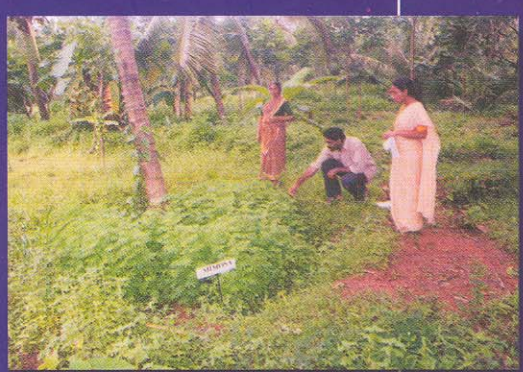
Technology Assessment Through Institution Village Linkage Programme



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TECHNOLOGY ASSESSMENT THROUGH INSTITUTION VILLAGE LINKAGE PROGRAMME

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Front cover

1. Dr V. Rajagopal, Director, CPCRI is distributing critical inputs to IVLP beneficiaries
2. The interface meeting of IVLP is in progress
3. Monitoring of the performance of green menure crops in coconut basin

Cover design

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FOREWORD

The National Agricultural Research System could evolve a large volume of technologies for improving the agricultural production and productivity in the country. These technologies could make a significant contribution for the green revolution in the country, through which we could achieve self-sufficiency in food production front. However, a large number of technologies recommended by the ICAR Institutes and State Agricultural Universities are available unutilised by the farming community, probably, due to certain inherent deficiency in the technology itself. To overcome this constraint, the Indian Council of Agricultural Research, in its committed attempts to generate and transfer agricultural technologies for the upliftment of farm families, has come up with a novel project 'Technology Assessment and Refinement through Institution Village Linkage Programme (IVLP)' during 1995-96.

The past few years have witnessed the beginning of a major shift in the approaches for improving food production in developing countries. Underlying this shift is a basic premise that the 'users' of technology are not only adopters but also creators of solutions themselves. This means, the end users of the technology must be elevated to the status of partners in the technology assessment and thereby refining the technology to suit their system. The IVLP strives to utilize this methodology for executing the technical programme.

CPCRI is one of the Centres implementing the IVLP since 1995-96. The project was implemented under ICAR Cess Fund Scheme during 1996-99 and subsequently under the National Agricultural Technology Programme (NATP) from 1999 onwards. CPCRI implemented over 39 technological interventions during the last six years and has come up with useful information.

The present publication entitled "Technology Assessment through IVLP" enlists the results of agro-eco system analysis carried out at the commencement of the project, along with the details of the technological interventions introduced in the study area, the results obtained from the interventions as well as the feedback for research and extension system and policy makers. I hope this document will be much useful to the personnel engaged in technology evaluation and transfer, so as to extrapolate the significant and successful technological interventions in similar domains.

I appreciate Dr. V. Rajagopal, Director, CPCRI, Kasaragod and Dr. S. Arulraj, Head of Division (Social Sciences), CPCRI, Kasaragod and Principal Investigator of the Project and other Core Team members for bringing out this publication. I wish all success to the scientists involved in the implementation of the project which strives for the betterment of Indian farmers.

New Delhi
28.01.2002

Dr. P. Das
Deputy Director General (Agrl. Extension)
ICAR

PREFACE

The Technology Assessment and Refinement Project is a step forward in achieving effective operational linkages between scientific institutions and the farmers for technology integration and optimization to meet the growing demands of different production systems to increase productivity, augment income and improve the quality of life of rural people.

Technology transfer, to be effective, must be preceded and succeeded by technology assessment. How reliable is the assessment can be judged by the effectiveness of transfer of a given technology. Technology assessment and transfer are complementary to each other. Technology transfer must be based on needs and capabilities of agro-ecological distribution systems and farm household. The ultimate aim of researchers, extensionists and developmental agencies is to empower the farmer with the appropriate knowledge, technique and skills so as to enhance the capability to judiciously exploit the natural resources and family labour for sustainable agriculture and rural development.

Realising the need for the identification of location - specific technologies, ICAR launched the Institution Village Linkage Programme (IVLP) for Technology Assessment and Refinement during 1995-96. In Kerala State, three centres are implementing the IVLP to cater to the specific requirements of respective regions. Thus, CPCRI is implementing the IVLP since 1995-96 to assess and refine the technologies as applicable to Northern Kerala conditions. The present publication includes a brief introduction about the back ground situation in which the project was envisaged, followed by a detailed chapter on the PRA exercise conducted at the commencement of the project for situation analysis and the results of the interventions undertaken in the different farming systems as prevailing in the study area.

We gratefully acknowledge the guidance, encouragement and support given by Dr.P. Das, Deputy Director General (Agrl. Extn), ICAR, Dr. A.N.Shukla, Asst. Director General (KVK), ICAR, Dr. R.K.Samanta, Zonal Coordinator, our former Directors Dr. M.K.Nair and Dr. K.U.K.Nampoothiri as well as the present Director Dr. V. Rajagopal and the Heads of Divisions as well as the entire scientific community from CPCRI, NRC for Cashew, Indian Institute for Spices Research and the Kerala Agricultural University. Special thanks are due to Mr. C. H. Amarnath, Technical Officer, CPCRI for his able support to prepare this book. We appreciate M/s. Niseema Printers for their kind co-operation to publish this book in record time. Suggestions for improving the effectiveness in the implementation of the project are most welcome.

Kasaragod
29.01.2002

AUTHORS

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CHAPTER I

INTRODUCTION

Indian Agriculture has made rapid strides in the past four decades, making the country self-sufficient in food production. Green Revolution from sixties onwards, has helped to increase the food grain production from 50 m tonnes in 1950-51 to 198 m tonnes in 2000-01. However in the present era of globalization and economic liberalization certain macro and micro level changes are taking place in the primary sector of the Indian economy posing many challenges to the research and development sectors of agriculture and its allied enterprises. To meet these challenges, Indian agriculture has to maintain a higher level of technical and economic efficiency through higher productivity, for which technology plays a very crucial role. Even among the technologies identified, location specific technologies, which could meet the challenges posed by the agro-ecological situations in a locality play a critical role in improving productivity and subsequently increased returns from adoption.

