COCONUT COMMUNITY IN INDIA - A PROFILE

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FOREWORD

The socio-economic profile of the farmers and also the agro-climatic situations under which they work, determine the performance of the agricultural sector in a major way. A basic understanding of the people, among whom a research/extension worker serves, is essential for the effective performance of the worker. The present volume on "Coconut Community In India – A Profile" presents a picture of the coconut growing farming situations in the country. During February 2001, the IPGRI entered into an agreement with the Central Plantation Crops Research Institute of India to undertake activities in relation to "Establishing a framework and selecting project sites for a nationwide deployment of coconut-based poverty reduction interventions in coconut growing communities using COGENT's three pronged strategy in India". The work was carried out during March-May 2001 with the active involvement of a multi-disciplinary team of 13 scientists from the CPCRI. Ten communities from Orissa, Andhra Pradesh, Goa, Karnataka, Pondicherry, Tamil Nadu and Kerala States, representing the major coconut growing regions in the country were surveyed for the project. Participatory methodology in the form of a "transect walk" was followed to obtain specific details on each community especially with reference to the present status of coconut productivity and infrastructure as well as production potential available in the area. Based on the details collected through the field survey and also the secondary information obtained from Coconut Development Board, respective State Agricultural Universities and the State Departments of Agriculture, the final report of the project was prepared. I am indeed happy to place it on record that the report was well appreciated by the audience, when I presented the results at the Steering Committee meeting held at Tanzania during June, 2001. The scientists involved in the survey are optimistic that the returns from coconut cultivation for the selected farm families could be improved significantly through the introduction of interventions suggested. This process would ultimately help in poverty reduction among the selected communities. This would also serve as a model project for other development agencies involved in the implementation of coconut development programmes in India in the preparation and execution of similar programmes. In this context, I record my appreciation to Dr.V.Rajagopal, Director, CPCRI, Dr.S.Arulraj, Head, Division of Social Sciences, CPCRI, Dr.C.V.Sairam, Scientist (Agricultural Economics) and other members of the project team for bringing out this publication effectively and efficiently in a record time.

New Delhi
05-09-2001

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MESSAGE

In 2002, IPGRI/COGENT plans to implement a 3-year research project to introduce poverty reduction interventions in coconut growing communities of selected countries through the use of coconut genetic resources. In preparation for this project, IPGRI/COGENT desired each potential participating country to select appropriate coconut growing communities which will serve as the project sites. Accordingly, the International Plant Genetic Resources Institute entered into an agreement with the CPCRI of India for identifying 10 coconut growing communities and preparing an agro economic profile of the communities along with an action plan for implementation. I am happy that the CPCRI could undertake this work in a mission mode and complete the work well before time. The progress report from CPCRI and other countries were presented and discussed at the Steering Committee Meeting held at Tanzania which received wide appreciation. We have recently received the approval for the implementation of the development plan and the necessary sanction orders to the different implementing organizations from various countries would be issued shortly. I appreciate the sincere efforts taken by the multi-discipline team of scientists under the able leadership of Dr. V. Rajagopal, Director, CPCRI for undertaking this survey covering different coconut growing region within a short period of time and submitting the final report in an impressive manner. I am happy to note that the CPCRI is proposing to bring out the abridged version of the final report in the form of a book entitled " Coconut Community in India - A Profile". The book would serve as a useful reference material for the coconut researchers, agricultural scientists, development managers and extension workers interested in coconut development and students to understand the socio- economic profile of coconut communities and also the method of coconut cultivation and marketing in seven different states in India. I wish that the CPCRI would continue to perform well in the implementation of the future COGENT/IPGRI sponsored research and extension programmes also.

