TECHNOLOGY ASSESSMENT AND REFINEMENT THROUGH INSTITUTE- VILLAGE LINKAGE

A SURVEY REPORT

CENTRAL PLANTATION CROPS RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
KASARAGOD - 671 124, KERALA
INDIA

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FOREWORD

Under the aegis of Indian Council of Agricultural Research, New Delhi, Central Plantation Crops Research Institute, Kasaragod has initiated a Pilot Project on "Technology Assessment and Refinement Through Institute-Village Linkage Programme" (IVLP) in order to generate and disseminate appropriate agricultural technologies and their integration into the farming systems through farmer participatory approach. A cluster of three villages having 710 farm families and representing Nothern Kerala for social, cultural, economic and agro-ecosystem was selected near Kasaragod for the implementation of this project.

The core team members of IVLP at our center have prepared a excellent project document using Participatory Rural Appraisal (PRA) exercises for agro-ecosystem analysis in order to formulate the need based technology modules for each farm family. Since the selected villages represent Northern Kerala in all the aspects of farmer-farming situations, I am confident, that the idea of publishing this Survey Report would help the Agricultural Scientists and Extension Officials along with farmers participation in boosting up the production and productivity of agricultural crops in the region.

(MK Nair)
Director

Kasaragod
20th August 1997

प्रस्तावना

उचित कृषि तकनीकों के विकास, विस्तार तथा कृषक सम्मिलित दृष्टिकोण द्वारा इन तकनीकों के कृषि पद्धति में एकीकरण के लिए भारतीय कृषि अनुसंधान परिषद, नई दिल्ली के अधीन केन्द्रीय रोपण फसल अनुसंधान की ओर से ''संस्थान-ग्राम संबंध कार्यक्रम से तकनीकी निर्धारण और परिष्कार'' पर एक पाइलट् परियोजना प्रारंभ की गई है । इस परियोजना के कार्यान्वयन के लिए कासरगोड़ के आसपास के तीन गॉवों के 710 कृषक परिवारों और उत्तार केरल सामाजिक, सांस्कृतिक आर्थिक एवं कृषि-जलवायु पद्धति के प्रतिनिधियों को चुना गया ।

हरएक कृषक परिवार के आवश्यकता आधारित तकनीकी को रूप देने के लिए ग्रामीण मूल्यनिरूपण की सहायता से कृषि-जलवायु पद्धति विश्लेषण के लिए इस केन्द्र के ऐ.वी. एल पी मुख्य टीम ने एक अत्युत्तम परियोजना प्रलेख तैयार किया है । उत्तर केरल के चुने गये गॉव कृषक-कृषि परिस्थिति के सभी पहलुओं का प्रतिनिधित्व करते है । मुझे विश्वास है कि इस सर्वेक्षण रिपोर्ट का प्रकाशन तथा कृषक भागीदारी, कृषि वैज्ञानिकों और विस्तार अधिकारियों को इस क्षेत्र में कृषि फसलों के उत्पादन एवं उत्पादन क्षमता बढाने केलिए सहायक होगा ।

एम. के. नायर.

(एम. के. नायर)
निदेशक

कासरगोड़
20 अगस्त 1997

ACKNOWLEDGMENTS

The cooperation, financial assistance and guidance received from the ICAR headquarters especially form DDG (Extension) and Dr SP Singh, Principal Scientist are duly acknowledged. Our thanks are due to Shri RS Ramamurthy, Technical Officer, Zonal Coordinating unit, TOT, NDRI campus, Bangalore for providing insight into the subject and inspiration. Finally, we acknowledge the farmers, farm women and officials from Development departments for their active participation and help in implementing the programme in the project area.

CONTENTS

1. INTRODUCTION

Green Revolution during sixties and Agricultural Research thereafter have helped to increase the food grain production from 50 m tonnes in 1950-51 to 193 m tonnes in 1995-96. During the course of time, it became obvious that for improvement in the food production, the research agenda as well as technology transfer have to be need based. This could be possible only when the researchers have direct contact with the farmers. Keeping this in view, earlier many extension programmes like Lab to Land, National Demonstration, ORP, KVK etc. were launched. However, they could achieve limited success since greater emphasis was given on demonstrating the research results rather than technology assessment and refinement suiting different production systems and local conditions.

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 do not consider these complexities might attempt to extend inappropriate technology which will not be accepted by the farmer. Agricultural scientists' often have little knowledge or understanding of the farmer's problems and the farming situations in which he operates. As a result, often the developed technologies are not suiting the users conditions. 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 extensionists establish a proper linkage in development of technology. This new concept of Institute - Village Linkage Project is expected to provide proper understanding of farmers' farming situations and strong Researcher - Extensionist - 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 preceeded 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, 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.

Further, the feed back received from the past extension programmes was not adequate enough to reset the research and transfer of technology agenda. The present project while in operation will bring out adequate feedback on concurrent basis in addressing the issues in a more comprehensive manner.

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 of Technology Assessment and Refinement

The specific objectives of technology assessment and refinement programme will be as under :

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 to sustain technological interventions and their integration to maintain productivity and profitability taking environmental issues into consideration in comparatively well defined farm production systems.
3. To introduce and integrate the appropriate technologies to increase the agricultural productivity with marketable surplus in commercial and off-farm production systems.
4. To facilitate adoption of appropriate post-harvest technologies for conservation and on-farm value addition to agricultural products, by-products and wastes for greater economic dividend and national priorities.
5. To facilitate adoption of appropriate technologies for removal of drudgery, increased efficiency and higher income of farm women.
6. To monitor socio-economic impact of the technological interventions for different farm production systems.
7. To identify extrapolation dom[illegible] technology/technology modu[illegible] environmental characterisation [illegible] mega levels.

2. *BACKGROUND INFORMATION*

2.1 Kasaragod District

Kasaragod is the northern most district of Kerala bordering Karnataka. The total geographical area of the district is 1061 sq. kms. It is spread in North-West-South-East axis and is about 82 kms 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 (as per 1991 census) 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. There is one veterinary institution for every 7960 ACWs. The fertilizer consumption in the district is 34.7 kg /ha as against 81.5 kg/ha in the state. Among 1,53,422 land holdings about 84% of the holdings are 1 ha and below.

2.2 Project Area

The project area covering 710 contiguous farm families are located in three villages namely

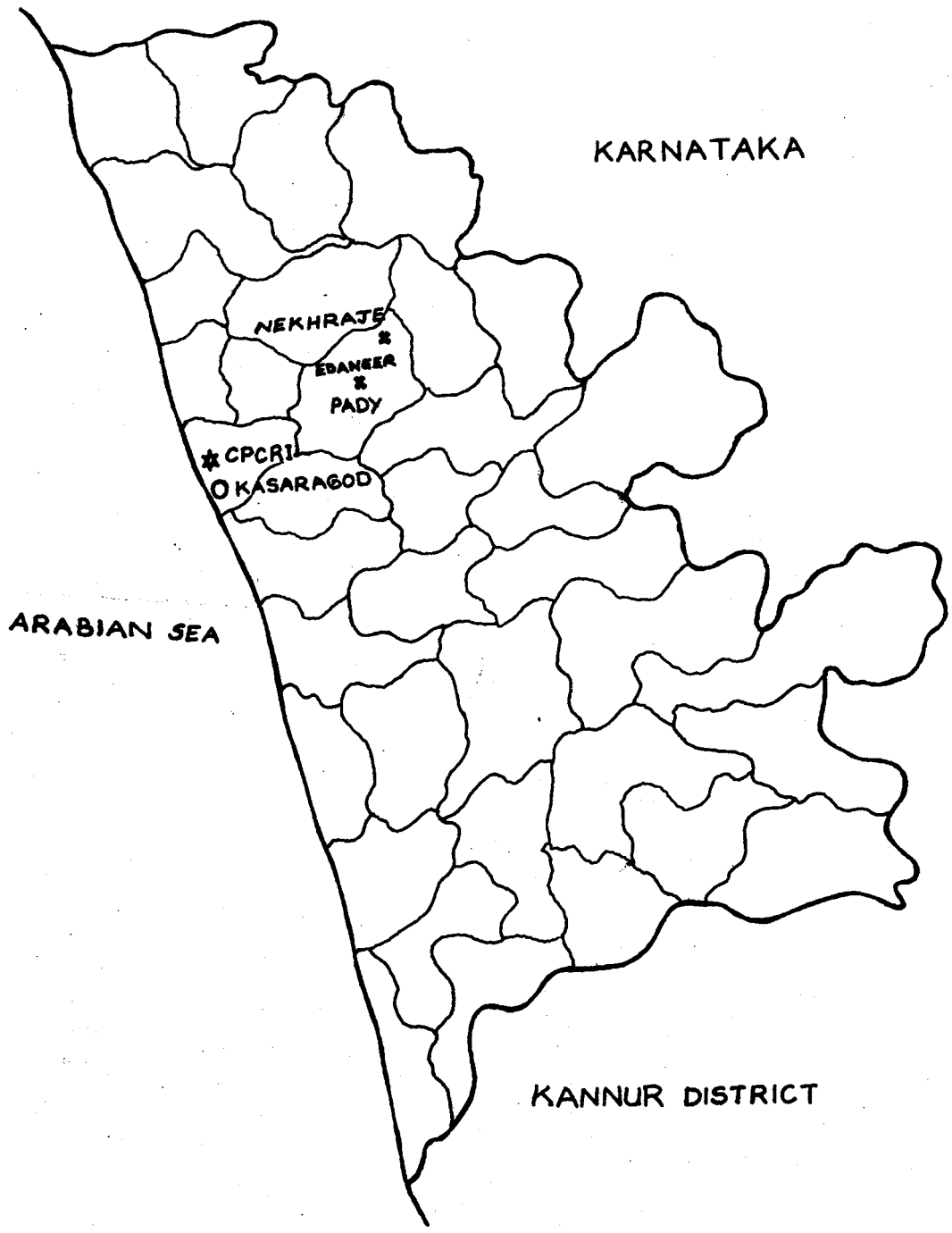


Fig. 1: Location Map of Project Villages

Edneer, Pady and Nekhraje (Fig.1). These villages are situated about 10-15 kms away from the Central Plantation Crops Research Institute. The distance from one village to another is 4-5 kms. 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 there in the villages.

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.

3.1 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 which presents information in a readily understandable visual form. Diagrams and maps are shared information which can be checked, discussed and demonstrated. Maps were prepared on social, physical, land use and soil and hydorlogy 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 details in respect of the village transect is given in Fig. 5.

The transect through these villages indicated that, there are three types of situations

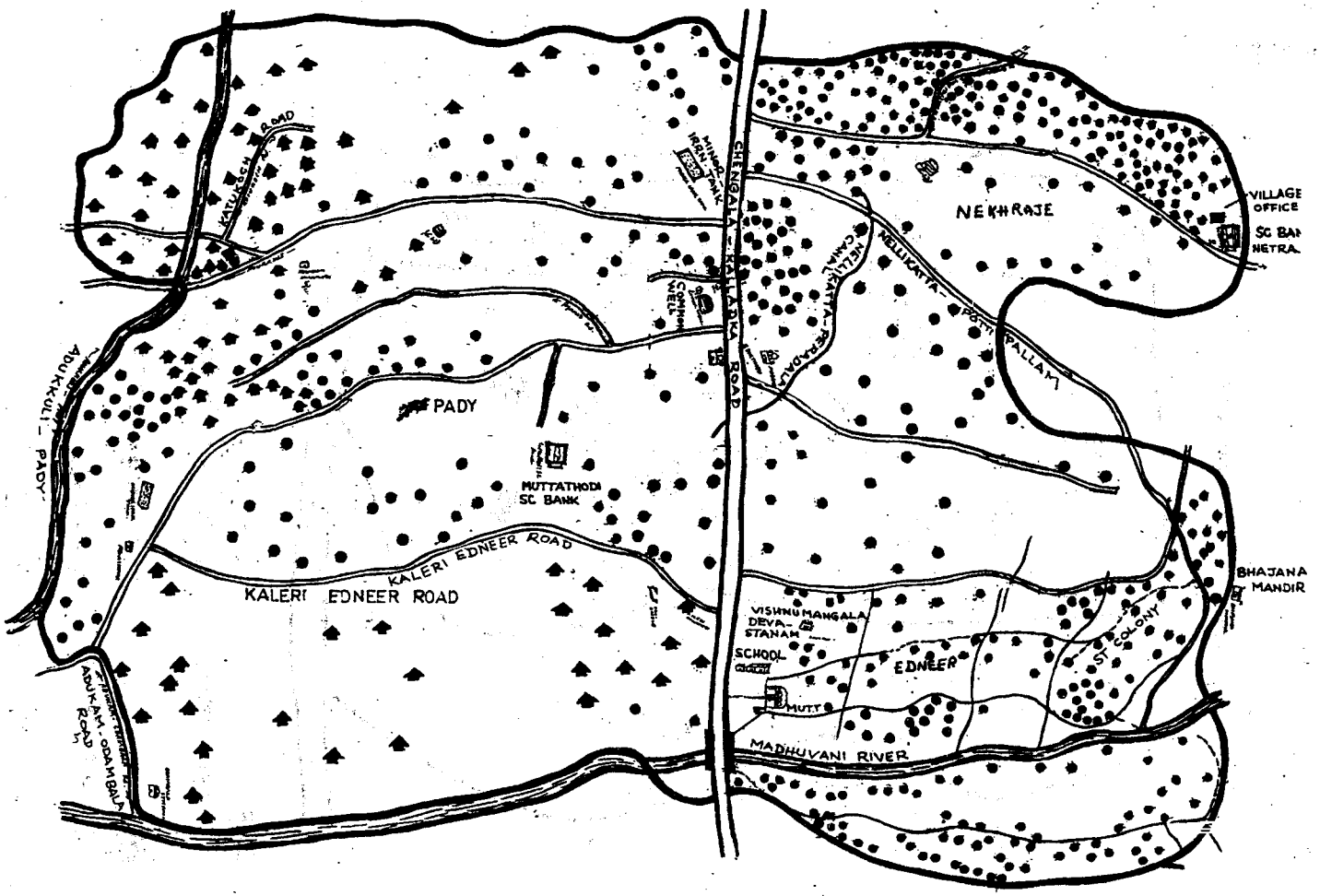


Fig. 2: Social and Physical Map of Project Area

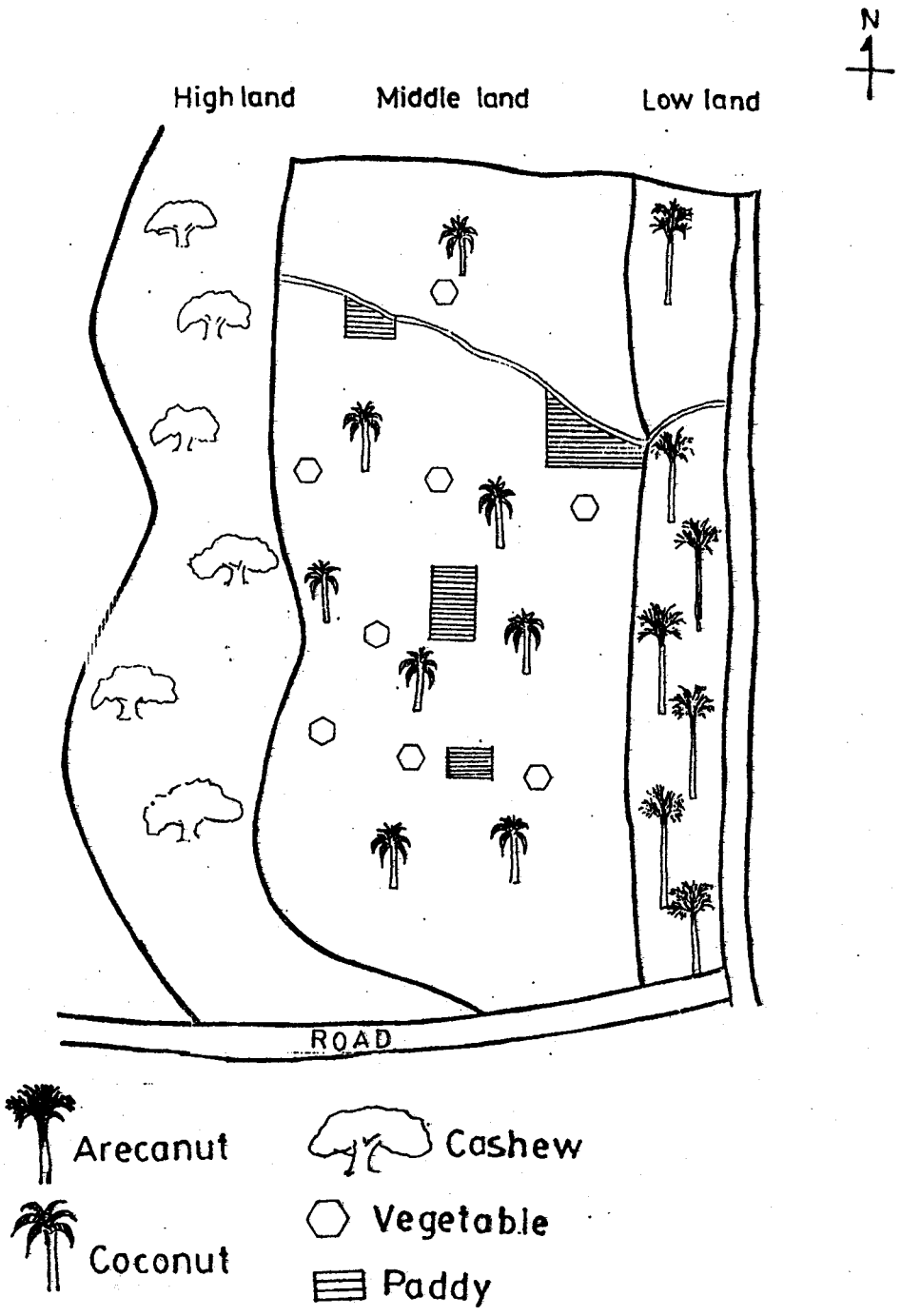


Fig. 3: Land Use Map

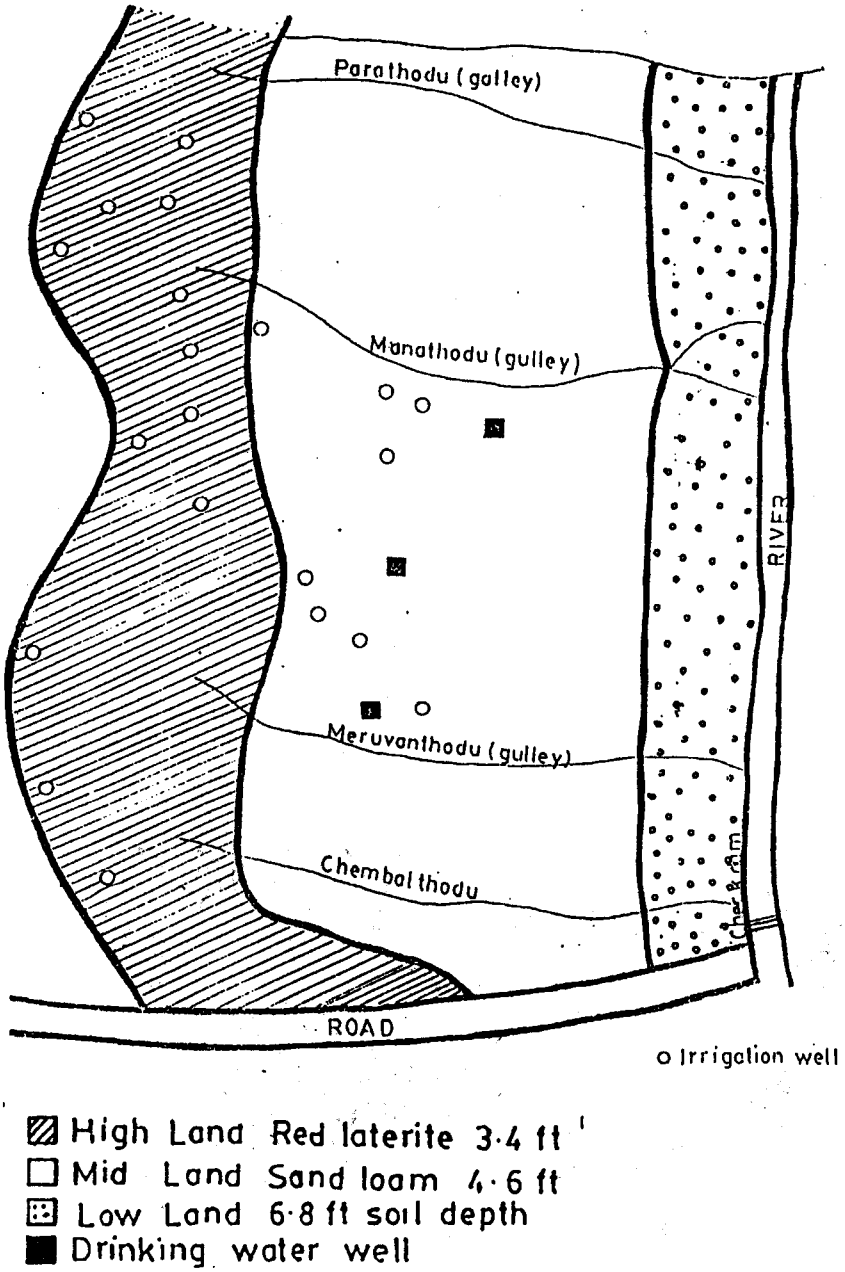
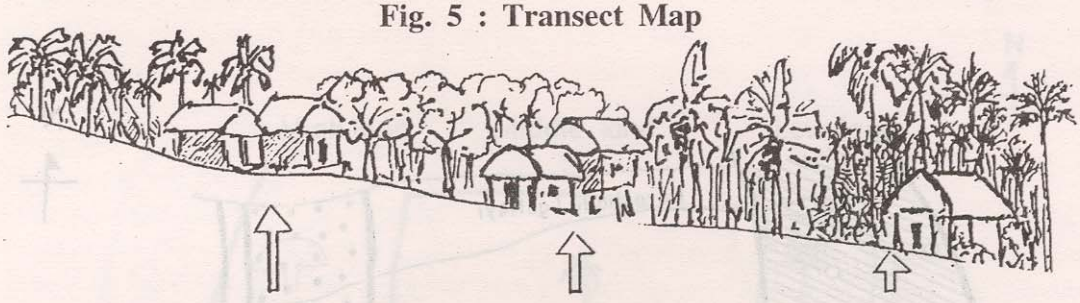


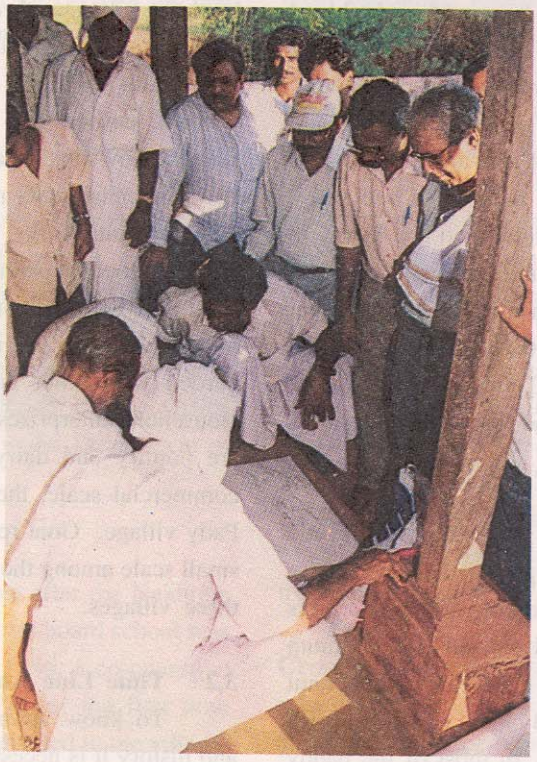
Fig. 4: Soil And Hydrology Map

Fig. 5 : Transect Map



Land Type	Upland	Medium Land	Low Land
Soil	Laterite, 3-4 ft	Sandy loam, Alluvial, 4-6 ft	Loam Sandy loam, 6-8ft
Water table	16 M	6-8 M	4 M
Crops	Cashew, Casurina	Coconut, Banana Paddy, Vegetables Mango, Jack fruit	Arecanut, Banana Pepper, Paddy, Vegetables
Trees	Casurina	Mango, Jack fruit	Mango, Jack fruit, Bamboo
Live stock	-	Goat, Cows, Poultry	Cows, Poultry
Problems	Soil erosion, Inadequate irrigation facility, Poor soil fertility, Poor Management	Man power shortage, Poor management, Pests and diseases, Inadequate irrigation, Poor water retention.	Poor irrigation facility, Poor management, Inadequate drainage, Soil erosions, Man power shortage.

Discussion with the farmers during the transect



Farmers preparing social map

Farmers preparing soil and hydrology map

based on the topography. It varied from highland to medium and lowland. In high lands mostly cashew and casurina, 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 60 feet, in medium land 25 feet and in low lands about 10-15 feet. Most of the households have wells. The water from the wells are used for drinking and also 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.

3.2 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 1970 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.

3.3 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 details in respect of average monthly rainfall collected through PRA is represented through bar diagram in Fig. 6.

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 the 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 perennial single crop. In the midlands previously it was a practice to grow two crops of paddy (Fig 7). Now-a-days, due to non-remunerative returns and labour shortage,

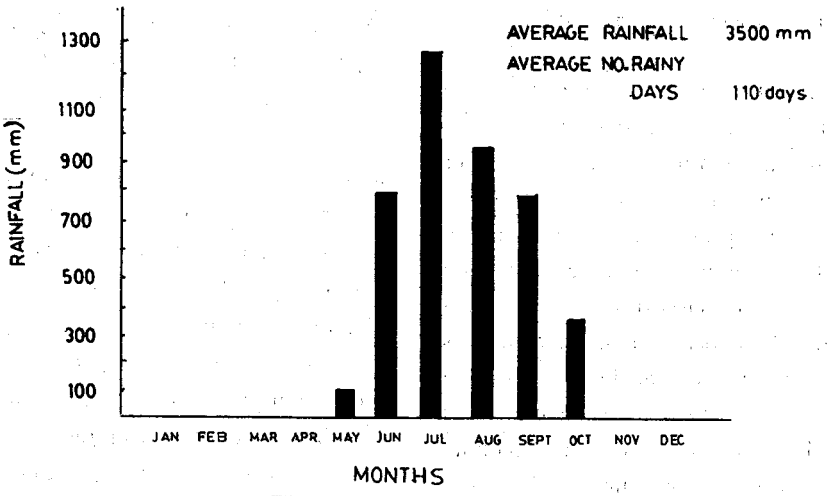
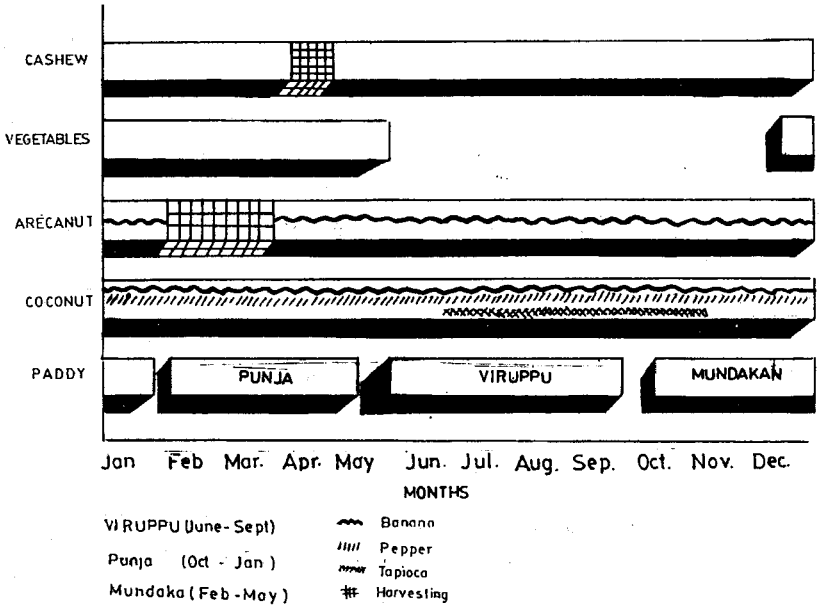


Fig. 6: Rainfall Pattern

Fig. 7: Cropping Pattern



only one crop is grown. Some of the cultivators are growing pulses like cowpea and some vegetable crop after first crop of paddy. 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 (Fig. 8). During these months, major works like paddy nursery and transplanting, spraying in arecanut, fertilizer application in coconut and arecanut gardens, and harvesting of paddy 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.

3.4 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. Matrix ranking for crops as conceived by the farmers of Edneer, Pady and Nekhraje are depicted in Table 1, 2 and 3. 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 paddy cultivation is not profitable due to

Fig. 8: Labour Requirement And Deficit

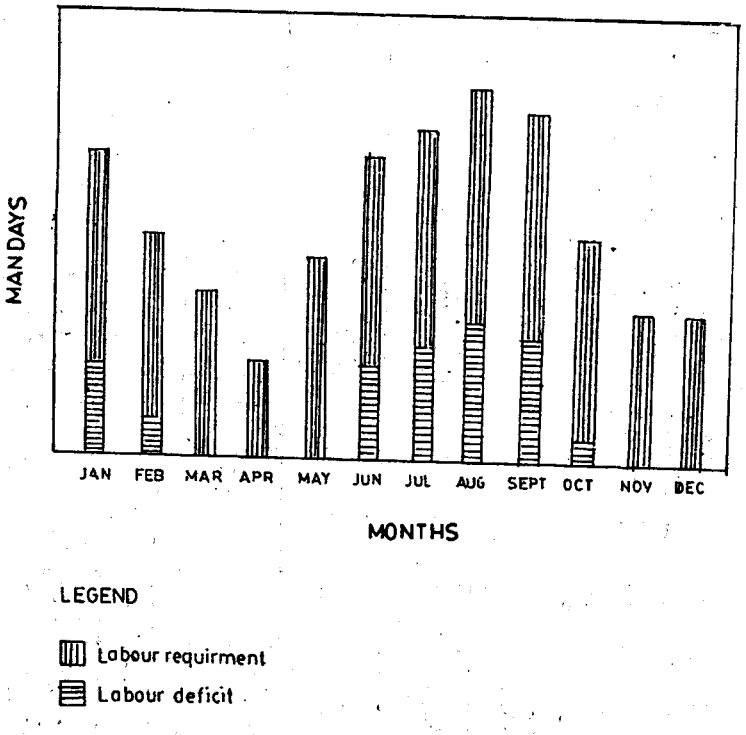


Table 1: Matrix Ranking For Crops - Edneer

PARTICULARS	ARECANUT	COCONUT	PADDY	CASHEW	VEGETABLES
1. Profitatability	▽▽▽▽▽ (5)	○○ (2)	(0)	○○○ (3)	▲ (1)
2 Less labour requirement	▽▽▽ (3)	○○○○ (4)	□ (1)	○○○○ (5)	▲▲▲ (3)
3 Domestic needs		○○○ (3)	□□□□ (4)	(0)	▲▲▲ (3)
4 Irrigation	▽▽▽▽▽ (5)	○○○○ (4)	□□□ (3)	(0)	▲▲ (2)
5 Market facility	▽▽▽▽▽▽ (5)	○○○ (3)	(0)	○○○○ (4)	▲▲ (2)
6 Saitabality for Inter crops	▽▽▽▽▽ (5)	○○○○ (4)	□ (1)	(0)	▲▲ (2)
7 Price fluctuation	▽▽▽▽▽ (5)	○○○○ (4)	(0)	○○○○○ (5)	▲▲ (2)
8 Initial Investment	▽▽▽▽▽ (5)	○○○ (3)	□□□□ (4)	○ (1)	▲▲ (2)
9 Soil type	▽▽▽▽ (4)	○○○○ (4)	□□□□□ (5)	○○○○ (4)	▲▲ (2)
10 Govt facility	▽▽▽▽ (4)	○○ (2)	□□□□□ (5)	○○○ (3)	▲▲ (2)

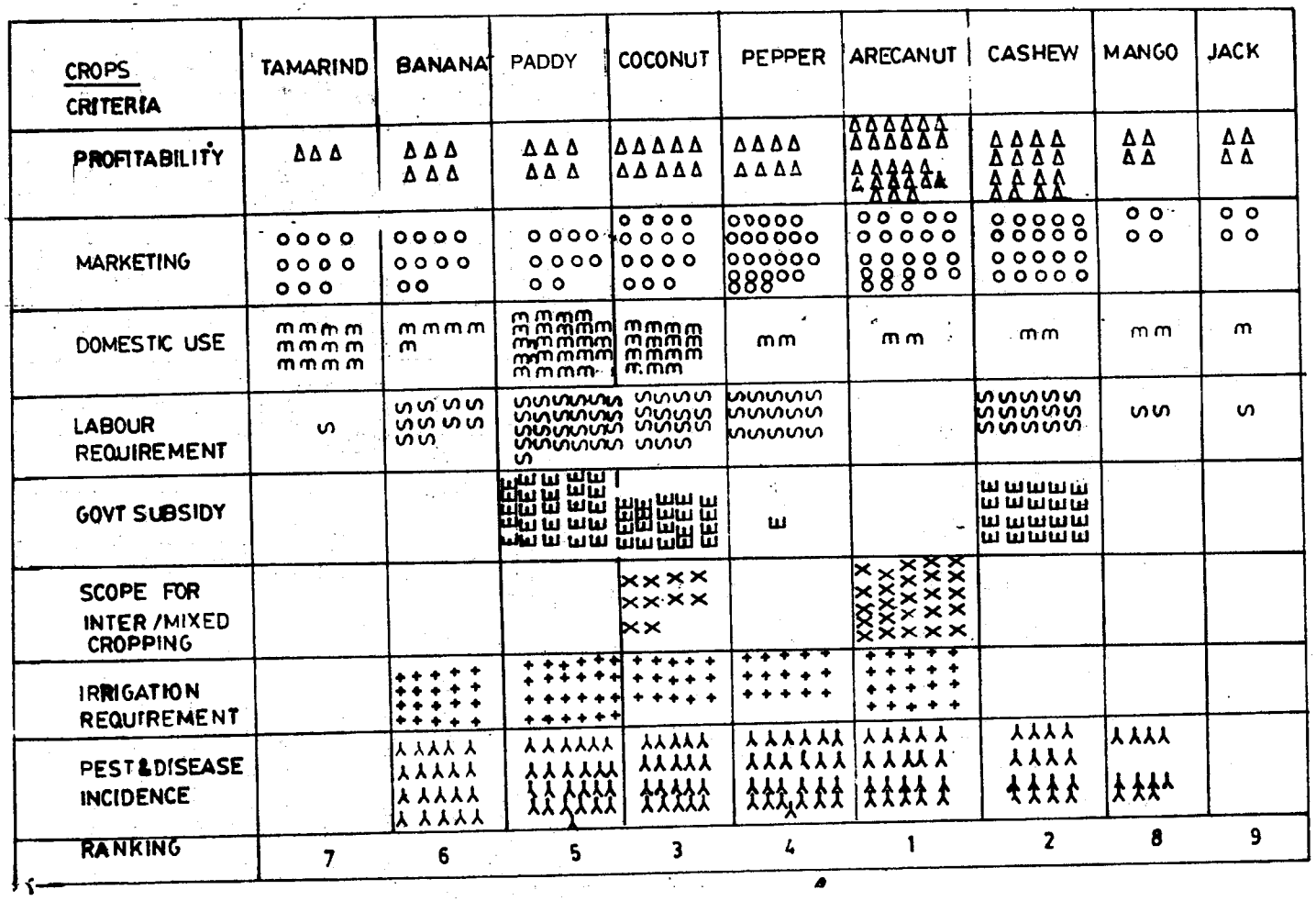


Table 2: Matrix Ranking For Crops - Pady Village

Table 3: Matrix Ranking For Crops - Nekhraje Village

Traits/criteria	Arecanut	Coconut	Banana	Paddy	Vegetables	Cashew	Pepper
High Price	6	5	2	3	1	5	7
High Profit	5	4	2	3	1	7	7
Low pest and disease incidence	6	6	4	2	3	5	1
High requirement for domestic consumption	-	6	4	9	5	1	1
High labour requirement	6	4	3	7	2	1	5
Marketing facility	5	4	2	3	1	11	6
Low irrigation requirement	3	6	4	3	3	10	8

its high labour demand and low market price for the produce. Hence, farmers felt that mechanization in cultivation and high supporting price for paddy should be given to encourage farmers for cultivation.

Pady : The crops chosen for this analysis are rice, coconut, pepper, arecanut, cashewnut, banana, mango and jackfruit. The criteria considered are profitability, marketing, domestic use, labour requirement, Govt. 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 preferred by the farmers whereas mango and jack have poor marketing facilities. With regards 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 which gets maximum subsidy followed by coconut and cashewnut. Farmers preferred arecanut and coconut as the crops having good scope for growing as 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 as they have high pest and disease problems. In general, farmers prefer arecanut because of higher profitability, paddy and coconut for domestic use, and pepper for good marketing facilities. They have a personal feeling that rice crop should be 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 which are grown as inter

corps are also preferred by farmers for their profit and seasonality and good marketing facility.

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 paddy and vegetable crops got minimum. However, considering the domestic needs, farmers felt that given the better technology and subsidised inputs, they are interested to take-up paddy and vegetable crops cultivation.

3.5 Changes And Trends

This is needed to know farmers perception for changes over the period of time on various 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 paddy, 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 year.

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 paddy 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 improve considerably during 1990's as compared to 1960's.

Nekhraje : A downward trend was noticed with respect to rainfall, paddy cultivation, forest area, cattle population and water availability from 1950's to 1995. But, upward trend was noticed in the production of arecanut, banana and coconut. Upward trend is also seen in human population, educational status, migration of labour, soil erosion and poultry farming.

3.6 Venn (Chapati) Diagrams

These can be used for understanding institutional relationship with the village and villagers. Each circle represent an individual or institution and the size of the circle indicate importance. The circle can be used to indicate the degree of contact or overlap in terms of arriving at decision. The venn diagrams depicting the relationships of various organisations, institution and individual programmes with each other and with the village as conceived and drawn by the villagers is given in Fig 9, 10, and 11.

Edneer: The perception of farmers about the importance and the actual relationship/closeness of the various institutions present in the village are depicted in the venn diagram (Fig 9). In this diagram the size of circle denotes the significance or extend of utility of institution as perceived by the farmers and the length of the

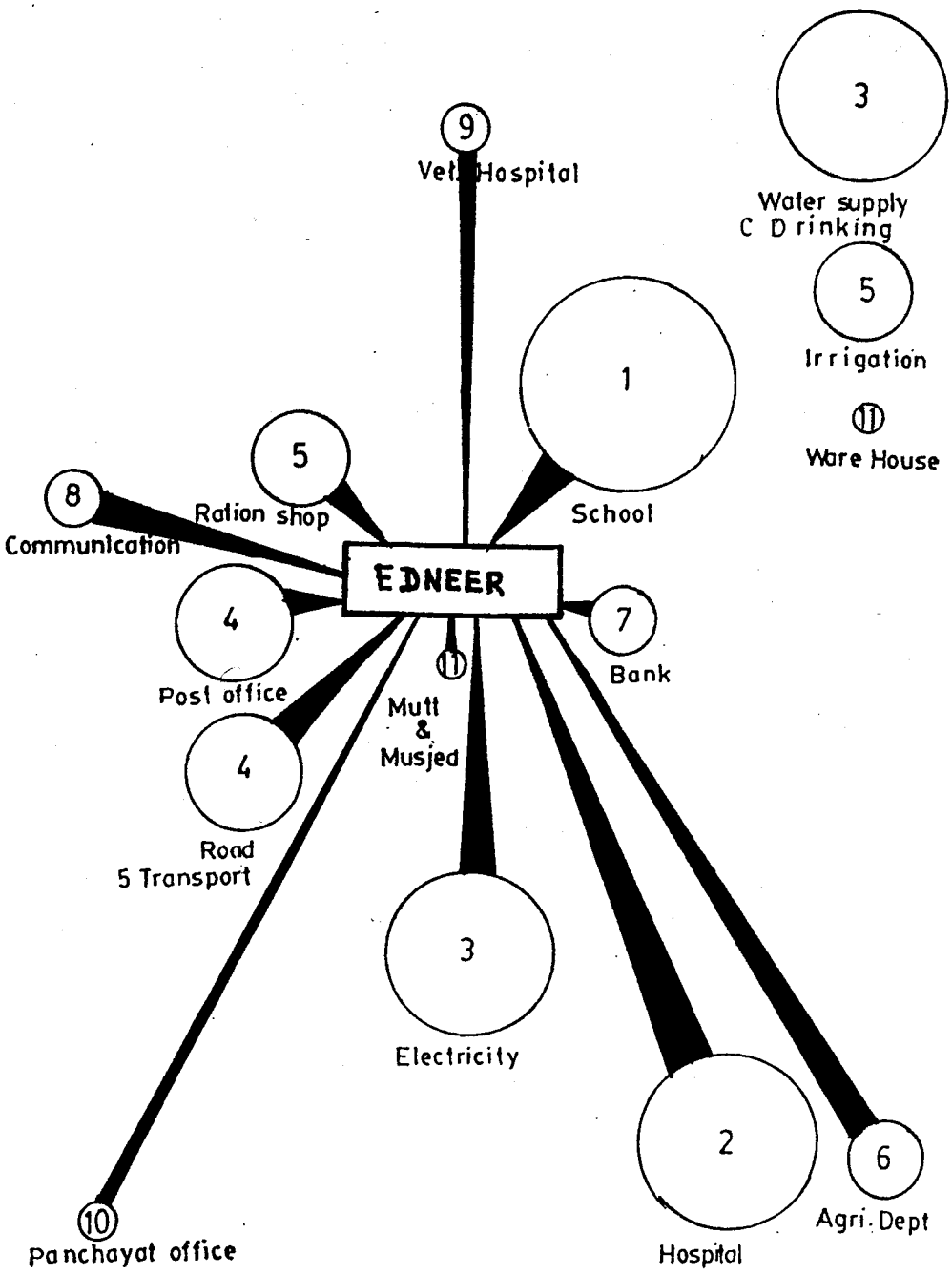


Fig. 9: Venn Diagram - Edneer

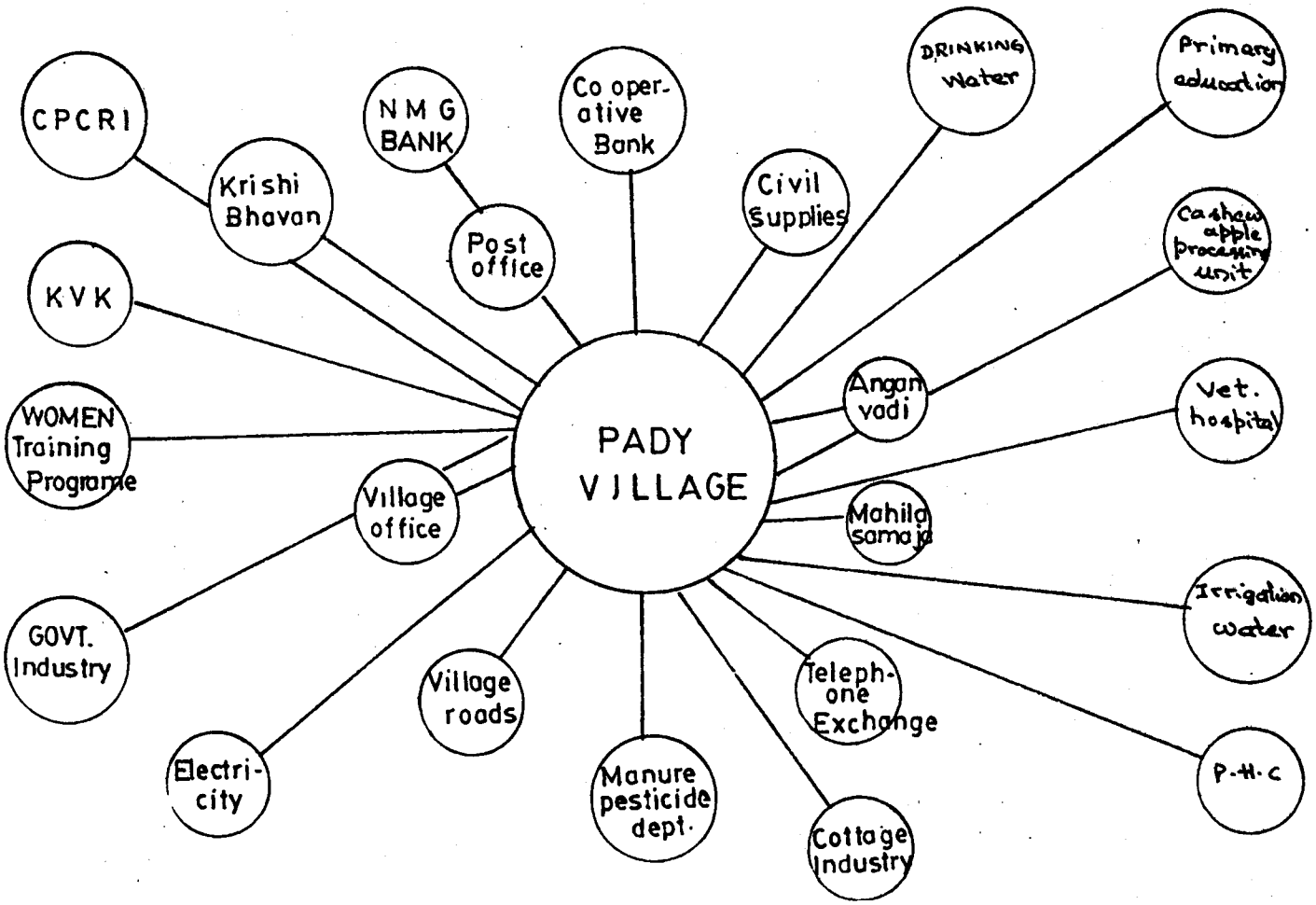


Fig. 10: Venn Diagram - Pady Village

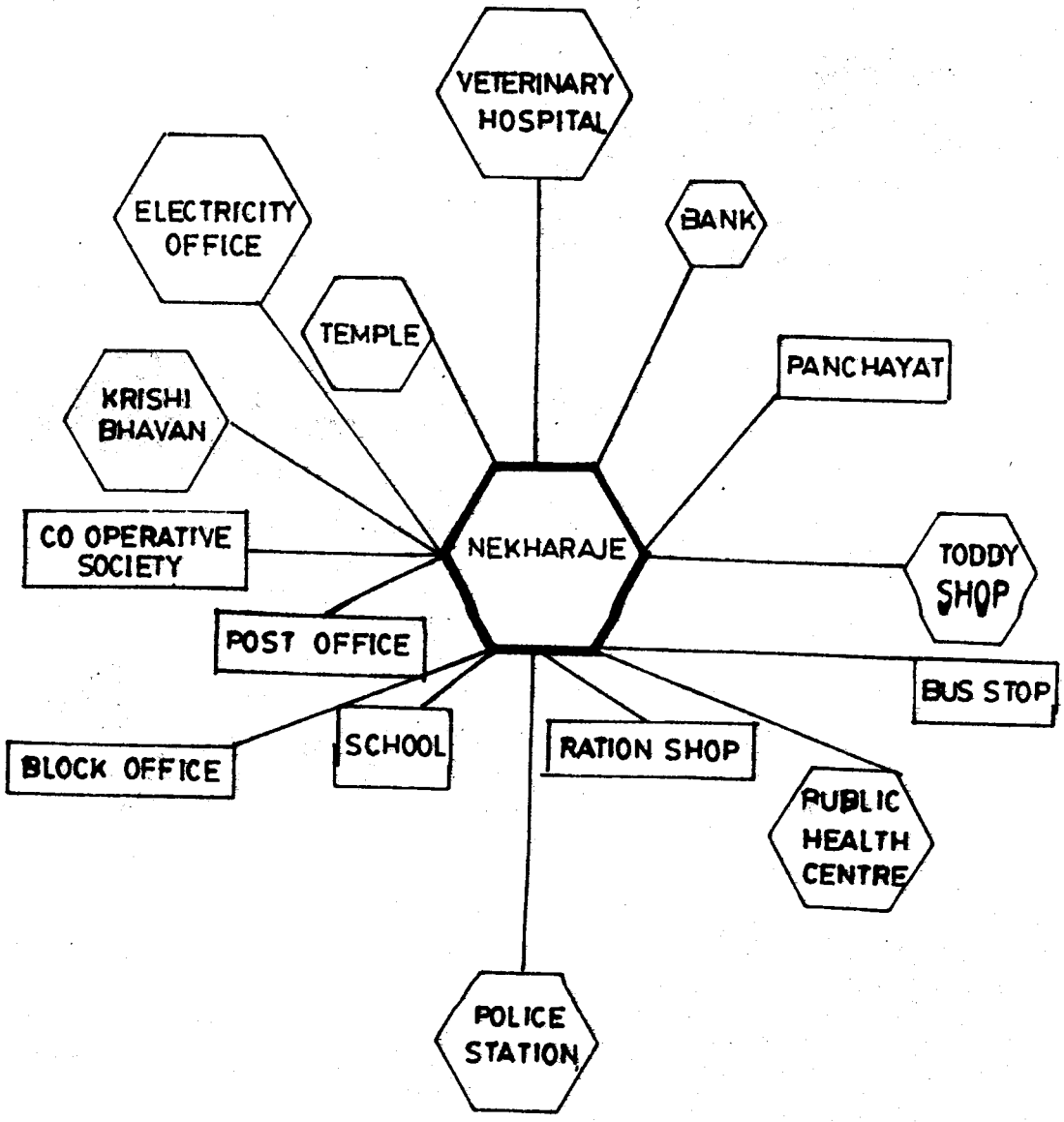


Fig. 11: Venn Diagram - Nekhraje

Farmers triangulation
in respect of land use map

Farmers going through
the maps prepared by them

Triangulation in respect
of Venn diagram

line indicates the extent of closeness. It is clear that school, hospital, electricity and drinking water supply are perceived as the important institutions in the village. Panchayat office, Krishi Bhavan and Hospital are located far from the village, thus resulting inconvenience to contact those institutions for getting things done (Fig. 9).

Pady: Farmers of the Pady village felt that Krishi Bhavan, North Malabar Grahmin Bank, Co-operative Bank, Civil Supplies Department are the important institutions with better services. CPCRI, Krishi Vigyan Kendra, drinking water facilities, primary education, veterinary hospital, primary health centre and electricity office are considered as very important institutions. Farmers expressed their desire to have close linkage with CPCRI and are of the opinion that steps may be taken for supplying of quality planting materials in required quantity (Fig. 10).

Nekhraje: Primary health centre, school, ration shop and service co-operative bank are the important institutions functioning in the village as perceived by them, which provide better service to the villagers. Police station, electricity office, public health centre and veterinary hospital are considered far from the village providing only meager service to the villagers (Fig. 11).

3.7 Well Being Analysis

To understand about the standard of living and resource availability of the farmers in the village this exercise is done with the involvement of villagers with their consensus.

Attributes like size of land holding, cropping pattern, irrigation facility, on and off-farm incomes were considered as criteria for grouping in terms of Rich, Medium and Poor. Categorization revealed that about 50% of the families were classified as poor, 40% as medium and 10% as rich.

3.8 Livelihood Analysis

In these villages nearly 65% of the income of the families is derived from agriculture, 20% income from labour wages, 10% from beedi rolling and 5% from service outside the village (Fig 12). On the expenditure side, 40% of the income is utilised towards food requirement followed by social and religious function (15%), children's education (8%), health care (7%) and miscellaneous (10%) (Fig. 13).

3.9 FLOW ANALYSIS

3.9.1 Identification and Prioritization of the Problems

Problems in the cultivation of various crops for achieving high yield as perceived by the farmers are identified through PRA technique. The problems are identified separately for upland, midland and lowland (Table 4) and also crop wise (Table 5).

In uplands, cashew being the main crop, soil erosion, poor soil fertility and drought in summer months are the major problems. In midlands, rice, coconut and arecanut are the main crops. Main problems as perceived by the farmers are poor water retention, inadequate irrigation and labour shortage. In lowlands, main crops are arecanut and rice. The reason for low productivity is poor management followed by labour scarcity.

Problems are also identified as experienced in the cultivation of different crops. In the case of arecanut, low productivity, water scarcity, non-availability of labour during critical times, poor management, especially with regard to fertilizers and control of major disease i.e. Mahali are serious problems. In coconut, low productivity, water scarcity, poor management and diseases/pests damage are the major problems. In the case of

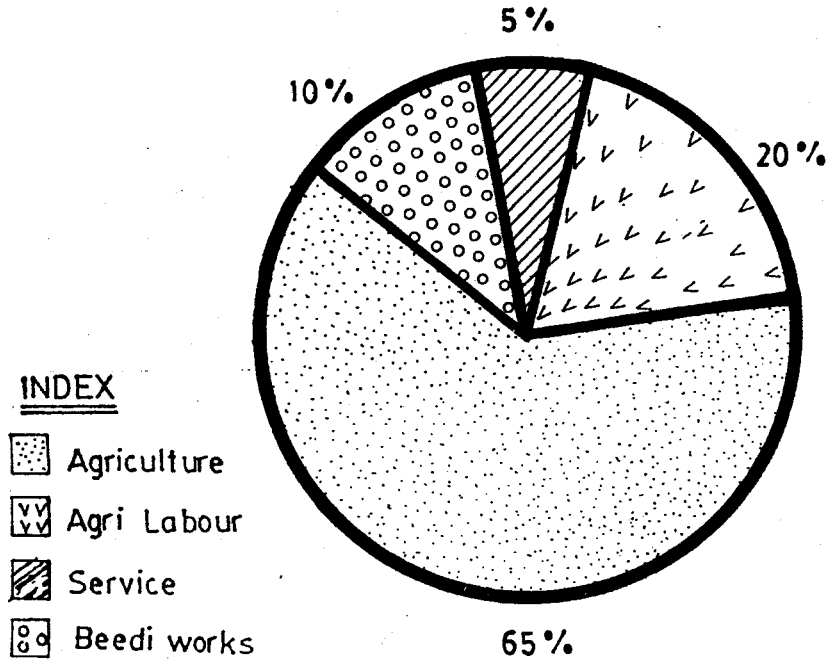


Fig. 12: Livelihood Analysis

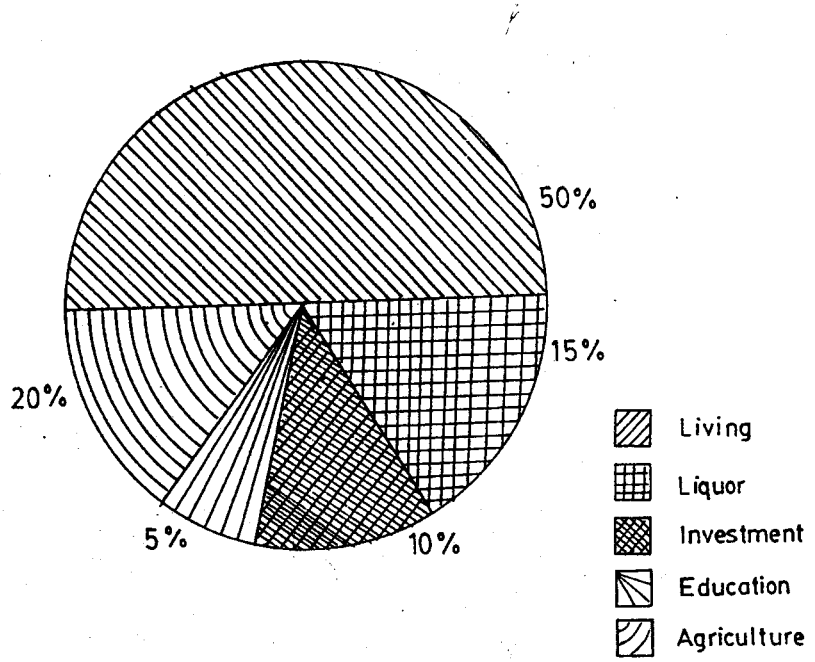


Fig. 13: Expenditure Analysis

rice, low yield, non-availability of labour during peak periods, poor management, inadequate knowledge about plant protection are the main problems. In the case of cashew, the incidence of insects/pests i.e. tea-mosquito and stem borer are the main reasons for low yield.

3.9.2 Problem Cause Diagram

Problem cause diagram for various problems as perceived by the farmers in different crops are prepared. Such diagrams are prepared for low yield of coconut, low productivity due to pests and diseases in arecanut, low yield in rice, low productivity in cashew and low milk yield in dairy cattle. For all the problems both bio-physical and socio-economic, primary and secondary reasons are pointed out. (Fig. 14, 15, 16, 17 and 18).

3.9.3 Intervening Points

The intervening points for all the problems identified were discussed in the presence of Scientists of the CPCRI and farmers' representatives from the villages. After detailed discussion to tackle the problems in the right manner, the intervening points are identified. In the case of low yield of coconut, intervening points are adequate and balanced use of fertilizer, control of stem bleeding, pitcher irrigation and in the case of arecanut, balanced use of fertilizer, mixed cropping, control of tea mosquito, trap pits for soil and moisture conservation. In rice, broadcasting vs transplanting, control of stem borer, balanced use of fertilizer are some of the intervening points for increasing production and productivity.

Table 4: Problem Priortisation

PROBLEMS	DISTRIBUTION	IMPORTANCE	SERVICE	RELATIVE IMPORTANCE
UPLAND				
Poor management	xxx	xxx	xxx	1
Soil erosion	xxx	xx	x	3
Poor soil fertility	xxx	x	xxx	2
Drought in summer		x	x	4
MIDLAND				
Man power shortage	xxx	xxx	x	3
Inadequate irrigation	xxx	xx	xx	2
Poor water management	xxx	xxx	xxx	1
Poor water retention	xxx	xx	xx	4
Lack of fodder	xx	x	xx	4
Cattle menace	xx	x	x	5
LOW LAND				
Poor management	xxx	xxx	xxx	1
Man power shortage	xxx	xxx	x	2
Inadequate irrigation	xx	xx	xx	3
Soil erosion	xx	x	x	5
Inadequate drainage	xx	x	xx	4

Table 5: Problem Ranking

PROBLEMS	ARECANUT	COCONUT	PADDY	VEGETABLES	CASHEW
Irrigation	xxx	xxx		xxx	
Labour	xx		xxx		
Fertilizer	xx	x	xx	xx	x
Pests & diseases	xx	xx	xx	xxx	xxx
Soil type	x				
Improved variety	x		x	x	
Lack of Mechanization	x				
Weeds	x		x		
Problem in availing Govt. facility			x	x	

Index - xxx - Most Imp. xx - More Imp. x - Imp.

4 STRATEGY

Keeping the above points in view, it is proposed to have a three-pronged strategy in developing appropriate technology integration process for streamlining the transfer of technology in a better way. The production systems based on the resources can be classified as Commercial Farm Production System, Green Revolution Farm Production System and Small Farm Production System.

4.1 Commercial Farm Production System

The Commercial Farm Production System is characterized by fully controlled production systems under irrigated conditions, mechanization, predominance of cash crops, high input technology, use of fully hired labourers and fertile land and production strategy for achieving higher returns. Under such farming systems, both the socio-economic conditions and bio-physical conditions are fully conducive for direct adoption of scientific knowledge developed in the research institutions without even going through the process of testing and adaptation. In this production system, interventions are in the form of free technical service for the implementation of latest technologies.

4.2 Green Revolution Farm Production System

The Green Revolution Farm Production System is characterized by irrigated/protective irrigation facilities, combination of good fertile or less fertile land, use of family labour in combination with hired labour, and combination of cash earning and food crops. Since the socio-economic conditions of the farmers of these systems are conducive for adoption of high external input agriculture, the knowledge developed in the research institutions mostly need to be tested and adapted on bio-physical conditions. In view of the conducive socio-economic resources and other physical factors of production prevailing, the testing and adaptation of technology development process is of prime importance in order to ascertain the

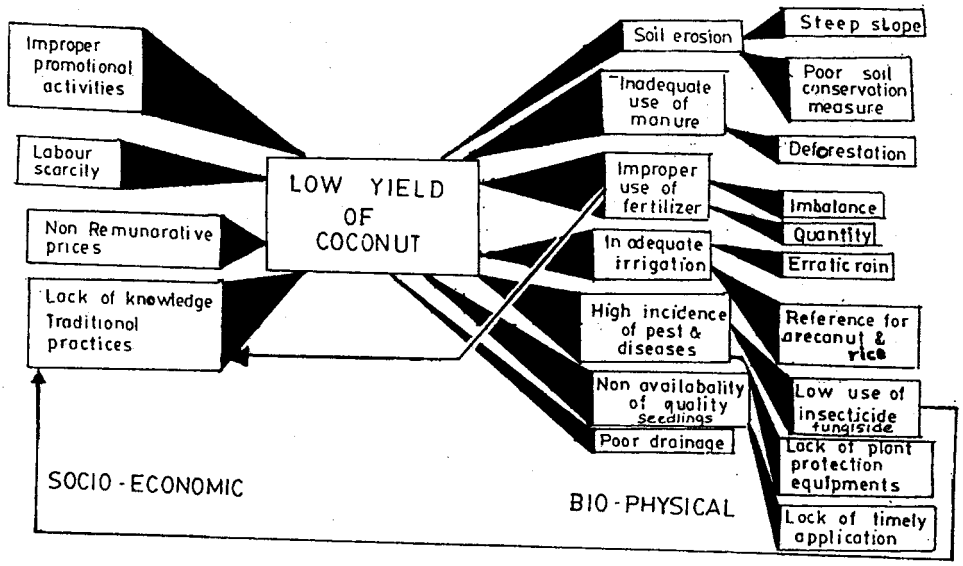


Fig. 14: Problem Cause Diagram For Low Yield of Coconut

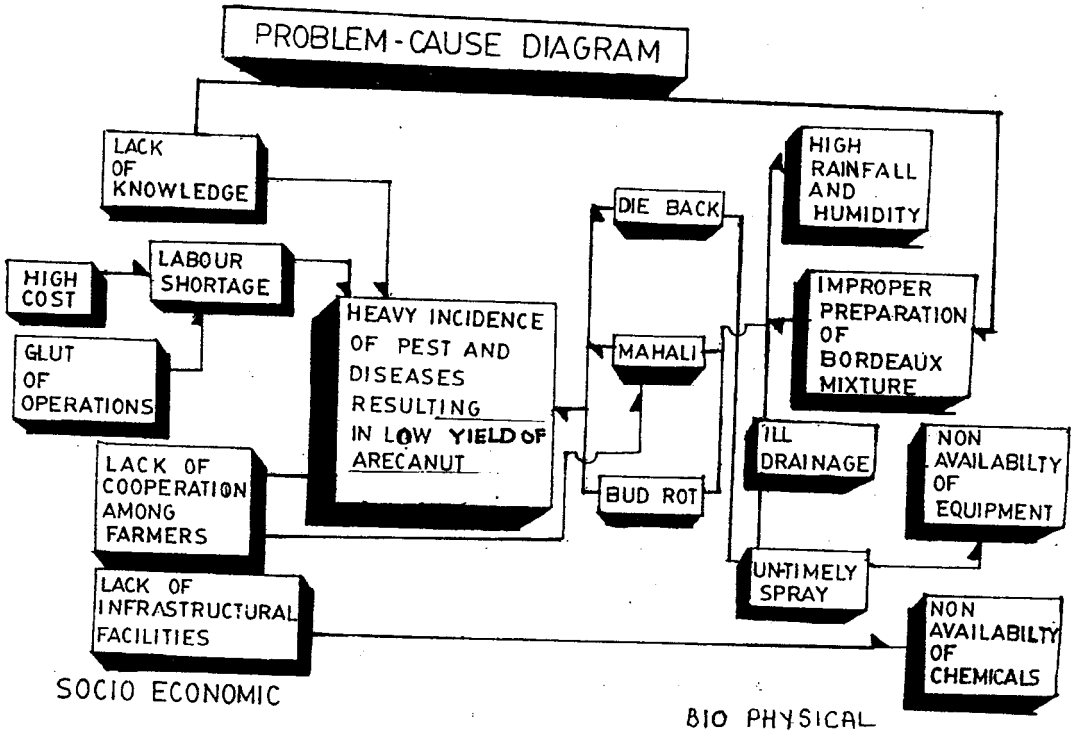


Fig. 15: Problem Cause Diagram For Low Yield of Arecanut

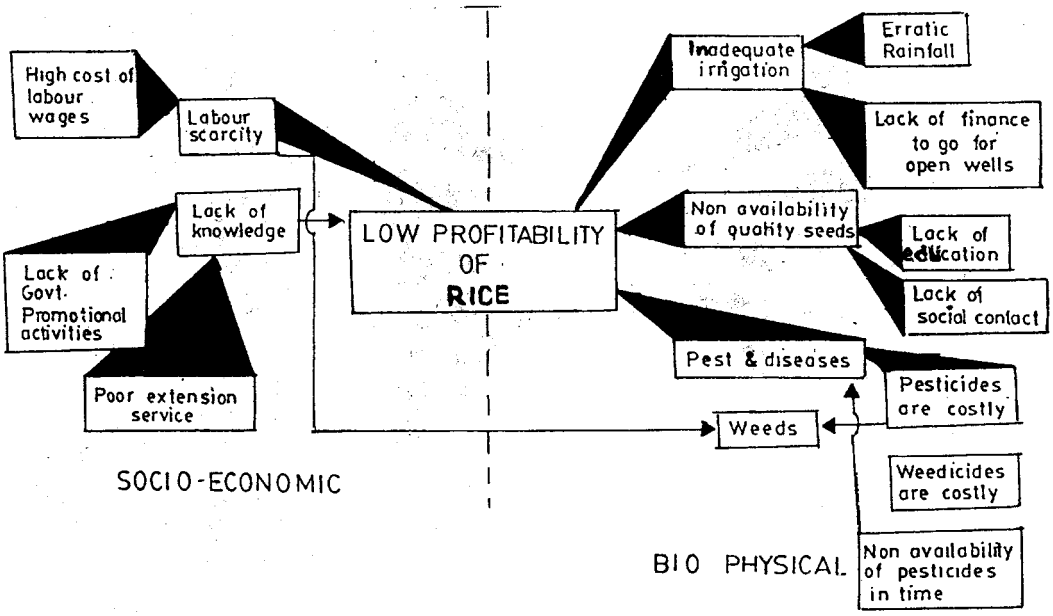


Fig. 16: Problem Cause Diagram For Low Profitability of Paddy

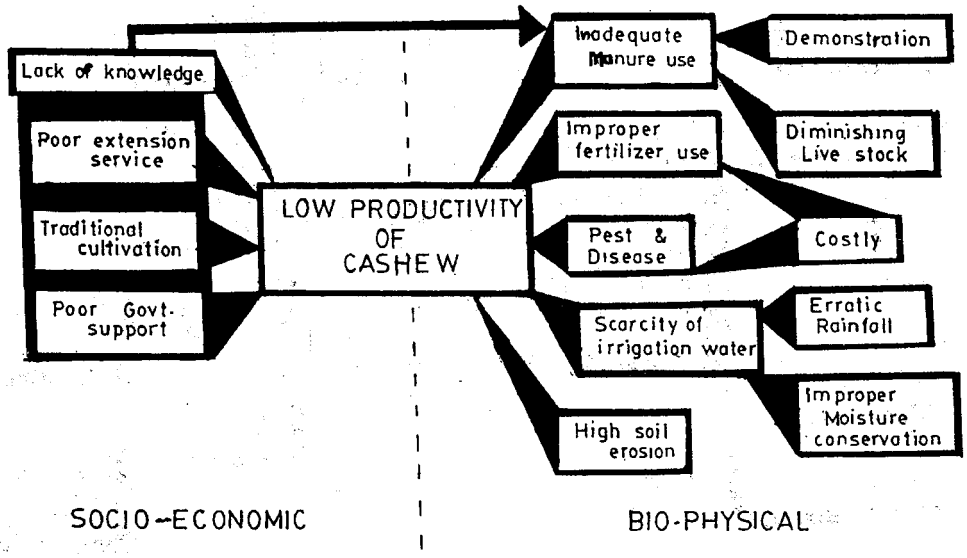


Fig. 17: Problem Cause Diagram For Low Productivity of Cashew

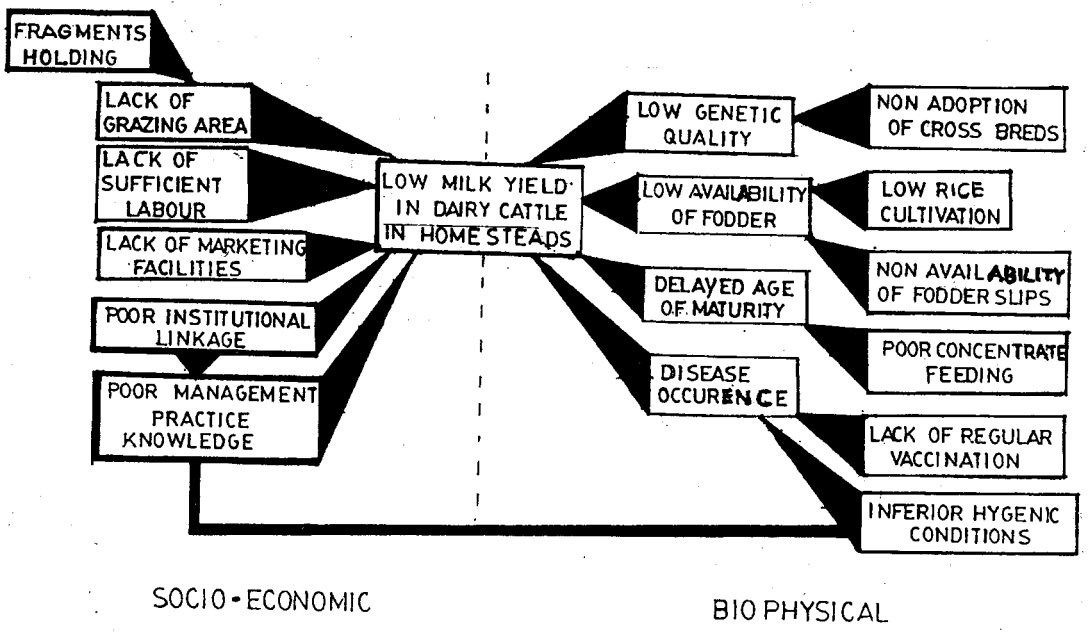


Fig. 18: Problem Cause Relationship of Low Milk Yield in Dairy Cattle in Homesteads

technological options for increasing the productivity of such farm. The trials and demonstrations on the appropriateness of a technology needs to be conducted. The cost of interventions is bared by farmer and institution on 50:50 basis.

4.3 Small Farm Production System

The Small Farm Production System is characterized by inter-dependency of on and off-farm activity, complete dependent of family labour, multipurpose use of the product and by-product of each farm enterprise, the production strategy confining to household food security system and not aiming at earning cash, wide variation in soil fertility due to slope and shade within the same plot, and no control on productivity and hence stability and sustainability have greater concern. However in the project area, although land holdings are very small, cash crops like coconut and cashew dominates and hence household food security system is not healthy. In such farming systems neither the socio-economic conditions nor the bio-physical conditions are compatible to that prevailing in the place of technology integration, therefore is of paramount importance for introduction of food crops and increasing the farm output with productivity, stability, sustainability and equitability considerations.

5 TECHNICAL ACTIVITIES

Broad technical programme of the project will be as follows:

1. Agro-eco-system analysis for resource characterization for different farming conditions of the selected areas.

Tailoring of appropriate technologies matching with the prevailing farming conditions of small production system.

Collection and assimilation of information on integrated farming systems for augmenting farmers' income through supplementary enterprises.

Testing of research information to tailor technological options for different production systems.

Refining high production sustainable technologies for well defined production systems.

Collection, classification and development of data base suitable for application in commercial production systems.

7. Technology refinement and tailoring for reduction of drudgery and also for increasing efficiency and income of women farmers.
8. Development of appropriate expert information system including market intelligence for various agri-business options.
9. The delineation and characterization of environment based on bio-physical and socio-economic parameters at meso and mega levels will be done using own survey data, secondary data and GIS data base for identification of extrapolation domains for different technologies/technology modules.

5.1 Gap Analysis For Different Crops

CROP : COCONUT

Sl. No.	Item of Technology	Recommended practice	Farmer's practice	Gap in adoption (%)	Priority No.
1	2	3	4	5	6
1.	Cultivars	West Coast Tall COD x WCT LO x GB LO x COD WCT x GB	WCT	80	I
2.	Spacing	7.5m x 7.5m	6-7m x 6-7m	60	II
3.	Fertilizer	500g N, 320g P_2O_5 1000g K_2O + 50 kg Leaf manure or compost	1 or 2 kg of complex fertilizer and green leaf	60	II
4.	Irrigation	200 litres/palm once in 5-6 days or 32 litres water per day through drip	Once in 10-15 days, or no irrigation	60	II
5.	Insects Rhinoceres Beetle	200g mixture of Sevidol + sand OR 5gm Phorate sachet per palm	-	60	II
6.	Diseases i) Stem bleeding	Chipping of affected portion and application of coaltar or root feeding with calixin	-	60	II
	ii) Bud Rot	Removal of the affected portion, apply about 1 lit. of 1% bordeaux mixture and cover with plastic sheet. As prophylactic measure spray 1% bordeaux mixture to all the neighbouring palms	-	60	II
7.	Yield	Variety - 60-80 nuts/palm-rainfed 80-100 nuts/palm-irrigated	30-40 nuts/palm 50-60 nuts/palm	40	III

CROP : ARECANUT

1	2	3	4	5
1.	Variety	Mangala, Sumangala, Sreemangala, Mohitnagar	Local variety	50
2.	Spacing	9' x 9'	6-7' x 6-7'	50
3.	Fertilizer	100g N; 40g P_2O_5; 140g K_2O/plant + 20 kg green manure	1/2 kg of complex fertilizer and green manure	60
4.	Insect management			
	Spindle bug	Keep 2gm Phorate sachets in leaf axil	Nil	40
5.	Disease management			
	i. Mahali	Spray of 1% Bordeaux mixture before the onset of monsoon and 30 days after	No spray during end of May in desired concentration	70
	ii. Bud Rot	Removal of affected tree and spray of 1% Bordeaux mixture in the crown	Nil	40

CROP : PADDY (KHARIF, TRANSPLANTED)

1.	Variety	Kairali, Jyothi, Jaya, Aiswarya, Athira, Jayathi	Kayama, Thonnooran	80
2.	Spacing	15 x 15cm or 20 x 15cm	10 cm between plants	40
3.	Fertilizer application			
	FYM	5 t/ha	8 t/ha	60
	N	60	50-60	
	P	30	Nil	
	K	30	Nil	
4.	Weed control	Benthiocarb @ 2kg ai/ha or Pendimethalin 1.5 kg ai/ha on 5th day after transplanting	1-2 hand weedings	60

1	2	3	4	5	6
5.	Insect management				
	i) Gall midge	Phorate 1.5 kg ai/ha or Carbofuran 0.5 kg ai/ha or Quinalphos 1.5 kg ai/ha 10-15 days after sowing	Nil	40	III
	ii) Leaf roller	Spraying of Quinalphos or Carboryl or Monocrotophos	Nil	40	III
	iii) Disease - Blast	Kitazin 500 ml/ha or Carbendazim 500g/ha	Nil		
6.	Yield	35-40 q/ha	25-30 q/ha	10 q/ha	
		CROP : CASHEW			
1.	Variety	Grafts of Anakkayam H-4-7, H-3-19 and Ullal-1	Seed progenies	60	II
2.	Spacing	6m x 6m	10-12m x 10-12m	50	III
3.	Fertilizer application	750gN, 325g P_2O_5 and 750g K_2O/tree	Nil	60	II
4.	Plant protection				
	i) Tea mosquito	Spray 0.05% Endosulfan or 0.10% carbaryl or 0.05% Quinolphos or 0.03% Phosphomedon	Nil	70	I
	ii) Stem borer	Drench with Carbaryl 0.1% suspension	Nil	60	II
		CROP:VEGETABLES			
1.	Quality Seed	High yielding varieties of vegetable crop seeds	Local	80%	I
2.	Pest and disease	Integrated pest management	Only chemical control	60%	II
3.	Manuring	Recommended NPK fertilizers	Inadequate FYM application	60%	II
		LIVESTOCK			
1.	Calf rearing Deworming	3rd day and then after every 21 days interval	-	70	I
2.	Balanced feeding Lactating -	Green fodder 30 kg Concentrate 3.5-4.0 kg per litre of milk	Meagre quantity Imbalanced	70	I

	Pregnant cows -	Green fodder 30kg Concentrate 2 kg per animal	Meagre quantity Imbalanced	60	II
3.	Breeding A.I. practice	6 hours after discharge and before 12 hours	Not followed	70	I
4.	Disease Control	Vaccination against foot and mouth, H.S, B.Q & Anthrax	Note done	50	III
		BACKYARD POULTRY			
1.	Poultry breeds	Gramalakshmi, Giriraja etc.	Local	95%	I
2	Disease control	Vaccination against Ranikhet disease, Fowl-pox, Marek's disease	Nil	90%	II

5.2 Summary of Technological Gaps Identified

Crop : Rice - Transplanted Paddy

1. Non-use of high yielding varieties
2. Low and imbalanced use of fertilizers
3. No proper and adequate plant protection
4. High planting density
5. Inadequate weed management

Crop : Coconut (Rainfed)

1. Non-adoption of proper spacing
2. Imbalanced and inadequate fertilizer application
3. Inadequate control measures against Rhinoceros beetle, stem bleeding and bud rot

Crop : Coconut (Irrigated)

1. Non-adoption of proper spacing
2. Inadequate and imbalanced use of fertilizers
3. Inadequate irrigation in summer
4. Monoculture of coconut (no intercropping/ mixed cropping)
5. No proper control measures against Rhinoceros beetle, stem bleeding disease and bud rot

Crop : Arecanut

1. Close spacing and high plant population
2. Inadequate and imbalanced fertilizer application
3. Improper method of control measures against Mahali and Bud rot
4. Inadequate drainage
5. Inadequate irrigation in summer
6. No intercropping/mixed cropping

Crop : Cashew

1. Non-use of grafts of improved varieties
2. Inadequate fertilizer application
3. Non-adoption of proper spacing
4. No suitable control measures against Tea Mosquito and stem borer

Crop : Vegetables

1. Non-use of seeds of improved varieties
2. Inadequate manure application
3. Inadequate plant protection against important pests and diseases
4. No irrigation

Enterprise : Dairy

1. Non-availability of high yielding breeds
2. Inadequate use of concentrates/feeds

3. Non-availability of fodder in summer months
4. Inadequate A.I. facility
5. Inadequate vaccination against major diseases
6. Improper calf rearing, especially in respect of deworming

Enterprise : Poultry

1. Non-availability of quality breeds of chicks
2. Inadequate veterinary facilities
3. Improper and unhygienic rearing

5.3 Technological Interventions

Through the Participatory Rural Appraisal (PRA) technique about 710 families are identified for the implementation of this project. In this 175 families belong to Edneer, 363 to Pady and 172 to Nekhraje. About twenty eight technological interventions were identified in various crops and enterprises. Of which eight are under green revolution production systems, fifteen under small production systems and five under miscellaneous. The details of the interventions are as under :

Summary of Technological Interventions

Sl. No.	Technology intervention	Remarks
1.	Balanced use of fertilizer in coconut under limited resource situation	Demonstration
2.	Management of stem bleeding in coconut	OFR
3.	Performance of improved coconut varieties/hybrids	OFR
4.	Pitcher irrigation in coconut	Demonstration
5.	Mixed cropping in coconut gardens	-Do-
6.	Performance of improved varieties of rice	OFR
7.	Broadcasting Vs transplanting in rice	Demonstration
8.	Control of stem borer in rice	-Do-
9.	Green manuring in rice	-Do-
10.	Recommended and balanced use of fertilizer in rice	-Do-
11.	Control of tea mosuqito in cashew	-Do-
12.	Use of recommended dose of fertilizer in cashew	-Do-
13.	Trap pits for soil and moisture conservation in cashew	-Do-
14.	Performance of vegetables in rice fallows	-Do-
15.	Rat control in coconut gardens	-Do-
16.	Control of Mahali in arecanut	OFT
17.	Control of important disease of arecanut	Demonstration
18.	Fertilizer management in arecanut	-Do-

19.	Mixed cropping in arecanut	-Do-
20.	Performance of Mohitnagar variety of arecanut	-Do-
21.	Sprinkler irrigation in arecanut garden	-Do-
22.	Drip irrigation in cashew	-Do-
23.	Weed management in paddy	OFR
24.	Introduction of backyard poultry as an household enterprise	Miscellaneous
25.	Deworming practices in calves	-Do-
26.	Introduction of oyster mushroom cultivation	-Do-
27.	Introduction of fodder crops	OFR
28.	Use of molasses treated straw for increasing protein intake in cows	Miscellaneous

OFR = On Farm Research OFT = On Farm Trial