Research results based on field experiments in the research institutes, need not suit to the needs of the farmers or some refinement on these findings would enhance the adoption rate of the recommended technologies. The reasons are obvious because there are many differences in the place where the technologies have originated from the place where they are going to be adopted. Hence for realizing better rate of adoption of the technologies, the researchers should understand these differences and needs to refine and assess their technology.

Major differences between the environment of the Research Station and Farmers Fields

S. No.	Particulars	Research Station	Farmers field
01.	Experimental results	Often evolved under homogeneous conditions	Heterogeneity is the rule
02.	Farming environment	Ideal conditions prevail	Heterogeneous
03.	Factors of production	Controlled	Subject to time, production and price risks
04.	Land	Usually large and in general land is not a major constraint for conducting the experiments	In India more than 80 percent of the farmers are small and marginal and are having land area of less than one hectare
05.	Source of investment	Based on budget allocation from the sponsoring organization	Mainly from farm business income
06.	Capital	Often unlimited	Often limited in case of small and medium farms and adequate in case of medium and large farms

S. No.	Particulars	Research Station	Farmers field
07.	Irrigation facilities	Not a serious constraint	Serious constraint during summer months
08.	Infra-structure	Often well developed	Often limited in case of small and medium farms and adequate to unlimited in case of medium and large farms
09.	Labour	Permanent labour and casual labour available in time	Mostly dependent on hired and family labour
10.	Marketing	Bulk and generally on contract basis	Often staggered and less marketed surplus and mostly to village traders
11.	Effect of production and price risks	Less impact	More impact
12.	Concept of resource recycling	Often in theory	Often put into practice
13.	Support from institutional agencies	Not required	Often needed
14.	Socio-economic Factors	Often have less impact	Often have more impact

Farming systems are usually characterized by activities related to crop and animal production, family and household consumption, production, labour and leisure time usage and off-farm household tasks. Technology development and transfer activities that consider these complexities would be able to provide technologies which will be accepted by the farmer. Technological developments, adoption and transfer based on problems identified by the farmer (bottom-up) are likely to be more effective in producing technology acceptable to farmers then a top-down approach. Unfortunately, technological packages developed are designed mostly through experimental station research work; their domains of extrapolation have not been delimited. Therefore, it is important that farmers, researchers and extension personnel establish a proper linkage in development of technology. The concept of Institution Village Linkage Programme is expected to provide proper understanding of farmers' farming, situations and strong Researcher - Extensionists - Farmer linkages.

Technology assessment and refinement project is a step forward in achieving effective operational linkages between scientific institutions and the farmers for technology integration and optimization to meet the growing demands of different production systems to increase productivity, augment income and improve the quality of life of rural people.

Technology transfer, to be effective, must be preceded and succeeded by technology assessment. How reliable is the assessment can be judged by the effectiveness of transfer of a given technology. Technology assessment and transfer are complementary to each other. Technology transfer must be based on needs

and capabilities of agro-ecological settings, resources endowments, agro-production distribution systems and farm household. The ultimate aim of researchers, extension personnel and developmental agencies is to empower the farmer with the appropriate knowledge, technique and skills so as to enhance the capability to judiciously exploit the natural resources and family labour for sustainable agriculture and rural development. Further, the feedback received from the past extension programmes was inadequate to reset the research and transfer of technology agenda on a large scale.

In this background, the significance of client oriented research projects received higher attention among the planners and policy makers, which had led to the genesis of the concept, Technology Assessment and Refinement (TAR) through Institution Village Linkage Programme (IVLP). This project aims in developing technologies, which are suited to specific farming situations. As the technologies are assessed and refined with full association and participation of the farmers, its adoption and dissemination will be better and faster.

Objectives

The Overall objective of the study is technology assessment and refinement which means to introduce technological interventions with emphasis on stability and sustainability along with productivity of different production systems. The specific objectives are :

1. To introduce technological interventions with emphasis on stability and sustainability along with productivity of small farm production systems.
2. To introduce and integrate the appropriate technologies for maintaining productivity, profitability and environmental securities.
3. To promote community action for developing and sharing of natural resources.
4. To monitor socioeconomic impact of the technological interventions for different farm production systems.
5. To identify extrapolation domains for new technology/technology modules based on environmental characterization at meso and mega levels.

CHAPTER II

PROBLEM IDENTIFICATION USING PRA TECHNIQUES

2.1. Technology Spread among Resource-Poor Farmers

During the past five decades, agricultural development policies have been remarkably successful by emphasizing external inputs as the means to increase food production. This has led to growth in the consumption of inorganic fertilizer, pesticides, animal feed stuffs and tractors and other machinery. Consequently, we have achieved appreciable levels of agricultural progress in the recent years. However, there has been little effect of green revolution technologies in most of the holdings of the resource-poor farmers. New technologies rarely spread beyond the large/ resourceful farmers and the aggregate impact remains small. But it is the declared intention of the Government in our country to increase production from these holdings as well, both to improve the standard of living of these hitherto neglected sector of farmers and also to make a greater contribution to our country's increasing needs. Where extension does reach them, the approach has been to attempt the transfer of technologies proven to work on research stations rather than on farmers' fields. Consequently, new technologies rarely spread beyond the large farmers and the aggregate impact remains small. The lack of progress by resource-poor farmers is a feature of agricultural development in many countries and it has been argued that it is largely due to its inappropriateness of the Transfer Of Technology (TOT) approach used in many research and development programmes.

2.1.1. The Linear Model

World-wide, most scientists and economists implicitly use the 'popular' linear model of KGEU (Knowledge Generation, Exchange and Utilization). This linear model underpins the design of most of the national agricultural knowledge institutions, the World Bank's T&V system of extension, the training of agricultural scientists and so on. The model is linear and sequential, in that research first generates knowledge, which is then transferred by extension and finally utilized by farmers. The one-directional flow is from National Agricultural Research System (NARS) to subject matter specialists, to extension workers, to contact farmers and from them to follower farmers. The model does not consider farmers as experimenters and technology developers but as passive receptors and users. In its extreme form, TOT can be summarized as an approach where scientists develop high input technologies on research stations where there are no constraints on resources and often with little or no direct contact with target farmers; these technologies are then 'transferred' to farmers via a process of demonstration and 'education'. The problem with modern agricultural science is that technologies are finalized before farmers get to see them. If new technologies are appropriate and fit a particular farmer's conditions or needs, then they stand a good chance of being adopted. But if they do not fit and if farmers are unable to make changes, then they have only one choice. They have to adapt to the technology or reject it entirely. While this approach has undoubtedly worked in many of the more favourable regions, it can have serious limitations for less favourable regions because the developed technologies can so easily be wholly inappropriate for an environment, which is both physically and socio-economically poor. Furthermore, in the less favourable regions, the likelihood of TOT approach developing inappropriate technologies is often exacerbated by a very

limited understanding of the real needs and constraints of the resource-poor farmers.

2.1.2. Participatory Technology Development (PTD)

The alternative to overcome the present malady is to seek and encourage the involvement of farmers in adapting technologies to their conditions. This constitutes a radical reversal of the normal mode of research and technology generation, because it requires interactive participation between professionals and farmers. Participatory Technology Development (PTD) is a process in which the knowledge and research capacities of farmers are joined with those of scientific institutions, whilst at the same time strengthening local capacities to experiment and innovate. Farmers are encouraged to generate and evaluate indigenous technologies and to choose and adapt external ones on the basis of their own knowledge and value systems.

Why PTD?

Our contention is that institutionalizing farmer participation in research could be of much relevance to Indian Agriculture due to the inadequate focus on Farmers' problems in the current system of research and development. The major problem areas that "threaten the very concept of evolving improved technologies" in agricultural research system, as identified by the G.V.K. Rao Committee are (1) an inadequate focus on local problems in research programmes and (2) an excessive emphasis on uniformity of experiments and a straight jacket approach in research. The National Agricultural Research Project (NARP) initiated in 1978 strengthened research infrastructure in the Zonal Research Stations of SAU's substantially. However, the research programme planning process at many ZRS were neither relevant to the farmer's needs nor have the researchers been able to embrace problem solving adaptive research mode. The Johl committee of ICAR in its report observed that the need and scope for substantial farmer participation through farmers' associations in developing appropriate research programmes in order to account for complexities of required knowledge involved and the ecology as well as the social environment in which farmers' work.

Emergence of PTD

In the recent years, increasing numbers of agricultural development projects have demonstrated that agricultural production can be improved in resource - poor regions through the adoption of technologies provided that farming households themselves are fully involved in the generation of technologies, in their extension to other farmers and in the experimental adaptation to local conditions. In many locations, small revolutions in institutional support and farming practice are occurring; returns to investment are rapid; the poor became better off and more secure; the region produces surpluses and the country as a whole benefit. But, of course, researchers and farmers participate in different ways, depending on the degree of control each factor has over the research process. The most common form of 'participatory' research is researcher designed and implemented, even though it might be conducted in farmers' fields. Many on-farm trials and demonstration plots represent nothing better than passive participation. Less commonly, farmers may implement trials designed by researchers. But greater roles for farmers are even rare. In a few researcher-designed experiments, even though farmers "participate" in implementing the trials, there is widespread uncertainty about what researchers are actually trying to achieve. Farmers misunderstand experiments and reject the new technologies. The reason is that "cooperation between farmers and researchers implies two groups continually listening carefully to one another. Most of the farmers are avid listeners to the researchers. The challenge is for all the on-farm researchers to complete the circle".

Although this means that technology development must involve farmers, it does not

mean that scientific research has no place. Research will have to contribute on many fronts, such as in the development of resistant cultivars, knowledge about the life cycle of pests, biological control methods, and suitable crops for erosion control and process in nitrogen fixation. Such research also gives insight into complex processes such as the movement of nutrients in the soil and their accessibility for plants. But all these contributions must be seen as providing choices for farmers as they make farm-specific decisions and move the whole farm towards greater sustainability.

The history of crop domestication is essentially the application of farmer selection techniques to the genetic diversity presented in their fields. Farmers are capable of maintaining a large number of varieties of crop and can select plants with desirable characteristics for continued development. Thus the majority of examples used to support the proposal of giving farmers the leading role in on-farm experimentation involve testing new varieties or new crops. However, participation, if it is to become part of the research system, must clearly be interactive and empowering. Any pretence to participation will result in little change. Allowing farmers just to come to meetings or letting a few representatives sit on committees will be insufficient. One of the justifications for giving more emphasis to farmer participation in breeding programmes is the argument that farmers have knowledge, experience and an ability to experiment that have been virtually ignored by conventional agricultural research. Participatory research is also put forward as a step towards "empowerment", a way of enabling farmers to organize and either demand attention from the State or performs for themselves those functions that the State is unwilling or unable to provide.

2.1.3. Transect walk

Situation analysis, prioritization of problems and preparation of action plan could be carried out by using the PRA methods like Transect walk. The method of Transect walk relates to learning about selected areas from local communities through undertaking joint walks to those areas. Such walking with communities helps in observing different aspects of a selected area in a locality, which require greater attention and detailed discussions with community members.

Transect walk with local communities can help in directly observing and probing on different issues. In such a method an outside team of professionals walk with local community members from one selected point in an area to another selected point and while walking, the community members explain and discuss the nature of the issue/s related to that area, whether of natural and/or social resources involved in that area, the problems, priorities and opportunities. Such joint walks involve detailed understanding of issues related to selected areas from local people.

2.1.4. Matrix Scoring

Acceptance of new technologies depends on the perceived economic benefits and the relative advantage of the technology as compared to the existing practice. While the economic benefits could be measured in terms of benefit-cost ratio, return per rupee of investment etc., the relative advantage factor could be measured through the PRA method of Matrix scoring.

Matrix scoring is concerned with scoring of a range of criteria against a range of comparable items. The range of comparable items on which scoring takes place can relate to a group of relevant items as selected by local community members. They can be a set of trees, a set of animals, a set of crops or different varieties of the same crop, a set of cooking devices, a set of trees in a home garden, a set of vegetables etc.

2.2. Project Area

The study is taken up at Kasaragod district of Kerala state, which is located in the northern most part of Kerala bordering Karnataka. The total geographical area of the district is

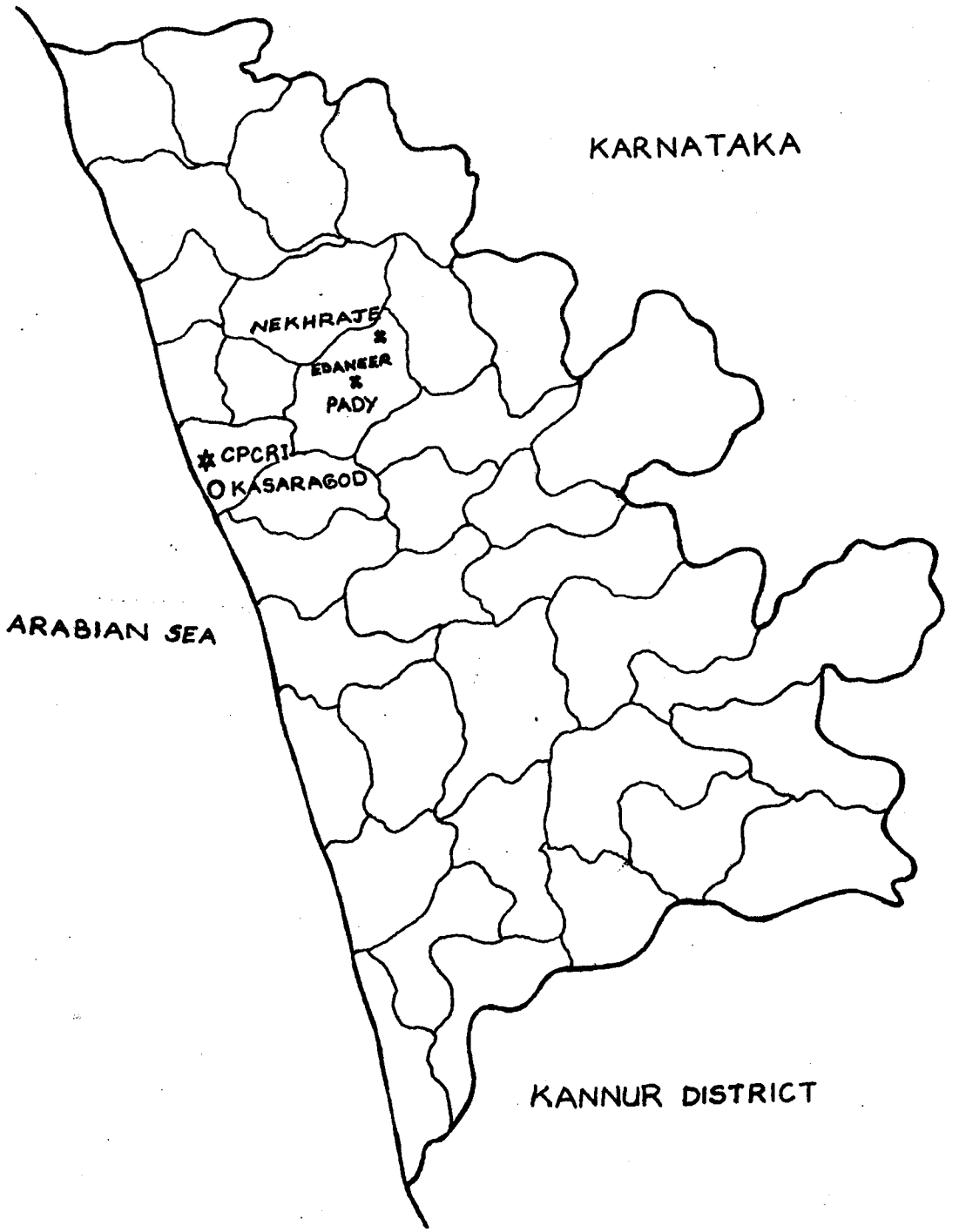

Fig. 1: Location Map of Project Villages

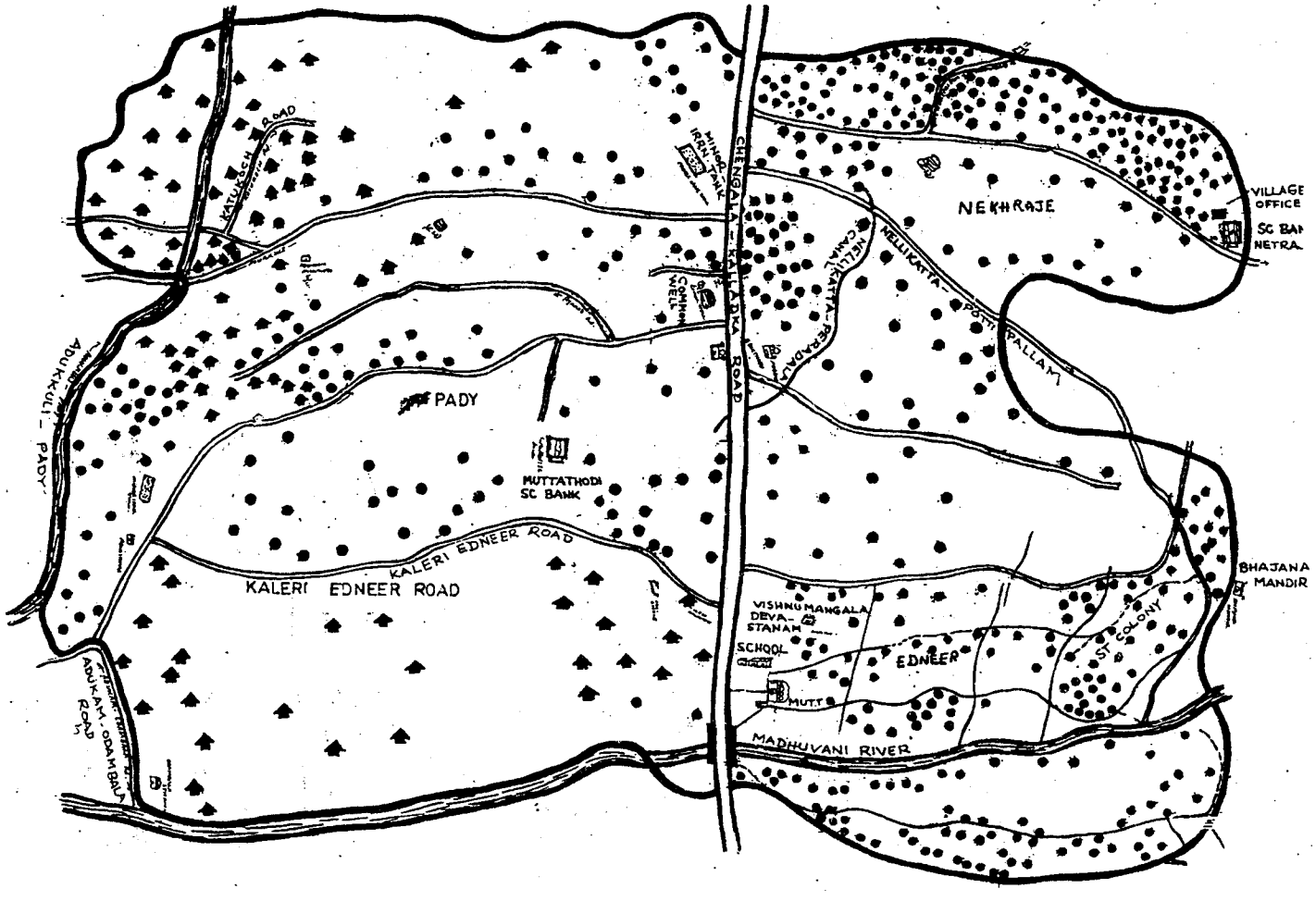

Fig. 2: Social and Physical Map of Project Area

1061 sq. km. It is spread in North-West-South-East axis and is about 82 km in length. It covers a total geographical area of 1,96,133 ha. The climate of the district is classified as warm-humid sub- tropical. The mean annual rainfall of the district is 3462 mm. The total population of the district is 10,71,508, which is about 3.8% of total population of the state. The Schedule Caste population is about 7.64% and that of Schedule Tribe is 2.73%. Density of population in the district is 537 per Km^2.

Out of the total geographical area of 1,96,133 ha, the gross cropped area is 1,40,757 ha. The net irrigated area in the district is 30,419 ha. The cultivable wasteland is 17,184 ha. The important crops grown in the district are coconut, arecanut, cashew and paddy. Per capita availability of milk is 112 g per day, which is one of the lowest in the state. There are 2,20,087 cows and 21,240 buffaloes. The district has two veterinary hospitals, 29 veterinary dispensaries and one veterinary polyclinic. The fertilizer consumption in the district is 34.7 kg /ha as against 8 1.5 kg/ha in the state. Among 1,53,422 land holdings about 84% of the holdings are 1 ha and below.

The project area covering 770 contiguous farm families are located in three villages namely Edneer, Pady and Nekhraje (Fig. 1). These villages are situated 15 km away from the Central Plantation Crops Research Institute. The distance from one village to another is 4-5 km. These villages represent the socio-economic situations of the district as it has representative soil types, crops and farming situations. Primary institutions like Co-operatives, Schools, Panchayat and Primary Health Centres are available in the villages.

2.3. Participatory Rural Appraisal (PRA)

Participatory Rural Appraisal (PRA) technique has been employed in this programme to ensure the actual involvement of people and the developmental agencies (both Government and non-Governmental) in the following:

- To gather general information on broadly defined problems and focus on priority issues. This also helps further research.
- To deepen knowledge on a particular topic and generate more specific hypothesis with recommendation for intervention.
- To evaluate the results of a programme (or) intervention and reconsider prior hypothesis in the light of experiences and modify the intervention programmes and
- To involve the population in planning or review action effecting them and chalk out a programme or plan of action researched and designed by the local people.

2.4. Agro-ecosystem Analysis

This is one of the important activity to be undertaken before the implementation of the programme. This will provide an idea about farmers' present production practices, resource levels and specific problems to be intervened under various crops and systems. Various components of the agro-ecosystem analysis are as follows:

Space Analysis: Information on social fabric of the villages, physical features and details on land use pattern are vital. These are necessary to know the problems of the farmers and then to formulate the concrete programmes. Village map depicting social, physical and land use pattern etc. of different villages are depicted in the form of figures.

Social, physical and land use map: Diagrams are simple schematic device that presents information in a readily understandable visual form. Diagrams and maps are shared information that can be checked, discussed and demonstrated. Maps were prepared on social, physical, land use and soil and hydrology aspects of Edneer, Pady and Nekhraje and are depicted in Fig. 2, 3 & 4. Through this mapping exercise, the main

features of the villages such as housing, temples, village water source, schools, balwadies, shops, hand pumps, wells for drinking water and irrigation, health centre, approach road connecting the village with nearby State/National highways are drawn by the villagers with the help of PRA technique.

Village Transect: The purpose of transect is to identify the major problems and opportunities in the agro-ecosystem and where they are located. Transect indicate the major topographical features with associated list of crops, livestock, problems and opportunities.

The transect through these villages indicated that, there are three types of situations based on the topography. It varied from highland to medium and lowland. In high lands mostly cashew and casuarina, in medium lands coconut, arecanut, banana, pepper, rice and vegetables and in lowlands arecanut and rice are grown. The soil types are lateritic in high lands, red sandy loam and alluvial in medium land and loamy in lowlands. In the high land the depth of water table is about 20 m, in medium land 8 m and in low lands about 3 to 4 m. Most of the households have wells. The water from the wells is used for drinking and also for irrigating crops in the household.

Land Use Pattern: In the highlands predominantly cashew is grown. However, there is no systematic cultivation of cashew. Farmers are satisfied with the yield realized with minimum attention. In the middle lands rice and coconut are grown. Predominantly local varieties of rice and coconut are grown. In most of the paddy fields only one crop of paddy is cultivated in rainy season and only 30-40% of the farmers are growing second crop of paddy. Few of the farmers are growing vegetables namely cucumber, bhendi, sweet potato and chilli after first crop of paddy. In the low land, paddy and arecanut are grown. The adoption of improved varieties in the three villages is only 10-15%. Nearly 20% of the land in these villages can be classified as wasteland.

Enterprises: Knowledge about the different enterprises in the village is necessary to develop realistic programmes. In all the three villages, important crops are coconut, arecanut, rice and cashew. In uplands, cashew and some forest tree species and in midlands, arecanut, paddy, coconut and vegetables and in low lands, arecanut and paddy are grown. In these villages, three categories of farmers namely, small, marginal and landless can be seen. Small and medium farmers grow arecanut, coconut, cashew and paddy crops. Marginal farmers grow mostly paddy, coconut and cashew. Landless inhabitants mostly go for agricultural related labour works. In their households they have few coconut palms and also grow vegetables for their household consumption. There are few big cultivators having more than 2 ha of arecanut garden with other enterprises like dairy etc. Household enterprises prevalent in the villages are poultry and dairy on a small scale. On commercial scale, there is one poultry unit at Pady village. Goat rearing is also prevalent on small scale among the Muslim community in all these villages.

2.5. Time Line Analysis

To know about the village background and history it is necessary to gather information from village elders. In this exercise, sequence of events that have taken place in village community with, approximate dates is prepared. This is very useful to understand the background of a village and the emergence and development of particular programmes and activities related to agriculture, education, health, social facilities etc. The time line details of the villages are as under:

Edneer

This village was under forests and inhabited by wild animals. Around 1900 AD, there were six families staying in the village. Earlier the main crop grown in the village was sugarcane. During 1915, there was an epidemic of plague and in 1941 there was severe flood. Consequent to severe scarcity of food in 1942-43, the cultivation of paddy was started. First primary school was started in 1926 and first post office was opened in 1960. In 1976 for the first time a check dam was constructed.

Television was first brought in the village in 1986 and cooking gas in 1991.

Pady

Origin of this village started with the migration of 15 families from near by Mogral Village. During 1970s high yielding varieties of rice namely IR-8 and IR-20 were introduced. During 1980s cashew crop was introduced into the village. During 1985, Krishi Bhavan Office was opened in the village under Department of Agriculture.

Nekhraje

This village is known after the Nekhraje dynasty. During 1935, district board school was opened in the village. In 1956, a co-operative bank was started. In 1978, for the first time coconut T x D hybrid was planted in the village. Electricity connection was given in 1985.

2.6. Seasonality Analysis

The crops grown in different seasons, their variety used, planting time, harvesting time and other operations related to various crops were collected through PRA technique.

Climate: To decide about the suitable crops and related problems, it is essential to know the details about various climatic parameters in the village. The maximum temperature ranged from 28.7° C to 33.1 °C and minimum temperature from 19.5° C to 24.2° C. The mean annual rainfall of the district is 3462 mm. The peak rainfall months are June, July and August. From November to May the rain received is only a small fraction of the total rainfall.

Crop and Crop Rotations: Knowledge about prevailing crops and crop rotation and their problems is necessary to formulate the programmes for the village. In the highlands, cashew is the major perennial crop cultivated. In the midlands previously it was a practice to grow two crops of paddy. Now-a-days, due to non-remunerative returns and labour shortage, only one crop is grown. Some of the cultivators are growing pulses like cowpea and some vegetable crop after first crop of rice. Coconut is also a major crop in the midlands. In the homesteads along with the coconut, mango, jackfruit, banana and pepper are also grown in a scattered way. In the low lands arecanut is the major crop. In the arecanut gardens, banana and pepper are grown as inter/mixed crops.

Seasonality and Labour Availability: The seasonality of the work indicated that peak labour, requirement in the months of June to October. During these months, major works like rice nursery and transplanting, spraying in arecanut, fertilizer application in coconut and arecanut gardens and harvesting of rice will be carried out. Next peak labour demand was in the months of January and February during which major works like harvesting and processing of arecanut will be under taken. The remaining periods i.e., November, December and March April were relatively with less labour demand.

2.7. Matrix Ranking

The purpose of matrix ranking is to know the criteria of preference of a crop or variety by the villagers. This information was collected from farmers of the villages, through PRA technique. The crops and criteria were chosen by farmers themselves, which was drawn on the floor, and was later transferred to the paper.

Edneer: The matrix scoring showed that the farmers' criteria for selection of crops and subsidiary enterprises was mainly dependent on profitability, labour demand, domestic needs, irrigation requirement and marketing. The farmers of the village, considering the above criteria felt that arecanut and cashewnut are the most preferred crops and coconut was preferred next to these crops. Majority of the farmers were of the view that rice cultivation is not profitable due to its high labour demand and low market price for the produce. Hence, farmers felt that mechanization in cultivation and high supporting price for rice should be given to encourage farmers for cultivation.

Pady: The crops chosen for this analysis are rice, coconut, pepper, arecanut, cashewnut,

banana, mango, tamarind and jackfruit. The criteria considered are profitability, marketing, domestic use, labour requirement, Government subsidy, scope for inter or mixed cropping, irrigation requirement and pests and disease incidence. Regarding profitability of the crops, arecanut got the maximum score followed by cashewnut and coconut while mango, jackfruit and tamarind got less scores. As far as marketing facilities are concerned, pepper followed by arecanut and cashewnut are more preferred by the farmers whereas mango and jack have poor marketing facilities. With regard to domestic use, rice followed by coconut and tamarind got maximum score followed by mango and jack, whereas pepper, arecanut and cashewnut got less score. When high labour requirement is placed as the criteria, farmers gave maximum score to rice followed by arecanut whereas tamarind and jack got least score. With reference to government subsidy, farmers are of the opinion that rice is the crop that gets maximum subsidy followed by coconut and cashewnut. Farmers preferred arecanut and coconut as the crops having good scope for growing inter or mixed cropping.

They consider that rice followed by arecanut and banana require maximum irrigation. With regard to pests and disease incidence, they rated rice, arecanut and pepper on par. In general, farmers prefer arecanut because of higher profitability, rice and coconut for domestic use, and pepper for good marketing facilities. They have a personal feeling that rice crop should he made profitable through mechanization of cultural operations. They consider arecanut as the best crop under irrigated conditions and cashewnut for rainfed condition in uplands. Banana and pepper grown as intercrops, are preferred by farmers as they are more profitable and have good marketing facilities.

Nekhraje: Based on the farmers' perception and preference for crops, pepper, arecanut, coconut and cashew are the most preferred. From the point of view of profitability, pepper, cashew and arecanut are given maximum score, while rice and vegetable crops minimum. However, considering the dome needs, farmers felt that given the bet technology and subsidized inputs, they a interested to take-up rice and vegetable cro cultivation.

2.8. Changes And Trends

This is needed to know farmers perceptio for changes over the period of time on variou aspects including, agriculture, health education, animal husbandry and related social aspects.

Edneer: The farmers of this village expressed that there is a gradual reduction in rainfall over the years. As a result of water scarcity rice, sugarcane and tobacco crops were replaced with arecanut and coconut. Pepper crop is newly introduced in coconut and arecanut gardens. Arecanut and coconut productivity is increasing over the years whereas paddy and cashew productivity is decreasing. Educational and living conditions are improved over the years. Thatched house is converted to tiled houses and number of houses are increased by 10-15 % a year. Soil erosion is increasing and live stock population is gradually decreasing over the years.

Pady: Village has undergone many changes in its agriculture, irrigation and infrastructure facilities. In 1960's there were subsurface tunnels for collecting water and as the days passed by during 1970, open wells became common. Regarding cropping pattern, from 1960's to 1990's, there is a steady decline in the rice cultivation as the crop became less and less profitable. Correspondingly arecanut area increased during the same period due to attractive price. Between 1960's and 1970's, labour availability has shown a declining trend due to migration and changing to other occupations, correspondingly labour charges have increased over the years. Marketing facilities have improved considerably during 1990's as compared to 1960's.

Nekhraje: A downward trend was noticed with respect to rainfall, rice cultivation, forest

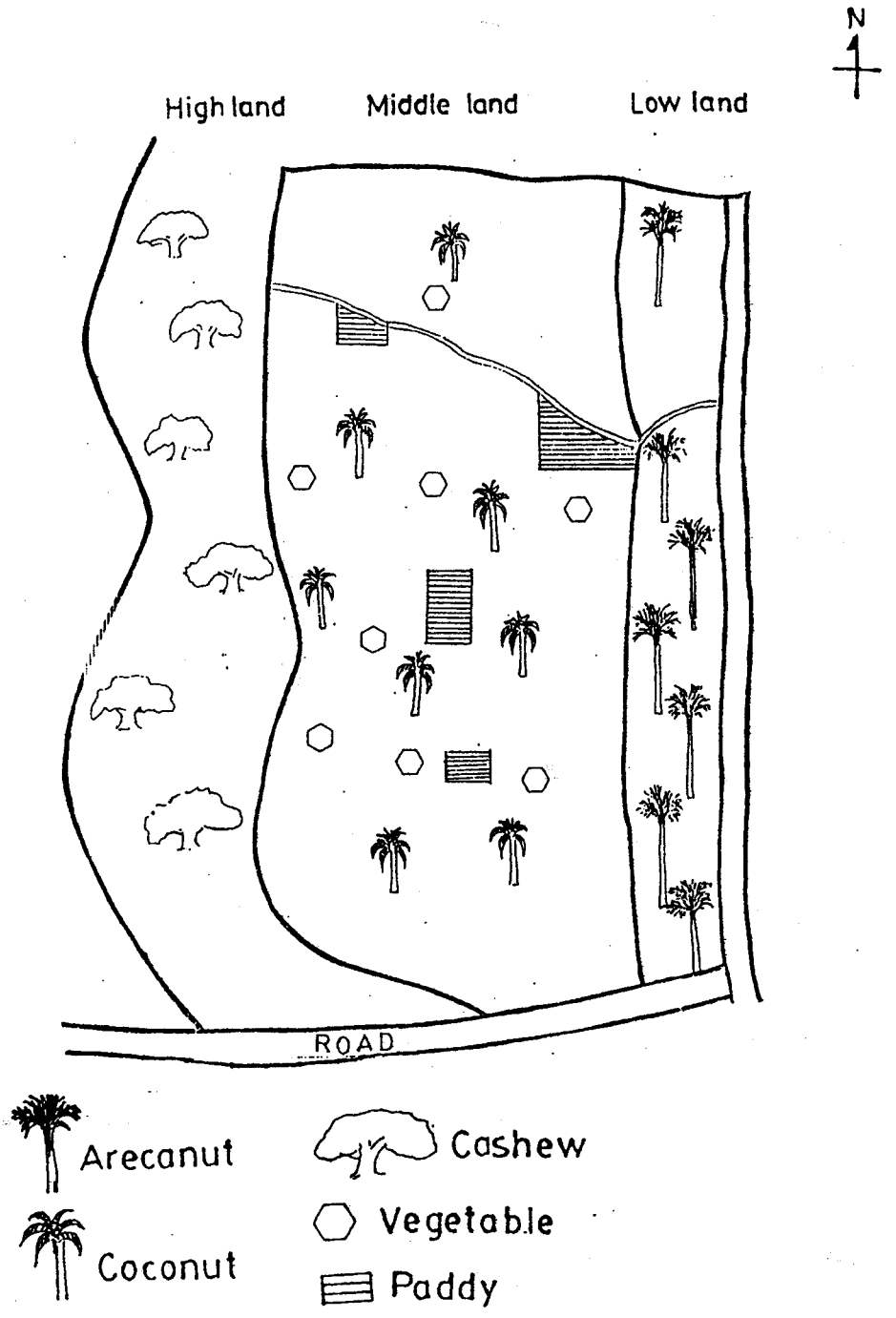

Fig. 3: Land Use Map

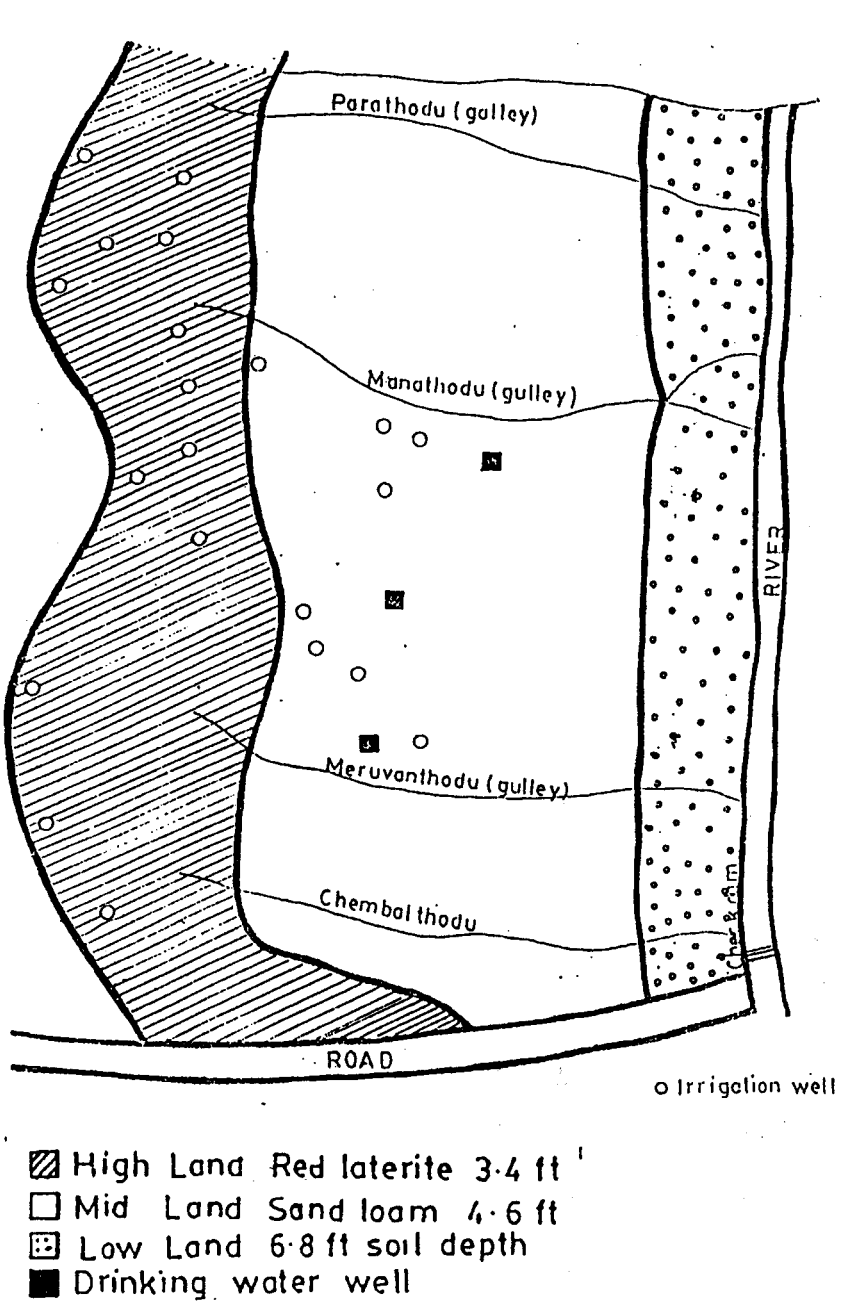

Fig. 4: Soil And Hydrology Map