06.09.2001
Malayasia

Dr. PONS BATUGAL,
IPGRI Senior Scientist &
Project Coordinator,

CONTENTS

CHAPTER I

INTRODUCTION

1.1. Understanding the social structure

The agricultural research and development personnel in India are striving to work with the farmers for bringing about improvements in farm sector. While working with the people to promote changes in their bahaviour, the worker enters a field in which prediction of results and effects is by no means simple and precise. This is so because the economic, social and cultural factors bear directly on the behaviour and attitude of people. If society is defined as a group of people who have lived together long enough to have become organised and to consider themselves and be considered by others as an unit, then the social structure may be considered as the construction of the members of a society. The social structure meets the needs of a society and facilitates its functioning. The major components of a social structure are:

i. Institutions
   - Government
   - Family
   - Education
   - Economic System

ii. Groups
iii. Organisations
iv. Patterns of influence
v. Value systems
vi. Media of communication
vii. Infra-structural facilities

In addition to social and cultural factors that influence agricultural development programmes, there are certain economic factors that must also be taken into consideration in the planning and operation of such activity. For his/her successful functioning in the village, an extension worker must be sensitive to the influences that make people behave and act in varying ways. With a sensitive finger on the pulse of the village and a clear understanding of his/her role and the job at hand, he/she will be able to effectively plan the strategy of his action with greater confidence and ultimate success.

1.2. Predominance of small farmers

Tropical agriculture is predominated with small and marginal farmers due to increasing population pressure on land and by sub-division and fragmentation. As compared to medium and large farms in which the major aims are only market-oriented production and profit maximization, in case of the small holder, the farm and the household is closely linked with regard to operations and objectives. Indian agriculture is predominated by small and marginal farms, which constitute more than three-fourths of the total farm holdings. Increase in population pressure on land and implementation of land reforms are the major reasons for the increasing trend in small and marginal farm holdings in the country. The number of small and marginal farms in India has increased from 49.1 million in 1970-71 to 82.1 million in 1990-91 and during the same period, the national average of operational holding size went

down from 2.3 ha to about 1.6 ha. The major aim of the small farmers is to stabilize their farm income through capital accumulation in the form of animals or plantations or by technical, social, and economic achievements. Hence small farms are also known as multi-objective farms.

1.3. Farm diversification

With the development of various production, protection and processing technologies in Indian agriculture, at present more emphasis is given for maintenance of soil fertility and productivity, increasing gross farm income and efficient utilization of farm resources through intensive cropping. This is done through farm diversification or farm intensification, which are often suggested as means for developing small and marginal farms.

Farm diversification may be defined as i) shift from subsistence farming to commercial farming, ii) shift from low value food/non-food crops to high value food/non-food crops and iii) switch over from local to high yielding plant varieties. The diversification would also mean that small farms would not only undertake seasonal crop farming, but also animal husbandry, fishing, agro-forestry, horticulture etc. and would participate in industrial and other non-farm economic activities, as either self-employed or wage earners, for supplementing their incomes. However some distinctions need to be made between farm diversification and farm intensification.

Farm diversification is the method of cultivating different crops in various segments of land of the same farm, while farm intensification is another method of cultivation of different crops on the same unit of land of the farm. In case of farm intensification, two or more complementary crops are cultivated in the interspaces of the main crop. It is also referred to as intercropping or multiple cropping. Farm intensification provides better yield stability than farm diversification due to the complementary effects of the intercrops, more effective utilization of land and available light, water or nutrients. While the traditional agricultural practises developed by the farmers over years of experience, focussed on increase in production through increase in area and productivity, new agricultural technology based on farming systems added space and time dimensions to these components. This phenomenon is broadly known as multiple cropping. This is a practice through which farm productivity is increased by simultaneous cultivation of crops.

Small and marginal farmers, who are more risk-averse than large farmers, are expected to adopt higher degree of farm diversification or intensification for protection against natural and economic risks. This means that these farmers can make use of the production complementarities to reap the benefits of synergism through appropriate choice of crop combinations or other economic activities. This would help them to achieve maximum resource use efficiency through i) intensive use of land, ii) optimum use of time, iii) benefits from additional enterprises, iv) reuse of farm wastes and byproducts, v) rational use of farm family labour and vi) integration of farm and non farm activities.

1.4. Coconut production scenario

The coconut palm, a small holder's tropical plantation crop is referred to as 'Kalpavriksha' – the '*tree of heaven*' as each and every part of the palm is useful in one

way or other. It provides food, drink, shelter and materials for industries. Coconut is cultivated in India since ages and it plays an important role in the social, economic and cultural activities of the people.

India is the largest producer of coconut in the World in terms of nut equivalent. The country had produced 12251.6 million nuts from an area of 17.77 lakh hectares and the average productivity of 6892 nuts/ha is the highest in the World. The southern states of India viz., Kerala, Tamil Nadu, Karnataka and Andhra Pradesh account for more than 90 percent of the country's area and production (Table 1.1)

the progress. Research work carried out by the Central Plantation Crops Research Institute (CPCRI), State Agricultural Universities and other organizations have resulted in the identification of a substantial number of technologies for improving the production and productivity of coconut. But studies have shown that there exists still a gap between the productivity level of coconut at Research Stations and the yield level realized in farmers' gardens. The national average of coconut productivity is 6892 nuts/ha/year while that of the best-managed garden is 27300 nuts/ha/year. It has been demonstrated that an increase in yield by four folds can be achieved by adopting

Table 1.1. Area, production and productivity of coconut in India (1999-2000)

States / UT's	Area ('000 ha)	Production (million nuts)	Productivity (nuts/ha)
Andhra Pradesh	101.7	1051.8	10342
Assam	20.2	150.1	7431
Goa	25.0	121.6	4864
Karnataka	320.6	1670.3	5210
Kerala	899.1	5167.0	5747
Maharashtra	15.1	226.7	15013
Orissa	29.0	163.3	5631
Tamil Nadu	304.0	3222.0	10599
Tripura	9.1	7.5	824
West Bengal	24.2	324.3	13401
A & N islands	24.7	87.5	3543
Lakshadweep	2.8	28.3	10107
Pondicherry	2.2	31.2	14182
All India	1777.7	12251.6	6892

Source: Directorate of Economics and Statistics, New Delhi

Tremendous progress has been made in increasing the production and productivity of coconut in our country. The combined efforts of coconut cultivators, development personnel and research workers have made it possible to achieve

proper cultivation practices for coconut as compared to the neglected palms. Thus there is a great scope for enhancing the production and productivity of coconut through the adoption of scientific cultivation practices.

The agricultural situation in India has been in the process of change during the recent years. However, it has been reported by different social science researchers that farmers in India, as in the case of most of the developing countries, do not keep pace with the fast developing technology. The structural and institutional constraints faced by the coconut farmers in different parts of the country are one among the major reasons for low rate of technology adoption. In addition, Indian coconut sector is facing tough challenges due to World Trade Agreements. Though India leads the world in the annual production of coconut, higher cost of production and pattern of consumption places her in a disadvantageous position in the arena of international trade for coconut and its products. Hence the farmers should expand their farming system through crop diversification and intensification to face the competition.

1.5 The IPGRI Project

Considering these facts, in 2002, the International Plant Genetic Resources Institute (IPGRI)/Coconut Genetic Resources Network (COGENT) plans to implement a 3-year research project to introduce poverty reduction interventions in coconut growing communities of selected countries through the use of coconut genetic resources. In preparation for this project, IPGRI/COGENT desired each potential participating country to select appropriate coconut growing communities that will serve as the project sites. In describing the sites, CPCRI has undertaken the following activities through Participatory Rural Appraisal (PRA) techniques.

1. Using primary and secondary data, ten strategically located coconut-growing communities in the country were identified. These communities would serve as effective models or project sites for a nationwide deployment of coconut-based poverty reduction interventions using COGENT's 3-pronged strategy to
   a) Increase yields and incomes by deploying high-yielding; high-value multipurpose and adapted coconut varieties and hybrids using locally produced seednuts and embryo culture-derived seedlings produced locally and internationally;
   b) Increase incomes by promoting the production and marketing of high-value products from the meat, husk, shell, water, wood and leaves and identifying suitable varieties for these uses; and
   c) Increase food security and income per unit area per unit time through intercropping and livestock/fodder production.
2. For each of the ten identified coconut-growing communities, poverty situation was defined. Constraints and opportunities and needed technological interventions for poverty reduction related to the following aspects of situation analysis were described:
   a) Who are the poor with respect to levels of income and viable livelihood opportunities;
   b) Coconut varieties used by farmers and their multipurpose uses;
   c) Livelihoods of farmers including differentiation of their types of livelihoods between different sub-types or

sub-groups (gender, age, ethnicity);

d) Gender issues that need to be addressed, if any, and interventions to improve the opportunities for women to earn incomes improve assets and reduce their economic and social vulnerabilities;

e) