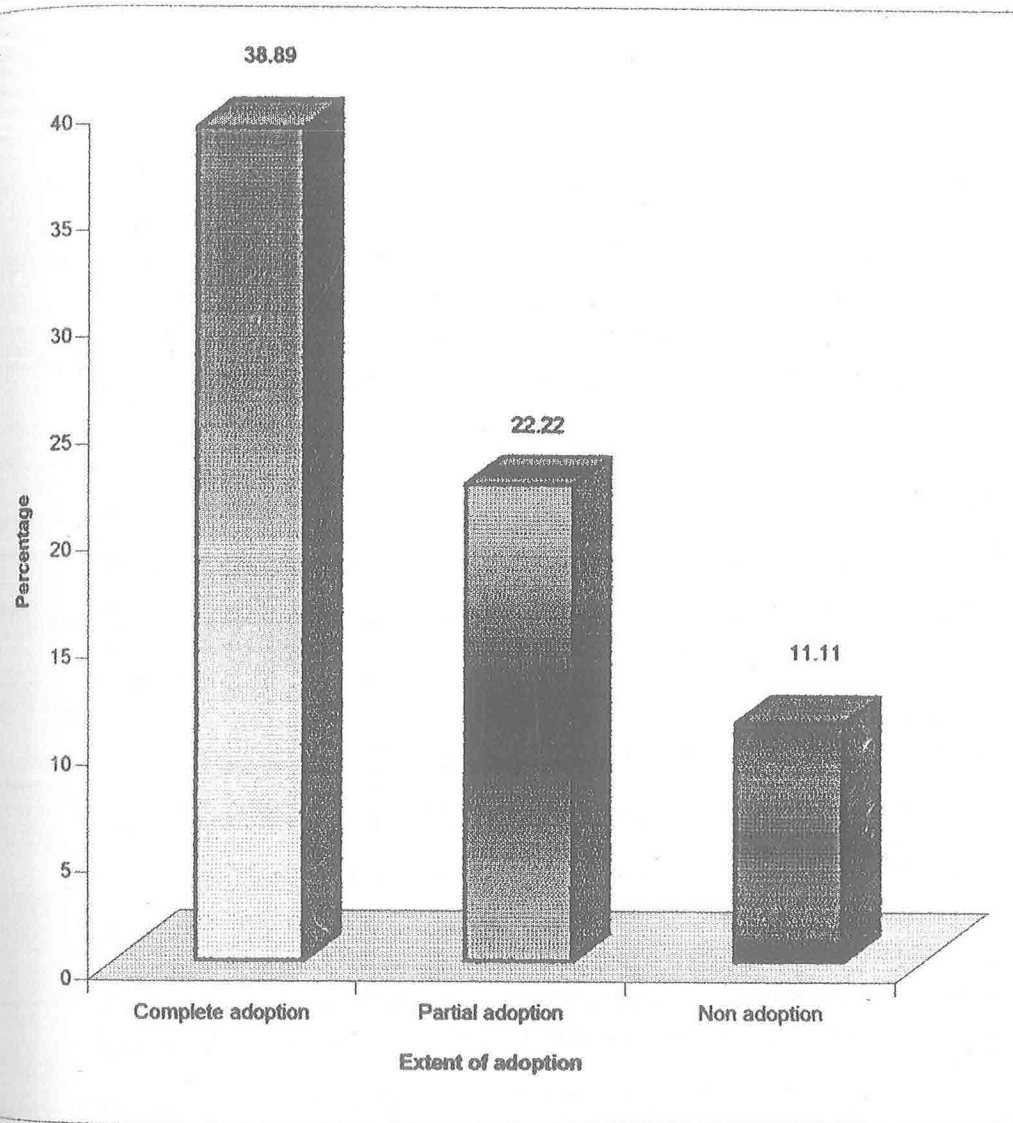


Fig. 26 Extent of adoption of ITK on vegetables

adopt. The possible cause behind the higher complete adoption of the ITK No. 400 (Ash is dusted on vegetables) was due to its low cost involvement.

The ITK No. 403 to 407 suggest post harvest storage of seeds of vegetables and the higher complete adoption of the ITK was due to their no cost involvement and they also does not require any special storage containers.

The ITK No. 392 (suitable season for sowing ladies finger), ITK No. 396 (cow dung is diluted with cow urine), ITK No. 397 (Bottle gourd is cultivated as boarder crop and ITK No. 398 (Bottle gourd is harvested) were adopted partially by more than 50% of the respondents. The possible cause for partial adoption was due to vagaries of monsoon (ITK No. 392), non rationality (ITK No. 396), difficulties involved complete in adoption (ITK No. 397 and 398).

The lower adoption of the ITK No. 393 (About 3 to 4 ladies finger seeds) and ITK No. 402 (Ash is sprinkled on cucumber crop) was attributed to the difficulty and cost involved in adoption of the ITK (ITK No. 393) and farmers reduced interest on the ITK (ITK No. 402).

5.4.2.19 Item wise extent of adoption of ITK on cowpea (*Vigna anguiculata*)

Table 51: Extent of adoption of ITK on cowpea (Alasandalu / Bobbarlu)

(N=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
408	Farmers sow the cowpea during July – August which they believe suitable season.	20	66.67	4	13.33	6	20.00
409	‘Tella alasandalu’ is an indigenous cow pea variety cultivated by the tribals (pods are light in colour).	9	30.00	16	53.33	5	16.67

410	'Nalla alsandalu' is an indigenous cow pea variety cultivated by the tribals (pods are dark in colour).	16	53.33	8	26.67	6	20.00
411	Pods of cowpea are harvested when they start drying and turn to brown in colour.	14	46.67	3	10.00	13	43.33
412	Cowpea is mostly cultivated as mixed crop with sorghum, ganti and red gram.	21	70.00	7	23.33	2	6.67
413	In some tracks of high altitude and tribal area zone cowpea seed is mixed with red gram and planted by digging with 'Kanka' as holes and covering with soil after dropping seed in it.	19	63.33	5	16.67	6	20.00
	Post Harvest Technology :						
414	Cowpea pods are sun dried until they become brittle to make the seed separation easy.	23	76.69	4	13.33	3	10.00
415	For safe storage of cowpea, seeds are filled in earthen pots in mix with kitchen ash.	21	70.00	5	16.67	4	13.33
416	Cow pea seed is stored as such in pods and tied with paddy straw so that the rats confused it as paddy straw and leaves it.	30	100.0	0	0	0	0

It could be inferred from the table 51, that out of the 9 ITKs on cowpea, more than 50.00 % the respondents adopted 6 ITKs (66.67 %) completely and one ITK (11.11 %) partially.

The 6 ITKs (66.67 %) adopted by more than 50 % of the respondents were the ITK No. 408, 410, 412, 413, 415 and 416. The ITK No. 408 (farmers sow the cowpea during July – August) suggest season for sowing cowpea and the higher complete adoption was due to its rationality. The possible reason behind the higher complete adoption of the ITK No. 410 (Nalla alasandalu is an indigenous variety) might be due to its performance.

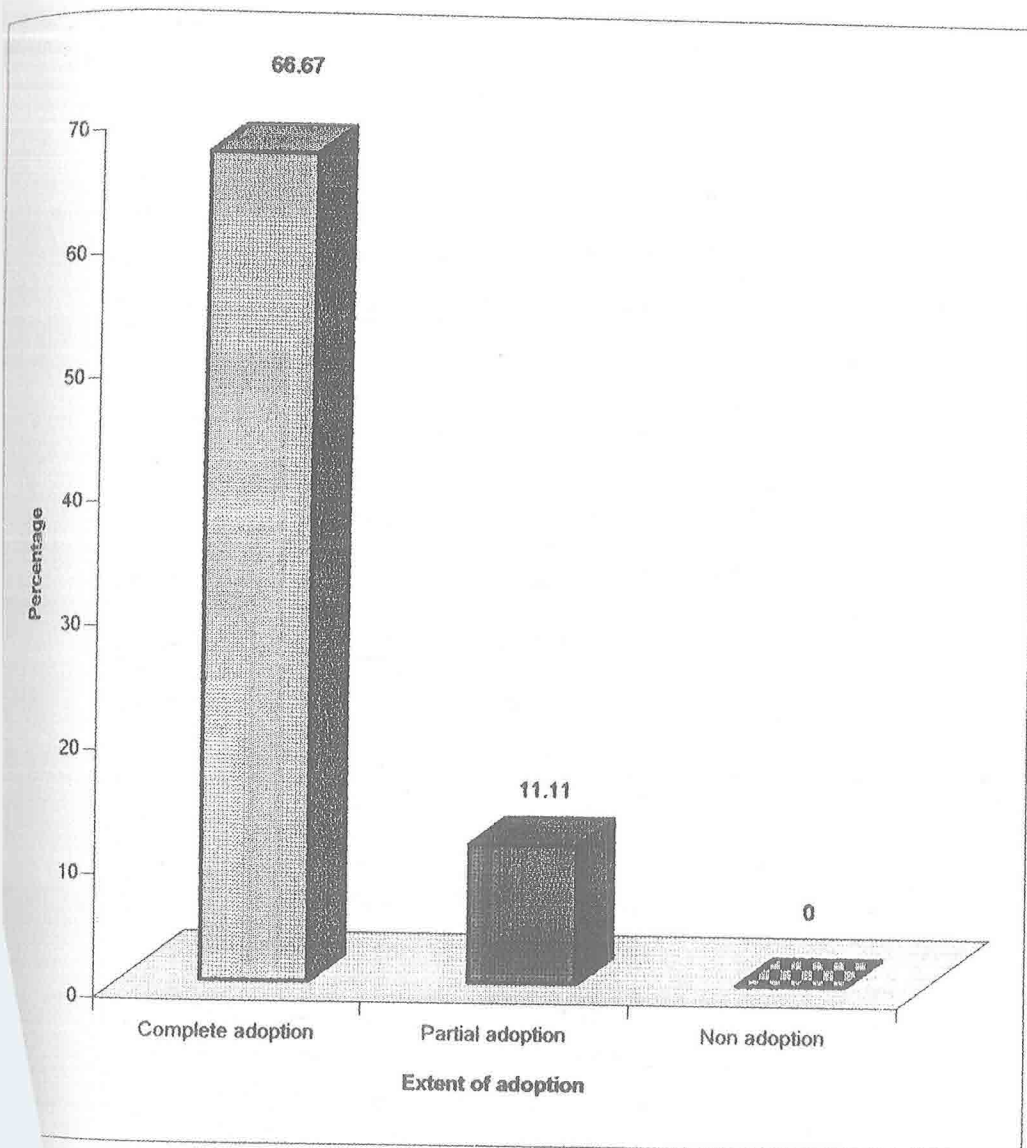


Fig. 27. Extent of adoption of ITK on cowpea

The ITK No. 412 (Cowpea is mostly cultivated as mixed crop) and ITK No. 413 (In some tracks of high altitude and tribal area zone) suggest mixed cropping in cow pea and the higher complete adoption was due to their rationality.

The ITK No. 415 (For safe storage of cowpea) and ITK No.416 (cow pea seed is stored as such in pods) represent post harvest storage of cowpea. The higher complete adoption of the ITK No.415 was due to the abundant availability of kitchen ash. The logical thinking of the farmers to make the rats confused by storing the cowpea in paddy straw was the possible cause behind the higher adoption of the ITK No.416.

The partial adoption of the ITK No. 409 (Tella alasandalu) was due to the competition from the other indigenous varieties.

5.4.2.20 Itemwise extent of adoption of ITK on rice bean

Table 52 : Extent of adoption of ITK on rice bean (*Thimmerlu*)
(n=29)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
417	'Chinna Timmerlu' is an indigenous short duration variety (60 days) with indeterminate growth habit. Seeds are small in size with light yellow coloured seed coat.	4	13.79	12	41.36	13	44.82
418	'Pedda timmerlu' is an indigenous long duration rice bean variety (90 days) with indeterminate viny growth. Seeds are larger in size with green seed coat.	0	0	9	31.02	20	68.96
419	'Nalla timmerlu' is an indigenous short duration rice bean variety with determinate growth and bushy habit with black seed coat.	4	13.79	15	51.72	10	34.48

420	'Machcha timmerlu' is a short duration indigenous rice bean variety with indeterminate viny growth with black spot on green seed coat.	0	0	12	41.36	17	58.62
421	'Yerupu timmerlu' is a long duration indigenous rice bean variety with indeterminate growth and red seed coat.	0	0	15	51.72	14	48.26
422	During ploughing ash obtained after burning trees in podu is applied to improve soil fertility.	11	37.93	18	62.07	0	0
423	Rice bean is cultivated only on sloppy hills	10	34.48	11	37.93	8	27.58
424	Rice bean sown during the month of July, which is found to be the optimum season.	20	68.96	9	31.04	0	0
	Plant Protection						
425	Kitchen ash is dusted on rice bean leaves during 6 – 8 AM early in the morning to control aphids by acting as physical barrier.	4	13.79	16	55.16	9	31.02
426	Rice bean is harvested at ground level with sickles when bottom leaves turn yellow and most of the pods turn brown.	0	0	24	82.75	5	17.25
	Post Harvest Technology						
427	Rice bean seeds are stored in bamboo baskets in mix with ash and common salt of 10 : 1 ratio. (BT)	8	27.58	16	55.16	5	17.25
428	Farmers store the seeds of rice bean in kitchens at 6 – 7 feet height in buhenia leaves.	9	31.02	11	37.93	9	31.02

It could be seen from the findings from the table 52, that out of the 12 ITKs on rice bean, more than 50 % of the respondents adopted one ITK (8.33 %) completely and 6 ITKs (50.00 %) partially and 2 ITKs (16.67 %) were not adopted by more than 50.00 % of the respondents.

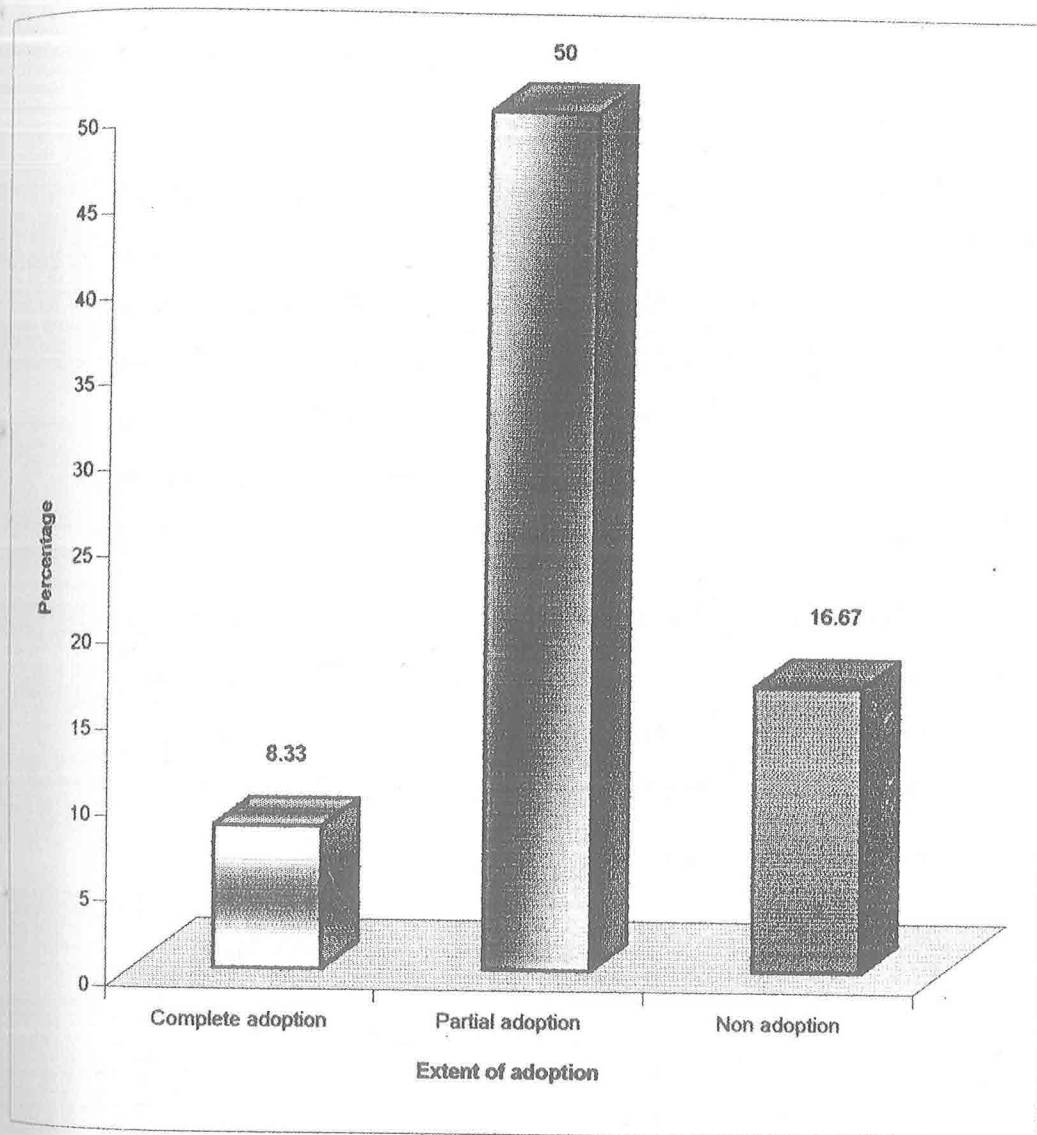


Fig.³⁸ : Extent of adoption of ITK on rice bean

The ITK No. 424 (Rice ban sown during the month of July) indicate season for cultivation of rice ban and adopted completely by more than 50.00 % of the respondents. The higher complete adoption of the ITK was due to its general nature in adoption during the season besides its rationality.

The 6 ITKs viz., 419 (Nalla timmerlu), 421 (Yerupu timmerlu), 422 (During ploughing), 425 (Kitchen ash is dusted), 426 (Rice bean is harvested at ground level) and 427 (Rice bean seeds are stored) were adopted partially by more than 50% of the respondents. The partial adoption of the ITK was due to competition from the other varieties (ITK No. 419 and 421), less importance of the farmers to the practices (ITK No. 422 and 425), inability to identify the harvest index (ITK No. 426) and difficulty in adoption of ITK (ITK No. 427) respectively.

The ITK No. 418 (Pedda timmerlu) and 420 (Machcha timmerlu) suggest the indigenous varieties of rice ban and not adopted by more than 50.00 % of the respondents. The lower adoption of the ITKs was due to competition from the other varieties and their relative performance.

5.4.2.21 Item wise extent of adoption of ITK on cauliflower

(*Brassica oleracea* Var. *botrytis*)

Table 53: Extent of adoption of ITK on cauliflower

(n=25)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
429	Water is sprinkled on raised beds after sowing cauliflower seed to get quick germination.	25	100.0	0	0	0	0
430	'Hemanthula' is an indigenous cauliflower variety cultivated by farmers in some parts of high altitude tribal area zone.	5	20.00	9	36	11	44
431	'Hemagiri' is an indigenous cauliflower variety cultivated by the tribals, which bears small size curds.	6	24.00	11	44	8	32

432	'Kushi kalyani' is a traditional early matured cauliflower variety cultivated by the tribals.	6	24.00	13	52	6	24
433	Maize is cultivated as boarder crop and Ginger is cultivated as mixed crop with cauliflower to substantiate income from one another thus growing three crops on single piece of land.	11	44.00	11	44	3	12
434	Farmyard manure is abundantly applied to the cauliflower for better yields.	13	52.00	12	48	0	0
	Plant Protection :						
435	To control diamond backmoth in cauliflower neem oil is mixed with water and sprayed on the crop.	14	56.00	2	8	9	36
436	Thrash is burned and mixed with soil in prepared raised beds of 1m x 4.5 m with height of 30 – 60 cm to prevent soil born insects, and also to improve soil fertility. (BT)	23	92.00	2	8	0	0

The findings from the table 53, shows that out of the 8 ITKs on cauliflower, more than 50.00 % of the respondents adopted 4 ITKs (50.00 %) completely and one ITK (12.50 %) partially.

The 4 ITKs (50.00 %) adopted completely by 50.00 % of the farmers were ITK No. 429, 434 to 436. The higher complete adoption of the ITK No.429 (water is sprinkled on raised beds) was attributed to its rationality. The possible cause for higher complete adoption of the ITK No.434 (Farmyard manure is abundantly applied) was due to its availability.

The ITK No. 435 (To control diamond back moth) and ITK No. 436 (Thrash is burned and mixed with soil) represents pest management in cauliflower and the higher complete adoption was due to low cost involved in the ITK besides the advantages like improving soil fertility (ITK No. 436).

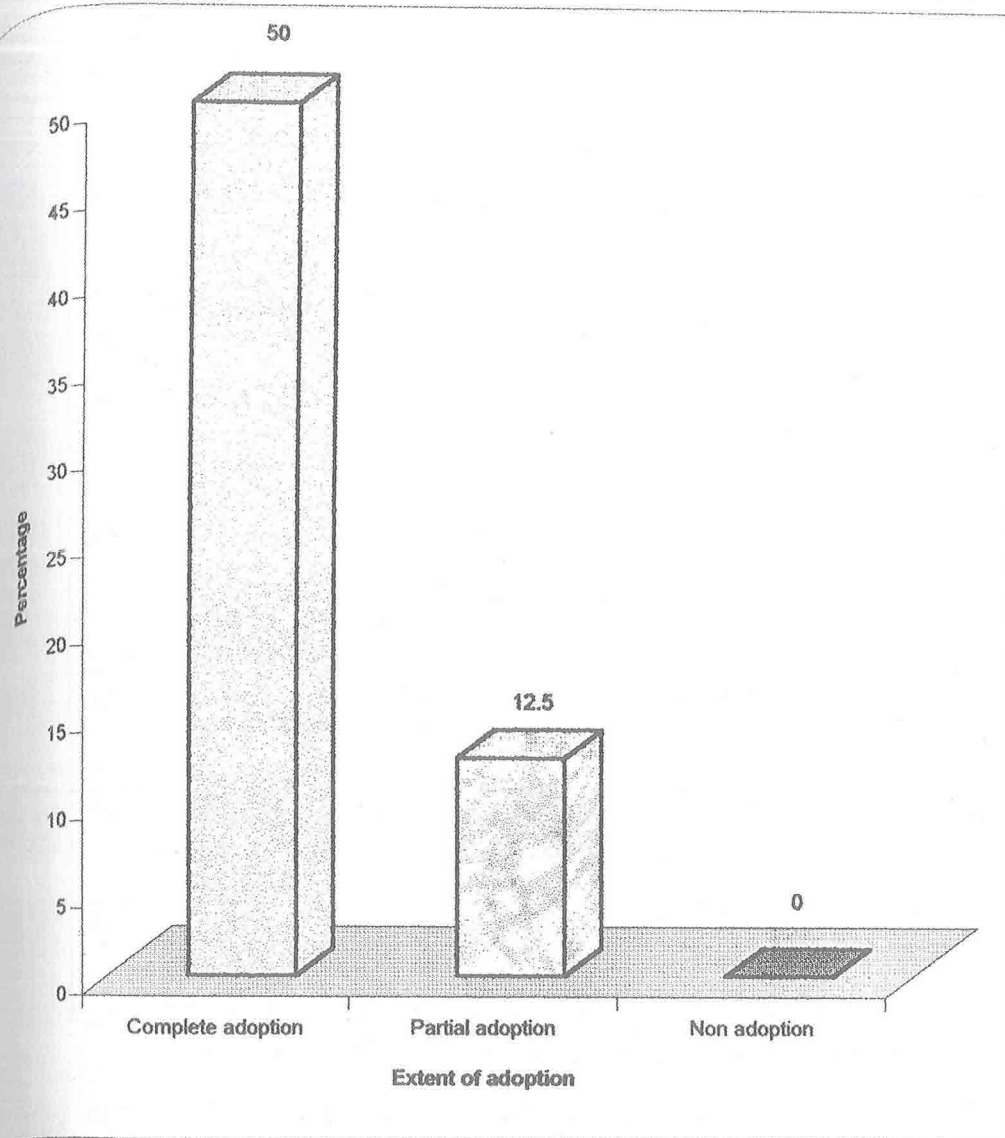


Fig. 3.9: Extent of adoption of ITK on cauliflower

The ITK No. 432 ('kushi kalyani' is a traditional early matured variety) represent indigenous variety of cauliflower and lower adoption of the ITK was due to competition from other indigenous varieties and improved high yielding varieties.

5.4.2.22 Item wise extent of adoption of ITK on tapioca (*Manihot esculenta*)

Table 54: Extent of adoption of ITK on tapioca (*Seema pendalum*)

(n=25)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
437	Tapioca stem only with shorter internodes are selected for planting.	25	100.0	0	0	0	0
438	Sets are planted vertically on the sides of ridges with their buds pointing upwards at a spacing of 3 – 4 feet on either side.	16	64.00	6	24.00	3	12
439	Planting tapioca throughout the year is practiced by the farmers without any season.	11	44.00	7	28.00	7	28
440	Yellowing and withering of bottom leaves indicate right time of harvest.	17	68.00	5	20.00	3	12
441	Tapioca is harvested by digging the soil with hand hoe after irrigating it to get complete crop.	18	72.00	2	8.00	5	20

The findings from the above table indicate that 4 ITKs (80.00 %) out of the 5 ITKs on tapioca were adopted completely by more than 50.00 % of the respondents.

The ITK No. 437 (Tapioca stem only with shorter internodes) and ITK No. 438 (sets are planted vertically on the sides of ridges) suggest selection of plant material and method of planting respectively and both the ITKs were adopted completely by more than 50.00 % of the respondents. The higher complete adoption of the both the ITK was due to their simple nature to adopt besides the scientific rationality behind them.

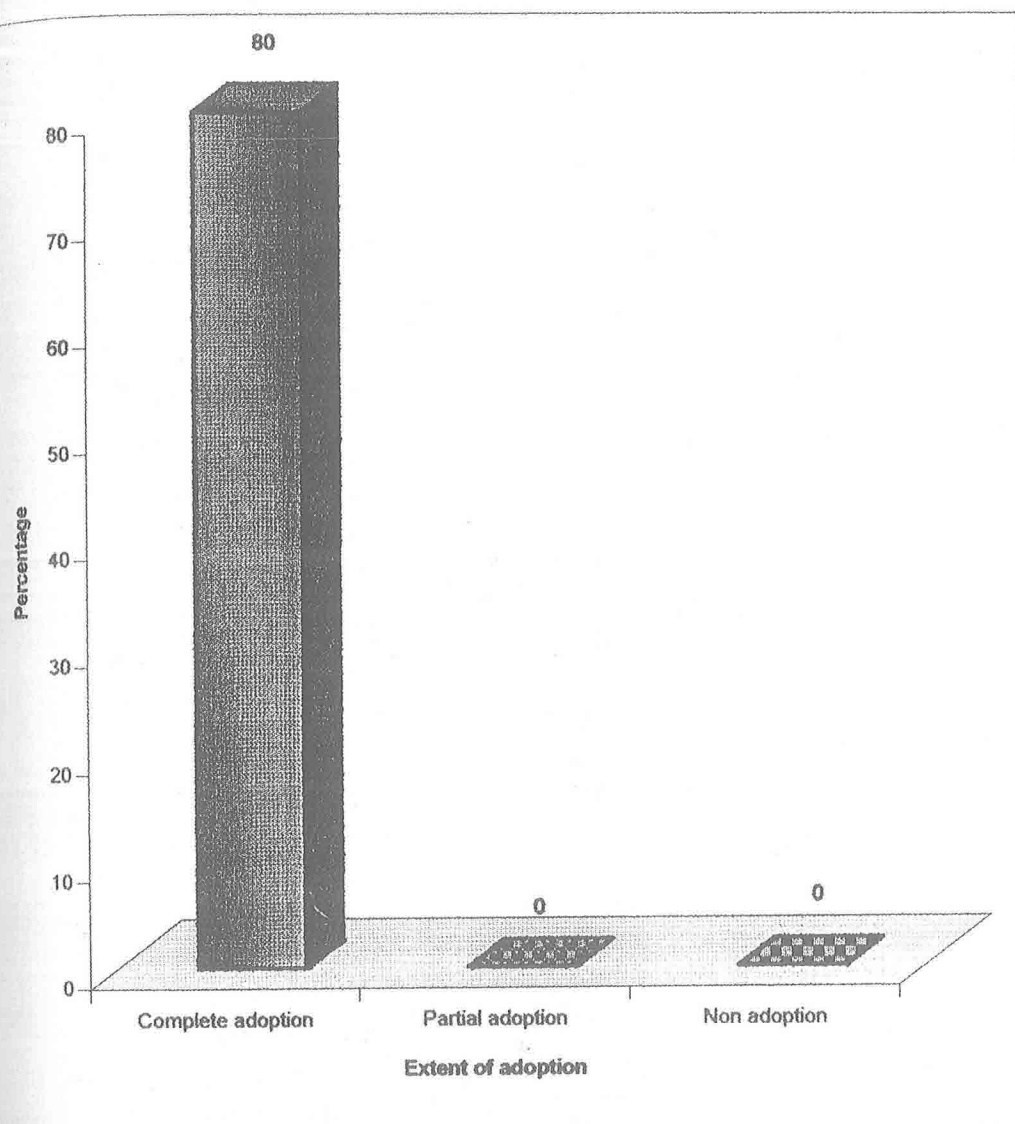


Fig.3a: Extent of adoption of ITK on tapioca

The ITK No. 440 (yellowing and withering of bottom leaves) and ITK No. 441 (Tapioca is harvested by digging the soil) represent harvest aspects of tapioca. The higher complete adoption was attributed to the easy identification of harvest index and additional yield (complete harvesting) expectation respectively.

5.4.2.23 Item wise extent of adoption of ITK on chillies (*Capsicum annum*)

Table 55: Extent of adoption of ITK on chillies

(n=27)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
442	'Rangan mirapa' is an indigenous variety of chillies with medium size capsules with more pungency and plant is bush like.	5	16.67	5	16.67	20	66.67
443	'Chitti mirapa' is an indigenous variety of chillies, capsule is little and plant is medium in size.	8	26.67	17	56.67	5	16.67
444	'Kolab mirchi' is an indigenous chilly variety bearing big size fruits and the plant is bush like.	1	3.33	9	60.00	20	66.67
445	After two weeks of sowing seeds in nursery, the nursery is protected from hot sun by construction of 3 – 4 feet height roof with use of available sticks and leaves called 'pandiri'.	18	60.00	3	10.0	9	30
446	Chilly seeds are broadcasted on the raised nursery beds, covered with a layer of ash and finally covered with adda leaves.	24	80.00	2	6.67	4	13.33
447	15 – 20 days period is optimum for transplantation of chilly seedlings from nursery to the main field.	22	73.33	8	26.67	0	0
448	For green chillies, well farmed intact and dark green fruits are alone picked.	23	76.67	7	23.33	0	0
449	Well ripened, red coloured fruits alone are harvested for dry chillies.	20	66.67	10	33.33	0	0

	Plant Protection						
450	Thrash is burned on prepared raised nursery bed of 30 – 60 cm and well mixed with the top soil to control soil born insects. (BT)	15	50.00	8	26.67	7	23.33
451	Two rows of maize or sorghum are grown for every five rows of chillies which control mosaic disease.	19	63.33	5	16.67	6	20
452	Malathion is dusted on chilli plants to reduce insect problem.	12	40.00	2	6.67	16	53.33
453	5 – 10 Kg of Kagu pindi is broadcasted in field during transplanting seedlings from nursery to protect the crop insect pests mostly termites.	14	46.67	7	23.33	9	30
	Post Harvest Technology						
454	If the seed is required for the next season, well dried fruits as such are stored for one year.	18	60.00	9	30.00	3	10
455	The red chillies are sundried for 10-15 days continuously to reduce the moisture level to zero and stored in gunny bags.	16	53.33	12	4.00	2	6.67

It could be seen from table 55, that out of the 14 ITKs on chillies more than 50.00 % of the respondents were adopted 9 ITKs (64.28 %) completely and one ITK (7.14 %) partially and the 2 ITKs (14.28 %) were not adopted by more than 50.00 % of the respondents.

The 9 ITKs adopted completely by more than 50.00 % of the respondents were ITK No. 445 to 451, 454 and 455. The ITK No. 445 (After two weeks of sowing seed in nursery) and ITK No. 446 (Chilli seeds are broadcasted on the raised nursery beds) concerned with inter cultivation in chillies and the higher complete adoption of the ITK was due to its economic feasibility. The ITK No. 447 (15-20 days period is optimum period for transplantation suggest transplantation period and the higher complete adoption was due to its general nature.

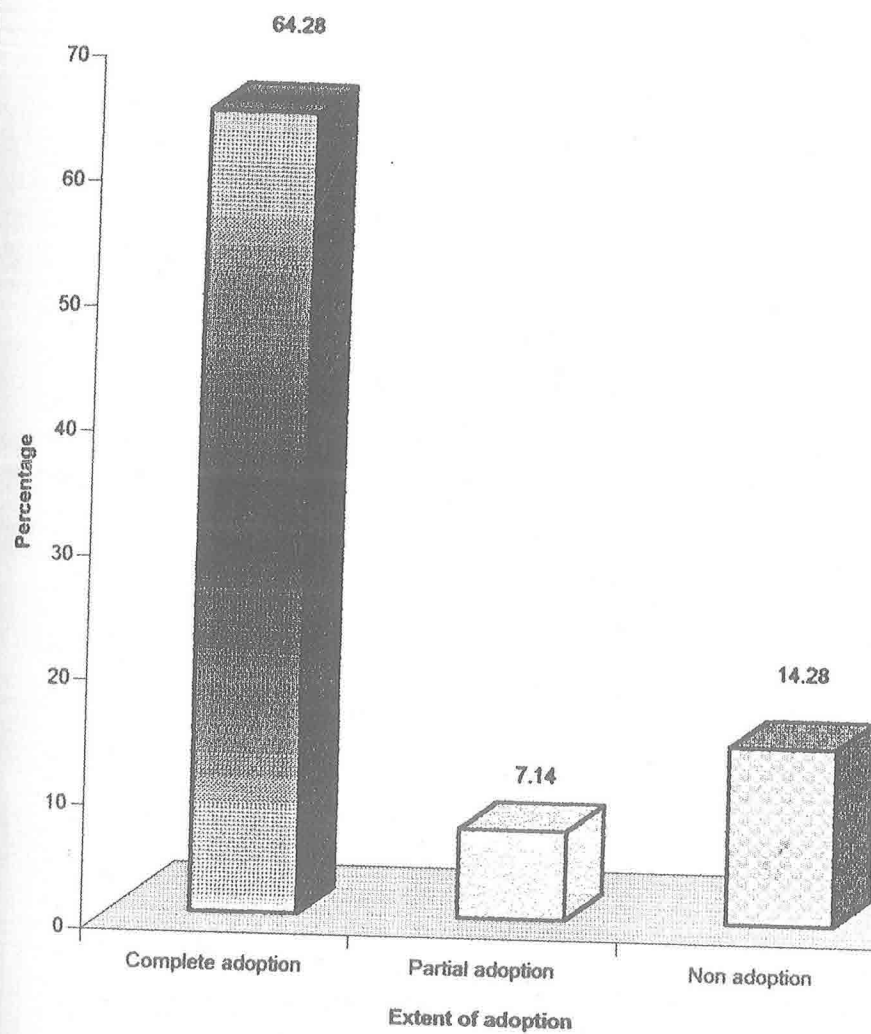


Fig 31: Extent of adoption of ITK on chillies

The ITK No. 448 (for green chillies, well formed) and ITK No. 449 (well ripened red colour fruits) represent harvest indices of chillies and the higher complete adoption was due to the farmers experience in identification of harvest indices.

The ITK No. 450 (Thrash is burned on prepared raised nursery bed) and ITK No. 451 (Two rows of maize or sorghum) indicate pest management through burning thrash and mixed cropping respectively. The higher complete adoption of these ITK was due to their rationality and economic feasibility

The ITK No. 454 (If the seed is required for the next season) and ITK No. 455 (The red chillies are sundried) suggest post harvest storage of chillies and the higher complete adoption of these ITKs was due to the perceived importance by the farmers to sun drying for safe storage.

The ITK No. 443 (Chitti mirapa) and ITK No. 444 (Kolab mirichi) indicate indigenous varieties of chillies. The partial and lower adoption of the ITK was due to the competition from the other indigenous varieties and improved varieties.

The ITK No. 453 (5-10 kg of kagu pindi is broadcasted) referred to pest management through biopesticides and non rationality of the ITK was attributed cause for its lower adoption.

5.4.2.24 Item wise extent of adoption of ITK on turmeric (*Curcuma longa*)

Table 56 : Extent of adoption of ITK on turmeric

(n=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
456	Turmeric is mostly cultivated as podu by the tribals.	5	17.24	9	31.02	15	51.72
457	Farmers used to sow turmeric rhizomes by digging soil with hand hoe and covering rhizomes with soil at 3 ½ x 2 feet spacing.	16	55.16	12	41.36	1	3.45

458	Farmers believes that more number of rhizomes per plant can obtain by adopting more spacing between the plants.	17	58.62	9	31.02	3	10.34
459	Finger rhizomes are more popular as a seed material and giving good yields.	20	68.96	8	27.58	1	3.45
460	Groundnut cake is applied as manure after 15 – 20 days of sowing turmeric rhizomes.	7	24.13	5	17.24	17	58.62
461	Mulching is practiced by the farmers with farm wastes to conserve soil moisture, and to increase water holding capacity of the soils. (BT)	22	75.86	5	17.24	2	6.89
462	A ‘kanka’ (indigenous implement) is worked in between rows to control weed growth and facilitate earthing up of the plants.	22	75.86	5	17.24	2	6.89
463	Harvesting of turmeric rhizomes is done by working by digging with the crow bar or spade after irrigating the field.	20	68.96	6	20.68	3	10.34
464	Turmeric is harvested at alternative years from the ratoon crop.	18	62.04	6	20.68	5	17.24
	Plant Protection						
465	Leaf blotch disease can be controlled by planting dried palmyrah leaves in the turmeric field.	21	72.39	5	17.24	3	10.34
466	Ash along with FYM improves the quality of turmeric and reduces the rhizome rot which is transmitted by carlbatofly.	21	72.39	8	27.58	0	0

	Post Harvest Technology						
467	Harvested turmeric is boiled in water and sun dried for 15 – 20 days and rubbed on soil to make it ready for sale.	23	79.31	6	20.68	0	0
468	Instead of using the recommended sodium carbonate for curing the turmeric fingers, the farmers boil the turmeric fingers in cow dung solution because cow dung slurry promotes colour development.	25	86.20	4	13.80	0	0
469	The graded turmeric is stored in gunny bags and kept on a long benches to reduce storage pest attack.	23	79.31	6	20.68	0	0

It could be observed from the table 56, that out of the 14 ITKs on turmeric, more than 50 % of the respondents completely adopted 12 ITKs (85.71 %) and not adopted 2 ITKs (14.29 %).

In the case of ITK No. 463 – 465 and 467 to 475 complete adopted by more than 50 % of the respondents was observed. The ITK No. 463-465 viz., farmers used to sow turmeric rhizomes, farmers believe that more number of rhizomes and finger rhizomes are more popular as seed material represent seeds and saving and the higher complete adoption was due to their general nature and their rationality.

The ITK No. 467 (mulching is practiced by the farmers) suggest indigenous water conservation method and the higher complete adoption was because it involves no cost. The ITK No. 468 ('kanka' worked between rows) indicate weed management in turmeric and the higher complete adoption was due to the specific suitability to the zone particularly on podu lands where ploughing between rows is not possible. The ITK No. 469 (harvesting of turmeric rhizomes) represent method of harvesting turmeric

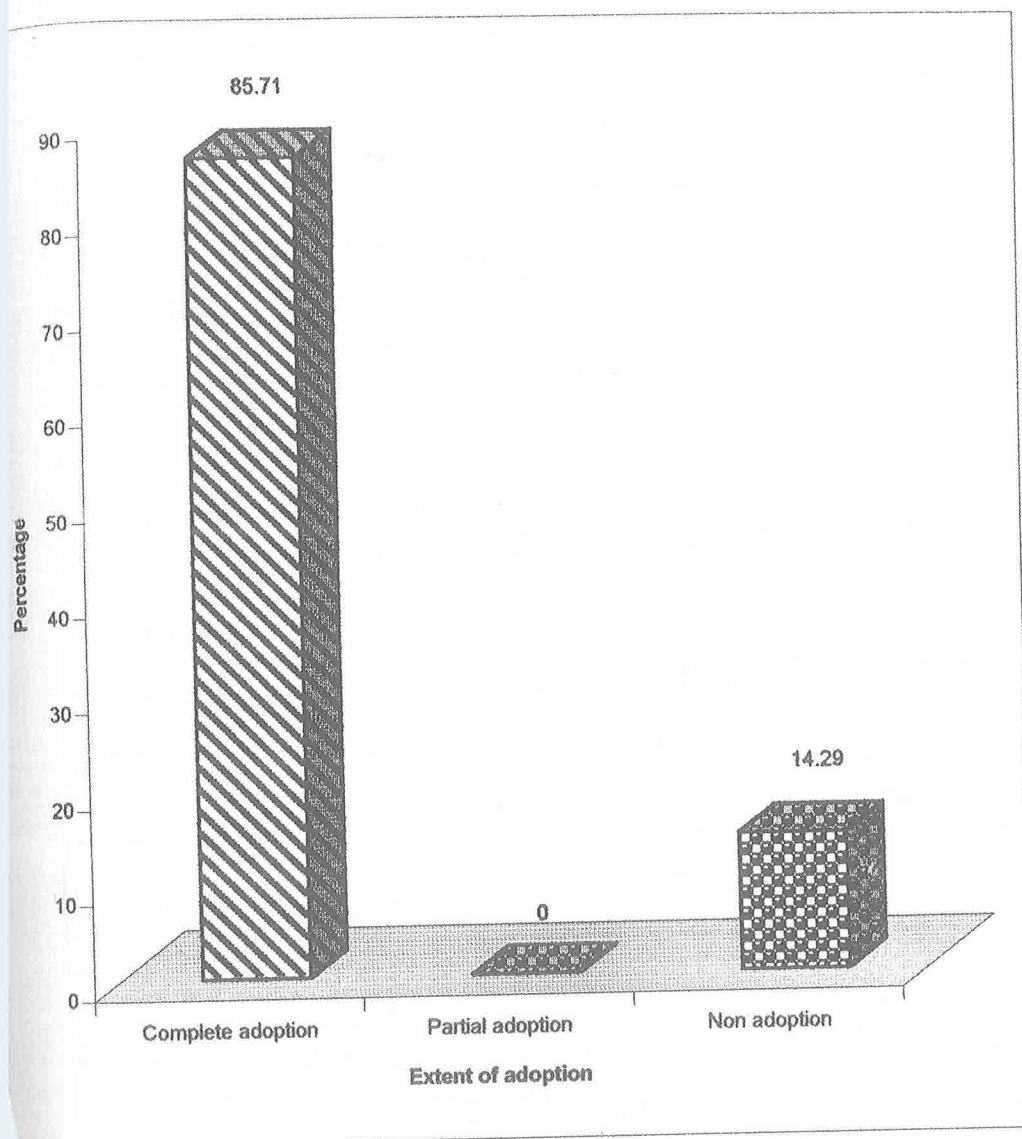


Fig. 3. Extent of adoption of ITK on turmeric

and the higher complete adoption was due to increased economic returns because of complete harvesting. The ITK No. 470 (Turmeric is harvested) indicate ratooning of turmeric and the higher complete adoption was due to additional income with out investment during second year.

The ITK No. 471 (leaf blotch disease can be controlled) and ITK No. 472 (Ash along with FYM) indicate pest management with indigenous inputs. The higher adoption of the non rational ITK was attributed to the abundant availability of indigenous inputs.

The ITK No. 473 (harvested turmeric is boiled), ITK No. 474 (instead of using recommended sodium carbonate) and ITK No. 475 (The graded turmeric is stored in gunny bags) suggest post harvest aspects of turmeric and the higher adoption was due to their economic feasibility in addition to their rationality.

5.4.2.25 Item wise extent of adoption of ITK on coriander (*Coriander sativa*)

Table 57 : Extent of adoption of ITK on coriander

(n=25)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
470	'Sada dhanja' is the local variety cultivated by the tribals with the crop duration of 30 – 40 days.	3	12.00	9	36.00	13	52.00
471	Raised beds of 1m x 10m with a height of 50 – 60 cm are prepared to grow nursery of coriander. (BT)	18	72.00	7	28.00	0	0
472	10 – 20 Kg of farm yard manure is broadcasted on the nursery bed before sowing seed and water is sprinkled on it after sowing coriander seed to get quick germination.	10	40.00	12	48.00	3	12.00
473	20 – 25 Kg / ac of seed is used by the tribals indigenously for coriander cultivation.	11	44.00	14	56.00	0	0

474	'Regara' is an indigenous implement used for intercultivation in coriander. The regara is worked immediately after broadcasting the coriander seed to get even distribution of seed in nursery. (BT)	16	64.00	7	28.00	2	8.00
	Post Harvest Technology						
475	Roots of coriander are thoroughly washed in steam and made into small packets to make it ready for sale.	21	84.00	4	16.00	0	0

It could be inferred from the table 57, that out of the 6 ITKs on coriander, more than 50.00 % of the farmers completely adopted 3 ITKs (50.00 %), partially adopted one ITK (16.67 %) and not adopted one ITKs (16.67 %).

The three ITKs adopted completely by more than 50.00 % of the respondents were ITK No. 457, 460 and 461. The ITK No. 457 (raised beds of 1m x 10m) indicate nursery preparation for coriander and the higher complete adoption of the non rational ITK was due to the farmers perceived importance to the raised nursery bed for coriander. The ITK No. 460 ('Regara' is an indigenous implement used for) suggest nursery management in coriander and the higher complete adoption was due to the economic feasibility and suitability of the ITK to the farming situation in the zone. The ITK No. 461 (roots of coriander are thoroughly washed) indicate post harvest aspects of coriander and the higher complete adoption was due to the availability of the flaming stream.

The ITK No. 459 (20-25 kg of seed rate is used) and ITK No. 456 (Sadha dhanja) were partially adopted and not adopted respectively and the cause was due to difficulty in adoption of correct seed rate (ITK No. 459) and competition from the other indigenous and improved varieties.

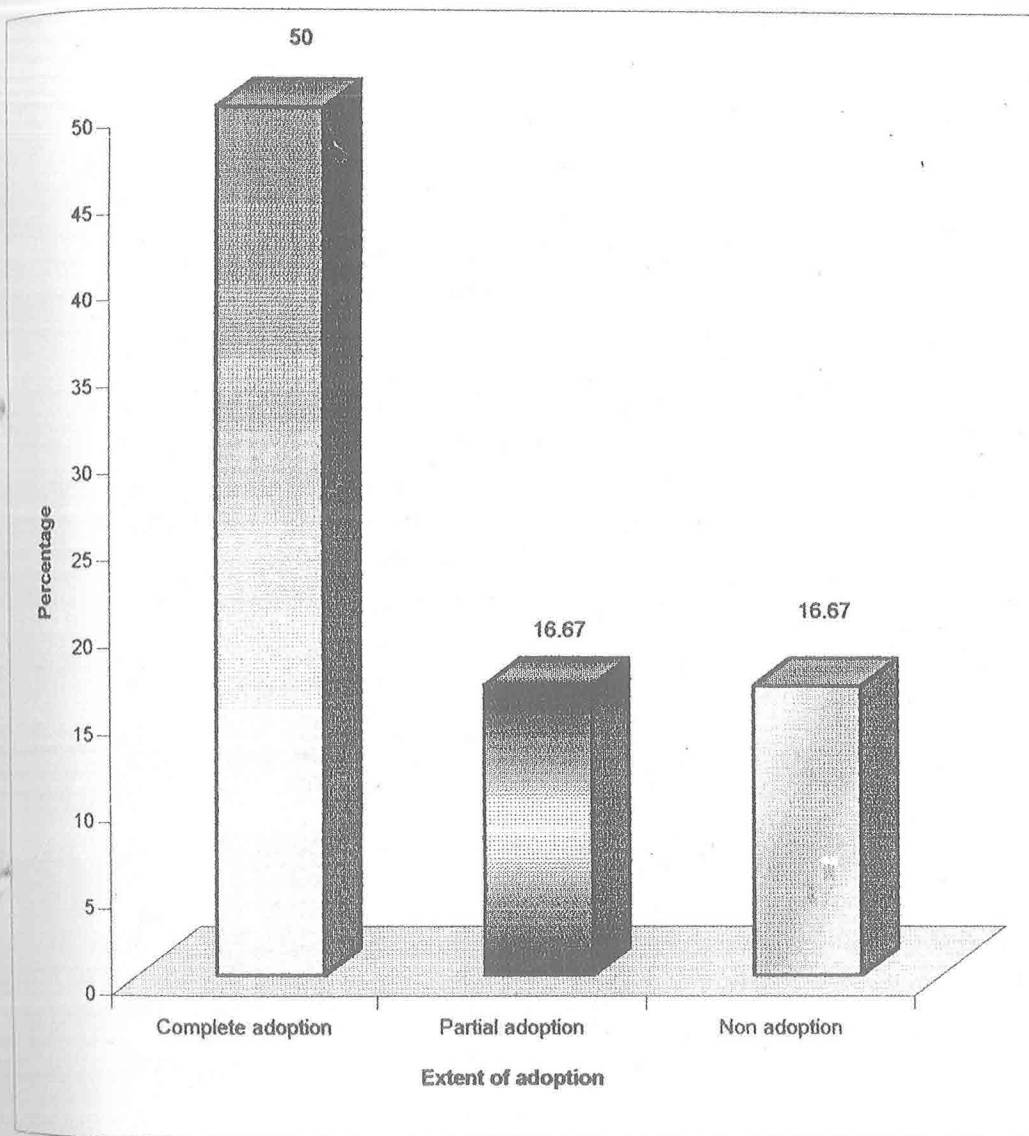


Fig. 3.3. Extent of adoption of ITK on coriander

5.4.2.26 Item wise extent of adoption of ITK on ginger

(*Ginger Officinale*)

Table 58 : Extent of adoption of ITK on ginger (Allam)

(n=25)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
476	After obtaining yield from ginger the stem portion is planted for ratoon, thus getting two crops in a year.	22	84.61	4	15.39	0	0
477	Ginger rhizomes having on eye are planted on ridges at a spacing of 1 x 1 feet to get maximum yields in ginger.	17	61.38	5	19.23	4	13.39
478	Mulching is done with green leaves at the time of planting ginger, to conserve soil moisture. (BT)	21	80.76	3	11.53	2	7.69
479	Frequent earthing up is practiced in ginger to enhance crop growth.	13	50.00	7	26.98	6	23.08
480	Time of harvest is indicated by the yellowing and drying of ginger leaves.	20	76.92	4	15.38	2	7.69

The findings from the above table clearly indicate that all the 5 ITKs on ginger were adopted by more than 50.00 % of the respondents completely.

The ITK No. 476 (after obtaining yield from ginger) represent rationing of ginger and the higher complete adoption of the non rational ITK was because the ratoon crop supports additional income without investment. The ITK No. 477 (Ginger rhizomes having one eye) indicate selection of seed material and the higher adoption was due to its rationality

The ITK no 478 (making in done with green leavers) suggest water conservation in ginger and the higher adoption was due to water scarcity and availability of leaves. The ITK no 478 (Frequent carrying up in practiced)

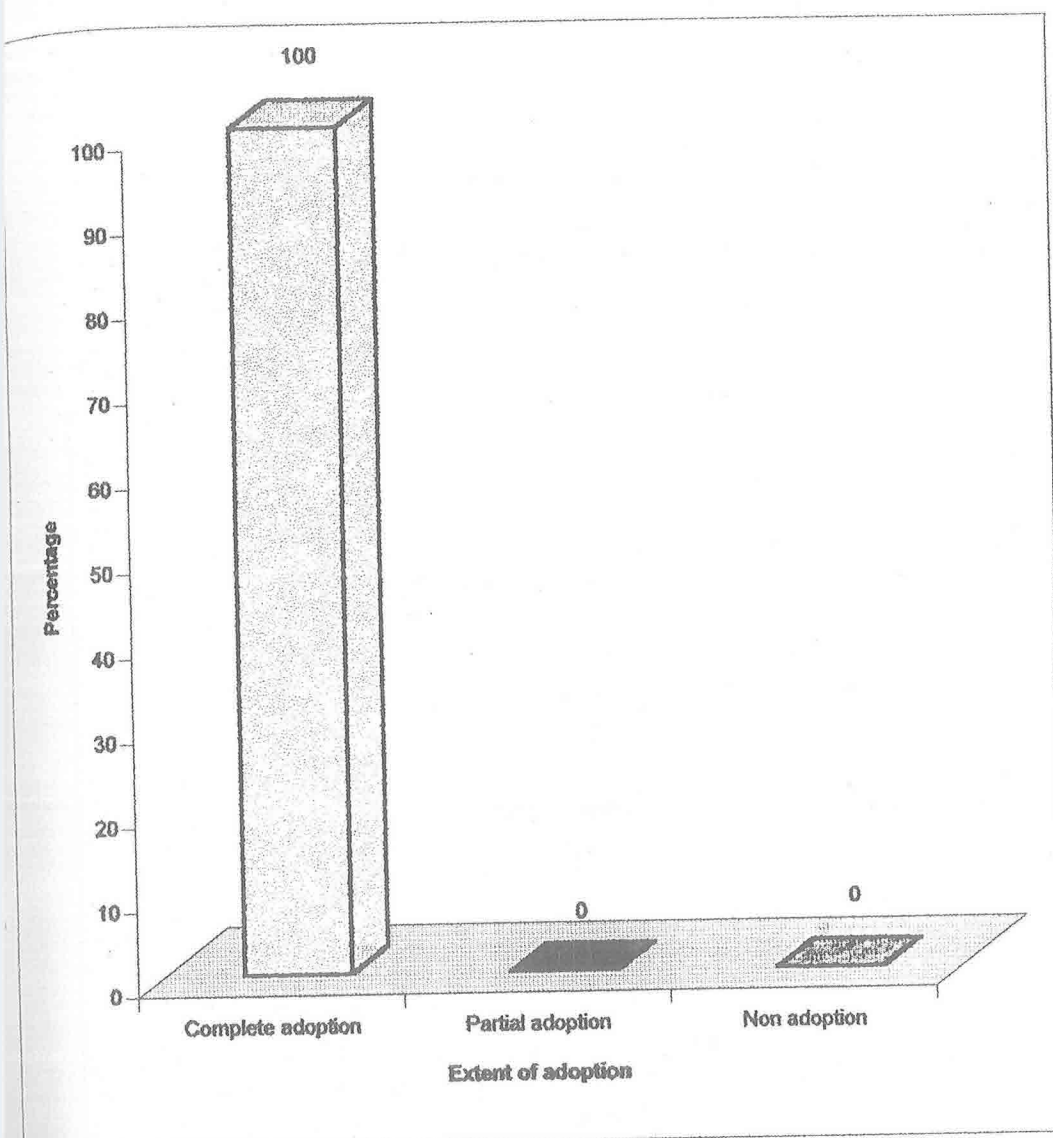


Fig. ³⁴: Extent of adoption of ITK on ginger

suggest inter cultivation in ginger and the higher complete adoption was but to its relative economic relations and rationality.

The ITK No. 480 (Time of harvest in indicated by) refer to harvest index in ginger and the higher complete adopter was attributed to its rationality and farmers experience in identification of harvest index.

5.4.2.27 Item wise extent of adoption of ITK on pineapple (*Anona squamosa*)

Table 59 : Extent of adoption of ITK in pine apple (*Anasa panasa*)

(n=30)

ITK No.	ITK	CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
481	'Panasa kaya' is the traditional Pine apple variety which is mostly cultivated by the tribals.	4	13.33	21	70.00	5	16.67
482	'Sada Anasa Panasa' is an indigenous pine apple variety with small fruits which are more juicy in nature.	6	20.00	22	73.33	2	6.67
483	July – August is the optimum season for sowing Pine apple hence it is practiced.	13	43.33	12	40.00	5	16.67
484	Six inches long suckers collected from mother plant weighed for 200 – 300 gm are perceived to be suitable for planting.	25	83.33	3	10.00	2	6.67
485	Farmers used to maintain 2 x 2 feet spacing in Pine apple cultivation.	24	80.00	2	6.67	4	13.33
486	Weeding is practiced along rows in Pine apple in early stages of crop growth i.e., before 2 months age.	20	66.67	7	28.33	3	10.00
487	Pine apple yields within 18-24 months after which two ratoons are allowed.	25	83.34	4	13.33	1	3.33
488	Mulching is practiced with crop wastes to retain soil moisture and to improve water holding capacity of the soil in pine apple field. (BT)	28	93.33	1	3.33	1	3.33

489	Growing tip of pine apple is nipped to obtain fruits with more size and weight.	21	70.00	6	20.00	3	10.00
490	Yellow colouration and size of the fruit is the indication of harvest time in pine apple.	24	80.00	4	13.33	2	6.67
491	The sucker bearing fruit is desuckered after harvesting the fruit thus allowing the other suckers to grow.	23	76.67	7	23.33	0	0

The findings from the above table shows that art of the 11 ITKs on pineapple, more than 50.00% of the respondents adopted completely 8 ITKs (72.73%) and not adopted 2 ITKs (18.18%).

The 8 ITKs adopted completely by more than 50.00 of the farmers were ITK No. 484 to 491. The ITK No. 484 (6 inches long suckers collected) and ITK no. 485 selection of seed material and spacing in pineapple and the higher completed adoption was due to their rationality and simple to adopt nature. The ITK No. 486 (weeding is practiced) and ITK No. 489 (Growing tip of pineapple is hipped) suggest intercultivation in pineapple and the higher complete adoption was due to the their rationality.

The ITK No. 487 (Pineapple yields within 18-24 months) and ITK No. 491 (The suckers bearing fruit) suggest crop management of pineapple and the economic feasibility of the ITK was the possible cause for its higher complete adoption.

The ITK No. 488 (Mulching is practiced in the crop wastes) represent water conservation method and the higher complete adoption was due to their availability of crop wastes and economic feasibility. The ITK No. 490 (Yellow coloration and size of the fruit) suggest harvest index of pineapple and farmers experience in judging the harvest index was the possible cause for its higher adoption.

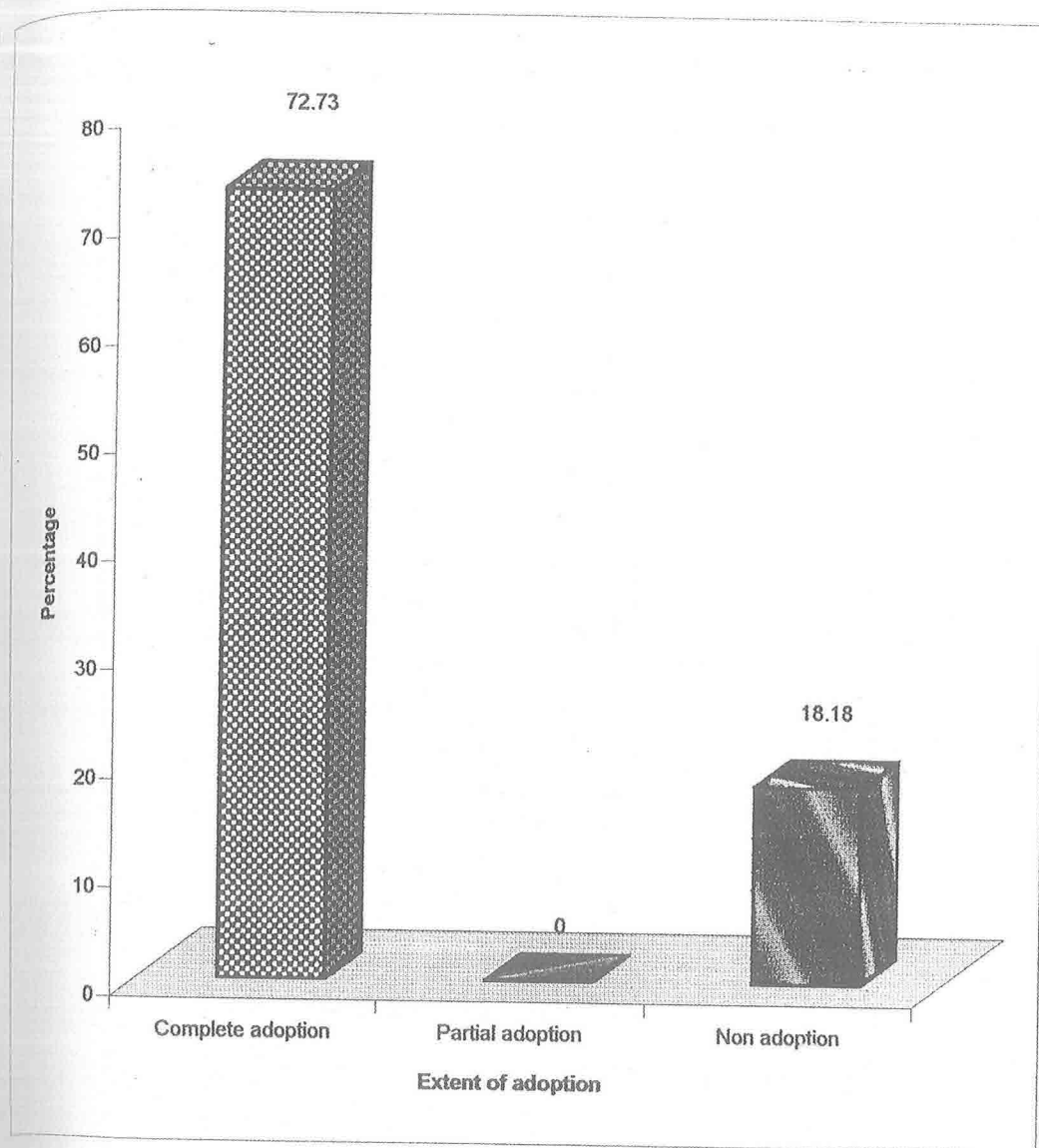


Fig.³⁵: Extent of adoption of ITK on pineapple

The ITK No. 481 (panasa kaya) and ITK No. 482 (Sada anasa panasa) refers to indigenous pineapple varieties and competition from one another lead to the partial adoption of these ITK.

5.4.2.28 Item wise extent of adoption of ITK on banana (*Musa paradisiaca*)

Table 60 : Extent of adoption of ITK in banana

ITK No.	ITK	(n=35)					
		CA		PA		NA	
		F	%	F	%	F	%
	Crop Production :						
492	'Konda arati' is a traditional banana variety cultivated by tribal farmers which requires less water.	4	11.43	27	77.14	4	11.43
493	'Yerra arati' is an indigenous high yielding banana variety which is grown where more water is available.	2	5.71	28	80.00	5	14.29
494	'Bathadigela' is a traditional banana variety grown by tribals for culinary purpose.	0	0	11	31.43	24	68.57
495	'Komma arati' is an indigenous banana variety bearing big long slender green fruits is cultivated.	1	2.86	13	37.14	21	60.00
496	'Konda mukhiri' is an indigenous banana variety bearing small yellow colour fruits in cultivated by the tribals.	0	0	17	48.57	18	51.43
497	6 – 8 feet spacing is maintained by the tribals in banana cultivation.	17	48.57	16	45.71	2	5.79
498	The suckers with 2 – 3 kg weight and 1 feet length are selected for planting.	19	54.28	16	45.71	0	0
499	Before planting the suckers 10 kg of FYM + 1 Kg Urea is applied as basal manure. (BT)	20	51.14	14	40.00	1	2.86
500	Before selecting banana suckers from a field the bunches of the mother suckers are seen for bunch weight and healthiness.	23	65.71	11	31.43	1	2.86

501	Tribals used to desucker the main sucker after harvesting thus allowing other suckers to grow.	21	60.00	9	25.71	5	14.29
502	For banana neem cake is applied @ 250 gms/sucker during 4 – 8 months age.	20	57.14	15	42.86	0	0
503	Banana is ratooned upto three years by the tribal farmers on podu, to get additional income from the same crop.	8	22.16	22	62.86	5	14.23
504	Inter cropping in banana with tuber crops like elephant foot yam and tapioca is practiced during first year.	16	45.71	3	8.57	16	45.71
505	Desuckering is done from 3 months after planting upto flowering.	21	60.00	13	37.14	1	2.86
506	Earthing up is practiced in once in 2 to 3 months to prevent soil erosion and to conserve soil moisture.	24	68.57	11	31.43	0	0
507	Drying of the top leaves, change of skin colour to light green, brittleness of the floral ends are the symptoms for harvesting.	30	85.71	5	14.29	0	0
	Plant Protection :						
508	Banana flag leaf is tied at the top of the bunch which prevents sun stroke and ensure healthy bunch.	34	97.14	1	2.86	0	0
509	Periodical search to identify the bunchy top diseased plants and destroying them along with the suckers is practiced to eliminate the source of the disease.	29	82.86	2	5.71	4	11.43
	Post Harvest Technology :						
510	Banana is stored by tying the banana leaves around the bunches to protect it from hot sun and to increase keeping quality.	27	77.14	7	20.00	1	2.86

It could be concluded from the table 60, that ant of the 19 ITKs on banana, more than 50.00 % of the farmers adopted completely 11 ITKs

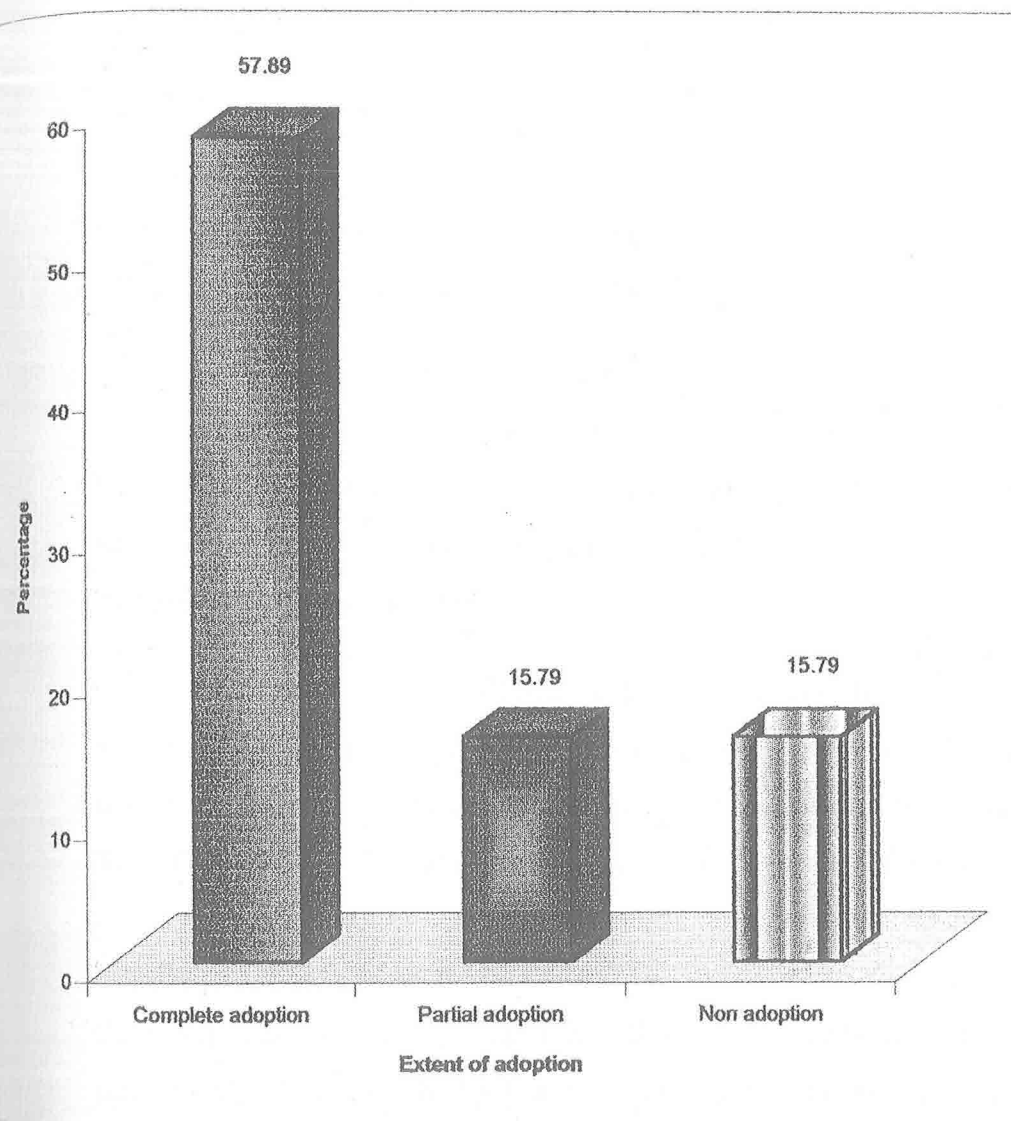


Fig. ³⁶: Extent of adoption of ITK on banana

(57.89%) and partially 3 ITKs (15.79%) were and 3 ITKs (15.79%) were not adopted by more than 50% of the farmers.

The 11 ITKs adopted completely by more than 50% of the respondents were the ITK No. 498 to 502 and 505 to 510. The ITK No. 498 (The suckers with 2.3 kg weight) and ITK no. 500 (Before selecting banana suckers) suggest selection of suckers for banana plantations and the higher complete adoption was due to their rationality.

The ITK No 499 (Before planting the suckers) and ITK No. 502 (For banana neem cake is applied) concern with manuring in banana and the higher complete adoption was due to availability of FYM and supply of neem cake by the department of agriculture, Sponsored by the Integrated Tribal Development Agency.

The ITK No. 501 (Tribals used to desucker the main suckers). Represents ratooning in banana and the higher complete adoption was due to the additional income obtained from ration crop besides their rationality. The ITK No. 505 (Desuckering is done from 3 months) indicate intercultivation operation in banana and the rationality behind the ITK and the general nature of adoption of the ITK were found possible causes for their higher complete adoption. The ITK No. 506 (Earthing up is practiced once in 2 to 3 months) highest inter cultivation in banana and the possible cause behind the higher complete adoption was due to their low cost involvement.

The ITK No. 507 (Drying of the top leaves) suggest harvest index in banana and the higher complete adoption was attributed to its easy identification by the farmers. The ITK no 509 (Periodical search to identify bunch top) indicate disease management in banana and the higher complete adoption was due to farmer's interest to control of the disease. The ITK No. 510 (Banana is stored by trying) indicate post harvest storage

of banana bunches and the higher complete adoption was because it does not require any external input.

In the case of ITK No. 492 (Konda arati), ITK No. 493 (Yerra arati) and ITK No. 503 Banana is ratooned upto three years) partial adoption by more than 50.00% of the respondents was observed. The partial adoption was attributed to the competition from other indigenous and improved varieties (ITK No. 492 & 493) and difficulty in complete adoption of the ITK (ITK no 503).

The ITK No. 494 (Bathadigela), ITK No. 495 (Komma arati) and ITK No. 496 (konda mukhiri) represents indigenous varieties and the leaver adoption was due to the relative performance and yields of the indigenous varieties and the competition form other varieties.

5.4.2.29 Item wise extent of adoption of ITK on cashew

(*Anacardium occidentale*)

Table 61 : Extent of adoption of ITK in cashew

ITK No.	ITK	(n=30)					
		CA		PA		NA	
		F	%	F	%	F	%
	Crop Production						
511	Cashew nuts are collected by the farmers by watching the yields of particular plants regularly.	13	43.33	5	16.67	12	40.00
512	Farmers sow cashew nuts in polythene covers filled with soil and farm yard manure and grow nursery for their plantations by their own.	13	43.33	5	16.67	12	40.00
513	Farmyard manure (2 kg) + urea (0-.50 kg) is used to apply at base if the plant immediately after transplanting cashew seedlings to give nutrients to transplanted seedlings (BT).	21	70.00	9	30.00	0	0

514	Cashew is inter cropped with sesamum, black gram or green gram upto five years age of cashew to substantiate income during prebearing period.	21	70.00	9	30.00	0	0
515	The cashew orchard is ploughed regularly to reduce weed problem and to give good tilth.	18	60.00	8	26.67	4	13.33
516	Debudding of cashew flowers is done upto the age of five years to enhance vegetative growth during the period.	17	56.67	8	26.67	5	16.67
	Plant Protection						
517	Cloth is hanged on top of the cashew plant to scar away the birds.	21	70.00	5	16.67	4	13.33
518	'Vadisa' is an indigenously made rope like pouch, in center of it a net will be there to host a small stone. The stone is thrown on birds by making rounds in air and thus realising stone lured to greater distance chasing away the birds.	9	30.00	7	23.33	14	46.67

It could be inferred from the table 61, that 5 ITKs (62.50 %) out of 8 ITKs on cashew were adopted completely by more than 50.00 % of the respondents.

The ITK No. 513 (Farmyard manure (2kg) + urea (0.50 kg) used to apply) suggest manuring of cashews the higher complete adoption was due to the availability of FYM and supply of urea by the NGO (GSRDs) to the tribals for cashew plantation. The ITK No. 514 (cashew is intercropped with) indicate inter cropping in cashew during pre bearing period and the higher complete adoption was due to the economic returns during pre bearing period.

The possible cause for higher complete adoption of the ITK No. 515 (the cashew orchard is ploughed regularly) was because farmers take this

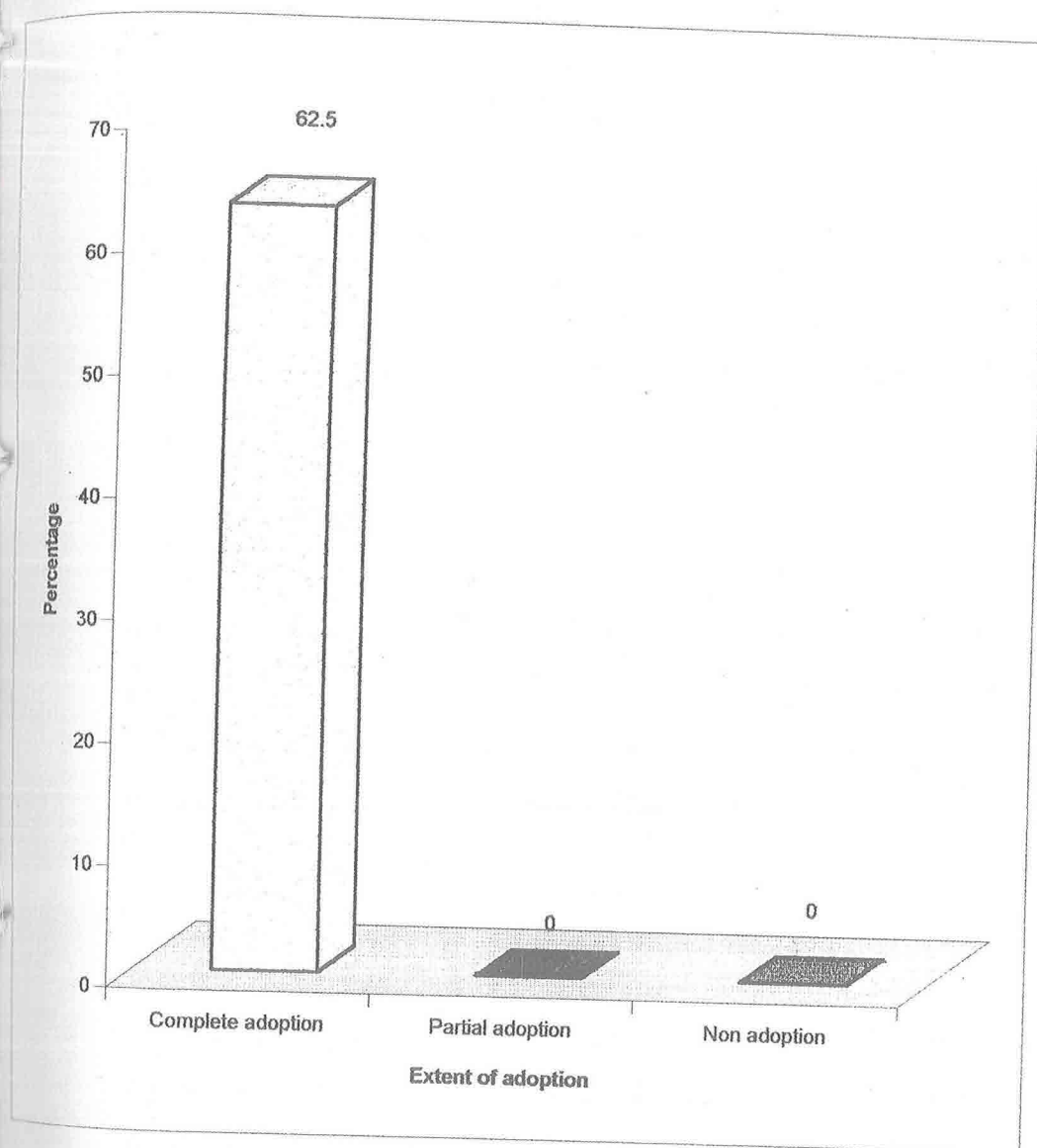


Fig. ³⁷ : Extent of adoption of ITK on cashew

operation during summer when they are free from farm operation of field crops. The rationality behind the ITK No. 516 (debudding of cashew buds in done) was the possible cause for higher complete adoption of the practice.

The higher complete adoption of not rational ITK No. 517 (cloth is hanged on top of the cashew plant) was because of low cost involved in the ITK.

5.5 EFFORTS OF NON GOVERNMENTAL ORGANISATIONS, STATE AGRICULTURAL UNIVERSITY AND STATE DEPARTMENT OF AGRICULTURE IN PROMOTION OF ITK AND THEIR BLENDED TECHNOLOGIES

Sustainable agricultural development is possible with the help of indigenous technologies which are ecofriendly and sustainable and hence promotion of such technology adoption was desired. By keeping this in view, the efforts of non governmental organisations, state agricultural university and state Department of agriculture were studied and the findings with a brief discussion are presented here under the following subheads.

5.5.1 Efforts of Non Governmental Organisations (NGOs) in promotion of ITK and their blended technologies

The NGOs playing a greater role in sustainable agriculture development as well in promotion of indigenous technical knowledge and their blending with modern technologies. Number of NGOs are in operation in the study area and two of them were selected to study their efforts in promotion of ITK and their blending with modern technologies. The findings with appropriate discussion were presented as case studies in forth coming pages.

5.5.1.1 Good Samiritans Rural Development Society (GSRDS)

The Non Governmental Organisation (NGO) established in 1996 and working in tribal areas of Vizianagaram and East Godavari districts. They adopted 16 villages in Vizianagaram district and 11 villages in East Godavari district. The head quarters of the NGO is at Gummalaxmipuram, Vizianagaram district.

The NGO has organised a training programme on vermicompost preparation with technical guidance from Krishi Vigyan Kendra (KVK), Rastakuntabai. 86 tribal farmers were participated from 16 villages of Vizianagaram district. They have also organised one demonstration each on compost preparation in 16 villages. This emphasized the adoption of indigenous practices in crop husbandry. Under the reforestation programme of the NGO, motivated farmers for plantation of 6000 acres of cashew, mango and jack fruit. In this scheme, the organisation supplied seedlings free of cost. They have role in dissemination of information on natural resource management. The organisation encourages adoption of indigenous practices in crop husbandry.

They have organised training programme on sustainable agriculture entitled “Sustira Vyavasayam tho bhusaram perugudala” (soil fertility improvement through sustainable agriculture) with 145 participants of scheduled castes and scheduled tribes from 19 villages of Gummalaxmipuram mandal. This training programme emphasized use of organic manures like cowdung, tobacco waste and other farm wastes. They have also emphasized preparation of Nuclear Polyhydrosis Virus (NPV) solution for tobacco caterpillar and *Heliothis sp.* control.

The organisation is also assisting small and marginal farmers (>2 acres of land) by providing credit of Rs. 1000 / acre with 12% interest

rate and repayment period for 3 years. In the case of crop failure if any, they give a discount of 50% in the principal amount.

It supplies neem cake to the farmers, which is useful to protect crop from pests and diseases in all its operation area at free of cost. Thus encourages the adoption of ITKs related to neem cake application for pest control under the study.

The NGO take its role in dissemination of technology on sustainable organic agriculture through its network. The organisation used training programmes, individual contacts, group meetings for popularisation of indigenous technologies.

5.5.1.2 Grameena Punarnirmana Kendram (GPK)

This was established during 1994 with an objective to uplift the tribal people by making effective use of the available resources at their disposal with out much dependence on external resources. It is in operation in tribal areas of Srikakulam and Vizianagaram districts.

The NGO encourages utilization of locally available resources and promotes indigenous technologies in agriculture and allied fields. It is also documenting ITK in agriculture, veterinary, cultural botany, biodiversity and traditional medicine. In addition to the documentation of ITKs, the NGO creates awareness on ITK adoption. The fortnight sessions of the organisation trains the farmers for effective utilization of on farm resources for sustainable agricultural development.

They also promote indigenous medicine through a net work of 40 medical healers in Srikakulam and Vizianagaram districts. They emphasize indigenous medicine (Ayurveda). The NGO taking part in technology dissemination and reorientation towards indigenous technologies through individual contacts and fortnight sessions.

It has organised a training programme for bare foot horticulturists in horticulture management through sustainable indigenous technologies in rural areas of Vizianagaram with technical guidance from Krishi Vigyan Kendra, Rastakuntabai. Thirty farmers from Kurupam and Gummalaxmipuram mandals attended the training programme.

The organisation promotes adoption of ITK on podu cultivation, paddy, finger millet little millet, foxtail millet, kodomillet and red gram which were found major crops in the study area and accounts for 37.64% of the total ITK under study. It effectively uses individual contacts and group meetings for popularisation of indigenous technical knowledge in major crops in the tribal areas of Srikakulam and Vizianagaram districts.

5.5.2 Efforts of State Agricultural University in Promotion of ITK and their Blended Technologies

5.5.2.1 Regional Agricultural Research Station (RARS), Chintapalle, Visakhapatnam district

The Regional Agricultural Research Station, Chintapalle is a research institute working under Acharya N.G. Ranga Agricultural University and it is under taking research on high altitude crops majorly on pepper. It has put forth its efforts in promotion of ITK and their blended technologies in agriculture and a few of them are explained in brief hereunder.

It has documented ITK in agriculture and allied sectors existing in the tribal areas of Visakhapatnam district i.e., ITK on upland paddy, little millet, rice bean, poultry farming, local festivals with relevance to agriculture, traditional knowledge on mixed cropping post harvest aspects of red gram, finger millet, apiculture, tattooing, social customs etc. In addition to the documentation of the ITK they emphasized the scientific rationality of the documented rational ITK and their importance for sustainable agricultural production.

It has brought out an unpublished booklet entitled “Traditional knowledge on crops grown in tribal areas of chintapalle” which contains the existing ITK on majors crops in the area and their social and religions customs, mores, taboos, their values and preferences.

The Regional Agricultural Research Station mostly concentrating their efforts on documentation of existing ITK in the region to further proceed to test verify the rationality, estimate cost benefit ratios and to test their adaptability on wider scale. It has used individual contact method and result demonstrations for popularization of ITKs in their adopted villages.

5.5.2.2 Krishi Vigyan Kendra (KVK), Rastakuntabai, Vizianagaram district

The Krishi Vigyan Kendra (KVK), Rastakuntabai is sponsored by Indian Council of Agricultural Research (ICAR) and working under the administrative control of Acharya N.G. Ranga Agricultural University. It is taking it's role in promotion of ITK and their blended technologies, some of the efforts are explained here under in brief.

It has documented the Indigenous Technical Knowledge (ITK) in agriculture and allied sectors related to preparatory cultivation, crop rotation, mixed cropping, pest and disease management with indigenously available materials, grain and seed storage, indigenous medicine, ethnic food preparations, fruit product preservation and fuel management etc. It has also contributed information on ITK for the voluntary disclosure programme of ITK, it is an ICAR sponsored programme country wide. The institute organised different training programmes to the farmers which emphasizes use of indigenous inputs in crop husbandry and sustainable agriculture. A few of which are:

1. Training on neem seed kernel extract preparation
2. Training on preparation and use of tobacco decoction for pest control.

3. Training on preparation and use of custard apple leaf extract for control of pests in sunflower, groundnut etc.
4. Training on custard apple kernel extract preparation.
5. Training programme on IPM on groundnut and red gram.

The future plans of the KVK, Rastakuntabai in promotion of ITK and their blended technologies, are :

1. To publish a booklet with existing ITK in tribal areas of Vizianagaram district.
2. To know the chemical nature of Musidi (*Nux vomica*) vadisa (*Cleistanthus hook*), Thummika (*Acacia nelotica* and Tentumu (*Cassia torra*) which were used by the farmers in pest control.
3. To test verify the scientific rationality of ITKs existing in tribal areas of Vizianagaram district.

They also assisted non-governmental organisations working in the tribal areas of Vizianagaram district by providing technical support for the training programmes organised by them.

5.5.3 Efforts of State Department of Agriculture in Promotion of ITK and their Blended Technologies

Department of agriculture, government of Andhra Pradesh is working in the state through their network and they considerably put forth their efforts in promotion of ITK and their blended technologies. The Assistant Directors of Agriculture and Agricultural Officers working in the study area were personally interviewed and the findings with brief discussion were presented below.

The Department of agriculture supplies green manure species like sun hemp (*Crotalaria* sp) and diancha (*Sesbania* sp), these reduces the requirement of crop for chemical fertilizers thus useful to check the soil pollution and increases the soil fertility in long run. In addition, it supplies gypsum to the tribals sponsored by Integrated Tribal development agency (ITDA) for groundnut cultivation but it was found untimely i.e., the gypsum was found supplied to the farmers just before the harvest of groundnut crop. This leads to the application of gypsum at the time of sowing next crop against to the recommended application gypsum at peg penetration stage (ITK No. 260 - Gypsum is essential for groundnut and hence farmers applying gypsum to the soil before sowing).

The Department of agriculture taking their role in technology dissemination on ITKs for sustainability through organised method demonstrations group meetings and individual contacts.

5.6.1 Constraints Faced by the Farmers in Adoption of ITK and their Blended Technologies

Constraints faced by the farmers in adoption of ITK and their blended technologies were studied and classified as technological, administrative and research and extension constraints and presented here under with rank order.

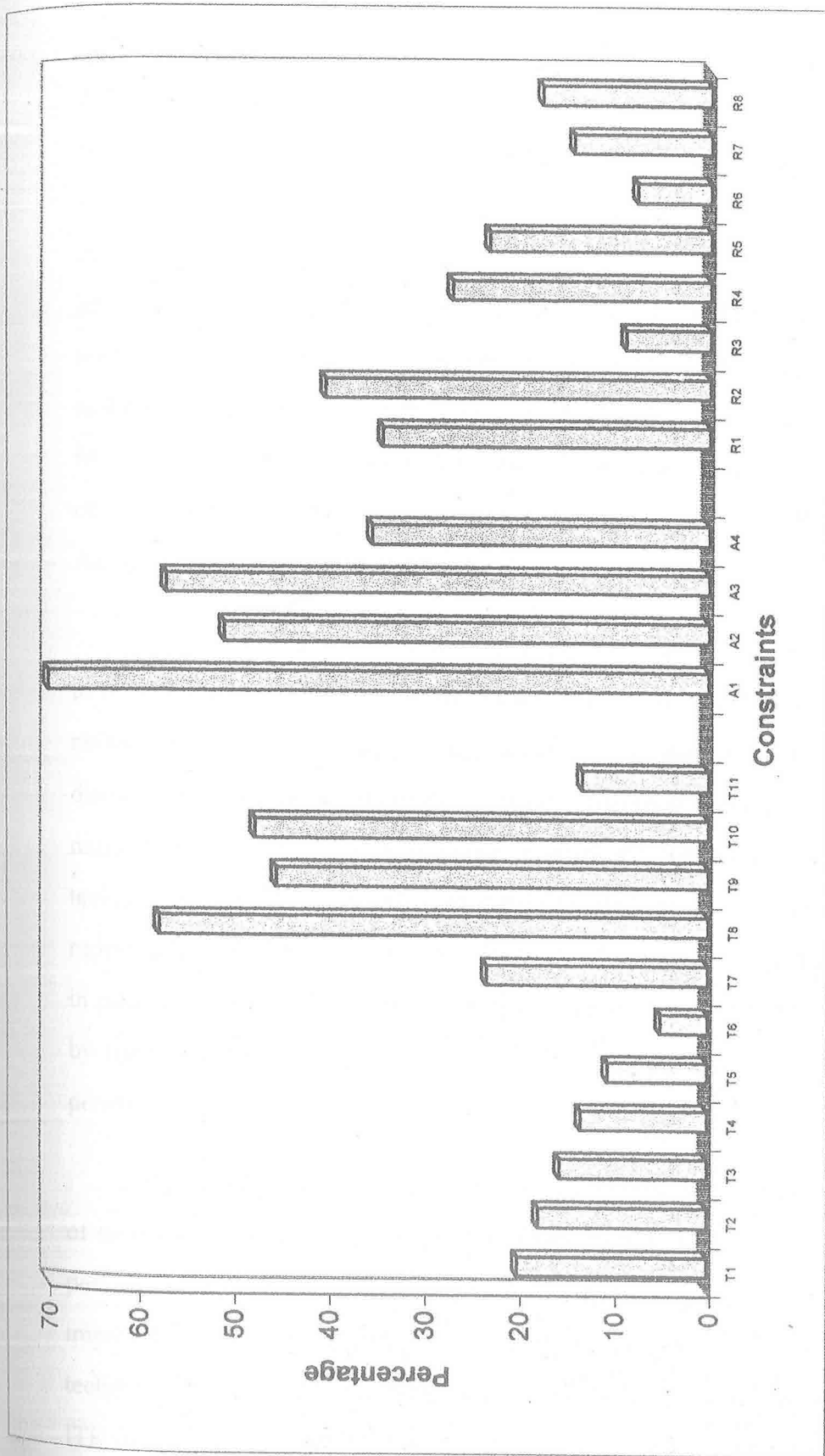
Table 62 : Constraints faced by the farmers in adoption of ITK and their blended technologies

S. No.	Category	(n=180)		
		Frequency	Percentage	Rank
	Technological constraints			
1	Lack of pest and disease resistant varieties	36	20.00	VI
2	Lack of short duration varieties	32	17.78	VII

3	Lack of improved green manure and green leaf manure species	28	15.56	VIII
4	Lack of improved technology on vermicompost preparation	24	13.33	IX
5	Lack of proper technology for integrated pest management	19	10.55	X
6	Lack of availability of biofertilizers such as BGA, Azolla, rhizobium, azospirillum etc	9	5.00	XII
7	Lack of high yielding varieties	42	23.33	IV
8	Lack of direct and immediate effect by adoption of ITK	104	57.78	I
9	Bulky nature of indigenous inputs	82	45.55	III
10	Time consuming and labour intensive nature of ITK	86	47.78	II
11	Need of clear plan for adoption of ITK unlike modern technology which are readymade in nature	24	13.33	IX
12	Competition from modern technologies	40	22.22	V
13	Climate conditions like uneven distribution of rainfall on set of monsoon etc.	12	6.67	XI
Administrative constraints				
1	Inadequate and untimely supply of agricultural inputs	126	70.00	I
2	Lack of good grading facility	92	51.11	III
3	Lack of more supporting price to the quality products	103	57.22	II
4	Lack of proper training facilities	64	35.55	IV

Research and Extension Constraints				
1	Lack of sound research and development on ecological farming practices	62	34.44	II
2	Lack of organized extension machinery to disseminate the proven ITKs and their blended technologies	73	40.55	I
3	Lack of publications on proven ITKs and their blended technologies	16	8.89	VII
4	Poor contact of extension workers with farmers	49	27.22	III
5	Poor maintenance of demonstration plots	42	23.33	IV
6	Less priority of agricultural research on TIK and their blending with modern technologies	14	7.78	VIII
7	Treating the ITK as inferior by the agricultural research and extension systems	26	14.44	VI
8	Lack of proper place for ITKs and their blended technologies in scientific recommendations	32	17.78	V

The findings from the above table shows the constraints faced by the farmers in their rank order. It could be concluded that, lack of direct and immediate outcome by adoption of ITKs (57.78%), time consuming and labour intensive nature of ITK (47.78%) and bulky nature of indigenous inputs (45.55%) are considered as the major technological constraints by the majority farmers in adoption of ITKs and their blended technologies. In addition, a considerable section of farmers expressed, lack of high yielding



T : Technological constraint

A : Administrative constraint

R : Research and extension constraint

Fig. : Constraints faced by the farmers in adoption of ITK and their blended technologies

varieties (23.33%), competition from modern technologies (22.22%) and lack of pest and diseases resistant varieties (20.00%) as constraints in adoption of ITK and their blended technologies. Very few farmers expressed, lack of short duration varieties (17.78%), lack of availability of improved green manure and green leaf manure species (15.56%), lack of information pertaining to improved technology on vermicompost preparation (13.33%), need of clear plan for adoption of ITKs unlike modern technologies. As they are readymade in nature (13.33 %), lack of proper technology for integrated pest management (10.55%), climatic conditions like uneven distribution of rainfall, onset of monsoon etc. (6.67%) and lack of availability of biofertilizers such as BGA, Azolla, Rhizobium, Azospirillum etc. (5.00%) as constraints.

Lack of direct and immediate outcome by adoption of ITK was found to be a major constraint and to overcome this, farmers should be educated about the long run and sustained benefits by adoption of ITK by group discussions and individual contacts. Time consuming and labour intensive nature of ITK was also found as a major constraints. To overcome this, such technologies should be blended appropriately with modern technologies to reduce labour and time requirement for their adoption. The third constraint in rank order was bulky nature of indigenous inputs and this can overcome by transportation and application of such indigenous inputs during lean periods.

As seen from the table the other technological constraints were lack of high yielding varieties, competition from modern technologies, lack of pest and disease resistant varieties, lack of short duration varieties, lack of improved green manure and green leaf manure species, lack of improved technology on vermicompost preparation, need of clear plan for adoption of ITK unlike modern technologies as they are ready made in nature, lack of

proper technology for integrated pest management, climatic conditions like uneven distribution of rainfall, onset of monsoon etc and lack of availability of biofertilizers such as BGA, Azolla, Azospirillum etc. Therefore, various research institutions involved in sustainable agricultural development should focus on formulating suitable research projects on various dimensions and also strengthen the educational activities to meet the requirements of farmers in the high altitude and tribal area zone. The findings are in line with Somasundaram (1995) and Rambabu (1997).

Among the administrative constraints, nearly three fourths of the farmers attributed inadequate and untimely supply of agricultural inputs (70.00%) as a constraint in adoption of ITK and their blended technologies. More than half of the respondents attributed lack of more supporting price to the quality products (57.22%) and lack of good grading facility (51.11%) as constraints. A considerable portion of farmers attributed lack of proper training facilities (35.55%) as a constraint.

The major administrative constraint was inadequate and untimely supply of agricultural inputs and it could be overcome by timely and subsidised supply of agricultural inputs by the Department of agriculture. The constraints viz., lack of more supporting price to the quality products and lack of good grading facilities can be overcome by fixing prices based on quality and appropriate grading. Provision of good training facilities to train the farmers on proven indigenous technologies was suggested as the last constraint.

Among the research and extension constraints, more than one third of the farmers expressed lack of organised extension machinery to disseminate the proven ITK and their blended technologies (40.55%) and lack of sound research and development on ecological farming practices (34.44%). A

considerable portion of farmers expressed poor contact of extension workers with farmers (27.22%) and poor maintenance of demonstration plots (23.33%) as constraints. A few farmers also expressed lack of proper place for ITKs and their blended technologies in scientific recommendation (17.78%), treating the ITK as inferior by the agricultural research and extension systems (14.44%), lack of publications on proven ITKs their blended technologies (8.89%) and less priority of agricultural research on ITK and their blending with modern technologies (7.78%) as constraints.

Lack of organised extension machinery to disseminate the proven ITKs and their blended technologies was found as a major constraint, this might be because extension system mostly concentrating on their efforts to deliver the information what they have rather than mutual dialogue to gather the information on actual situation at farm and home level. In addition, it lacks the organised structure and coordination between different departments viz., extension unit of state agricultural university and state Department of agriculture. This constraint can be overcome with good rapport building and mutual dialogue between the extension workers and farmers as well as between extension unit of state agricultural university and state Department of agriculture. This also serves as a solution for the constraint that the poor contact of extension workers with farmers.

Lack of sound research and development on ecological farming practices was also found as a major constraint and by keeping the efforts of agricultural research system on development of ecological farming practices, the constraint can be overcome with the solution. The constraint viz., less priority of agricultural research on ITK and their blending with modern technologies can be solved by the above solution.

The other constraints like poor maintenance of demonstration plots, lack of proper place for ITKs and their blended technologies in scientific

recommendations, treating the ITKs as inferior by the agricultural research and extension systems, lack of publications on proven ITKs and their blended technologies. Therefore, agricultural research and extension systems should concentrate their efforts on these dimensions to overcome the above constraints.

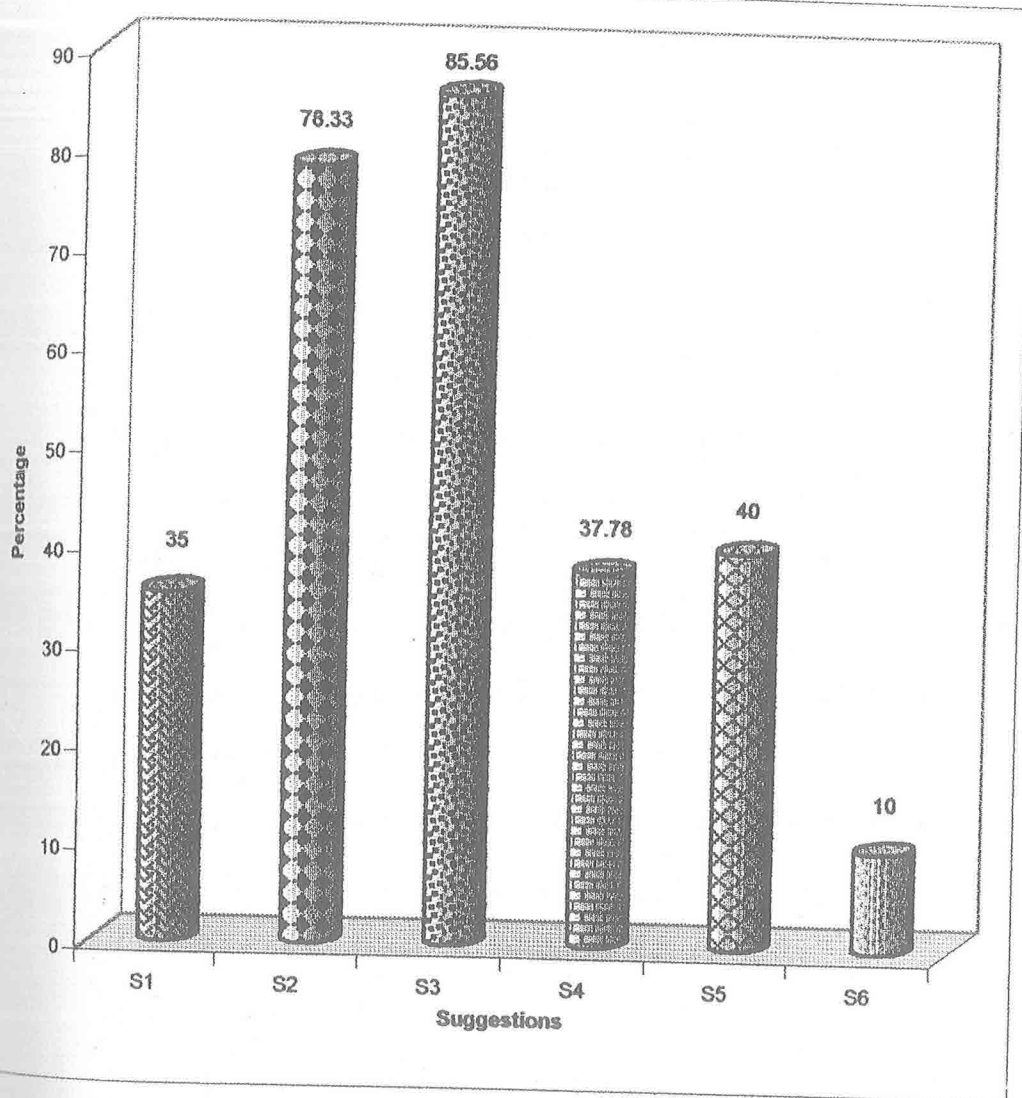
5.6.2 Suggestions for Higher Adoption of Indigenous Technical Knowledge and their Blended Technologies

Table 63: Suggestions for higher adoption of indigenous technical knowledge and their blended technologies

(n=180)

S. No.	Suggestion	Frequency	Percentage	Rank
1	Provision of improved species of green manure and green leaf manure by the government	63	35.00	V
2	Made available the biofertilizers and neem products on subsidized rates by the government	141	78.33	II
3	Improvement of sound research on ITK and their blended technologies	154	85.56	I
4	Strengthening the extension system for immediate discrimination of proven ITK and their blended technologies	68	37.78	IV
5	Training to farmers on proven ITK and their blended technologies elsewhere	72	40.00	III
6	More publication on proven ITK and their blended technologies in local language	18	10.00	VI

It could be concluded from the table that, more than three fourth of the respondents attributed improvement of sound research on ITK and their blended technologies (85.56 %) and made available the biofertilizers and neem products on subsidised rates by the government (78.33 %) were the major suggestions for higher adoption of ITK and their blended technologies. Some other suggestions attributed by the respondents were training to farmers on proven ITK and their blended technologies elsewhere



³⁹
Fig. : Suggestion for higher adoption of ITK and their blended technologies

(40.00 %), strengthening the extension system for immediate dissemination of proven ITK and their blended technologies (37.78 %), provision of improved species of green manure and green leaf manure (35.00 %) and more publications on proven ITK and their blended technologies in local languages (10.00 %).

Improvement of sound research on ITK and their blended technologies was the suggestion ranked as number one, because of ill and toxic effects of modern technologies on soil and environment. Made available the biofertilizer and neem products on subsidised rates by the government ranked second because biofertilizers and neem products reduces the requirement of chemical fertilizers and inturn reduces the ill effect on soil and environment.

Training to farmers on proven ITK and their blended technologies elsewhere was suggested by the farmers to gain skill in adoption of ITK proven elsewhere.

Strengthening the extension system for immediate dissemination of proven ITK and their blended technologies as the fourth suggestion by the farmers so that they will be encouraged to adopt the ITK and their blended technologies.

Provision of improved species of green manure and green leaf manure by the government was the fifth suggestion by the farmers so that it reduces the requirement for chemical fertilizers and also sustainable and ecofriendly.

More publications on proven ITK and their blended technologies in local languages was the sixth and last suggestion by the farmers. Therefore, it popularises the ITK and their blended technologies further leads to the higher adoption.

5.7 Strategy for Promotion of Indigenous Technical Knowledge Adoption Including Blended Technologies

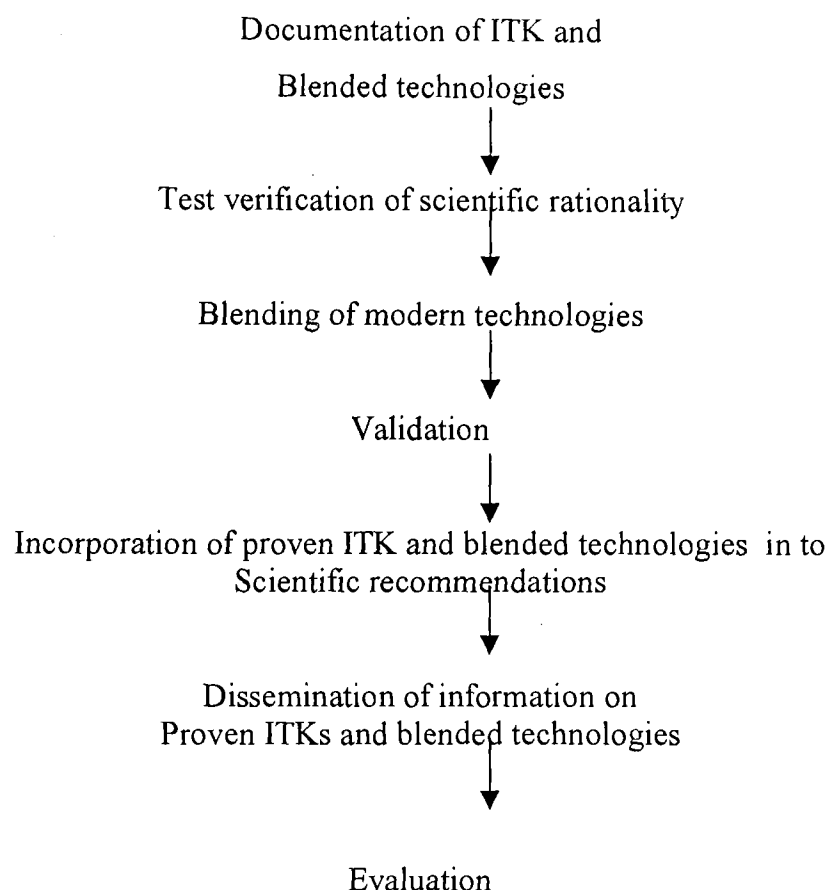


Fig. 41: Paradigm of ITK promotion strategy

This strategy involves seven stages which includes documentation, scientific rationality, blending with modern technologies, validation, inclusion in to scientific recommendations, dissemination and evaluation of the technologies.

1. Documentation of ITK and blended technologies

This is the initial step in promotion of ITK adoption including blended technologies and it should involve a multidisciplinary team consists of agricultural scientists, extension specialists, non governmental organisations and farmers. The documentation should use the participatory methods which involve group discussion, field visits, transact walk etc.,

besides individual contacts with the elderly farmers (i.e., more than 50 years of age). The multidisciplinary team should also use the available secondary literature, folk songs etc., to cull out as maximum as possible. The ITK should be documented by the above method across the nation.

2. Test verification of scientific rationality

The ITK and blended technologies should be classified in to different categories and before going to test verify the scientific rationality, the team should get the possible reasons for the rationality from the farmers so that it will guide the scientific community to test verify the rationality effectively. The rationality of the ITK and blended technologies can be test verified by expertise of the scientists and extensionists and through experimentation of the ITK through 'on farm trials'. The non rational ITK can be excluded after this stage to proceed with rational ITK further.

3. Blending of ITK with modern technologies

The ITK has been blended with modern technologies through farmers trial and error for certain extent. The scientific community should encourage the farmers in discovering the technologies for blending ITK with modern technologies for greater adaptability while meeting their requirements. Further, scientific community should blend the ITK with modern technologies to meet the changing needs and to increase the adaptability of the ITK in different regions.

4. Validation of proven ITK and blended technologies

At this stage, the multidisciplinary team involve in study of cost benefit ratios, ill effects if any, and finally their adaptability to different regions. Therefore, further refinement of the technologies is possible for incorporation in to the scientific recommendations.

5. Incorporation of proven ITK and blended technologies in to scientific recommendations

The proven ITK and blended technologies should be incorporated in to the scientific recommendations in similar farming situations.

6. Dissemination of information on proven ITK and blended technologies

At this stage, the extension community disseminate the proven ITK and blended technologies by use of appropriate extension methods viz., individual contacts, group discussions, result demonstrations and through publication in local languages. Mutual dialogue between extension and clientele system gives better results than one way of delivery information what they have.

7. Evaluation

At this final state, multidisciplinary team involves in evaluation of strengths, weakness, opportunities and threats (SWOT) of the ITK and blended technologies, which will be useful for further refinement of these technologies for their higher adoption.

The developed strategy for promotion of ITK adoption including blended technologies through seven step model as described above, to enhance the sustainability of agricultural production without degrading the resources for future use. Thus, the said model provides a strong base for identification of individual ITKs paving the way for system ITKs.

SUMMARY

CHAPTER VI

SUMMARY

Interest in Indigenous Technical Knowledge (ITK) has been fueled by the recent world wide ecological crisis and the realization that it's causes lies partly in the over exploitation of natural resources based on inappropriate attitudes and technologies. Scientists now recognize that indigenous people have managed the environments in which they have lived for generations, often without significantly damaging local ecologies. Many feel that indigenous knowledge can thus provide a powerful basis from which alternative ways of managing resources can be developed.

Hence, for the countries like India, the alternatives for the modern technologies are indigenous methods. Also the capital and technological skill requirements in the use of indigenous methods are generally low and their adoption often requires little restructure of the traditional societies. Indigenous methods are nothing but indigenous knowledge or ITK. By adopting such indigenous knowledge our ancestors did not face any problem of large scale pest out break or economic crisis unlike the today's farmer.

SPECIFIC OBJECTIVES OF THE STUDY

1. To document the Indigenous Technical Knowledge (ITKs) including blended technologies existing in high altitude and tribal area zone of Andhra Pradesh.
2. To find out the scientific rationality of identified Indigenous Technical Knowledge (ITKs) including blended technologies.
3. To know the attitude of farmers on ITKs and their blending with modern technologies.
4. To measure the extent of adoption of ITK including blended technologies by the farmers of high altitude and tribal area zone.

5. To fortify the efforts of Non-Governmental organisations (NGO's), State Agricultural University (SAU) and state department of Agriculture (SDA) for promotion of ITK in high altitude and tribal area zone.
6. To analyse the constraints and elicit suggestions for adoption of ITKs including the blended technologies.
7. To develop a strategy for promotion of ITK adoption including blended technologies.

Research Design

Descriptive Research Design was followed in conduct of the study.

Sampling Procedure

High altitude and tribal area zone comprises of parts of Srikakulam, Vizianagaram, Visakhapatnam, East Godavari and Khammam districts was selected purposively. The study was conducted in two phases.

a. Sampling in First Phase

One village was selected randomly from a selected high altitude mandal from each district. Eighteen elderly (>50 years) farmer respondents were selected by simple random sampling thus a sample of 90 was taken for study during first phase.

b. Sampling in Second Phase

One village each selected from two high altitude mandals from each district thus the study comprises of a total of 10 villages. Eighteen farmer respondents from each village were selected by simple random sampling thus a sample of 180 farmers was taken for the study.

A Total of 92 Agricultural Scientists were taken as sample, which comprise of 32 crop production Scientists (Agronomy, Plant Breeding and

Soil Science), 30 plant protection scientists (Entomology and Plant Pathology) and 30 Horticulturists for test verification of scientific rationality.

Two Non Governmental organizations, Regional Agricultural Research Station (RARS), Krishi Vigyan Kendra, 5 Assistant directors of Agriculture and 10 Mandal Agricultural officers were selected purposively.

Collection of Data

Well structured pretested interview schedules and questionnaires were prepared for data collection. Personal interview, personal informal interview, questionnaires, group discussion and field visit methods were used in the study.

SALIENT FINDINGS OF THE STUDY

6.1.1 CLASSIFICATION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITK) IN AGRICULTURE

6.1.1 Classification of Indigenous Technical Knowledge (ITK) in Agriculture Based on Nature of Practice

Among the 518 ITKs documented, 95 ITKs (18.54 %) belong to indigenous varieties, 67 ITKs (12.93 %) were related to seeds, sowing and planting, 66 ITKs (12.74 %) related to pest and disease management, 63 ITKs (12.16%) corresponding to post harvest management and 52 ITKs (10.04 %) concerned with crop rotation and mixed cropping. A minor portion of ITK belongs to harvest aspects (6.18 %), seasons (5.40 %), inter cultivation and weed management (4.83 %), preparatory cultivation (4.44 %), rain forecasting (2.89 %), others (2.12 %) and soil and water management (1.93 %).

6.1.2 Classification of Indigenous Technical Knowledge (ITK) in Agriculture Based on Crop Economic Botanical Classification

Among the 518 ITKs documented, 97 ITKs (18.72%) were belong to cereals, 85 ITKs (16.41%) belong to millets and 72 ITKs (13.90%) were related to general agriculture followed by vegetables (11.20%), pulses (11.00%), fruit crops (7.33%), spices and condiments (6.37%), oil seeds (4.63%), podu cultivation (4.44%), fibre crop (3.28%) and narcotics (2.70%).

6.2 RATIONALITY OF INDIGENOUS TECHNICAL KNOWLEDGE ITEMS (ITKs) IN AGRICULTURE

Among the 518 ITKs on agriculture 444 (85.71 %) of the ITKs were judged as rational by the scientists and remaining 74 (14.29 %) were judged as not rational.

6.2.1 Rationality of ITK in Agriculture According to Nature of Practice

More than 90 per cent of the ITKs were judged rational in case of harvest aspects (96.87), post harvest management (95.24%), seasons (92.86%), varieties (91.58%) and preparatory cultivation (91.30%). More than 80.00% rational ITKs were found in case of soil and water management (90.00%), seeds, sowing and planting (85.07%), pest and disease management (86.36%), intercultivation and weed management (84.00%) and manures and soil fertility (83.87%). A majority of ITKs found rational in the case of crop rotation and mixed cropping (75.00%) and others (63.64%) but less than overall average of 86.29%. Very few ITKs were found rational in the case of rain forecasting (20.00%).

6.2.2 Rationality of ITK in Agriculture According to Crop Economic Botanical Classification

Most of the ITKs were rated rational by the scientists in the case of oil seeds (95.83%), fruit crops (94.74%), millets (94.39%), vegetables (92.30%) narcotics (92.86%), pulses (89.47%) and cereals (88.00%). Among the crops, 75 to 85% of ITK were found rational in the case of fibre crop (76.47%) and general agriculture (75.00%). A few majority of ITK were found rational in case of spices and condiments (66.67%) and podu cultivation (56.52%).

6.2.3 Item wise Rationality of ITK in Agriculture

6.2.3.1 Rationality of ITK on crop production

Out of 44 ITKs on crop production in general agriculture, 27 ITKs (61.36%) were judged rational by the scientists and 17 ITKs (38.64%) were judged not rational.

Among the 21 ITKs on crop production aspects related to podu cultivation, 11 ITKs (52.18%) were found rational and 10 ITK (47.62%) were found not rational.

Out of the 46 ITKs on crop production of paddy, 40 ITKs (86.96%) were found rational and 6 ITKs (13.04%) were found not rational.

Among the 37 ITKs on crop production of maize and sorghum, 35 ITK (94.59%) were found rational and remaining 2 ITKs (5.41%) were found not rational.

Out of the 59 ITKs on crop production of millets, 56 ITKs (94.91%) were judged rational by the scientists and remaining 3 ITKs (5.09%) were judged not rational.

Among the 41 ITKs on crop production of pulses, 37 ITKs (90.24%) were found rational and remaining 4 ITKs (9.76%) were found not rational.

Among the 20 ITKs on crop production of oil seeds, 19 ITKs (95.00%) were found rational and remaining one ITK (5.00%) was found not rational.

Out of the 10 ITKs on crop production of mesta, 7 ITKs (70.00%) were found rational and 3 ITKs (30.00%) were found not rational.

All the 6 ITKs (100%) on crop production of tobacco were found rational.

6.2.3.2 Rationality of ITK on plant protection

Out of the 28 ITKs on plant protection in general agriculture, 27 ITKs (96.43%) were found rational and one ITK (3.57%) was found not rational.

All the 2 ITKs (100%) on podu cultivation were judged as rational by the scientists.

Out of the 29 ITKs on plant protection in paddy, 26 ITKs (89.65%) were found rational and remaining 3 ITKs (10.35%) were found not rational.

All the 5 ITKs on plant protection related to maize and sorghum coarse cereals were judged rational by the scientists.

Out of the 6 ITKs on plant protection in millets, 5 ITKs (83.33%) were found rational and one ITK (16.67%) was found not rational.

Among the 16 ITKs in plant protection of pulses, 14 ITKs (87.5%) were found rational while 2 ITKs (12.50%) were found not rational.

All the 4 ITKs (100%) on plant protection in oil seeds were judged rational by the scientists.

All the 7 ITKs on plant protection in mesta were judged rational by the scientists.

Out of the 8 ITKs on plant protection in tobacco, 7 ITKs (87.50%) were found rational and one ITK (12.50%) was found not rational.

6.2.3.3 Rationality of ITKs related to horticultural crops

Among the 52 ITKs on vegetables, 48 ITKs (92.31%) were found rational and 4 ITKs (7.69%) were found not rational.

Out of the 39 ITKs related to spices and condiments, 26 ITKs (66.69%) were found rational and 13 ITKs (33.33%) were found not rational.

Among the 38 ITKs related to fruit crops, 36 ITKs (94.74%) were judged rational and 2 ITKs (5.26%) were judged not rational by the scientists.

6.3 ATTITUDE OF FARMERS TOWARDS INDIGENOUS TECHNICAL KNOWLEDGE (ITK) AND THEIR BLENDING WITH MODERN TECHNOLOGIES

Majority of the respondents (72.78%) had favourable attitude followed by neutral attitude (10.56%), unfavourable attitude (7.78%), highly favourable attitude (5.55%) and highly unfavourable attitude (3.33%) towards Indigenous technical knowledge and their blending with modern technologies. These finding shows that the higher favourable attitude of farmers towards indigenous technical knowledge and their blending with modern technologies.

6.4 ITEM WISE EXTENT OF ADOPTION OF ITK IN AGRICULTURE

Out of the 72 ITKs on general agriculture, more than 50% of the respondents were adopted 14 ITKs (19.44%) completely, 25 ITKs (34.72%) partially and 7 ITKs (9.72%) were not adopted by more than 50% of the respondents.

Among the 23 ITKs on podu cultivation, more than 50% of the respondents adopted 14 ITKs (60.87%) completely, 3 ITKs (21.43%)

partially and 3 ITKs (21.43%) were not adopted by more than 50% of the respondents.

Among the 75 ITKs on paddy, more than 50% of the farmers adopted 14 ITKs (18.67%) completely and 24 ITKs (32.00%) partially and 20 ITKs (26.67%) were not adopted by more than 50% of the respondents.

Out of the 22 ITKs on maize, more than 50.00% of the respondents had adopted 11 ITKs (50%) completely, 5 ITK (22.73%) partially and 2 ITKs (9.09%) were not adopted by more than 50% of the respondents.

Out of the 20 ITKs on sorghum, more than 50% of the respondents adopted 8 ITKs (40.00%) completely and 3 ITKs (15.00%) partially and 7 ITKs (35.00%) were not adopted by more than 50% of the respondents.

Out of the 26 ITKs on finger millet, more than 50% of the respondents were adopted 9 ITKs (34.61%) completely, 4 ITKs (15.38%) partially and more than 50% of the farmers were not adopted 11 ITKs (42.30%).

Among the 14 ITKs on little millet, 7 ITKs (50.00%) were adopted completely by more than 50% of the respondents and 4 ITKs (28.57%) were not adopted by more than 50% of the respondents.

Out of the 9 ITKs on fox tail millet, 7 ITKs (77.77%) were adopted completely by more than 50% of the respondents and one ITK (11.11%) was not adopted by more than 50% of the respondents.

Out of the 9 ITKs on bajra, more than 50% of the respondents were adopted 2 ITKs (22.22%) each completely and partially and one ITK (11.11%) was not adopted by more than 50% of the respondents.

Out of the 7 ITKs on Kodo millet, 3 ITKs (42.86%) were adopted completely by more than 50% of the respondents and 2 ITKs (28.57%) were not adopted by more than 50% of the respondents.

Out of the 15 ITKs on black gram and green gram , more than 50% percentage of the respondents adopted 5 ITKs (33.33%) completely and 8 ITKs (53.33%) partially and one ITK (6.67%) was not adopted by more than 50% of the respondents.

Out of the 32 ITKs on red gram, more than 50% of the respondents were adopted 10 ITKs (31.25%) completely and 9 ITKs (30%) partially and 3 ITKs (10%) were not adopted by more than 50% of the respondents.

Two ITKs (20.00%) each were completely adopted, partially adopted and not adopted by more than 50% of the respondents in the case of horse gram.

Out of the 15 ITKs on groundnut, complete adoption by more than 50% of the respondents was observed in case of 13 ITKs (86.67%).

Out of the 9 ITKs on sesamum, complete adoption by more than 50% of the respondents was found in the case of 5 ITKs (55.55%).

Out of the 17 ITKs on mesta, more than 50% of the respondents completely adopted 13 ITK (76.47%) and not adopted 2 ITKs (11.76%).

Out of the 14 ITKs on tobacco, more than 50% of the respondents were adopted 5 ITKs (35.7%) completely and 2 ITKs (14.28%) partially and one ITK (7.14%) was not adopted by more than 50% of the respondents.

Out of the 18 ITKs on vegetables, 7 ITKs (38.89%) were adopted completely, 4 ITKs (22.22%) adopted partially and the 2 ITKs (11.11%) were not adopted by more than 50% of the respondents.

Out of the 9 ITKs on cowpea, more than 50.00 % the respondents adopted 6 ITKs (66.67 %) completely and one ITK (11.11 %) partially.

Out of the 12 ITKs on rice bean, more than 50 % of the respondents adopted one ITK (8.33 %) completely and 6 ITKs (50.00 %) partially and 2 ITKs (16.67 %) were not adopted by more than 50.00 % of the respondents.

Out of the 8 ITKs on cauliflower, more than 50.00 % of the respondents adopted 4 ITKs (50.00 %) completely and one ITK (12.50 %) partially.

Four ITKs (80.00 %) out of the 5 ITKs on tapioca were adopted completely by more than 50.00 % of the respondents.

Out of the 14 ITKs on chillies more than 50.00 % of the respondents were adopted 9 ITKs (64.28 %) completely and one ITK (7.14 %) partially and the 2 ITKs (14.28 %) were not adopted by more than 50.00 % of the respondents.

Out of the 14 ITKs on turmeric, more than 50 % of the respondents completely adopted 12 ITKs (85.71 %) and not adopted 2 ITKs (14.29 %).

Out of the 6 ITKs on coriander, more than 50.00 % of the farmers completely adopted 3 ITKs (50.00 %), positively adopted one ITK (16.67 %) and not adopted one ITK (16.67 %).

All the 5 ITKs on ginger were adopted by more than 50.00 % of the respondents completely.

Out of the 11 ITKs on pineapple, more than 50.00% of the respondents adopted completely 8 ITKs(72.73%) and not adopted 2 ITKs (18.18%).

Out of the 19 ITKs on banana, more than 50.00 % of the farmers adopted completely 11 ITKs (57.89%) and partially 3 ITKs (15.79%) and 3 ITKs (15.79%) were not adopted by more than 50% of the farmers.

Five ITKs (62.50 %) out of 8 ITKs on cashew were adopted completely by more than 50.00 % of the respondents.

6.5 EFFORTS OF NON GOVERNMENTAL ORGANIZATIONS, STATE AGRICULTURAL UNIVERSITY AND STATE DEPARTMENT OF AGRICULTURE IN PROMOTION OF ITK AND THEIR BLENDED TECHNOLOGIES

6.5.1 Efforts of Non Governmental Organization (NGOs) in Promotion of ITK and their Blended Technologies

6.5.1.1 Good Samiritans Rural Development Society (GSRDS)

They adopted 16 villages in Vizianagaram district and 11 villages in East Godavari district.

The NGO organized training programmes on vermicompost preparation, 'sustira vyavasayam to bhusaram perugudala' (soil fertility improvement through sustainable agriculture) and demonstrations on vermicompost preparation.

It supplies neem cake to the farmers at free of cost and encourages the adoption of ITK related to neem cake application.

The organization used training programmes, individual contacts, group meetings for popularization of indigenous technologies

6.5.1.2 Gramina Purnanirmana Kendram (GPK)

The NGO is in operation in Srikakulam and Vizianagaram district. It is also documenting ITK in agriculture, veterinary, cultural botany, biodiversity and traditional medicine. They also promote indigenous medicine through a net work of 40 medical healers in Srikakulam and Vizianagaram districts.

The organization promotes adoption of ITK on podu cultivation, paddy, finger millet, little millet, foxtail millet, kodo millet and red gram, which accounts for 37.64 % of the total ITK under study. It effectively used individual contacts and group meetings for populations of ITK in major crops in the tribal areas to Srikakulam and Vizianagaram district.

6.5.2 Efforts of State Agricultural University in Promotion of ITK and their Blended Technologies

6.5.2.1 Regional Agricultural Research Station (RARS), Chintapalle, Visakhapatnam district

It has documented ITK in agriculture and allied sectors existing in tribal areas of visakhapatnam district i.e., ITK on upland paddy, little millet, rice bean, poultry farming, local festivals with relevance to agriculture, traditional knowledge on mixed cropping, post harvest aspects of red gram, finger millet, apiculture, tattooing, social customs etc. It has used individual contact method and result demonstrations for popularization of ITKs in their adopted villages.

6.5.2.2 Krishi Vigyan Kendra (KVK), Rasta Kuntabai, Vizianagaram district

It has documented the ITK in agriculture and allied sectors related to preparatory cultivation, crop rotation, mixed cropping, pest and disease management with indigenously available materials, grain and seed storage, indigenous medicine, ethnic food preparations, fruit product preservation and fuel management etc. It has also contributed information on TIK for the voluntary disclosure programme of ITK, ICAR. The institute organized different training programmes to the farmers, which emphasizes use of indigenous inputs in crop husbandry and sustainable agriculture.

6.3 EFFORTS OF STATE DEPARTMENT OF AGRICULTURE IN PROMOTION OF ITK AND THEIR BLENDED TECHNOLOGIES

The department of agriculture supplies green manure species like sun hemp (*Crotalaria* sp.) and diancha (*Sesbania* sp.) and gypsum to the tribals. It is taking it's role in technology discrimination on ITKs for sustainability

through organized method demonstrations, group meetings and individual contacts.

6.6 CONSTRAINTS FACED BY THE FARMERS IN ADOPTION OF ITK AND THEIR BLENDED TECHNOLOGIES

Lack of direct and immediate outcome by adoption of ITKs (57.78%), time consuming and labour intensive nature of ITKs (47.78%) and bulky nature of indigenous inputs (45.55%) are considered as the major technological constraints by the majority farmers in adoption of ITKs and their blended technologies. In addition, a considerable section of farmers expressed, lack of high yielding varieties (23.33%), competition from modern technologies (22.22%) and lack of pest and diseases resistant varieties (20.00%) as constraints in adoption of ITKs and their blended technologies. Very few farmers expressed, lack of short duration varieties (17.78%), lack of availability of improved technology on vermicompost preparation (13.33%), need of clear plan for adoption of ITKs unlike modern technologies. As they are readymade in nature (13.33%), lack of proper technology for integrated pest management (10.55%), climatic conditions like uneven distribution of rainfall, onset of monsoon etc., (6.67%) and lack of availability of biofertilizers such as BGA, Azolla, Rhizobium, Azospirillum etc., (5.00%) as constraints.

Among the administrative constraints, nearly three fourths of the farmers attributed inadequate and untimely supply of agricultural inputs (70.00%) as a constraint in adoption of ITKs and their blended technologies. More than half of the respondents attributed lack of more supporting price to the quality products (57.22%) and lack of good grading facility (35.55%) as a constraint.

Among the research and extension constraints, more than one third of the farmers expressed lack of organized extension machinery to disseminate the proven ITKs and their blended technologies (40.55%) and lack of sound

research and development on ecological farming practices (34.44%). A considerable portion of farmers expressed poor contact of extension workers with farmers (27.22%) and poor maintenance of demonstration plots (23.33%) as constraints. A few farmers also expressed lack of proper place for ITKs and their blended technologies in scientific recommendation (17.78%), treating the ITKs as inferior by the agricultural research and extension systems (14.44%), lack of publications on proven ITKs their blended technologies (8.89%) and less priority of agricultural research on ITKs and their blending with modern technologies (7.78%) as constraints.

6.7 SUGGESTIONS FOR HIGHER ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE AND THEIR BLENDED TECHNOLOGIES

More than three forth of the respondents attributed improvement of sound research on ITKs and their blended technologies (85.56%) and made available the biofertilizers and neem products on subsidized rates by the government (78.33%) were the major suggestions for higher adoption of ITKs and their blended technologies. Some other suggestions attributed by the respondents were training to farmers on proven ITKs and their blended technologies elsewhere (40.00%), strengthening the extension system for immediate dissemination of proven ITKs and their blended technologies (37.78%), provision of improved species of green manure and green leaf manure (35.00%) and more publications on proven ITKs and their blended technologies in local languages (10.00%).

6.8 STRATEGY FOR PROMOTION OF INDIGENOUS TECHNICAL KNOWLEDGE ADOPTION INCLUDING BLENDED TECHNOLOGIES

The strategy involves seven stages which includes documentation of ITK, test verification of scientific rationality, blending with modern

technologies, validation, integration in to scientific recommendations, dissemination and evaluation of the technologies.

The developed strategy is for promotion of ITKs adoption including blended technologies through seven step model to enhance the sustainability of agricultural production without degrading the resources for future use.

6.9 IMPLICATIONS OF THE STUDY

1. ITKs have been propagated and passed on through several generations, unlike the modern technologies. The present study has brought out more than 500 ITKs on various crops cultivated in the study area. These ITKs may be well documented, test verified, standardized, blended with modern technologies and recommended as alternatives.
2. Farmers were found to adopt both rational and not rational ITKs. The extension personnel while encouraging the continued use of rational ITKs may suitably educate their clientele to discontinue the not rational ITKs.
3. Farmers were found to have more favourable attitude towards ITKs and their blended technologies. This can be effectively utilized by the extension personnel in dissemination of information on ITKs and their blended technologies.
4. The methodology developed in this study for documentation of ITKs and measurement of attitude of farmers on ITKs and their blended technologies may be very well utilized by research workers, change agents etc.
5. An over view of documented ITKs and blended technologies reveals that many package of practices recommended by change agents have been developed from ITKs, however the extension agencies may try to include those suitable ITKs and blended

technologies in the technology dissemination process in order to replace those modern technologies, which are hazardous to environment and ecosystem.

6. Most of the ITKs don't involve the use of injurious chemicals and hence their produces can be considered as healthy and eco-friendly. The extension agencies may suitably educate the consumers to patronize the produces produced with the use of ITKs.
7. The efforts of different agencies in promotion of ITKs gives a brief comprehension and hence, it can be effectively utilized in promotion of these technologies through different agencies.

6.10 FUTURE FOCUS OF THE STUDY

1. Documentation of the existing ITKs through out the nation may be undertaken.
2. Testing of the rationality of Indigenous Technical Knowledge (ITK) in agriculture and allied sectors.
3. Analysis of the ITKs for their productivity, suitability, sustainability and cost-benefit ratio may be undertaken by multidisciplinary team including agricultural researchers, extensionists with involvement of farmers.
4. Study of indigenous technologies as a system in their operation.
5. The investigation was continued to one agro ecological zone of the state with a sample size 180. It is therefore, necessary to conduct similar studies with larger samples in other zones of the state so that the conclusions can be generalized to wider area.
6. The tools and techniques of measurements developed for the present study appears to be promising and convenient. However,

they need to be tried on larger samples and to be cross validated with other similar measurements.

7. The study has not considered independent variables of respondents in relation with the dependent variables being it is a descriptive in nature. Where as the independent factors underlies the dependent variables may be studied.
8. Field trials may be conducted to test the documented ITKs and to develop crop wise package of indigenous practices for use by the farmers and also to show the on farm results.
9. Case studies on success stories of adoption of ITKs and blended technologies may be undertaken by the extension agencies for their further popularization and dissemination.

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APPENDICES

Bapatla,
Dt. 8-8-2002.

From

Dr. P.VENKATARAMAIAH
Professor & Head
Department of Agricultural Extension
Agricultural College, BAPATLA,
ANGRAU, Hyderabad-500 030.

To

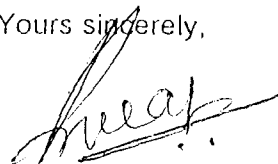
Dear Sir/Madam,

Sub:- Ph.D. Thesis Lakshmana Kella - Study of Scientific Rationality of
Indigenous Technical knowledge items - Documented in high altitude and
tribal area zone - Reg.

This is in relation with the research work undertaken by Mr. Lakshmana Kella, a Ph.D. Scholar working under my guidance. He is working on "Indigenous Technical Knowledge (ITK) in Agriculture in High Altitude and Tribal Area Zone of Andhra Pradesh". He has documented ITK existing in the study area and it is needed to find out the scientific rationality behind the practices. The ITKs are given on three point continuum viz., rational / undecided / not rational. Further, I request you to please give your judgement against each ITK by tick mark (✓) in appropriate column.

Thanking you.

Yours sincerely,



(Dr. P.VENKATARAMAIAH)

**RATIONALITY OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs)
ON CROP PRODUCTION**

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	GENERAL			
1	Summer ploughing is practiced by the farmers during April-May which exposes the soil to hot sun so that the soil born insects will be killed by heat.			
2	Sheep penning and cattle penning are practiced during summer for 2-3 days in each field to improve soil fertility.			
3	Farmyard manure (FYM) is applied to the soil every year during summer without fail to improve soil fertility.			
4	The pooled household garbage is used as manure after its putrification which enhances the fertility of the soil.			
5	Tribals incorporate ash in to the soil which believed to reclaim the soil gradually and improves fertility.			
6	Four ploughings for cultivation of ragi, and three ploughings for cultivation of Sama, Korra, ganti are sufficient.			
7	Ploughing after every shower during the pre-sowing season to conserve enough moisture for the crop, remove weeds and ensure good crop.			
8	Application of sand from river beds during summer is practiced to increase the fertility of black soil.			
9	'Bali' is practiced by the tribal farmers during nursery preparation, transplantation, grain formation and harvesting of major crop like paddy, ragi and red gram.			
10	Application of gypsum to the soil is practiced to correct alkalinity. (BT)			
11	Tuvvatam (digging) with use of 'Kanka' along the slope is done before sowing the crop.			
12	Deep ploughing is practiced during summer to improve water holding capacity of soil and to conserve enough soil moisture.			
13	Laying stone bunds around the fields across the slope for preventing soil erosion and for conserving moisture is practiced.			
14	Excessive application of farm yard manure (FYM) is practiced to improve the soil texture.			
15	Application of hill soil (Konda mannu) is practiced to increase the water holding capacity of red soils.			
16	Repeated ploughing is practiced to reduce weed population in dry lands.			
17	Profuse weed growth after rain is an indication for high soil fertility.			
18	Fouls stretch their feathers in hot summery days which indicates the rain incidence.			
19	Ants changes their eggs from one place to another which indicates initiation of rains.			
20	Hallow around the moon indicates occurrence of rains.			
21	Hallow near to moon indicates rains for away.			
22	It will rain if termite fly in large number in the air at 10 – 20 fts height			
23	.If a rainbow appears in the east in the evening or West in the morning, it will rain.			
24	Streaks of lightening in the east with rainbow in the West would lead to rain.			
25	If the sky becomes dark near the horizon, there will be instant rain.			
26	If the North wind blows, it will surely rain.			
27	Ants raising maunds is an indicator of rains.			
28	Rain can be forecasted by looking at the sight of burrow of ants.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
29	If white ant take wing in the evening, it will rain exclusively.			
30	Dragan flies flying indicates rain fall			
31	Rain follows the frogs crocking.			
32	Even if the seeds are of good quality, they must be sown in the right season only to get higher yields.			
33	New moon day or days before new moon day is better for sowing or harvesting any crop.			
34	It is better to avoid sowing on Ashtami (eighth) and Navami (ninth) days from full moon and new moon days.			
35	Ragi, redgram and black gram seeds are mixed and broadcasted infield and harvested each separately in parts of tribal area zone.			
36	Seed stored for next year is taken out only after celebrating 'Itukula Panduga' which comes during April to May months.			
37	If rains are delayed beyond the season (too late) higher niger is cultivated for subsidiary income.			
38	Farmers practiced to change seeds once in two years to get good seed vigour.(BT)			
39	Red gram is mixed cropped with sorghum + korra + ganti + junuvulu. The seeds of sorghum, korra, ganti and junuvulu is mixed and broadcasted in the field. Redgram is sown by digging holes using an indigenous implement called 'Kanka' at 1 meter spacing after broad casting the mixed seed.			
40	Intercultural operations and timely weeding are essential for rainfed agriculture thus followed to possible extent.			
41	In mixed crop korra yields first followed by junuvulu, sorghum, ganti and finally farmers harvest redgram.			
42	Continuos submergence of the field for some time is practiced if water is available which controls the weeds.			
43	Konda Puja (prayer to hill) is practiced by the farmers collectively before harvesting the major crops such as paddy, redgram, ragi etc.			
44	Mesta or sesamum is grown as summer crop preceeding to paddy which give additional income which inturn useful as investment for paddy crop.			
	Podu Cultivation			
45	Tribals practiced shifting cultivation locally known as 'podu'. There are two types of podu practiced by the tribals i.e., 'chelaka podu' (plain forest clearance) and konda podu (podu in steepy hills).			
46	Podu is used to start by the farmers during summer (after celebrating Nandi panduga festival) by clearing the bushes with use of knife, sickle, axe etc. and burning them. They allows it for some days with on set of monsoon they start sowing seeds, after working with spades.			
47	April – May is found to be the optimum season to start the process of podu cultivation.			
48	Bushes are cleared during November, December and keep it to sundry up to kotha Amavasya (March) than burn it and ploughed to make it ready for cultivation in some parts of high altitude and tirbal area zone.			
49	Podu cultivation improves fertility of native soil because more number of crops are grown on the same piece of land.			
50	Farmers used to cultivate the podu for three years and than they shift the cultivation in search of new land.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
51	In konda podu (podu on steep hills) digging with spades (Tuvvuta) is practiced instead of ploughing as in the case of 'banda podu' (podu at hill bases)			
52	Tribals believes that podu cultivation has no harmful effects an overall rainfall pattern and even on infiltration of rain water.			
53	During the first year of podu cultivation (Kotha bhumi) redgram and paddy (konda danyam) mixed crop is grown. Farmers use 20 kg paddy+ 3 kg of red gram per acre of podu land.			
54	Korra +sorghum+redgram+junuvulu are cultivated as mixed crop in konda podu during second year.			
55	3-4 kg of mix of all available seeds are broadcasted per acre of soil in podu cultivation during 3rd year .			
56	Sorghum +cowpea in grown as mixed crop during the first year of podu in some parts of high altitude and tribal area zone.			
57	Budamalu (Mettu danyam) and red gram are mixed cropped during second year by the tribals in some parts of high altitude and tribal area zone.			
58	'Ganti' followed by Black gram or green gram are cultivated during third year of podu in some parts of high altitude tribal area zone.			
59	Farmers mix the seeds of korra and sorghum and broadcast in field. After this by use of a kanka, they dig the soil at 2-3 feet distance and drop two seeds of red gram in each hole and than closes the hole with soil..			
60	In some areas of high altitude and tribal area zone ganti + sorghum + korra + sama mixed cropping is followed in podu.			
61	Weeding is practiced by the farmers in podu cultivation without fail because in podu lands weed problem is more.			
62	Weeding twice is practiced in new podu land (kotha podu) and once in old podu land (patha podu) because weed problem is more in new podu land.			
63	Weed problem is more in podu cultivation compared to plain cultivation because some weeds could survive by means of rhizomes, corms etc. where weeding is practiced regularly.			
64	Difference in maturity period for crops gives opportunity to harvest each crop separately, farmers harvest first korra followed by sama, junuvulu, ganti, sorghum and finally red gram.			
65	Tribals followed Karthe to initiate every farm operations in podu cultivation.			
	CEREALS			
	Paddy (<i>Oryza sativa</i>)			
66	'Arudhra Karthe' is suitable season for sowing mettudanyam (paddy variety-light) which is an early matured variety(short duration).			
67	'Mrugasira Karthe' is suitable season for sowing late maturing (long duration) varieties of paddy.			
68	'Mrugasira karthe' (Month of June) is the optimum season for growing paddy nursery.			
69	'Punrvasa karthe' is suitable season for transplantation of paddy seedlings into mainfield.			
70	If nursery is sown in 'Arudhra karthe' the seedlings will not grow well because of Arudhra dosam.			
71	If paddy is sown in 'Arudhra karthe' requires more seed			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
72	Transplanting paddy during punarvasa to ashlisha period gives higher crop yields and hence practiced by the tribal farmers.			
73	Before sowing paddy in nursery, hundred seeds will be sown as sample and irrigated to check the percentage of germination.			
	a. 80% germination is considered good.			
	b. If germination percentage is less than 70, more seed will be sown than required quantity. The whole operation is called as 'pallemuveyuta' (BT)			
74	Direct sown paddy is cultivated on podu land (slopy hills) called 'Yada panta'			
75	Dense planting of paddy gives higher crop yields, hence farming adopted more seed rate.			
76	In some parts of the high altitude and tribal area zone, farmers used to broadcast paddy seed with ash to over come dry spells (Mostly in red and black soils).			
77	Groundnut cake (40-50 kg/ac) mixed with cowdung is incorporated in to the soil during puddling to improve soil fertility.			
78	Indigenous spade is used to trim the bunds and to level the puddled field.			
79	Transplanting is done along the wind direction and not against the wind direction.			
80	Paddy seed for next season is selected based on seed weight (by use of their discretion power on seed characters)			
81	For seed collection, the field is identified during growth stage (uniform and better growth) and harvested separately.			
82	'Konda danyam' (paddy) is cultivated as mixed crop with redgram in which paddy is harvested early and red gram will be retained up to 6 months for maturity.			
83	'Karavakkulu' is a traditional paddy variety cultivated by the farmers in high altitude and tribal areas.			
84	'Garika sannalu' is a traditional early maturing variety with good taste is cultivated by the tribal farmers.			
85	'Budamalu' (Mettudanyam) is a traditional paddy variety used to cultivate as mixed crop with red gram.			
86	'Bobbili ganti' is a traditional high yielding paddy variety with 90-100 days duration and the seed is red in colour.			
87	'Kichidi' is a traditional late maturing variety (110-130 days) which is suitable for 'pulav' (good taste)			
88	'Pedamaipala' is a traditional tall early maturing variety of paddy with small grains.			
89	'Potti basangi' is a traditional early maturing (90 days) paddy variety with small seeds cultivated by the tribal farmers.			
90	'Krishna Kathikalu' is a traditional medium maturing variety (100-120 days) of paddy with good taste is cultivated by the tribals.			
91	'Kampu sannalu' is an indigenous scented paddy variety with 6 months crop duration and the grain is medium to big in size.			
92	'Isuka ravvalu' is an indigenous scented paddy variety with 6 months crop duration and seed is small in size.			
93	'Pantulu danyam' is an indigenous paddy variety with a duration of 120 days with brown shiny seed coat.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
94	'Ooda sannalu' is a indigenous short duration (100 days) variety of paddy bearing one or two tillers and the seed coat is reddish brown.			
95	'Yerra danyam' is an indigenous paddy variety which used to give higher yields without any fertilizer application.			
96	'Yerra danyam' is traditional tall variety which is high yielding variety among the traditional varieties of paddy.			
97	'Daniyalu' is traditional (Sanna Danyam) paddy variety which is tasty and suitable for Biriyan making.			
98	'Konda Danyam' is a traditional variety which is late maturing with good taste.			
99	Srikakulam sannalu (RGL-2537) is never cultivated in podu or as a dry crop (BT).			
100	MTU-1001 is cultivated as dry crop by the tribals which gives tasty rice (BT).			
101	Chemical fertilizers are applied to the field in combination with neem cake (20 kg / acre) to get better crop yields (BT).			
102	Five cart loads FYM per acre (2.5 tons approximately) is applied to the field during summer in which the paddy will be sown in coming season.			
103	Four to five ploughings are desirable for paddy cultivation are practiced.			
104	Indigenous country plough is used for preparatory cultivation, forming ridges and furrows.			
105	The place with higher elevation in the field is selected for raising the nursery.			
106	Dry paddy ploughed once after sowing to give better yields. (care is taken so that crop is not damaged)			
107	'Katte seed' (vernacular name) mesta is sown in field and incorporated in paddy field at the time of puddling at good vegetative growth stage.			
108	Tentemu leaf and jeelugu (Fish tail palm) twigs are incorporated during second ploughing for better decomposition and utilization to improve soil fertility.			
109	Tentum (vernacular name) leaves are collected and broadcast in the field before puddling. During puddling the leaves get decomposed thus improves the soil fertility.			
110	Weeding is done twice in paddy first at 15 days after transplanting and second at active tillering stage which gives good vegetative growth.			
111	Panicle is indicator for healthy status of paddy crop.			
112	Alternate wetting and drying results in good paddy crop (BT).			
	Maize (<i>Zea mays</i>)			
113	One to two Cart loads of farm yard manure per acre is applied to the soil during summer in which maize is to be cultivated.			
114	Neem cake is applied to the soil at the time of sowing maize @ 20-25 kg/acre			
115	'Konda mokaajonna' is traditional maize variety which is tasty(sweet) cultivated by tribals.			
116	'Pedda moka jonna' is a traditional maize variety with big size cobs.			
117	Gada mokaajonna' is a traditional tall maize variety which is resistant to foxes because of its height.			
118	'Korra mokaajonna' is a traditional short maize variety which is mostly damaged by the wild animals like foxes.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
119	After getting good tilth maize is sown by use of 'kanka' (indigenous implement) to dig the soil at 2 feet spacing.			
120	5 kg/ac of seed rate is followed traditionally by the farmers to get higher yields in maize.			
121	0.5 kg/ acre of Maize seed is used if it is cultivated in lines i.e in mixed crop.			
122	Maize seeds are dibbled along the ridges in small holes farmed with fingers or small sticks and covered with soil.			
123	Cucumber, Ridge gourd, Brinjal etc. are cultivated as boarder crop around the Maize field.(BT)			
124	Maize is mostly cultivated as mixed crop.			
125	Maize is cultivated as mixed crop with redgram because two crops belongs to different families.			
126	Maize is cultivated as mixed crop with korra to get two yields from a single plot at different periods because of different maturing period.			
127	Maize is cultivated as mixed crop with budamalu (mettu danyam) to get additional yields from single plot.			
128	Maize is cultivated as mixed crop with cow pea (alasandalu) which creeps on maize. (BT)			
129	Maize is cultivated as mixed crop with sesamum because they yield at different periods.			
130	Stage of harvest in maize is indicated by sheaths covering the cobs turning to yellow and seeds become fairly hard and dried.			
131	When a sample of maize grains are chewed, metallic sound indicates their optimal dryness.			
132	Maize cobs only are harvested when it grown as mixed crop with cowpea leaving the plant to give support for creeping.			
	Sorghum (<i>Sorghum bicolor</i>)			
133	'Rohini karthe' is optimum season for sowing sorghum.			
134	Three ploughings are required for sorghum cultivation.			
135	'Pedda jonna' is a traditional sorghum variety grown by tribal farmers which is late maturing variety.			
136	'Dassera jonna' is a traditional early maturing variety harvested at the time of dassera festival.			
137	'Karthika jonna' is an indigenous early maturing variety gives more yield.			
138	Konda jonna is an indigenous variety cultivated in konda podu by the tribal farmers.			
139	'Biyyapujonna' is an indigenous sorghum variety with good taste of grains is cultivated by the tribals.			
140	'Yenugu matta jonna' (Tella jonna) is an indigenously cultivated sorghum variety with big size spikelets. The big size spikes are congenial for birds to sit and eat it, hence bird damage is observed.			
141	'Pidaka jonna' is an indigenously cultivated sorghum variety by the tribals, its small spikes used to escape from birds.			
142	'Patcha jonna' is an indigenous sorghum variety cultivated by the tribal farmers.			
143	'Kaki jonna' is a traditional sorghum variety cultivated as mixed crop with ragi by tribal farmers			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
144	For high yielding, varieties seeds are collected from well to do farmers in the village who store grain and sell it as seed and for hybrids seed is purchased from private dealers or government agencies supplied by integrated tribal development agency (ITDA).			
145	Soaking the sorghum seeds in common salt solution before sowing to secure good germination under adverse conditions.			
146	If rains are late, sowing of early duration varieties are taken up even after mrugasira karthe with high seed rate.			
147	Sorghum transplanted immediately after up rooting seedlings for better growth without shock of transplantation.			
148	Sorghum is cultivated as mixed crop with cowpea (alasandalu or bobbarlu).			
149	Cowpea (bobbarlu) seed is broadcasted in the field at the time of transplantation of sorghum seedlings.			
150	Less cultural operations are required for cultivating the sorghum crop, since it does not require fine tilth.			
	MILLETS			
	Ragi (Finger Millet) <i>Eleusina coricana</i>			
151	20 days after sowing ragi is practiced which is optimum time for transplantation in to main field.			
152	Ragi seedlings are sown behind country plough furrow in main field, generally farm women used to perform the transplantation of seedlings.			
153	'Bharani karthe' is suitable season for sowing ragi.			
154	3 kg per acre seed rate is followed by the farmers in ragi cultivation.			
155	Transplantation of ragi seedlings is done by using indigenous implement called 'borigi' (hand hoe). The farmers used to dig soil with the help of borigi and seedlings are sown in the digged place.			
156	Chillies, Brinjal, Bhendi, ridge gourd, beans etc are randomly sown here and there in the ragi field. (BT)			
157	'Punasa cholu' is an indigenous ragi variety which gives higher yields among such varieties.			
158	'Gotti cholu' is a traditional ragi variety which is cultivated as direct sown crop by the tribals.			
159	'Korra cholu' is an indigenous ragi variety cultivated by the tribal farmers which is an early mature variety, give yields with in 70-80 days.			
160	'Budi chodi' is a traditional high yielding early mature ragi variety, seeds are small in size with small fingers.			
161	'Reka chodi' is an indigenous long duration ragi variety bearing 6 – 8 fingers protruding outwards with greater length.			
162	'Burada chodi' is a short duration (110 days) indigenous ragi variety bearing 5 – 6 finger in panicle.			
163	'Pedda chodi' is a traditional long duration ragi variety cultivated by tribal farmers.			
164	'Selaga chodi' is a traditional ragi variety sown behind country plough furrow.			
165	'Budi chodi' is cultivated as mixed crop with Black gram or bobbarlu (cowpea).			
166	'Budi chodi' is used to give ratoon crop after harvesting thus giving two yields in a year.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
167	'Dassera budelu' is a long duration indigenous ragi variety cultivated by the tribals.			
168	'Chindi mundiya' is a early mature indigenous ragi variety cultivated by the tribal farmers.			
169	2-3 cart loads / acre of farm yard manure is applied by the farmers during summer in which ragi is to be cultivated during next season.			
170	A combined operation of earthing up and weeding (goppulu tavvuta) is practiced by the farmers twice in ragi cultivation which enhances crop growth.			
171	Remainings of ragi seed and broken ragi seeds are broad casted in field to partially substantiate the fertilizier requirement.			
172	Five kuncha (15 kg) seed for nursery will ultimately fetch 9 puttulu (180 kunchas) yield.			
173	Red colouration of ragi seed is taken as indices for harvesting.			
174	Panicles alone are picked and sundried for 3-4 days. Than the panicles are beaten with sticks to separate grain.			
	Sama (Little Millet) <i>Panicum miliare</i>			
175	Single ploughing is sufficient to sow sama seed.			
176	Yada (direct sown crop) is used to cultivate for sama with out transplantation, thus reducing the cost of cultivation.			
177	10-15 kg / ac seed rate is maintained by the tribals if sama is grown as sole crop.			
178	Sama is completely cultivated as rainfed crop for subsidiary income.			
179	Seeds of ragi (2kg) and pedda samalu (1/2 kg) is mixed and broad casted. The transplantation in also done as mixed seedlings. Because of differential maturity periods sama is harvested earlier than ragi.			
180	'Korra samalu' is the mostly cultivated traditional variety of sama gives more yield.			
181	'Magha samalu' is a traditional sama variety which is used to sow in magha karthe			
182	'Mandi sama' is a traditional short duration (60 – 70 days) sama variety the seed are round and flat.			
183	'Bontha sama' is a traditional sama variety with big size round seeds.			
184	'Nalla sama' is a traditional short duration sama variety with black small seeds.			
185	'Pedda sama' is a traditional long duration sama variety of which the seeds are small with big size spikelets grown as mixed crop with ragi.			
186	'Mai sama' is a short duration (60 – 70 days) indigenous sama variety grown up to a height of 1 m to 1.25 mt.			
187	Black (dark) coloration of sama seeds is taken as index to harvest the crop.			
	Foxtail Millet (Korra) (<i>Sataria italica</i>)			
188	Local varieties of korra are preferred because they are more tasty and keeping quality of their straw is high.			
189	'Pedda korra' is an indigenous korra variety with big spiklets and it gives very soft food when cooked.			
190	'Bula nemadam' is an indigenous korra variety with small hairy structures on seeds which gives rough (not soft) food on cooking.			
191	'Pedda korra' spikes alone are harvested and thrampled with animals after sun drying for 3 – 4 days.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
192	Korra is sown during May – June (Kartharlu time) to facilitate the cultivation of next crop.			
193	Maturity of korra crop is indicated by the leaves turning yellow, the earheads turning greenish and the grains getting hard to chew.			
194	After harvest, earheads are dried for 3-4 days in the field and beaten with sticks for grain separation, followed by traditional winnowing along the wind direction.			
	Bajra (Ganti) <i>Pennisetum americanum</i>			
195	'Arudhra karthe' (month of June) is suitable season for sowing bajra seeds.			
196	'Pala poda ganti' is an indigenous bajra variety with big size spikes and grains.			
197	'Pitta ganti' is an indigenous bajra variety with small spikes and grains.			
198	'Pedda ganti' (badi ganti) is an indigenous bajra variety mostly cultivated as mixed crop with sorghum.			
199	'Mrugasira' is optimum season for sowing bajra as mixed crop and punarvasa is for transplantation.			
200	20 days after sowing is the optimum season for transplantation of ganti seedlings.			
201	Horsegram or black gram is cultivated after ganti harvest to get additional income.			
202	No weeding is required for ganti because it is highly competitive with weeds.			
203	Ganti is harvested with 2 – 3 feet long sticks, a sun dried and trampled with animals to separate grains followed by winnowing.			
	Arika (Alu) Kodo Millet (<i>Paspalum scrobiculatum</i>)			
204	'Korra alu' and 'Pedda alu' are the two indigenous kodo millet varieties grown by the tribals.			
205	'Madda alu' is an indigenous kodo millet variety with big size spikes and grains.			
206	'Kodi arika' is an indigenously cultivated kodo millet variety with small spikes and grains.			
207	Kodo millet is grown as mixed crop with red gram			
208	Two ploughings are done perpendicular to one another and seed of kodo millet is broadcasted in the field. Third time is ploughed perpendicular to the second ploughing, so that, the seed will be covered with soil.			
209	Kodo millet is cultivated as mixed crop with mesta to gain additional income from it.			
	PULSES			
	Blackgram and Greengram (<i>Vigna sp.</i>)			
210	'Nalla Pesalu' is a traditional greengram variety cultivated as sole crop in dry lands.			
211	'Pacha pesalu' is a traditional green gram variety grown as relay crop in paddy. 10 – 15 days before harvesting paddy crop the seed is broadcasted in the paddy field.			
212	'Nalla minumulu' and 'Tella minumulu' are the traditional blackgram varieties grown by the tribals.			
213	Black gram is mostly cultivated as border crop on field bunds.			
214	Growing of blackgram after paddy enhances the soil fertility and soil structure.			
215	'Magha karthe' is optimum season for sowing pulses (black gram and green gram).			
216	Seeds are soaked in water for 10 hours before sowing in paddy fallow blackgram crop in less soil moisture fields.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
217	Pulses are highly competitive with weeds. This belief makes farmers not to adopt weed management practices in pulses.			
218	One to two percent urea solution is sprayed on the crop which suffered due to severe adverse weather conditions to improve growth and yield of pulse crop. (BT)			
219	Yellowing of leaves with dried pods are the maturity symptoms for harvesting the crop.			
220	Threshing of blackgram is done by trampling under the feet of cattle.			
221	Blackgram seeds are separated from sand and dust particles through locally manufactured and graded sieves (Jalleda).			
	Red Gram (<i>Cajanas cajan</i>)			
222	'Bharani Karthe' is suitable season for sowing redgram seeds.			
223	'Doni kandulu' is an indigenous red gram variety resistant to pests and diseases with less flower drop.			
224	'Binnisa' is an indigenous redgram variety cultivated by the tribals			
225	'Gotcha Kandulu' is an indigenous red gram variety with big size grains with spots.			
226	'Billa Kandulu' is an indigenous red gram variety bears single pods (without clusters), seeds are big in size and white in colour.			
227	Red gram is grown during first year of three years podu (shifting) cultivation to reduce weed infestation.			
228	Black soils are found to be the best to cultivate red gram by the farmers.			
229	Short duration and high yielding varieties are cultivated to escape from risk due to dry spells.			
230	Farmers maintain spacing of 31/2 X 4 feet for cultivation of 'Pedda Kandulu (traditional varieties of red gram).			
231	Farmers maintain spacing of 2 x 2 feet for cultivation of 'China Kandulu (improved varieties of red gram).(BT)			
232	Red gram seeds are sown using 'Kanka' a traditional farm implement. Half a feet deep holes are digged with use of 'Kanka' and two seeds are dropped in each hole maintaining optimum spacing.			
233	Ten kg per acre of seed rate is used by the farmers in the case of sole crop and 2-3 kg / acre in the case of mixed crop.			
234	Farmers waits for a week after sowing red gram for seed germination and otherwise they consider as the crop failure.			
235	Red gram is mostly cultivated as mixed crop by the tribal farmers.			
236	Red gram is mostly cultivated as mixed crop with budamalu (Mettu danyam) on podu lands.			
237	Red gram is cultivated as mixed crop with sesamum to get additional income			
238	Cloudiness induces flower drop in red gram and hence it is not desired by the farmers during flowering stage.			
239	Farmers never apply fertilizer to red gram. They believe that the deep root system of red gram can absorb sufficient nutrients from the soil.			
240	In some areas of high altitude and tribal area zone, red gram is harvested early in the morning at full maturity stage. Farm women used to separate pods from the cutted stems of red gram and beaten with sticks to separate grain from the pods. The total operation lasts for a day.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	Horse Gram (<i>Macrotylam unifloram</i>)			
241	'Nalla vulavalu' is a traditional horse gram variety grown by the tribals.			
242	'Tella vulavalu' (pedda ulavalu) is a traditional horse gram variety gives more yield and more price.			
243	'Nalla Vulavalu' is used as cattle feed and household consumption where as 'Tella vulavalu' is used exclusively for household consumption.			
244	Dassera (Uttara karthe) is optimum season for sowing horsegram.			
245	Horse gram is mostly cultivated as subsidiary crop without depending on it.			
246	4 – 5 Kg / acre seed rate is followed by the farmers in sole crop of horse gram traditionally.			
247	Horse gram is cultivated in dry lands after harvesting ragi crop in rabi season.			
248	No inter cultivation operation is practiced between sowing and harvesting of horse gram.			
249	Tella vulavalu is cultivated as mixed crop with black gram in dry lands (Garuvu) by the tribals.			
250	Matured horse gram is uprooted and sun dried for 4 – 5 days to trample under the feet of animals to separate grain.			
	OIL SEEDS			
	Groundnut (<i>Arachis hypogea</i>)			
251	'Gutti senaga' is an indigenous groundnut variety grows like a bush and gives more yield.			
252	Groundnut is mostly cultivated for rabi because farmers believes that rabi groundnut yields more than kharif.			
253	Groundnut seeds from plants which are grown in dry lands gives good crop stand compared to other fields.			
254	When groundnut is grown in wet lands, crop grows luxuriently but fails to set seed.			
255	Dropping of basal leaves is taken as indication time to harvest groundnut and this is observed by the frequent visits of crows to the groundnut field for pods.			
256	Well dried seeds with pink seed coat without wrinkles are selected for sowing.			
257	Good quality, unbroken kernels free from insects shrivelling, insect damage are alone used for sowing.			
258	Light red soils are best for cultivation of groundnut.			
259	Groundnut kernels are dibbled by making a small dig in the field with 'Kanka' and covered with soil.			
260	Sowing the kernels behind the country plough called as 'Bongaram salu' and farming beds and channels later.			
261	Weeding is practiced twice in groundnut once is at fortnight after sowing and second is at the time of flowering.			
262	Gypsum is essential for groundnut and hence farmers apply gypsum to the soil before sowing. (BT)			
263	If the soil is dry, groundnut field is irrigated or other wise wait for a rain prior to harvest to facilitate easy and complete harvesting.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	Sesamum (<i>Sesamum Indicum</i>)			
264	'Yerra nuvvulu' is a traditional sesamum variety which is mixed with sand at 4:1 ratio and broadcasted (1 kg seed + ¼ kg sand) for sowing to get uniform distribution of seed in the field.			
265	'Nalla Nuvvulu' is a traditional sesamum variety is broadcasted as it is, 2.5 to 3 kg seed is required for one acre.			
266	Farmers used to sow sesamum by observing fruit initiation of Thummi tree (<i>Acacia</i> sp) which they believe optimum season for sowing.			
267	Soil fertility is depleted by sesamum cultivation.			
268	Rain is not desired at the time of flowering in sesamum by the farmers.			
269	Sesamum is harvested when its stem, leaves and capsules turn yellow and seeds in middle capsule turn black.			
270	After harvest, sesamum plants along with capsules are stalked in the field in upright position. Top portion is covered with straw and kept for 3-5 days after which seeds are separated by shaking the plants.			
	FIBRE CROP			
	Mesta (<i>Hibiscus subdarifa</i>)			
271	Just three ploughing are sufficient for mesta cultivation.			
272	Dense planting is desired by the farmers in mesta because they believe that more plant population gives more yield in mesta.			
273	Sowing of mesta before Telugu new year (Ugadi) fetches higher fibre yield.			
274	Sowing of mesta is practiced during the month of August in some parts of high altitude and tribal area zone.			
275	Mesta is cultivated for consumptive uses only such as to stich tobacco leaves, make ropes etc. not as commercial crop.			
276	Mesta is cultivated as mixed crop with horsegram and harvesting horsegram after three months thus allowing mesta for maturity upto 6 months is practiced.			
277	Mesta is cultivated as mixed crop either with sesamum or red gram.			
278	Hand hoeing (Goppulu tavvuta) is the only intercultivation operation practiced by the farmers at early stages of mesta to control weeds.			
279	Mesta is harvested at the time of flowering for fibre and for seed purpose cultivate upto full maturity.			
280	Sprouting of buds in the axils of leaf is the indication for last stage of harvesting mesta. If harvest mesta beyond this stage fibre quality is poor.			
	Tobacco (<i>Nicotiana tabacum</i>)			
281	Punarvasha to Ashlisha is the best season for sowing tobacco in nursery beds.			
282	Tobacco seedlings are grown in raised nursery beds with adequate drainage facility.			
283	Tobacco seeds are mixed with dry sand and broadcast on nursery bed to get uniform distribution and covered with available farm wastes as mulch.			
284	Diammonium phosphate (DAP) + calcium ammonium nitrate (CAN) + sulphate of potash + Farm Yard Manure is applied as basal after 15 days of sowing tobacco seedlings by digging at the roots of tobacco (BT).			
285	Sheep penning is practiced in tobacco field for getting higher yields during summer.			
286	Weeding is practiced after 15-20 days of basal application of fertilizers.			

R : Rational UD : Undecided NR : Not rational

BT : (Blended Technologies) are operationalized as the technologies which are a blend of indigenous and modern practices

Rationality is operationally defined as the scientific evidence behind the ITK

Signature

**RATIONALITY OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) ON
PLANT PROTECTION AND POST HARVEST TECHNOLOGY**

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	GENERAL			
1	Collection and burning of insects is practiced by the farmers in initial stages of pest attack. (BT)			
2	Stones are kept in a leather pouch tied with string thus releasing the stones with lured to a greater distance chasing away the birds.(BT)			
3	Jatropha is planted as fence around the crop which repels goats and can serve as a strong fence against animals.			
4	A man like effigy made up of straw wearing a dress is used to keep at the centre of the field. The birds fly away because of human appearance in the field.			
5	A man like effigy made up rice straw wearing a dress and head is covered with a earthen wear made like a human head is used to keep in the centre of the field. The birds fly away because of human appearance in the field.			
6	Continous drizzling encourages the spread of pests and disease.			
7	There will be no incidence of pest and diseases if neem leaves are applied as basal manure.			
8	Burning the dry stalks in the field and dusting the ash on the field to control diseases is practiced by the tribals.(BT)			
9	Digging rat burrows and killing rats after each harvest is practiced to reduce the rat population in the field.			
10	Rat damage is reduced by throwing fresh cow dung on both the bunds and field.			
11	Tribals now and than beats empty iron tin with a stick to scare away the animals and birds which destroy the crop.			
12	Guns are used by the tribals to kill wild animals which destructs the crops like maize, sorghm etc. in some parts of high attitude and tribal area zone.(BT)			
13	Indigenous arrows (Banalu) are used to ward off wild animals which damage food crops by the tribals.			
14	'Adapa' is stone trap used to kill wild animals. A flat heavy stone made like a hut opening onside placing a trap support called mita inside the stone hut. When the animal touches the mita the whole structure falls on the animals thus killing it.			
15	Farmers used to stay in the field during nights to ward of wild animals and farm women watches the field during day times.			
16	Neem leaves are mixed with seeds and stored for long time which prevents pest attack.			
17	For maximum storage period, grains must be dried to greatest possible extent.			
18	Cup shaped structure knitted with Buhenia leaves called as 'Burudi' (Telugu) in which grains are stored.			
19	A whole is made to a big size bottle gourd and pour hot water and ash in it and allowed for 2 days. The hallow bottle gourd is cleaned with water and dried for 5-10 days. This indigenous storage structure is known as 'Anapa tumba' which is used to store seeds like redgram, blackgram, greengram etc. It is sufficient to store 4-6 kg of seed up to ten years which prevents the attack of insects and rodents.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
20	Farmers used to store paddy and pulses in earthen pots or gunny bags kept on planks suspended in the kitchen. They believe that the smoke emitted from chulahs during cooking prevents storage pest attack.			
21	Storing food grains in big drums made up of clay and pasted with cow dung outside the drum.			
22	Farmers used to apply fresh mud mixed with cow dung to the granaries before each new crop is stored.			
23	Seeds are stored in indigenously made storage structure called 'butti' (vernacular name) which is made up of bamboo in different sizes.			
24	Seed are stored in gunny bags in mix with gramoxone to prevent storage pest attack.			
25	De husking and crushing of millets and pulses is done by use of indigenously made stone crusher called Thiragali (Vernacular name). This is a modification of wooden crusher.			
26	Harvested produce of millets is threshed by keeping the crop on roads and allowing the vehicles to pass on it to separate the grain is practiced.			
27	Seed material is stored in earthen pots which is kept on the roof inside the houses directly above the furnace in the kitchen. The smoke acts as repellent to the insects.			
28	The seeds are generally stored along with the leaves of neem, thulasi, in gunny bags.			
	Podu cultivation			
29	After clearing vegetation setting of fire is practiced in podu cultivation which improves soil fertility, kills insects and reduces weed problem			
30	The operation of thuvvatam (digging) is practiced with 'kanka' indigenous implements after burning the bushes with this crop sowing operation initiates, which kills the soil borne insects.			
	CEREALS			
	Paddy (Oryza Sativa)			
31	Fifty kg of neem cake is broadcasted in the field to control insect pests in paddy, during puddling in some parts of high attitude and tribal areas			
32	Tribals use plant material like, fish tail palm leaves (vernacular name: Jeelugu) for the control of leaf folder and stem borer in paddy. They erect 25-30 leaves per acre scattlery in the paddy field. This fish tail palm leaves excudes alkaloids, which prevents pests.			
33	Farmers used to mix the powder of stem of yegisa manu (Vernacular name) in irrigation channels to control tip burn (Etchi tegulu) in paddy.			
34	Thummika and Nakkide plant branches (Vernacular names) are erected around paddy field and paddy grain is broadcasted on field bunds at the time of grain formation.			
35	Leaves of vadisa plant and cow dung are broadcast around field bund if leaf folder infestation is observed.			
36	Wood apple (Velaga fruit) is made in to powder and used to broadcast in field to reduce tella chitta (leaf turns white) in paddy.			
37	'Musidi' leaves (vernacular name) are used to broadcast in the field (Mettu danyam) if termite attack in observed in paddy.			
38	Neem cake (40 kg) + Kagu cake (5 kg) + Kosam pindi (5 kg) per acre applied during puddling which prevents pest attack in paddy and improves soil fertility.			
39	Paddy seed is stored for next year in gunny bags which are hanged to the roof of the house there fore pest attack can be reduced because there will be less physical access to insects to attack the seed.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
40	When paddy is infested with leaf flower and gall midge farmers drag thorny bushes in field.			
41	Neem cake (50 kg) + gypsum (25 kg) is used to apply to the field at the time of puddling which prevents pest attack in paddy and improves soil fertility (BT).			
42	For any problem in paddy nursery, the gamoxine and kerosene is sprayed (BT).			
43	Farmers used to broadcast 15-20 kg of common salt / acre of paddy field to control leaf spot disease in paddy.			
44	Neem cake (20 kg/ac) is applied as basal manure which helps to protect paddy crop from BPH and improves soil fertility.			
45	Uprooting gallmidge effected seedlings and burning in the nursery before transplantation is practiced.			
46	To prevent thrips attack in nursery 'musidi' leaves (Vernacular name) are applied as green manure during puddling.			
47	Farmers believes that presence of the Gaviribethi snake improves crop yields because it predares on rodents.			
48	'Bali' is practiced at the time of grain formation stage in paddy which believe to fetch more yields.			
49	Paddy harvesting is started after a fortnight of change in leaf colour from yellow to pink			
50	Harvesting in paddy is done by leaving ½ feet height stubbles which improves soil fertility after decomposition in the soil.			
51	Before harvesting the crop a few rice spikelets are hanged in the houses and temples to be eaten by sparrows.			
52	If the paddy is stored in room the floor is coated with cow dung solution to avoid insect multiplication.			
53	Paddy seed is sun dried for 2-3 days continuously and than stored in gunny bags on indigenously made 4-5 feet stand to prevent pest infestation.			
54	Paddy seed is stored in small containers knitted with bamboo called as 'butta' (in telugu) . The container is filled with paddy seed and covered with straw and than closed with cow dung paste.			
55	Harvested crop is allowed for sundrying for 3-4 days in the field it self to reduce the level of moisture in grains before bundling.			
56	Threshing is done by trampling under the feet of cattle on a threshing floor.			
57	Winnowing and clearing of rice produce is done by the use of winnowing baskets called (chetalu in Telugu)			
58	Seeds are stored in indigenously constructed storage structures called 'jaadi'. The storage structure constructed with burned clay with a capacity of 60 – 80 kunchas (180 – 200 kg) paddy seed.			
59	Seed for consumption purpose are stored in big size Jaadi called 'Gadhi' with a capacity of 100 – 150 kunchas (300 – 450 kg) paddy seed.			
	Maize (<i>Zea mays</i>)			
60	Before sowing maize, seeds are soaked in warm water for 3-6 hours and shade dried to induce better germination and to control shoot borer which is seed borne. (BT)			
61	Cobs covered with sheaths are stored as such for more than four months when they store the maize for consumption purpose.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	Sorghum (<i>Sorghum bicolor</i>)			
62	To scare away the birds colored polythene carry bags are tied to a few tall sorghum plants.			
63	For threshing sorghum, ear heads are spread over on the roads to allow vehicles to pass on it.			
64	Frequent sun drying of seed to protect from stored grain pest irrespective of Amavasya.			
	MILLETS			
	Finger millet Ragi (<i>Eleusina coricana</i>)			
65	Farmers sprinkle (sodipindi) Ragi seed powder mixing in water for control of pests and diseases in ragi.			
66	Matakara ginjalu (chaffy grains) is a problem observed at the time grain filling in ragi.			
	Kodo millet (<i>Paspalum scrobiculatum</i>)			
67	Processing of kodo millet seed is laborious consists of dehusking twice with indigenous wooden crusher called 'Thiragali' and third time is crushed with stone crusher to get 'Arika powder' for consumption. (BT)			
	Sama Little millet (<i>Panicum miliare</i>)			
68	Dehusking of little millet grain is done with the help of wooden grinding machine called 'Tiragali' (Vernacular name) locally made with mango or terminalia (maddi).			
	Korra Foxtail millet (<i>Setaria italica</i>)			
69	Korra seeds are put in water and the floating and disease affected seeds are removed.			
70	If sowing of korra is delayed beyond the June, it becomes more susceptible for pest attack.			
	PULSES			
	Blackgram and Greengram (<i>Vigna sp.</i>)			
71	Ill filled and diseased seeds are eliminated by removing the floated seeds during soaking in water before sowing. (BT)			
72	Farmers store pulses in earthen containers in mix with kitchen ash @ 5 kg seed + 1 kg ash to prevent insect attack during storage.			
73	Pulse seeds are well dried and mixed with the dried leaves of neem and stored in airtight gunny bags by keeping on 2 – 3 feet height locally made stands.			
	Red gram (<i>Cajanas cajan</i>)			
74	Alu (kodo millet) straw smoking is practiced by the farmers to reduce scale and aphid attack in red gram. Alu straw is smoked around the red gram field which believes to reduce scale and aphid attack in red gram.			
75	Pods which are not infested with any pest and disease are selected for seed purpose for next year.			
76	To control the pod borer in red gram spraying of neem seed kernel extract is sprayed on crop.			
77	Harvested sticks of red gram along with pods are sundried for 5-6 days in the field keeping upward down.			
78	The powdered red gram leaf is used as feed for animals which got high nutritive value.			
79	The sticks are used as fuel for cooking after separation of red gram seeds.			
80	If red gram is sundried during Amavasya day the storage pests cannot attack the seed.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
81	Red gram is mixed with ash and stored in gunny bags in hanging position from the roof of the house.			
82	Red gram seeds are stored in mix with ash 30 kg of red gram is mixed with 1 kg of ash which acts as physical barrier for insect pests.			
83	Frequent sundrying of seeds is practiced to protect red gram from stored grain pests.			
84	Red gram seed is stored in earthen pots in mix with gamaxone to protect it from storage pests.(BT)			
85	Red gram is stored in earthen pots in mix with layers of sand to protect it from insect pests during storage.			
86	Red gram is stored after adding wet red clay and sundrying it for 2-3 days to increase shelf life.			
	OIL SEEDS			
	Ground nut (<i>Arachis hypogea</i>)			
87	Farmers grow Jatropa plants around the groundnut field, which acts as catch crop against red hairy caterpillar.			
88	Farmers used to burn thrash adjacent to the groundnut fields during nights to attract nymphs and adults of insect.(BT)			
	Sesamum (<i>Sesamum indicum</i>)			
89	Storing sesamum oil in earthen pots is practiced to increase its keeping quality.			
90	Sesamum seeds are stored in earthen pots in mixed with sand in 9:1 ratio.			
	FIBRE CROP			
	Mesta (<i>Hibiscus subdarifa</i>)			
91	Farmers use light traps i.e. setting of fire on field bunds to control insect pests.(BT)			
92	Removal of bunchy tops along with masses of mealybugs (<i>Meconellicoccus hirsutus</i>) and their destruction to prevent the spread of pest to adjacent plants.			
93	Farmers produce mesta seed for next crop by keeping the part of the crop up to full maturity stage which is identified by brown colouration of pods. The seeds are extracted after sundrying the mesta pods for 15-20 days in the field in upright position.			
94	Farmers used to sundry the seeds of mesta for 3-4 days and store in earthen pots to prevent storage pests.			
95	After harvesting mesta crop farmers keep the crop in field for 7-10 days. Meanwhile crop dries and leaves and twigs fall down in the field. It improves the soil fertility.			
96	Farmers keep the mesta sticks for 10 to 15 days in the farm ponds to soak them in water. Meanwhile the fibre becomes soft and easy to separate fibre from the sticks.			
97	Mesta seed is stored after sun drying in mix with gamaxone (cheemala mandu) to prevent storage pest attack.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	Tobacco (<i>Nicotiana tabacum</i>)			
98	Tobacco crop is rotated with maize or sorghum to reduce pest problem in tobacco.			
99	Tobacco plant is uprooted and burned or thrown out if Manukullu (Stem rot) is observed.			
100	Monocrotophos or Endosulfon is sprayed if akuchitta (leaf spot) is observed (BT).			
101	Neem is kernal extract (2%) is sprayed on the crop if leaf curl disease is observed in tobacco.			
102	Orabanche is manually removed as and when it appears before its flowering and seed set.			
103	Sorghum is cultivated as trap crop in tobacco which controls orabanche.			
104	A small piece of neem trunk is cutted and soaked in water for 2-3 months. An extract is prepared from this solution and sprayed on tobacco crop if Aku mudatha (leaf curl) is observed.			
105	Harvested leaves of tobacco are stitched with mesta fibre and sundried by tieing both ends to two poles on open sun and allowing it for 15 – 20 days.			

R-Rational UD-Undecided NR- Not rational

BT : (Blended Technologies) are operationalized as the technologies which are a blend of indigenous and modern practices

Rationality is operationally defined as the scientific evidence behind the ITK

Signature

**RATIONALITY OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs)
RELATED TO HORTICULTURAL CROPS**

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	VEGETABLES			
1	'Patcha vanga' is an indigenous variety of brinjal bear fruits with broad green strips.			
2	Though it yieldless, it fetches more price because the fruits are tasty.			
3	About 40-45 days old brinjal seedlings are used for transplantation in to main field.			
4	Suitable season for sowing ladies finger are Chaitram (March) and Shravanam (July-Aug.) of which Shravanam is the best.			
5	About 3 or 4 ladies finger seeds are sown in each hole and later thinned to two plants per hill at two weeks after sowing.			
6	Cucumber seeds are sown as one side of the long channels formed 5 feet apart.			
7	Three or four seeds of cucumber are planted in each hole with the use of hand hoe to dig the soil.			
8	Cow dung is diluted with cow urine and applied near the base of transplanted seedlings of vegetables such as chilly, tomato etc. to improve soil fertility and to enhance crop growth.			
9	Bottle gourd is cultivated as boarder crop around the groundnut field to get additional income.			
10	Bottle gourd is harvested, when it turns from pale green to dark green and finger nails get pierced in to it, while pressing.			
11	Cucumbers are mostly cultivated in kitchen garden allowing them to creep on the huts.			
12	Ash is dusted on vegetables which acts as physical barrier against pests.			
13	Ash and turmeric powder are mixed in equal proportion and sprinkled to control aphids which attacks vegetables.			
14	Ash is sprinkled on cucumber crop to control aphids and powdery mildew.			
15	Cucumber seeds are extracted from fully ripened fruits, washed well with water, mixed with ash, dried and stored up to one year (Also for Bottle gourd).			
16	Sundrying the seeds of bottle gourd for storage, along with outer shell of the fruit which will acts as a storage container and protect from pets.			
17	Cucumber seeds are pasted to wall when they are wet to store for 4-6 months.			
18	Cucumber seeds are mixed with ash when they are wet and sun dried on houses for a week and than stored inside the houses in polythene covers.(BT)			
19	Bottle gourd and ridge gourd seeds are stored as such in fruits, after sundrying for a week. Whenever they need seeds for sowing they broke the gourds and extract the seeds.			
	Cowpea (<i>Vigna anguiculata</i>) (Alasandalu / Bobbarlu)			
20	Farmers sow the cowpea during July – August which they believe suitable season.			
21	'Tella alasandalu' is an indigenous cow pea variety cultivated by the tribals (pods are light in colour).			
22	'Nalla alsandalu' is an indigenous cow pea variety cultivated by the tribals (pods are dark in colour).			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
23	'Chiru bobbarlu' is an indigenous cowpea variety with small and tasty grains.			
24	'Pedda bobbarlu' is an indigenous cow pea variety with big size seeds and give more yields among the indigenous varieties.			
25	Pods of cowpea are harvested when they start drying and turn to brown in colour.			
26	Cowpea pods are sun dried until they become brittle to make the seed separation easy.			
27	For safe storage of cowpea, seeds are filled in earthen pots in mix with kitchen ash.			
28	Cow pea seed is stored as such in pods and tied with paddy straw so that the rats confused it as paddy straw and leaves it.			
	Junuvulu (<i>V. anguilata sub. sp.</i>)			
29	Junuvulu is mostly cultivated as mixed crop with sorghum, ganti and red gram.			
30	In some tracks of high altitude and tribal area zone Junuvulu seed is mixed with red gram and planted by digging with 'Kanka' as holes and covering with soil.			
	Rice Bean (<i>Thimmerlu</i>)			
31	'Chinna Timmerlu' is an indigenous short duration variety (60 days) with indeterminate growth habit. Seeds are small in size with light yellow coloured seed coat.			
32	'Pedda timmerlu' is an indigenous long duration rice bean variety (90 days) with indeterminate viny growth. Seeds are larger in size with green seed coat.			
33	'Nalla timmerlu' is an indigenous short duration rice bean variety with determinate growth and bushy habit with black seed coat.			
34	'Machcha timmerlu' is a short duration indigenous rice bean variety with indeterminate viny growth with black spot on green seed coat.			
35	'Yerupu timmerlu' is a long duration indigenous rice bean vareity with indeterminate growth and red seed coat.			
36	During ploughing ash obtained after burning trees in podu is applied to improve soil fertility.			
37	Rice bean is cultivated only on sloppy hills			
38	Rice bean sown during the month of July which is found to be optimum season.			
39	Kitchen ash is dusted on rice bean leaves during 6 – 8 AM early in the morning to control aphids by acting as physical barrier.			
40	Rice bean is harvested at ground level with sickles when bottom leaves turn yellow and most of the pods turn brown.			
41	Rice bean seeds are stored in bamboo baskets in mix with ash and common salt of 10 : 1 ratio. (BT)			
42	Farmers having the seeds of rice bean in kitchens at 6 – 7 feet height in buhienia leaves.			
	Cauliflower (<i>Brassica oleracea Var. botrytis</i>)			
43	Water is sprinkled on raised beds after sowing cauliflower seed to get quick germination.			
44	'Hemanthula' is an indigenously cultivated cauliflower variety by farmers in some parts of high altitude tribal area zone.			
45	'Hemagiri' is an indigenous cauliflower variety cultivated by the tribals, with the small size curds.			

46	'Kushi kalyani' is a traditional early matured cauliflower variety cultivated by the tribals.			
47	Maize is cultivated as boarder crop and Ginger is cultivated as mixed crop with cauliflower to substantiate income from one another thus growing three crops on single piece of land.			
48	Farmyard manure is abundantly applied to the cauliflower for better yields.			
49	To control diamond backmoth in cauliflower neem oil is mixed with water and sprayed on the crop.			
50	Thrash is burned and mixed with soil in prepared raised beds of 1m x 4.5 m with height of 30 – 60 cm to prevent soil born insects, and also to improve soil fertility. (BT)			
	Tapioca (<i>Manihot esculenta</i>):			
51	Tapioca stem only with shorter internodes are selected for planting.			
52	Sets are planted vertically on the sides of ridges with their buds pointing upwards at a spacing of 3 – 4 feet on either side.			
53	Planting tapioca throughout the year is practiced by the farmers without any season.			
54	Yellowing and withering of bottom leaves indicate right time of harvest.			
55	Tapioca is harvested by digging the soil with hand hoe after irrigating it to get complete crop.			
	SPICES AND CONDIMENTS			
	Chillies (<i>Capsicum annum</i>)			
56	'Rangan mirapa' is an indigenous variety of chillies with medium size capsules and plant is bush like with more odour.			
57	'Chitti mirapa' is an indigenous variety of chillies, capsules is little and plant is medium in size.			
58	'Amengme' (tribal dialect) is an indigenous green chili cultivated by tribals in drylands (Garuvu) specifically.			
59	'Kolab mirchi' is an indigenous chilly variety bearing big size fruits and the plant is bush like.			
60	After two weeks of sowing seeds in nursery, the nursery is protected from hot sun by construction of 3 – 4 feet height roof with use of available sticks and leaves called 'pandiri'.			
61	Chilly seeds are broadcasted on the raised nursery beds, covered with a layer of ash and finally covered with adda leaves.			
62	15 – 20 days period is optimum for transplantation of chilly seedlings from nursery to the main field.			
63	For green chillies, well farmed intact and dark green fruits are alone picked.			
64	Well ripened, red coloured fruits alone are harvested for dry chillies.			
65	Thrash is burned on prepared raised nursery bed of 30 – 60 cm and well mixed with the top soil to control soil born insects. (BT)			
66	Two rows of maize or sorghum are grown for every five rows of chillies which control mosaic disease.			
67	Gramaxone is dusted on chilli plants to reduce insect problem.			
68	5 – 10 Kg of Kagu pindi is broadcasted in field during transplanting seedlings from nursery to protect the crop insect pests mostly termites.			
69	If the seed is required for the next season, well dried fruits as such are stored for one year.			
70	The red chillies are hunded for 10-15 days continuously to reduce the moisture level to zero and stored in gunny bags.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	Coriander:			
71	'Sada dhania' is the local variety cultivated by the tribals with the crop duration of 30 – 40 days.			
72	Raised beds of 1m x 10m with a height of 50 – 60 cm are prepared to grow nursery of coriander. (BT)			
73	10 – 20 Kg of farm yard manure is broadcasted on the nursery bed before sowing seed and water is sprinkled on it after sowing coriander seed to get quick germination.			
74	20–25 Kg/ac of seed is used by the tribals indigenously for coriander cultivation.			
75	'Regara' is an indigenous implement used for intercultivation in coriander. The regara is worked immediately after broadcasting the coriander seed to get even distribution of seed in nursery. (BT)			
76	Roots of coriander are thoroughly washed in steam and made into small packets to make it ready for sale.			
	Turmeric (<i>Curcuma longa</i>)			
77	Turmeric is mostly cultivated as podu by the tribals.			
78	Farmers used to sow turmeric rhizomes by digging soil with hand hoe and covering rhizomes with soil at 3 ½ x 2 feet spacing.			
79	Farmers believes that more number of rhizomes per plant can obtain by adopting more spacing between the plants.			
80	Finger rhizomes are more popular as a seed material and giving good yields.			
81	Groundnut cake is applied as manure after 15 – 20 days of sowing turmeric rhizomes.			
82	Mulching is practiced by the farmers with farm wastes to conserve soil moisture, and to increase water holding capacity of the soils. (BT)			
83	A 'kanka' (indigenous implement) is worked in between rows to control weed growth and facilitate earthing up of the plants.			
84	Harvesting of turmeric rhizomes is done by working by digging with the crow bar or spade after irrigating the field.			
85	Turmeric is harvested at alternative years from the ratoon crop.			
86	Leaf blotch disease can be controlled by planting dried palmyrah leaves in the turmeric field.			
87	Ash along with FYM improves the quality of turmeric and reduces the rhizome rot which is transmitted by carlbatofly.			
88	Harvested turmeric is boiled in water and sun dried for 15 – 20 days and rubbed on soil to make it ready for sale.			
89	Instead of using the recommended sodium carbonate for curing the turmeric fingers, the farmers boil the turmeric fingers in cow dung solution because cow dung slurry promotes colour development.			
90	The graded turmeric is stored in gunny bags and kept on a long benches to reduce storage pest attack.			
	Ginger (<i>Zingiber officinale</i>):			
91	After obtaining yield from ginger the stem portion is planted for ratoon, thus getting two crops in a year.			
92	Ginger rhizomes having on eye are planted on ridges at a spacing of 1 x 1 feet to get maximum yields in ginger.			
93	Mulching is done with green leaves at the time of planting ginger, to conserve soil moisture. (BT)			
94	Frequent earthing up is practiced in ginger to enhance crop growth.			
95	Time of harvest is indicated by the yellowing and drying of ginger leaves.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
	FRUIT CROPS			
	Pine Apple (<i>Anona squamosa</i>):			
96	'Panasa kaya' is the traditional Pine apple variety which is mostly cultivated by the tribals.			
97	'Sada Anasa Panasa' is an indigenous pine apple variety with small fruits which are more juicy in nature.			
98	July – August is the optimum season for sowing Pine apple hence it is practiced.			
99	Six inches long suckers collected from mother plant weighed for 200 – 300 gm are perceived to be suitable for planting.			
100	Farmers used to maintain 2 x 2 feet spacing in Pine apple cultivation.			
101	Weeding is practiced along rows in Pine apple in early stages of crop growth i.e., before 2 months age.			
102	Pine apple yields within 18-24 months after which two ratoons are allowed.			
103	Mulching is practiced with crop wastes to retain soil moisture and to improve water holding capacity of the soil in pine apple field. (BT)			
104	Growing tip of pine apple is nipped to obtain fruits with more size and weight.			
105	Yellow colouration and size of the fruit is the indication of harvest time in pine apple.			
106	The sucker bearing fruit is desuckered after harvesting the fruit thus allowing the other suckers to grow.			
	Banana (<i>Musa paradisiaca</i>):			
107	'Konda arati' is a traditional banana variety cultivated by tribal farmers which requires less water.			
108	'Yerra arati' is an indigenous high yielding banana variety which is grown where more water is available.			
109	'Bathadigela' is a traditional banana variety grown by tribals for culinary purpose.			
110	'Komma arati' is an indigenous banana variety bearing big long slender green fruits is cultivated.			
111	'Konda mukhiri' is an indigenous banana variety bearing small yellow colour fruits in cultivated by the tribals.			
112	6 – 8 feet spacing is maintained by the tribals in banana cultivation.			
113	The suckers with 2 – 3 kg weight and 1 feet length are selected for planting.			
114	Before planting the suckers 10 kg of FYM and 1 Kg Urea is applied as basal manure. (BT)			
115	Before selecting banana suckers from a field the bunches of the mother suckers are seen for bunch weight and healthiness.			
116	Tribals used to desucker the main sucker after harvesting thus allowing other suckers to grow.			
117	For banana neem cake is applied @ 250 gms/sucker during 4 – 8 months age.			
118	Banana is ratooned upto three years by the tribal farmers on podu, to get additional income from the same crop.			
119	Inter cropping in banana with tuber crops like elephant foot yam and tapioca is practiced during first year.			
120	Desuckering is done from 3 months after planting upto flowering.			

S. No.	Indigenous Technical Knowledge (ITKs)	R	UD	NR
121	Earthing up is practiced in once in 2 to 3 months to prevent soil erosion and to conserve soil moisture.			
122	Drying of the top leaves, change of skin colour to light green, brittleness of the floral ends are the symptoms for harvesting.			
123	Banana flag leaf is tied at the top of the bunch which prevents sun stroke and ensure healthy bunch.			
124	Periodical search to identify the bunchy top diseased plants and destroying them along with the suckers is practiced to eliminate the source of the disease.			
125	Banana is stored by tying the banana leaves around the bunches to protect it from hot sun and to increase keeping quality.			
	Cashew (<i>Anacardium occidentale</i>)			
126	Cashew nuts are collected by the farmers by watching the yields of particular plants regularly.			
127	Farmers sow cashew nuts in polythene covers filled with soil and farm yard manure and grow nursery for their plantations by their own.			
128	Farmyard manure (2 kg) and urea (0-50 kg) is used to apply at base if the plant immediately after transplanting cashew seedlings to give nutrients to transplanted seedlings (BT).			
129	Cashew is inter cropped with sesamum, blackgram or greengram upto five years age of cashew to substantiate income during prebearing period.			
130	The cashew orchard is ploughed regularly to reduce weed problem and to give good tilth.			
131	Debudding of cashew flowers is done upto the age of five years to enhance vegetative growth during the period.			
132	Cloth is hanged on top of the cashew plant to scar away the birds.			
133	'Vadisa' is an indigenously made rope like pouch, in center of it a net will be there to host a small stone. The stone is thrown on birds by making rounds in air and thus realising stone lured to greater distance chasing away the birds.			

R-Rational UD-Undecided NR- Not rational

BT : (Blended Technologies) are operationalized as the technologies which are a blend of indigenous and modern practices

Rationality is operationally defined as the scientific evidence behind the ITK

Signature

From
Dr. P. VENKATA RAMAIAH
 Professor and Head
 Dept. of Agricultural Extension Education
 Agricultural College
 BAPATLA
 Acharya N. G. Ranga Agricultural University
 Rajendranagar, Hyderabad.

To

Dear Sir/Madam

Sub: Research work on **“Indigenous Technical knowledge (ITK) in Agriculture in high altitude and tribal area zone of Andhra Pradesh” – “Attitude of farmers on ITK and their blending with modern technologies”**—scale construction - Reg.

I am glad to introduce **Mr. Lakshmana Kella**, a Research Scholar working under my guidance on the research work entitled **“Indigenous Technical knowledge (ITK) in Agriculture in high altitude and tribal area zone of Andhra Pradesh”** and for this purpose he is in the process of construction of a scale on **“Attitude of farmers on ITK and their blending with modern technologies”**. Enclosed here with the list of statements in three print continuam (i.e., Most relevant, Relevant and Least relevant). Please indicate your judgement by use of a tick mark (✓) in appropriate column against each statement.

Thanking you,

Yours sincerely,

(Dr. P. VENKATA RAMAIAH)

**ATTITUDE OF FARMERS ON INDIGENOUS TECHNICAL KNOWLEDGE (ITK)
AND THEIR BLENDING WITH MODERN TECHNOLOGIES**

S. No.	Statement	SA	A	UD	DA	SDA
1	Indigenous technologies are unique to the culture of the people and hence adoption of such practice keeps the cultural heritage					
2	Indigenous practices are eco-friendly and sustainable					
3	Pests can not be controlled effectively by adoption of indigenous practices.					
4	Adoption of indigenous practices prevents soil degradation and salinity					
5	The farmers who adopt indigenous practices should be treated backward					
6	Adoption of indigenous practices are the only solution for food safety and prevents pesticide residues in food products.					
7	Indigenous inputs are bulky in nature, hence adoption of indigenous technology is a difficult task.					
8	Adoption of indigenous practices needs clear and effective planning					
9	Absolute gains in terms of economic returns from indigenous technologies are very low.					
10	Sustainability in agriculture can only be possible through the indigenous practices.					
11	Ecological balance can be maintained by adoption indigenous technologies on wider scale.					
12	Indigenous practices are useful to maintain nutrient balance in the soil					
13	Expected yields are not assured when indigenous technologies are followed					
14	Indigenous technologies are more suited for resource poor farmers					
15	Produce of the crops grown by indigenous practices are least preferred by consumer					
16	Beneficial insects can be protected by adoption of indigenous practices					
17	Scientific rationality of promising indigenous technologies should be given wider propaganda among the farming community					
18	Agricultural scientist and policy makers should extend their efforts to increase production through indigenous farming					

S. No.	Statement	SA	A	UD	DA	SDA
19	Blending of indigenous technologies with modern practices is very much needed for sustainable Agricultural development					
20	A mix of indigenous and chemical inputs gives higher crop yields					
21	Principle of indigenous technologies should be effectively used in modern practices					
22	Indigenous inputs should be processed and made available to the farmers to promote blended technologies					
23	Government should make policies to promote blending of indigenous technologies into modern practices.					
24	Extension agency should strengthen their efforts to promote the adoption of blended technologies.					
25	The information on blended technologies should be provided at global level					
26	Multi-locational trials should be followed to test the feasibility of the blended technologies in different regions					
27	Blended technologies are location specific and hence it is not feasible to adopt in different regions					
28	Identification of indigenous technologies and their blending in the modern practices needs more research and it is not worth while					
29	Cost benefit ratios of the blended technologies should be studied on wider scale					
30	Indigenous technologies should be adopted extensively by all the farmers					
31	Indigenous technologies are not the means to protect environment					
32	Indigenous technologies are complex for adoption					
33	Blended technologies are complex for adoption					
34	Indigenous practices are more compatible with the culture of the farming community					
35	More guidance is needed in adoption of blended technologies					
36	The government should encourage the farming community to go for indigenous technologies					
37	The Government should discourage the adoption of indigenous technologies by farming community					
38	Weed problem can be reduced by following indigenous practices					

S. No.	Statement	SA	A	UD	DA	SDA
39	Natural resources can be conserved by the adoption of blended technologies					
40	Farmers following indigenous practices can better depend on subsidiary occupation					
41	More drudgery is involved in adoption of indigenous practices					
42	Scientific rationality behind the blended technologies should be given priority					
43	Protect environment slogan can be achieved only through adoption of blended technologies					
44	Higher yields to feed the growing population with out degrading the natural resources could be possible through blended technologies.					
45	Modern agriculture is a major cause for ecological problems.					
46	The future agricultural development lies on the learning of eco-friendly practices and their application in the filed					
47	It is better to go for modern agriculture practices then indigenous practices					
48	Indigenous practices provide efficient utilization and recycling of farm waste					

SA : Strongly Agree

A : Agree

UD : Undecided

DA : Disagree

SDA : Strongly Disagree

t-values of the statements in the attitude scale construction

Statement No.	t-value	Statement No.	t-value
*1	12.184	25	2.968
*2	9.638	26	6.079
*3	13.37	*27	7.586
4	0.438	*28	11.347
*5	10.54	29	5.883
6	1.96	30	3.942
*7	13.92	31	1.650
8	6.126	*32	7.271
*9	9.294	33	3.360
10	1.349	34	2.190
11	6.5811	35	2.840
12	0.6614	36	1.714
13	1.401	37	6.607
*14	10.521	38	5.948
15	3.378	39	4.988
*16	10.44	40	7.057
*17	10.95	*41	9.026
*18	13.95	*42	8.052
*19	8.62	*43	8.386
20	0.844	44	6.616
*21	9.11	*45	9.332
*22	16.329	*46	8.903
*23	8.523	47	6.426
*24	9.68	*48	11.697

* Selected statements for attitude scale

ANNEXURE

PROFILE CHARACTERISTICS OF THE RESPONDENTS

S. No.	Profile character	Percentage
1	Age	
	Young	32.50
	Middle	46.50
	Old	21.00
2	Educational status	
	Low	58.50
	Medium	32.50
	High	09.00
3	Farm size	
	Marginal farmer	21.50
	Small farmer	42.00
	Medium farmer	28.50
	Big farmer	08.00
4	Farming experience	
	Low	12.00
	Medium	49.75
	High	38.25
5	Contact with extension agency	
	Low	42.50
	Medium	32.50
	High	25.00
6	Cosmopoliteness	
	Low	48.00
	Medium	36.00
	High	16.00

ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE GENERAL

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production :			
1	Summer ploughing is practiced by the farmers during April-May which exposes the soil to hot sun so that the soil born insects will be killed by heat.			
2	Sheep penning and cattle penning are practiced during summer for 2-3 days in each field to improve soil fertility.			
3	Farmyard manure (FYM) is applied to the soil every year during summer without fail to improve soil fertility.			
4	The pooled household garbage is used as manure after its putrification which enhances the fertility of the soil.			
5	Tribals incorporate ash in to the soil which believed to reclaim the soil gradually and improves fertility.			
6	Four ploughings for cultivation of ragi, and 3 ploughings for cultivation of Sama, Korra, ganti are sufficient.			
7	Ploughing after every shower during the pre-sowing season to conserve enough moisture for the crop, remove weeds and ensure good crop.			
8	Application of sand from river beds during summer is practiced to increase the fertility of black soil.			
9	'Bali' is practiced by the tribal farmers during nursery preparation, transplantation, grain formation and harvesting of major crop like paddy, ragi and red gram.			
10	Application of gypsum to the soil is practiced to correct alkalinity. (BT)			
11	Tuvvatam (digging) with use of 'Kanka' along the slope is done before sowing the crop.			
12	Deep ploughing is practiced during summer to improve water holding capacity of soil and to conserve enough soil moisture.			
14	Laying stone bunds around the fields across the slope for preventing soil erosion and for conserving moisture is practiced.			
15	Excessive application of farm yard manure (FYM) is practiced to improve the soil texture.			
16	Application of hill soil (Konda mannu) is practiced to increase the water holding capacity of red soils.			
17	Repeated ploughing is practiced to reduce weed population in dry lands.			
18	Profuse weed growth after rain is an indication for high soil fertility.			
19	Fouls stretch their feathers in hot summery days which indicates the rain incidence.			
20	Ants changes their eggs from one place to another which indicates initiation of rains.			
21	Hallow around the moon indicates occurrence of rains.			
22	Hallow near to moon indicates rains for away.			
23	It will rain if termite fly in large number in the air at 10 – 20 fts height			
24	If a rainbow appears in the east in the evening or West in the morning, it will rain.			
25	Streaks of lightening in the east with rainbow in the West would lead to rain.			
26	If the sky becomes dark near the horizon, there will be instant rain.			
27	If the North wind blows, it will surely rain.			
28	Ants raising maunds is an indicator of rains.			
29	Rain can be forecasted by looking at the sight of burrow of ants.			
30	If white ant take wing in the evening, it will rain exclusively.			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
31	Dragan flies flying indicates rain fall			
32	Rain follows the frogs crocking.			
33	Even if the seeds are of good quality, they must be sown in the right season only to get higher yields.			
34	New moon day or days before new moon day is better for sowing or harvesting any crop.			
35	It is better to avoid sowing on Ashtami (eighth) and Navami (ninth) days from full moon and new moon days.			
36	Ragi, redgram and black gram seeds are mixed and broadcasted infield and harvested each separately in parts of tribal area zone.			
37	Seed stored for next year is taken out only after celebrating 'Itukula Panduga' which comes during April to May months.			
38	If rains are delayed beyond the season (too late) higher niger is cultivated for subsidiary income.			
39	Farmers practiced to change seeds once in two years to get good seed vigour.(BT)			
40	Red gram is mixed cropped with sorghum + korra + ganti + junuvulu. The seeds of sorghum, korra, ganti and junnuvulu is mixed and broadcasted in the field. Redgram is sown by digging holes using an indigenous implement called 'Kanka' at 1 meter spacing after broad casting the mixed seed.			
41	Intercultural operations and timely weeding are essential for rainfed agriculture thus followed to possible extent.			
42	In mixed crop korra yields first followed by junuvulu, sorghum, ganti and finally farmers harvest redgram.			
43	Continuos submergence of the field for some time is practiced if water is available which controls the weeds.			
44	Konda Puja (prayer to hill) is practiced by the farmers collectively before harvesting the major crops such as paddy, redgram, ragi etc.			
45	Mesta or sesamum is grown as summer crop preceeding to paddy which give additional income which inturn useful as investment for paddy crop.			
	Plant protection			
46	Collection and burning of insects is practiced by the farmers in initial stages of pest attack. (BT)			
47	Stones are kept in a leather pouch tied with string thus releasing the stones with lured to a greater distance chasing away the birds.(BT)			
48	Jatropha is planted as fence around the crop which repells goats and can serve as a strong fence against animals.			
49	A man like effigy made up of straw wearing a dress is used to keep at the centre of the field. The birds fly away because of human appearance in the field.			
50	A man like effigy made up rice straw wearing a dress and head is covered with a earthen wear made like a human head is used to keep in the centre of the field. The birds fly away because of human appearance in the field.			
51	Continous drizzling encourages the spread of pests and disease.			
52	There will be no incidence of pest and diseases if neem leaves are applied as basal manure.			
53	Burning the dry stalks in the field and dusting the ash on the field to control diseases is practiced by the tribals.(BT)			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
54	Digging rat burrows and killing rats after each harvest is practiced to reduce the rat population in the field.			
55	Rat damage is reduced by throwing fresh cow dung on both the bunds and field.			
56	Tribals now and then beats empty iron tin with a stick to scare away the animals and birds which destroy the crop.			
57	Guns are used by the tribals to kill wild animals which destructs the crops like maize, sorghum etc. in some parts of high altitude and tribal area zone.(BT)			
58	Indigenous arrows (Banalu) are used to ward off wild animals which damage food crops by the tribals.			
59	'Adapa' is stone trap used to kill wild animals. A flat heavy stone made like a hut opening on side placing a trap support called mita inside the stone hut. When the animal touches the mita the whole structure falls on the animals thus killing it.			
60	Farmers used to stay in the field during nights to ward off wild animals and farm women watches the field during day times.			
	Post harvest technology			
61	Neem leaves are mixed with seeds and stored for long time which prevents pest attack.			
62	For maximum storage period, grains must be dried to greatest possible extent.			
63	Cup shaped structure knitted with Buhenia leaves called as Burudi (Vernacular name) in which grains are stored.			
64	A whole is made to a big size bottle gourd and pour hot water and ash in it and allowed for 2 days. The hollow bottle gourd is cleaned with water and dried for 5-10 days. This indigenous storage structure is known as 'Anapatumba' which is used to store seeds like redgram, blackgram, greengram etc. It is sufficient to store 4-6 kg of seed up to ten years which prevents the attack of insects and rodents.			
65	Farmers used to store paddy and pulses in earthen pots or gunny bags kept on planks suspended in the kitchen. They believe that the smoke emitted from chulahs during cooking prevents storage pest attack.			
66	Storing food grains in big drums made up of clay and pasted with cow dung outside the drum.			
67	Farmers used to apply fresh mud mixed with cow dung to the granaries before each new crop is stored.			
68	Seeds are stored in indigenously made storage structure called 'butti' (vernacular name) which is made up of bamboo in different sizes.			
69	Seed are stored in gunny bags in mix with gamoxone to prevent storage pest attack.			
70	De husking and crushing of millets and pulses is done by use of indigenously made stone crusher called Thiragali (Vernacular name). This is a modification of wooden crusher.			
71	Harvested produce of millets is threshed by keeping the crop on roads and allowing the vehicles to pass on it to separate the grain is practiced.			
72	Seed material is stored in earthen pots which is kept on the roof inside the houses directly above the furnace in the kitchen. The smoke acts as repellent to the insects.			
73	The seeds are generally stored along with the leaves of neem, thulasi, in gunny bags.			

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**ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
PODU CULTIVATION**

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	Tribals practiced shifting cultivation locally known as 'podu'. There are two types of podu practiced by the tribals i.e., 'chelaka podu' (plain forest clearance) and konda podu (podu in steepy hills).			
2	Podu is used to start by the farmers during summer (after celebrating Nandi panduga festival) by clearing the bushes with use of knife, sickle, axe etc. and burning them. They allows it for some days with on set of monsoon they start sowing seeds, after working with spades.			
3	April – May is found to be the optimum season to start the process of podu cultivation.			
4	Bushes are cleared during November, December and keep it to sundry up to kotha Amavasya (March) than burn it and ploughed to make it ready for cultivation in some parts of high altitude and tribal area zone.			
5	Podu cultivation improves fertility of native soil because more number of crops are grown on the same piece of land.			
6	Farmers used to cultivate the podu for three years and than they shift the cultivation in search of new land.			
7	In konda podu (podu on steep hills) digging with spades (Tuvvuta) is practiced instead of ploughing as in the case of 'banda podu' (podu at hill bases)			
8	Tribals believes that podu cultivation has no harmful effects an overall rainfall pattern and even on infiltration of rain water.			
9	During the first year of podu cultivation (Kotha bhumi) redgram and paddy (konda danyam) mixed crop is grown. Farmers use 20 kg paddy+ 3 kg of red gram per acre of podu land.			
10	Korra +sorghum+redgram+junuvulu are cultivated as mixed crop in konda podu during second year.			
11	3-4 kg of mix of all available seeds are broadcasted per acre of soil in podu cultivation during 3 rd year .			
12	Sorghum +cowpea in grown as mixed crop during the first year of podu in some parts of high altitude and tribal area zone.			
13	Budamalu (Mettu danyam) and red gram are mixed cropped during second year by the tribals in some parts of high altitude and tribal area zone.			
14	'Ganti' followed by Black gram or green gram are cultivated during third year of podu in some parts of high altitude tribal area zone.			
15	Farmers mix the seeds of korra and sorghum and broadcast in field. After this by use of a kanka, they dig the soil at 2-3 feet distance and drop two seeds of red gram in each hole and than closes the hole with soil..			
16	In some areas of high altitude and tribal area zone ganti + sorghum + korra + sama mixed cropping is followed in podu.			
17	Weeding is practiced by the farmers in podu cultivation without fail because in podu lands weed problem is more.			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
18	Weeding twice is practiced in new podu land (kotha podu) and once in old podu land (patha podu) because weed problem is more in new podu land.			
19	Weed problem is more in podu cultivation compared to plain cultivation because some weeds could survive by means of rhizomes, corms etc. where weeding is practiced regularly.			
20	Difference in maturity period for crops gives opportunity to harvest each crop separately, farmers harvest first korra followed by sama, junuvulu, ganti, sorghum and finally red gram.			
21	Tribals followed Karthe to initiate every farm operations in podu cultivation.			
	Plant Protection :			
23	After clearing vegetation setting of fire is practiced in podu cultivation which improves soil fertility, kills insects and reduces weed problem			
24	The operation of thuvvatam (digging) is practiced with 'kanka' indigenous implements after burning the bushes with this crop sowing operation initiates, which kills the soil borne insects.			

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**ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
PADDY**

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production			
1	'Arudhra Karthe' is suitable season for sowing mettudanyam (paddy variety-light) which is an early matured variety(short duration).			
2	'Mrugasira Karthe' is suitable season for sowing late maturing (long duration) varieties of paddy.			
3	'Mrugasira karthe' (Month of June) is the optimum season for growing paddy nursery.			
4	'Punrvasa karthe' is suitable season for transplantation of paddy seedlings into mainfield.			
5	If nursery is sown in 'Arudhra karthe' the seedlings will not grow well because of Arudhra dosam.			
6	If paddy is sown in 'Arudhra karthe' requires more seed			
7	Transplanting paddy during punarvasa to ashlisha period gives higher crop yields and hence practiced by the tribal farmers.			
8	Before sowing paddy in nursery, hundred seeds will be sown as sample and irrigated to check the percentage of germination.			
9	70 to 80% germination is considered good.			
10	If germination percentage is less than 70, more seed will be sown than required quantity. The whole operation is called as 'pallemuveyuta' (BT)			
11	Direct sown paddy is cultivated on podu land (slopy hills) called 'Yada panta'			
12	Dense planting of paddy gives higher crop yields, hence farming adopted more seed rate.			
13	In some parts of the high altitude and tribal area zone, farmers used to broadcast paddy seed with ash to over come dry spells (Mostly in red and black soils).			
14	Groundnut cake (40-50 kg/ac) mixed with cowdung is incorporated in to the soil during puddling to improve soil fertility.			
15	Indigenous spade is used to trim the bunds and to level the puddled field.			
16	Transplanting is done along the wind direction and not against the wind direction.			
17	Paddy seed for next season is selected based on seed weight (by use of their discretion power on seed characters)			
18	For seed collection, the field is identified during growth stage (uniform and better growth) and harvested separately.			
19	'Konda danyam' (paddy) is cultivated as mixed crop with redgram in which paddy is harvested early and red gram will be retained up to 6 months for maturity.			
20	'Karavakkulu' is a traditional paddy variety cultivated by the farmers in high altitude and tribal areas.			
21	'Garika sannalu' is a traditional early maturing variety with good taste is cultivated by the tribal farmers.			
22	'Budamalu' (Mettudanyam) is a traditional paddy variety used to cultivate as mixed crop with red gram.			
23	'Bobbili ganti' is a traditional high yielding paddy variety with 90-100 days duration and the seed is red in colour.			
24	'Kichidi' is a traditional late maturing variety (110-130 days) which is suitable for 'pulav'(good taste)			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
25	'Pedamaipala' is a traditional tall early maturing variety of paddy with small grains.			
26	'Potti basangi' is a traditional early maturing (90 days) paddy variety with small seeds cultivated by the tribal farmers.			
27	'Krishna Kathikalu' is a traditional medium maturing variety (100-120 days) of paddy with good taste is cultivated by the tribals.			
28	'Kampu sannalu' is an indigenous scented paddy variety with 6 months crop duration and the grain is medium to big in size.			
29	'Isuka ravvalu' is an indigenous scented paddy variety with 6 months crop duration and seed is small in size.			
30	'Pantulu danyam' is an indigenous paddy variety with a duration of 120 days with brown shiny seed coat.			
31	'Ooda sannalu' is a indigenous short duration (100 days) variety of paddy bearing one or two tillers and the seed coat is reddish brown.			
32	'Yerra danyam' is an indigenous paddy variety which used to give higher yields without any fertilizer application.			
33	'Yerra danyam' is traditional tall variety which is high yielding variety among the traditional varieties of paddy.			
34	'Danyalu' is traditional (Sanna Danyam) paddy variety which is tasty and suitable for Biryani making.			
35	'Konda Danyam' is a traditional variety which is late maturing with good taste.			
36	Srikakulam sannalu (RGL-2537) is never cultivated in podu or as a dry crop (BT).			
37	MTU-1001 is cultivated as dry crop by the tribals which gives tasty rice (BT).			
38	Chemical fertilizers are applied to the field in combination with neem cake (20 kg / acre) to get better crop yields (BT).			
39	Five cart loads FYM per acre (2.5 tons approximately) is applied to the field during summer in which the paddy will be sown in coming season.			
40	Four to five ploughings are desirable for paddy cultivation are practiced.			
41	Indigenous country plough is used for preparatory cultivation, forming ridges and furrows.			
42	The place with higher elevation in the field is selected for raising the nursery.			
43	Dry paddy ploughed once after sowing to give better yields. (care is taken so that crop is not damaged)			
44	'Katte seed' (vernacular name) mesta is sown in field and incorporated in paddy field at the time of puddling at good vegetative growth stage.			
45	Tentemu leaf and jeelugu (Fish tail palm) twigs are incorporated during second ploughing for better decomposition and utilization to improve soil fertility.			
46	Tentum (vernacular name) leaves are collected and broadcast in the field before puddling. During puddling the leaves get decomposed thus improves the soil fertility.			
47	Weeding is done twice in paddy first at 15 days after transplanting and second at active tillering stage which gives good vegetative growth.			
48	Panicle is indicator for healthy status of paddy crop.			
49	Alternate wetting and drying results in good paddy crop (BT).			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	PLANT PROTECTION			
50	Fifty kg of neem cake is broadcasted in the field to control insect pests in paddy, during puddling in some parts of high attitude and tribal areas			
51	Tribals use plant material like, fish tail palm leaves (vernacular name: Jeelugu) for the control of leaf folder and stem borer in paddy. They erect 25-30 leaves per acre scattlery in the paddy field. This fish tail palm leaves excudes alkaloids, which prevents pests.			
52	Farmers used to mix the powder of stem of yegisa manu (Vernacular name) in irrigation channels to control tip burn (Etchi tegulu) in paddy.			
53	Thummika and Nakkide plant branches (Vernacular names) are erected around paddy field and paddy grain is broadcasted on field bunds at the time of grain formation.			
54	Leaves of vadisa plant and cow dung are broadcast around field bund if leaf folder infestation is observed.			
55	Wood apple (Velaga fruit) is made in to powder and used to broadcast in field to reduce tella chitta (leaf turns white) in paddy.			
56	'Musidi' leaves (vernacular name) are used to broadcast in the field (Mettu danyam) if termite attack in observed in paddy.			
57	Neem cake (40 kg) + Kagu cake (5 kg) + Kosam pindi (5 kg) per acre applied during puddling which prevents pest attack in paddy and improves soil fertility.			
58	Paddy seed is stored for next year in gunny bags which are hanged to the roof of the house there fore pest attack can be reduced because there will be less physical access to insects to attack the seed.			
59	When paddy is infested with leaf flower and gall midge farmers drag thorny bushes in field.			
60	Neem cake (50 kg) + gypsum (25 kg) is used to apply to the field at the time of puddling which prevents pest attack in paddy and improves soil fertility (BT).			
61	For any problem in paddy nursery, the gamoxine and kerosene is sprayed (BT).			
62	Farmers used to broadcast 15-20 kg of common salt / acre of paddy field to control leaf spot disease in paddy.			
63	Neem cake (20 kg/ac) is applied as basal manure which helps to protect paddy crop from BPH and improves soil fertility.			
64	Uprooting gallmidge effected seedlings and burning in the nursery before transplantation is practiced.			
65	To prevent thrips attack in nursery 'musidi' leaves (Vernacular name) are applied as green manure during puddling.			
66	Farmers believes that presence of the Gaviribethi snake improves crop yields because it predares on rodents.			
67	'Bali' is practiced at the time of grain formation stage in paddy which believe to fetch more yields.			
68	Paddy harvesting is started after a fortnight of change in leaf colour from yellow to pink			
69	Harvesting in paddy is done by leaving ½ feet height stubbles which improves soil fertility after decomposition in the soil.			
70	Before harvesting the crop a few rice spikelets are hanged in the houses and temples to be eaten by sparrows.			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	POST HARVEST TECHNOLOGY			
71	If the paddy is stored in room the floor is coated with cow dung solution to avoid insect multiplication.			
72	Paddy seed is sun dried for 2-3 days continuously and than stored in gunny bags on indigenously made 4-5 feet stand to prevent pest infestation.			
73	Paddy seed is stored in small containers knitted with bamboo called as 'butta' (in telugu) . The container is filled with paddy seed and covered with straw and than closed with cow dung paste.			
74	Harvested crop is allowed for sundrying for 3-4 days in the field it self to reduce the level of moisture in grains before bundling.			
75	Threshing is done by trampling under the feet of cattle on a threshing floor.			
76	Winnowing and clearing of rice produce is done by the use of winnowing baskets called (chetalu in Telugu)			
77	Seeds are stored in indigenously constructed storage structures called 'jaadi'. The storage structure constructed with burned clay with a capacity of 60 – 80 kunchas (180 – 200 kg) paddy seed.			
78	Seed for consumption purpose are stored in big size Jaadi called 'Gadhi' with a capacity of 100 – 150 kunchas (300 – 450 kg) paddy seed.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

MAIZE (*Zea mays*)

S.No	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production:			
1	1-2 Cart loads of farm yard manure per acre is applied to the soil during summer in which maize is to be cultivated.			
2	Neem cake is applied to the soil at the time of sowing maize @ 20-25 kg/acre			
3	'Konda moka jonna' is traditional maize variety which is tasty(sweet) cultivated by tribals.			
4	'Pedda moka jonna' is a traditional maize variety with big size cobs.			
5	Gada moka jonna' is a traditional tall maize variety which is resistant to foxes because of its height.			
6	'Korra moka jonna' is a traditional short maize variety which is mostly damaged by the wild animals like foxes.			
7	After getting good tilth maize is sown by use of 'kanka' (indigenous implement) to dig the soil at 2 feet spacing.			
8	5 kg/ac of seed rate is followed traditionally by the farmers to get higher yields in maize.			
9	0.5 kg/ acre of Maize seed is used if it is cultivated in lines i.e in mixed crop.			
10	Maize seeds are dibbled along the ridges in small holes farmed with fingers or small sticks and covered with soil.			
11	Cucumber, Ridge gourd, Brinjal etc. are cultivated as boarder crop around the Maize field.(BT)			
12	Maize is mostly cultivated as mixed crop.			
13	Maize is cultivated as mixed crop with redgram because two crops belongs to different families.			
14	Maize is cultivated as mixed crop with korra to get two yields from a single plot at different periods because of different maturing period.			
15	Maize is cultivated as mixed crop with budamalu (mettu danyam) to get additional yields from single plot.			
16	Maize is cultivated as mixed crop with cow pea (alasandalu) which creeps on maize. (BT)			
17	Maize is cultivated as mixed crop with sesamum because they yield at different periods.			
18	Stage of harvest in maize is indicated by sheaths covering the cobs turning to yellow and seeds become fairly hard and dried.			
19	When a sample of maize grains are chewed, metallic sound indicates their optimal dryness.			
20	Maize cobs only are harvested when it grown as mixed crop with cowpea leaving the plant to give support for creeping.			
	Plant protection:			
21	Before sowing maize, seeds are soaked in warm water for 3-6 hours and shade dried to induce better germination and to control shoot borer which is seed borne. (BT)			
	Post harvest technology:			
22	Cobs covered with sheaths are stored as such for more than four months when they store the maize for consumption purpose.			

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S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Post harvest technology:			
23	Harvested sticks of red gram along with pods are sundried for 5-6 days in the field keeping upward down.			
24	The powdered red gram leaf is used as feed for animals which got high nutritive value.			
25	The sticks are used as fuel for cooking after separation of red gram seeds.			
26	If red gram is sundried during Amavasya day the storage pests cannot attack the seed.			
27	Red gram is mixed with ash and stored in gunny bags in hanging position from the roof of the house.			
28	Red gram seeds are stored in mix with ash 30 kg of red gram is mixed with 1 kg of ash which acts as physical barrier for insect pests.			
29	Frequent sundrying of seeds is practiced to protect red gram from stored grain pests.			
30	Red gram seed is stored in earthen pots in mix with gamaxone to protect it from storage pests.(BT)			
31	Red gram is stored in earthen pots in mix with layers of sand to protect it from insect pests during storage.			
32	Red gram is stored after adding wet red clay and sundrying it for 2-3 days to increase shelf life.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
SORGHUM (*Sorghum bicolor*)

S.No	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Rohini karthe' is optimum season for sowing sorghum.			
2	Three ploughings are required for sorghum cultivation.			
3	'Pedda jonna' is a traditional sorghum variety grown by tribal farmers which is late maturing variety.			
4	'Dassera jonna' is a traditional early maturing variety harvested at the time of dassera festival.			
5	'Karthika jonna' is an indigenous early maturing variety gives more yield.			
6	Konda jonna is an indigenous variety cultivated in konda podu by the tribal farmers.			
7	'Biyyapujonna' is an indigenous sorghum variety with good taste of grains is cultivated by the tribals.			
8	'Yenugu matta jonna' (Tella jonna) is an indigenously cultivated sorghum variety with big size spikelets. The big size spikes are congenial for birds to sit and eat it, hence bird damage is observed.			
9	'Pidaka jonna' is an indigenously cultivated sorghum variety by the tribals, its small spikes used to escape from birds.			
10	'Pacha jonna' is an indigenous sorghum variety cultivated by the tribal farmers			
11	'Kaki jonna' is a traditional sorghum variety cultivated as mixed crop with ragi by tribal farmers			
12	For high yielding, varieties seeds are collected from well to do farmers in the village who store grain and sell it as seed and for hybrids seed is purchased from private dealers or government agencies supplied by integrated tribal development agency (ITDA).			
13	Soaking the sorghum seeds in common salt solution before sowing to secure good germination under adverse conditions.			
14	If rains are late, sowing of early duration varieties are taken up even after mrugasira karthe with high seed rate.			
15	Sorghum transplanted immediately after up rooting seedlings for better growth without shock of transplantation.			
16	Sorghum is cultivated as mixed crop with cowpea (alasandalu or bobbarlu).			
17	Cowpea (bobbarlu) seed is broadcasted in the field at the time of transplantation of sorghum seedlings.			
18	Less cultural operations are required for cultivating the sorghum crop, since it does not require fine tilth.			
	Plant Protection :			
19	To scare away the birds colored polythene carry bags are tied to a few tall sorghum plants.			
	Post Harvest Technology :			
20	For threshing sorghum, ear heads are spread over on the roads to allow vehicles to pass on it.			
21	Frequent sun drying of seed to protect from stored grain pest irrespective of Amavasya.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
RAGI (FINGER MILLET) *Eleusina coricana*

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	20 days after sowing ragi is practiced which is optimum time for transplantation in to main field.			
2	Ragi seedlings are sown behind country plough furrow in main field, generally farm women used to perform the transplantation of seedlings.			
3	'Bharani karthe' is suitable season for sowing ragi.			
4	3 kg per acre seed rate is followed by the farmers in ragi cultivation.			
5	Transplantation of ragi seedlings is done by using indigenous implement called 'borigi' (hand hoe). The farmers used to dig soil with the help of borigi and seedlings are sown in the digged place.			
6	Chillies, Brinjal, Bhendi, ridge gourd, beans etc are randomly sown here and there in the ragi field. (BT)			
7	'Punasa cholu' is an indigenous ragi variety which gives higher yields among such varieties.			
8	'Gotti cholu' is a traditional ragi variety which is cultivated as direct sown crop by the tribals.			
9	'Korra cholu' is an indigenous ragi variety cultivated by the tribal farmers which is an early mature variety, give yields with in 70-80 days.			
10	'Budi chodi' is a traditional high yielding early mature ragi variety, seeds are small in size with small fingers.			
11	'Reka chodi' is an indigenous long duration ragi variety bearing 6 – 8 fingers protruding outwards with greater length.			
12	'Burada chodi' is a short duration (110 days) indigenous ragi variety bearing 5 – 6 finger in panicle.			
13	'Pedda chodi' is a traditional long duration ragi variety cultivated by tribal farmers.			
14	'Selaga chodi' is a traditional ragi variety sown behind country plough furrow.			
15	'Budi chodi' is cultivated as mixed crop with Black gram or bobbarlu (cowpea).			
16	'Budi chodi' is used to give ratoon crop after harvesting thus giving two yields in a year.			
17	'Dassera budelu' is a long duration indigenous ragi variety cultivated by the tribals.			
18	'Chindi mundiya' is a early mature indigenous ragi variety cultivated by the tribal farmers.			
19	2-3 cart loads / acre of farm yard manure is applied by the farmers during summer in which ragi is to be cultivated during next season.			

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
20	A combined operation of earthing up and weeding (goppulu tavvuta) is practiced by the farmers twice in ragi cultivation which enhances crop growth.			
21	Remainings of ragi seed and broken ragi seeds are broad casted in field to partially substantiate the fertilizer requirement.			
22	Five kuncha (15 kg) seed for nursery will ultimately fetch 9 puttulu (180 kunchas) yield.			
23	Red colouration of ragi seed is taken as indices for harvesting.			
24	Panicles alone are picked and sundried for 3-4 days. Then the panicles are beaten with sticks to separate grain.			
	Plant Protection :			
26	Farmers sprinkle (sodipindi) Ragi seed powder mixing in water for control of pests and diseases in ragi.			
27	Matakara ginjalalu (chaffy grains) is a problem observed at the time grain filling in ragi.			

CA : Complete Adoption

PA : Partial Adoption NA: Non adoption

BT : (Blended Technologies) are operationalized as the technologies which are a blend of indigenous and modern practices

ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
SAMA (LITTLE MILLET) *Panicum miliare*

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production			
1	Single ploughing is sufficient to sow sama seed.			
2	Yada (direct sown crop) is used to cultivate for sama with out transplantation, thus reducing the cost of cultivation.			
3	10-15 kg / ac seed rate is maintained by the tribals if sama is grown as sole crop.			
4	Sama is completely cultivated as rainfed crop for subsidiary income.			
5	Seeds of ragi (2kg) and pedda samalu (1/2 kg) is mixed and broad casted. The transplantation is also done as mixed seedlings. Because of differential maturity periods sama is harvested earlier than ragi.			
6	'Korra samalu' is the mostly cultivated traditional variety of sama gives more yield.			
7	'Magha samalu' is a traditional sama variety which is used to sow in magha karthe			
8	'Mandi sama' is a traditional short duration (60 – 70 days) sama variety the seed are round and flat.			
9	'Bontha sama' is a traditional sama variety with big size round seeds.			
10	'Nalla sama' is a traditional short duration sama variety with black small seeds.			
11	'Pedda sama' is a traditional long duration sama variety of which the seeds are small with big size spikelets grown as mixed crop with ragi.			
12	'Mai sama' is a short duration (60 – 70 days) indigenous sama variety grown up to a height of 1 m to 1.25 mt.			
13	Black (dark) coloration of sama seeds is taken as index to harvest the crop.			
	Post Harvest Technology :			
14	Dehusking of little millet grain is done with the help of wooden grinding machine called 'Tiragali' (Vernacular name) locally made with mango or terminalia (maddi).			

CA : Complete Adoption

PA : Partial Adoption NA: Non adoption

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**ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
FOXTAIL MILLET (KORRA) (*Sataria italica*)**

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production			
1	Local varieties of korra are preferred because they are more tasty and keeping quality of their straw is high.			
2	'Pedda korra' is an indigenous korra variety with big spiklets and it gives very soft food when cooked.			
3	'Bula nemadam' is an indigenous korra variety with small hairy structures on seeds which gives rough (not soft) food on cooking.			
4	'Pedda korra' spikes alone are harvested and thrampled with animals after sun drying for 3 – 4 days.			
5	Korra is sown during May – June (Kartherlu time) to facilitate the cultivation of next crop.			
6	Maturity of korra crop is indicated by the leaves turning yellow, the earheads turning greenish and the grains getting hard to chew.			
7	After harvest, earheads are dried for 3-4 days in the field and beaten with sticks for grain separation, followed by traditional winnowing along the wind direction.			
	Plant protection:			
8	Korra seeds are put in water and the floating and disease affected seeds are removed.			
9	If sowing of korra is delayed beyond the June, it becomes more susceptible for pest attack.			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
BAJRA (GANTI) *Pennisetum americanum*

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Arudhra karthe' (month of June) is suitable season for sowing bajra seeds.			
2	'Pala poda ganti' is an indigenous bajra variety with big size spikes and grains.			
3	'Pitta ganti' is an indigenous bajra variety with small spikes and grains.			
4	'Pedda ganti' (badi ganti) is an indigenous bajra variety mostly cultivated as mixed crop with sorghum.			
5	'Mrugasira' is optimum season for sowing bajra as mixed crop and punarvasa is for transplantation.			
6	20 days after sowing is the optimum season for transplantation of ganti seedlings.			
7	Horsegram or black gram is cultivated after ganti harvest to get additional income.			
8	No weeding is required for ganti because it is highly competitive with seeds.			
9	Ganti is harvested with 2 – 3 feet long sticks, a sun dried and trampled with animals to separate grains followed by winnowing.			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
ARIKA (ALU) KODO MILLET *Paspalum scrobiculatum*

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Korra alu' and 'Pedda alu' are the two indigenous kodo millet varieties grown by the tribals.			
2	'Madda alu' is an indigenous kodo millet variety with big size spikes and grains.			
3	'Kodi arika' is an indigenously cultivated kodo millet variety with small spikes and grains.			
4	Kodo millet is grown as mixed crop with red gram			
5	Two ploughings are done perpendicular to one another and seed of kodo millet is broad casted in the field. Third time is ploughed perpendicular to the second ploughing, so that, the seed will be covered with soil.			
6	Kodo millet is cultivated as mixed crop with mesta to gain additional income from alu.			
	Post harvest technology			
7	Processing of kodo millet seed is laborious consists of dehusking twice with indigenous wooden crusher called 'Thiragali' and third time is crushed with stone crusher to get 'Arika powder' for consumption. (BT)			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

PULSES (*Vigna sp.*)
Blackgram and Greengram

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Nalla Pesalu' is a traditional greengram variety cultivated as sole crop in dry lands.			
2	'Pacha pesalu' is a traditional green gram variety grown as relay crop in paddy. 10 – 15 days before harvesting paddy crop the seed is broadcasted in the paddy field.			
3	'Nalla minumulu' and 'Tella minumulu' are the traditional blackgram varieties grown by the tribals.			
4	Black gram is mostly cultivated as boarder crop on field bunds.			
5	Growing of blackgram after paddy enhances the soil fertility and soil structure.			
6	'Magha karthe' is optimum season for sowing pulses (black gram and green gram).			
7	Seeds are soaked in water for 10 hours before sowing in paddy fallow blackgram crop in less soil moisture fields.			
8	Pulses are highly competitive with weeds. This belief makes farmers not to adopt weed management practices in pulses.			
9	One to two percent urea solution is sprayed on the crop which suffered due to severe adverse weather conditions to improve growth and yield of pulse crop. (BT)			
10	Yellowing of leaves with dried pods are the maturity symptoms for harvesting the crop.			
11	Threshing of blackgram is done by trampling under the feet of cattle.			
12	'Blackgram seeds are separated from sand and dust particles through locally manufactured and graded sieves (Jalleda).			
	Plant Protection :			
13	Ill filled and diseased seeds are eliminated by removing the floated seeds during soaking in water before sowing. (BT)			
	Post Harvest Technology :			
14	Farmers store pulses in earthen containers in mix with kitchen ash @ 5 kg seed + 1 kg ash to prevent insect attack during storage.			
15	Pulse seeds are well dried and mixed with the dried leaves of neem and stored in airtight gunny bags by keeping on 2 – 3 feet height locally made stands.			

CA : Complete Adoption

PA : Partial Adoption NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
RED GRAM (*Cajanas cajan*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production:			
1	'Bharani Karthe' is suitable season for sowing redgram seeds.			
2	'Doni kandulu' is an indigenous red gram variety resistant to pests and diseases with less flower drop.			
3	'Binnisa' is an indigenous redgram variety cultivated by the tribals			
4	'Gotcha Kandulu' is an indigenous red gram variety with big size grains with spots.			
5	'Billa Kandulu' is an indigenous red gram variety bears single pods (without clusters), seeds are big in size and white in colour.			
6	Red gram is grown during first year of three years podu (shifting) cultivation to reduce weed infestation.			
7	Black soils are found to be the best to cultivate red gram by the farmers.			
8	Short duration and high yielding varieties are cultivated to escape from risk due to dry spells.			
9	Farmers maintain spacing of 3½ X 4 feet for cultivation of 'Pedda Kandulu (traditional varieties of red gram).			
10	Farmers maintain spacing of 2 x 2 feet for cultivation of 'China Kandulu (improved varieties of red gram).(BT)			
11	Red gram seeds are sown using 'Kanka' a traditional farm implement. Half a feet deep holes are digged with use of 'Kanka' and two seeds are dropped in each hole maintaining optimum spacing.			
12	Ten kg per acre of seed rate is used by the farmers in the case of sole crop and 2-3 kg / acre in the case of mixed crop.			
13	Farmers waits for a week after sowing red gram for seed germination and otherwise they consider as the crop failure.			
14	Red gram is mostly cultivated as mixed crop by the tribal farmers.			
15	Red gram is mostly cultivated as mixed crop with budamalu (Mettu danyam) on podu lands.			
16	Red gram is cultivated as mixed crop with sesamum to get additional income			
17	Cloudiness induces flower drop in red gram and hence it is not desired by the farmers during flowering stage.			
18	Farmers never apply fertilizer to red gram. They believe that the deep root system of red gram can absorb sufficient nutrients from the soil.			
19	In some areas of high altitude and tribal area zone, red gram is harvested early in the morning at full maturity stage. Farm women used to separate pods from the cutted stems of red gram and beaten with sticks to separate grain from the pods. The total operation lasts for a day.			
	Plant protection:			
20	Alu (kodo millet) straw smoking is practiced by the farmers to reduce scale and aphid attack in red gram. Alu straw is smoked around the red gram field which believes to reduce scale and aphid attack in red gram.			
21	Pods which are not infested with any pest and disease are selected for seed purpose for next year.			
22	To control the pod borer in red gram spraying of neem seed kernel extract is sprayed on crop.			

ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

HORSE GRAM (*Macrotylam unifloram*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production			
1	'Nalla vulavalu' is a traditional horse gram variety grown by the tribals.			
2	'Tella vulavalu' (pedda ulavalu) is a traditional horse gram variety gives more yield and more price.			
3	'Nalla Vulavalu' is used as cattle feed and household consumption where as 'Tella vulavalu' is used exclusively for household consumption.			
4	Dassera (Uttara karthe) is optimum season for sowing horsegram.			
5	Horse gram is mostly cultivated as subsidiary crop without depending on it.			
6	4 – 5 Kg / acre seed rate is followed by the farmers in sole crop of horse gram traditionally.			
7	Horse gram is cultivated in dry lands after harvesting ragi crop in rabi season.			
8	No inter cultivation operation is practiced between sowing and harvesting of horse gram.			
9	Tella vulavalu is cultivated as mixed crop with black gram in dry lands (Garuvu) by the tribals.			
10	Matured horse gram is uprooted and sun dried for 4 – 5 days to trample under the feet of animals to separate grain.			

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PA : Partial Adoption NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
GROUNDNUT (*Arachis hypogea*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production			
1	'Gutti senaga' is an indigenous groundnut variety grows like a bush and gives more yield.			
2	Groundnut is mostly cultivated for rabi because farmers believes that rabi groundnut yields more than kharif.			
3	Groundnut seeds from plants which are grown in dry lands gives good crop stand compared to other fields.			
4	When groundnut is grown in wet lands, crop grows luxuriently but fails to set seed.			
5	Dropping of basal leaves is taken as indication time to harvest groundnut and this is observed by the frequent visits of crows to the groundnut field for pods.			
6	Well dried seeds with pink seed coat without wrinkles are selected for sowing.			
7	Good quality, unbroken kernels free from insects shrivelling, insect damage are alone used for sowing.			
8	Light red soils are best for cultivation of groundnut.			
9	Groundnut kernels are dibbled by making a small dig in the field with 'Kanka' and covered with soil.			
10	Sowing the kernels behind the country plough called as 'Bongaram salu' and farming beds and channels later.			
11	Weeding is practiced twice in groundnut once is at fortnight after sowing and second is at the time of flowering.			
12	Gypsum is essential for groundnut and hence farmers apply gypsum to the soil before sowing.(BT)			
13	If the soil is dry, groundnut field is irrigated or other wise wait for a rain prior to harvest to facilitate easy and complete harvesting.			
	Plant protection:			
14	Farmers grow Jatropha plants around the groundnut field, which acts as catch crop against red hairy caterpillar.			
15	Farmers used to burn thrash adjacent to the groundnut fields during nights to attract nymphs and adults of insect.(BT)			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
SESAMUM (*Sesamum indicum*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production:			
1	'Yerra nuvvulu' is a traditional sesamum variety which is mixed with sand at 4:1 ratio and broadcasted (1 kg seed + ¼ kg sand) for sowing to get uniform distribution of seed in the field.			
2	'Nalla Nuvvulu' is a traditional sesamum variety is broadcasted as it is, 2.5 to 3 kg seed is required for one acre.			
3	Farmers used to sow sesamum by observing fruit initiation of Thummi tree (<i>Acacia</i> sp) which they believe optimum season for sowing.			
4	Soil fertility is depleted by sesamum cultivation.			
5	Rain is not desired at the time of flowering in sesamum by the farmers.			
6	Sesamum is harvested when its stem, leaves and capsules turn yellow and seeds in middle capsule turn black.			
7	After harvest, sesamum plants along with capsules are stalked in the field in upright position. Top portion is covered with straw and kept for 3-5 days after which seeds are separated by shaking the plants.			
	Post harvest technology:			
8	Storing sesamum oil in earthen pots is practiced to increase its keeping quality.			
9	Sesamum seeds are stored in earthen pots in mixed with sand in 9 : 1 ratio.			

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PA : Partial Adoption

NA : Non Adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE VEGETABLES

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production:			
1	'Pacha vanga' is an indigenous variety of brinjal bear fruits with broad green strips. Though it yieldless, it fetches more price because the fruits are tasty.			
2	About 40-45 days old brinjal seedlings are used for transplantation in to main field.			
3	Suitable season for sowing ladies finger are Chaitram (March) and Shravanam (July-Aug.) of which Shravanam is the best.			
4	About 3 or 4 ladies finger seeds are sown in each hole and later thinned to two plants per hill at two weeks after sowing.			
5	Cucumber seeds are sown as one side of the long channels formed 5 feet apart.			
6	Three or four seeds of cucumber are planted in each hole with the use of hand hoe to dig the soil.			
7	Cow dung is diluted with cow urine and applied near the base of transplanted seedlings of vegetables such as chilly, tomato etc. to improve soil fertility and to enhance crop growth.			
8	Bottle gourd is cultivated as boarder crop around the groundnut field to get additional income.			
9	Bottle gourd is harvested, when it turns from pale green to dark green and finger nails get pierced in to it, while pressing.			
10	Cucumbers are mostly cultivated in kitchen garden allowing them to creep on the huts.			
	Plant protection:			
11	Ash is dusted on vegetables which acts as physical barrier against pests.			
12	Ash and turmeric powder are mixed in equal proportion and sprinkled to control aphids which attacks vegetables.			
13	Ash is sprinkled on cucumber crop to control aphids and powdery mildew.			
	Post harvest technology:			
14	Cucumber seeds are extracted from fully ripened fruits, washed well with water, mixed with ash, dried and stored up to one year (Also for Bottle gourd).			
15	Sundrying the seeds of bottle gourd for storage, along with outer shell of the fruit which will acts as a storage container and protect from pests.			
16	Cucumber seeds are pasted to wall when they are wet to store for 4-6 months.			
17	Cucumber seeds are mixed with ash when they are wet and sun dried on houses for a week and than stored inside the houses in polythene covers.(BT)			
18	Bottle gourd and ridge gourd seeds are stored as such in fruits, after sundrying for a week. Whenever they need seeds for sowing they broke the gourds and extract the seeds.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

COWPEA (*Vigna anguiculata*)
(Alasandalu / Bobbarlu)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	Farmers sow the cowpea during July – August which they believe suitable season.			
2	'Tella alasandalu' is an indigenous cow pea variety cultivated by the tribals (pods are light in colour).			
3	'Nalla alsandalu' is an indigenous cow pea variety cultivated by the tribals (pods are dark in colour).			
4	'Chiru bobbarlu' is an indigenous cowpea variety with small and tasty grains.			
5	'Pedda bobbarlu' is an indigenous cow pea variety with big size seeds and give more yields among the indigenous varieties.			
6	Pods of cowpea are harvested when they start drying and turn to brown in colour.			
	Post Harvest Technology :			
7	Cowpea pods are sun dried until they become brittle to make the seed separation easy.			
8	For safe storage of cowpea, seeds are filled in earthen pots in mix with kitchen ash.			
9	Cow pea seed is stored as such in pods and tied with paddy straw so that the rats confused it as paddy straw and leaves it.			
	JUNUVULU (<i>V. anguiculata sub. sp.</i>)			
	Crop Production :			
1	Junuvulu is mostly cultivated as mixed crop with sorghum, ganti and red gram.			
2	In some tracks of high altitude and tribal area zone Junuvulu seed is mixed with red gram and planted by digging with 'Kanka' as holes and covering with soil.			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

CORIANDER

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Sada dhania' is the local variety cultivated by the tribals with the crop duration of 30 – 40 days.			
2	Raised beds of 1m x 10m with a height of 50 – 60 cm are prepared to grow nursery of coriander. (BT)			
3	10 – 20 Kg of farm yard manure is broadcasted on the nursery bed before sowing seed and water is sprinkled on it after sowing coriander seed to get quick germination.			
4	20 – 25 Kg / ac of seed is used by the tribals indigenously for coriander cultivation.			
5	'Regara' is an indigenous implement used for intercultivation in coriander. The regara is worked immediately after broadcasting the coriander seed to get even distribution of seed in nursery. (BT)			
	Post Harvest Technology :			
6	Roots of coriander are thoroughly washed in steam and made into small packets to make it ready for sale.			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

CAULIFLOWER *Brassica oleracea* Var. *botrytis*

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	Water is sprinkled on raised beds after sowing cauliflower seed to get quick germination.			
2	'Hemanthula' is an indigenously cultivated cauliflower variety by farmers in some parts of high altitude tribal area zone.			
3	'Hemagiri' is an indigenous cauliflower variety cultivated by the tribals, with the small size curds.			
4	'Kushi kalyani' is a traditional early matured cauliflower variety cultivated by the tribals.			
5	Maize is cultivated as boarder crop and Ginger is cultivated as mixed crop with cauliflower to substantiate income from one another thus growing three crops on single piece of land.			
6	Farmyard manure is abundantly applied to the cauliflower for better yields.			
	Plant Protection :			
7	To control diamond backmoth in cauliflower neem oil is mixed with water and sprayed on the crop.			
8	Thrash is burned and mixed with soil in prepared raised beds of 1m x 4.5 m with height of 30 – 60 cm to prevent soil born insects, and also to improve soil fertility. (BT)			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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**ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
RICE BEAN (THIMMERLU)**

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production			
1	'Chinna Timmerlu' is an indigenous short duration variety (60 days) with indeterminate growth habit. Seeds are small in size with light yellow coloured seed coat.			
2	'Pedda timmerlu' is an indigenous long duration rice bean variety (90 days) with indeterminate viny growth. Seeds are larger in size with green seed coat.			
3	'Nalla timmerlu' is an indigenous short duration rice bean variety with determinate growth and bushy habit with black seed coat.			
4	'Machcha timmerlu' is a short duration indigenous rice bean variety with indeterminate viny growth with black spot on green seed coat.			
5	'Yerupu timmerlu' is a long duration indigenous rice bean vareity with indeterminate growth and red seed coat.			
6	During ploughing ash obtained after burning trees in podu is applied to improve soil fertility.			
7	Rice bean is cultivated only on sloppy hills			
8	Rice bean sown during the month of July which is found to be optimum season.			
	Plant Protection :			
9	Kitchen ash is dusted on rice bean leaves during 6 – 8 AM early in the mornming to control aphids by acting as physical barrier.			
10	Rice bean is harvested at ground level with sickles when bottom leaves turn yellow and most of the pods turn brown.			
	Post Harvest Technology :			
11	Rice bean seeds are stored in bamboo baskets in mix with ash and common salt of 10 : 1 ratio. (BT)			
12	Farmers having the seeds of rice bean in kitchens at 6 – 7 feet height in buhienia leaves.			

CA : Complete Adoption

PA : Partial Adoption

NA : Non Adoption

BT : (Blended Technologies) are opertionalized as the technologies which are a blend of indigenous and modern practices

ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

TAPIOCA (*Manihot esculenta*)*Seema pendalum* (Telugu)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	Tapioca stem only with shorter internodes are selected for planting.			
2	Sets are planted vertically on the sides of ridges with their buds pointing upwards at a spacing of 3 – 4 feet on either side.			
3	Planting tapioca throughout the year is practiced by the farmers without any season.			
4	Yellowing and withering of bottom leaves indicate right time of harvest.			
5	Tapioca is harvested by digging the soil with hand hoe after irrigating it to get complete crop.			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

TURMERIC (*Curcuma longa*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production :			
1	Turmeric is mostly cultivated as podu by the tribals.			
2	Farmers used to sow turmeric rhizomes by digging soil with hand hoe and covering rhizomes with soil at 3 ½ x 2 feet spacing.			
3	Farmers believes that more number of rhizomes per plant can obtain by adopting more spacing between the plants.			
4	Finger rhizomes are more popular as a seed material and giving good yields.			
5	Groundnut cake is applied as manure after 15 – 20 days of sowing turmeric rhizomes.			
6	Mulching is practiced by the farmers with farm wastes to conserve soil moisture, and to increase water holding capacity of the soils. (BT)			
7	A 'kanka' (indigenous implement) is worked in between rows to control weed growth and facilitate earthing up of the plants.			
8	Harvesting of turmeric rhizomes is done by working by digging with the crow bar or spade after irrigating the field.			
9	Turmeric is harvested at alternative years from the ratoon crop.			
	Plant Protection :			
10	Leaf blotch disease can be controlled by planting dried palmyrah leaves in the turmeric field.			
11	Ash along with FYM improves the quality of turmeric and reduces the rhizome rot which is transmitted by carlbatofly.			
	Post Harvest Technology :			
12	Harvested turmeric is boiled in water and sun dried for 15 – 20 days and rubbed on soil to make it ready for sale.			
13	Instead of using the recommended sodium carbonate for curing the turmeric fingers, the farmers boil the turmeric fingers in cow dung solution because cow dung slurry promotes colour development.			
14	The graded turmeric is stored in gunny bags and kept on a long benches to reduce storage pest attack.			

CA : Complete Adoption

PA : Partial Adoption

NA: Non adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

GINGER (*Zingiber officinale*)

ALLAM (Telugu)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	After obtaining yield from ginger the stem portion is planted for ratoon, thus getting two crops in a year.			
2	Ginger rhizomes having on eye are planted on ridges at a spacing of 1 x 1 feet to get maximum yields in ginger.			
3	Mulching is done with green leaves at the time of planting ginger, to conserve soil moisture. (BT)			
4	Frequent earthing up is practiced in ginger to enhance crop growth.			
5	Time of harvest is indicated by the yellowing and drying of ginger leaves.			

CA : Complete Adoption

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

CHILLIES (*Capsicum annum*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Rangan mirapa' is an indigenous variety of chillies with medium size capsules and plant is bush like with more odour.			
2	'Chitti mirapa' is an indigenous variety of chillies, capsules is little and plant is medium in size.			
3	'Amengme' (tribal dialect) is an indigenous green chili cultivated by tribals in drylands (Garuvu) specifically.			
4	'Kolab mirchi' is an indigenous chilly variety bearing big size fruits and the plant is bush like.			
5	After two weeks of sowing seeds in nursery, the nursery is protected from hot sun by construction of 3 – 4 feet height roof with use of available sticks and leaves called 'pandiri'.			
6	Chilly seeds are broadcasted on the raised nursery beds, covered with a layer of ash and finally covered with adda leaves.			
7	15 – 20 days period is optimum for transplantation of chilly seedlings from nursery to the main field.			
8	For green chillies, well farmed intact and dark green fruits are alone picked.			
9	Well ripened, red coloured fruits alone are harvested for dry chillies.			
	Plant Protection :			
10	Thrash is burned on prepared raised nursery bed of 30 – 50 cm and well mixed with the top soil to control soil born insects. (BT)			
11	Two rows of maize or sorghum are grown for every five rows of chillies which control mosaic disease.			
12	Gramaxone is dusted on chilli plants to reduce insect problem.			
13	5 – 10 Kg of Kagu pindi is broadcasted in field during transplanting seedlings from nursery to protect the crop insect pests mostly termites.			
	Post Harvest Technology :			
14	If the seed is required for the next season, well dried fruits as such are stored for one year.			
15	The red chillies are hundred for 10-15 days continuously to reduce the moisture level to zero and stored in gunny bags.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

PINE APPLE (*Anona squamosa*) *Anasa panasa* (Telugu)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Panasa kaya' is the traditional Pine apple variety which is mostly cultivated by the tribals.			
2	'Sada Anasa Panasa' is an indigenous pine apple variety with small fruits which are more juicy in nature.			
3	July – August is the optimum season for sowing Pine apple hence it is practiced.			
4	Six inches long suckers collected from mother plant weighed for 200 – 300 gm are perceived to be suitable for planting.			
5	Farmers used to maintain 2 x 2 feet spacing in Pine apple cultivation.			
6	Weeding is practiced along rows in Pine apple in early stages of crop growth i.e., before 2 months age.			
7	Pine apple yields within 18-24 months after which two ratoons are allowed.			
8	Mulching is practiced with crop wastes to retain soil moisture and to improve water holding capacity of the soil in pine apple field. (BT)			
9	Growing tip of pine apple is nipped to obtain fruits with more size and weight.			
10	Yellow colouration and size of the fruit is the indication of harvest time in pine apple.			
11	The sucker bearing fruit is desuckered after harvesting the fruit thus allowing the other suckers to grow.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

BANANA (*Musa paradisiaca*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	'Konda arati' is a traditional banana variety cultivated by tribal farmers which requires less water.			
2	'Yerra arati' is an indigenous high yielding banana variety which is grown where more water is available.			
3	'Bathadigela' is a traditional banana variety grown by tribals for culinary purpose.			
4	'Komma arati' is an indigenous banana variety bearing big long slender green fruits is cultivated.			
5	'Konda mukhiri' is an indigenous banana variety bearing small yellow colour fruits is cultivated by the tribals.			
6	6 – 8 feet spacing is maintained by the tribals in banana cultivation.			
7	The suckers with 2 – 3 kg weight and 1 feet length are selected for planting.			
8	Before planting the suckers 10 kg of FYM + 1 Kg Urea is applied as basal manure. (BT)			
9	Before selecting banana suckers from a field the bunches of the mother suckers are seen for bunch weight and healthiness.			
10	Tribals used to desucker the main sucker after harvesting thus allowing other suckers to grow.			
11	For banana neem cake is applied @ 250 gms/sucker during 4 – 8 months age.			
12	Banana is ratooned upto three years by the tribal farmers on podu, to get additional income from the same crop.			
13	Inter cropping in banana with tuber crops like elephant foot yam and tapioca is practiced during first year.			
14	Desuckering is done from 3 months after planting upto flowering.			
15	Earthing up is practiced in once in 2 to 3 months to prevent soil erosion and to conserve soil moisture.			
16	Drying of the top leaves, change of skin colour to light green, brittleness of the floral ends are the symptoms for harvesting.			
	Plant Protection :			
17	Banana flag leaf is tied at the top of the bunch which prevents sun stroke and ensure healthy bunch.			
18	Periodical search to identify the bunchy top diseased plants and destroying them along with the suckers is practiced to eliminate the source of the disease.			
	Post Harvest Technology :			
19	Banana is stored by tying the banana leaves around the bunches to protect it from hot sun and to increase keeping quality.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

CASHEW (*Anacardium occidentale*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production			
1	Cashew nuts are collected by the farmers by watching the yields of particular plants regularly.			
2	Farmers sow cashew nuts in polythene covers filled with soil and farm yard manure and grow nursery for their plantations by their own.			
3	Farmyard manure (2 kg) + urea (0-.50 kg) is used to apply at base if the plant immediately after transplanting cashew seedlings to give nutrients to transplanted seedlings (BT).			
4	Cashew is inter cropped with sesamum, blackgram or greengram upto five years age of cashew to substantiate income during prebearing period.			
5	The cashew orchard is ploughed regularly to reduce weed problem and to give good tilth.			
6	Debudding of cashew flowers is done upto the age of five years to enhance vegetative growth during the period.			
	Plant Protection :			
7	Cloth is hanged on top of the cashew plant to scar away the birds.			
8	'Vadisa' is an indigenously made rope like pouch, in center of it a net will be there to host a small stone. The stone is thrown on birds by making rounds in air and thus realising stone lured to greater distance chasing away the birds.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE

TOBACCO (*Nicotiana tabacum*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop Production :			
1	Punarvasha to Ashlisha is the best season for sowing tobacco in nursery beds.			
2	Tobacco seedlings are grown in raised nursery beds with adequate drainage facility.			
3	Tobacco seeds are mixed with dry sand and broadcast on nursery bed to get uniform distribution and covered with available farm wastes as mulch.			
4	Diammonium phosphate (DAP) + calcium ammonium nitrate (CAN) + sulphate of potash + Farm Yard Manure is applied as basal after 15 days of sowing tobacco seedlings by digging at the roots of tobacco (BT).			
5	Sheep penning is practiced in tobacco field for getting higher yields during summer.			
6	Weeding is practiced after 15-20 days of basal application of fertilizers.			
	Plant Protection :			
7	Tobacco crop is rotated with maize or sorghum to reduce pest problem in tobacco.			
8	Tobacco plant is uprooted and burned or thrown out if Manukullu (Stem rot) is observed.			
9	Monocrotophos or Endosulfon is sprayed if akuchitta (leaf spot) is observed (BT).			
10	Neem is kernal extract (2%) is sprayed on the crop if leaf curl disease is observed in tobacco.			
11	Orabanche is manually removed as and when it appears before its flowering and seed set.			
12	Sorghum is cultivated as trap crop in tobacco which controls orabanche.			
13	A small piece of neem trunk is cutted and soaked in water for 2-3 months. An extract is prepared from this solution and sprayed on tobacco crop if Aku mudatha (leaf curl) is observed.			
	Post Harvest Technology :			
14	Harvested leaves of tobacco are stitched with mesta fibre and sundried by tieing both ends to two poles on open sun and allowing it for 15 – 20 days.			

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ADOPTION OF INDIGENOUS TECHNICAL KNOWLEDGE (ITKs) IN AGRICULTURE
MESTA (*Hibiscus subdarifa*)

S. No.	Indigenous Technical Knowledge (ITKs)	CA	PA	NA
	Crop production:			
1	Just three ploughing are sufficient for mesta cultivation.			
2	Dense planting is desired by the farmers in mesta because they believe that more plant population gives more yield in mesta.			
3	Sowing of mesta before Telugu new year (Ugadi) fetches higher fibre yield.			
4	Sowing of mesta is practiced during the month of August in some parts of high altitude and tribal area zone.			
5	Mesta is cultivated for consumptive uses only such as to stich tobacco leaves, make ropes etc. not as commercial crop.			
6	Mesta is cultivated as mixed crop with horsegram and harvesting horsegram after three months thus allowing mesta for maturity upto 6 months is practiced.			
7	Mesta is cultivated as mixed crop either with sesamum or red gram.			
8	Hand hoeing (Goppulu tadvuta) is the only intercultivation operation practiced by the farmers at early stages of mesta to control weeds.			
9	Mesta is harvested at the time of flowering for fibre and for seed purpose cultivate upto full maturity.			
10	Sprouting of buds in the axils of leaf is the indication for last stage of harvesting mesta. If harvest mesta beyond this stage fibre quality is poor.			
	Plant protection:			
11	Farmers uses light traps i.e. setting of fire on field bunds to control insect pests.(BT)			
12	Removal of bunchy tops along with masses of mealybugs (<i>Meconellicoccus hirsutus</i>) and their destruction to prevent the spread of pest to adjacent plants.			
	Post harvest technology:			
13	Farmers produce mesta seed for next crop by keeping the part of the crop up to full maturity stage which is identified by brown colouration of pods. The seeds are extracted after sundrying the mesta pods for 15-20 days in the field in upright position.			
14	Farmers used to sundry the seeds of mesta for 3-4 days and store in earthen pots to prevent storage pests.			
15	After harvesting mesta crop farmers keep the crop in field for 7-10 days. Meanwhile crop dries and leaves and twigs fall down in the field. It improves the soil fertility.			
16	Farmers kep the mesta sticks for 10 to 15 days in the farm ponds to soak thm in water. Meanwhile the fibre become soft and easy to separate fibre from the sticks.			
17	Mesta seed is stored after sun drying in mix with gamaxone (cheemala mandu) to prevent storage pest attack.			

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ANNEXURE

**EXTENT OF AREA OF MAJOR CROPS IN HIGH ALTITUDE AND
TRIBAL AREA ZONE OF ANDHRA PRADESH**

S. No.	Crop	Acerage (ha)
1	Paddy	1,46,000
2	Ragi	40,865
3	Sorghum	28,146
4	Little millet	26,215
5	Mesta	17,843
6	Niger	17,063
7	Bajra	15,159
8	Groundnut	12,682
9	Cashew	2,692
10	Banana	490
11	Vegetables	2,721
12	Ginger	1,193
13	Turmeric	1,350
14	Chillies	8,655
15	Beans	1,285
16	Tapioca	602

Source : High altitude and tribal area zone, Status Report, RARS,
Chintapalle

DOCUMENTATION OF ITKs

Plate 1 : Informal interview at Boyapadu village



Plate 2 : Group discussion with farmers of Kodisingi village



Plate 3 : Data collection during second phase at Pandirimamidi village



Plate 4 : Data collection during second phase at Nallaraiguda village



**Plate 5 : Prepared nursery bed for cauliflower indicate ITK No. 441
(Table 29)**



Plate 6 : Country plough indicate ITK No. 1, 6, 7, 12, 16 etc. (Table 11)



**Plate 7: Border crop of maize around cauliflower indicate ITK No. 433
(Table 29)**



**Plate 8 : Intercrop of cowpea with sorghum indicate ITK No. 146
(Table 14)**



**late 9 : Storage of seed in kitchens directly above the furnace indicate
ITK No. 311 (Table 20)**



**Plate 10 : Storage of pulses in earthen pots indicate ITK No. 356
(Table 25)**



**Plate 11 : 'Anapatumba' a storage structure with cucumbers indicate
ITK No. 303 (Table 20)**

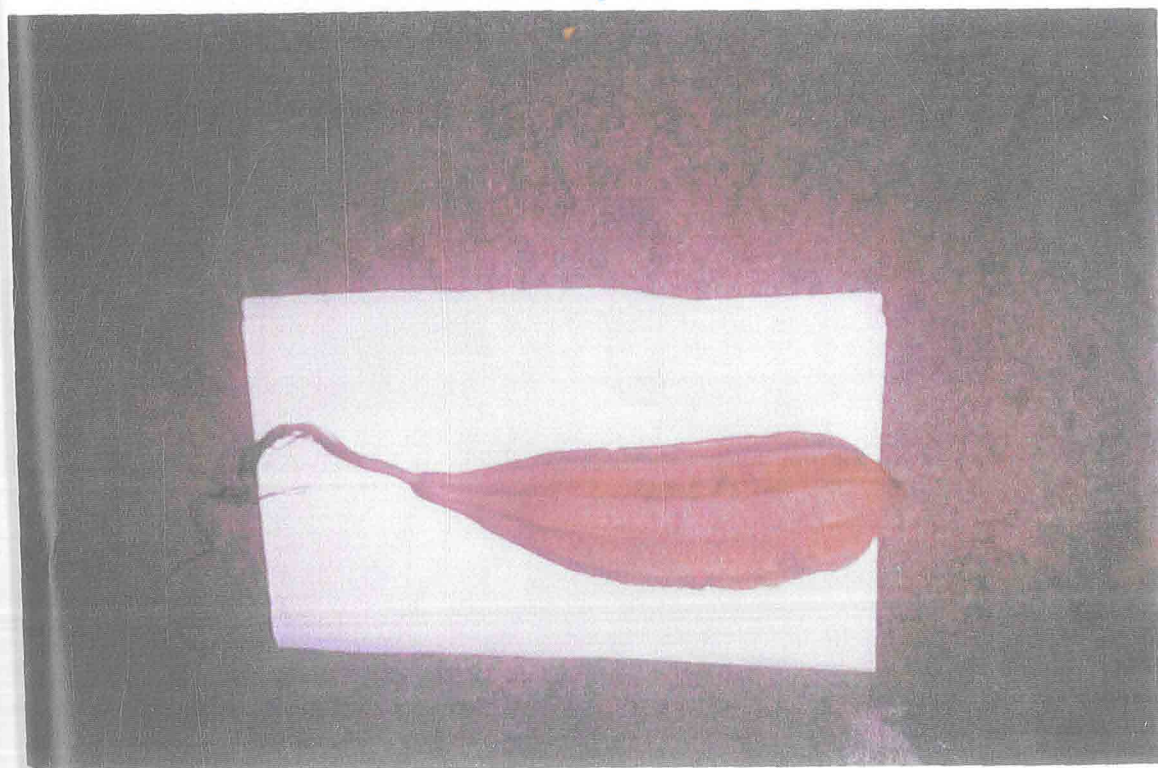


**Plate 12 : Storage of seed as such in gourds indicate ITK No. 407
(Table 29)**



**Plate 13 : Indigenous storage structure made with clay indicate
ITK No. 305 (Table 20)**

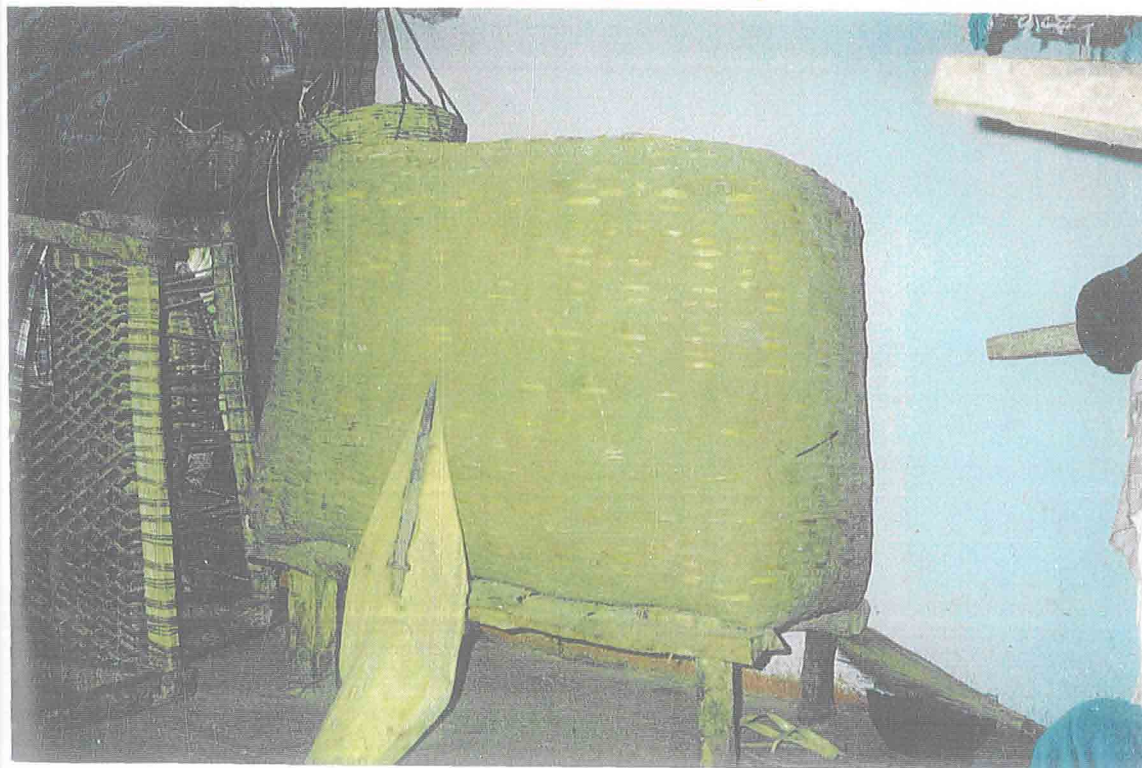


**Plate 14 : Indigenous storage structure with bamboo indicate
ITK No. 338 (Table 22)**



**Plate 15 : Land prepared for podu cultivation indicate ITK No. 46 & 48
(Table 12)**

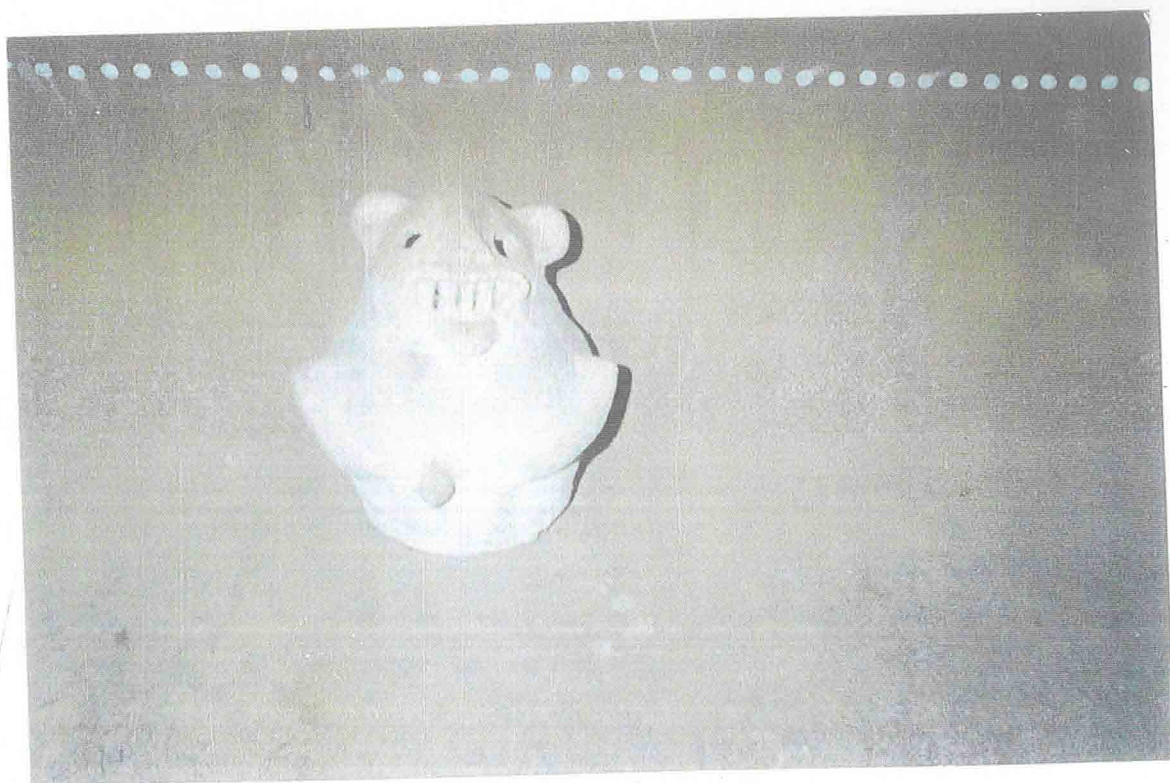


**Plate 16 : Earthen head weared for effigy indicate ITK No. 289
(Table 20)**

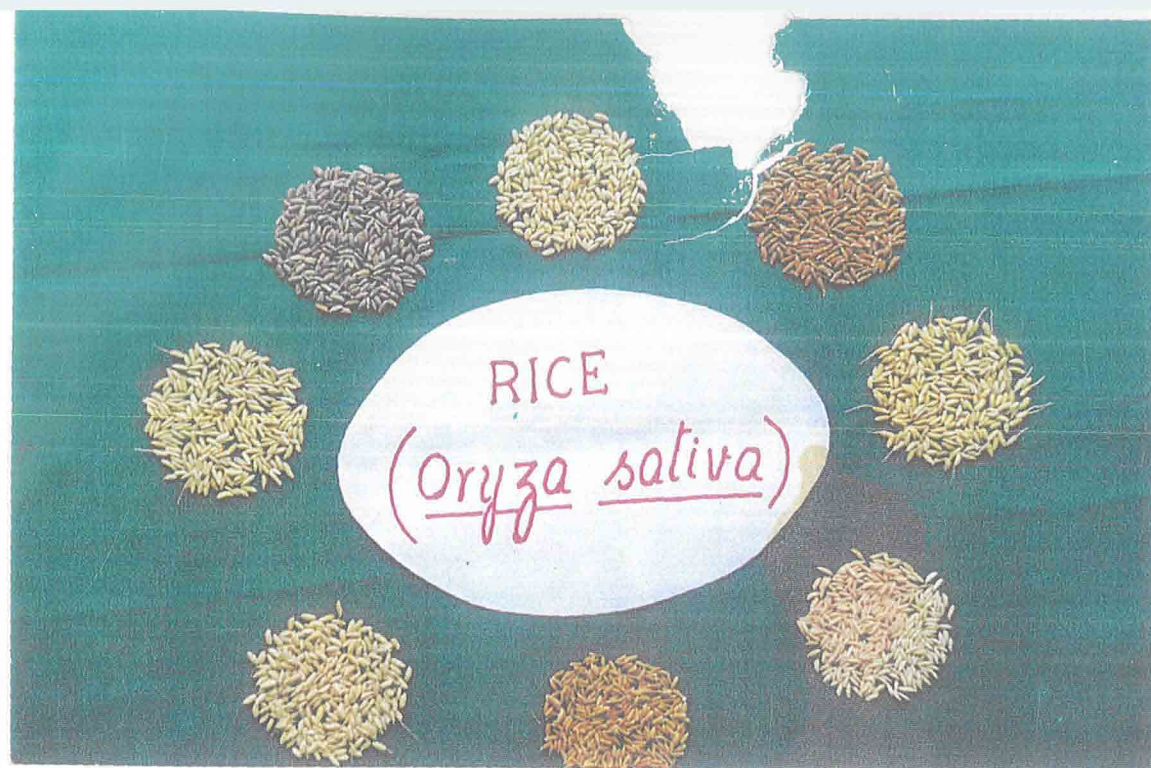


**Plate 17 : Indigenous paddy varieties indicate ITK No. 82 to 97
(Table 13)**

Source : RARS, Chintapalli



**Plate 18 : Indigenous variety of cowpea indicate ITK No. 409
(Table 29)**



**Plate 19: Indigenous implement 'Kanka' used by tribals indicate
ITK No. 11 and 39 (Table 11)**



Plate 20 : Modified 'Kanka' with iron shaft for digging

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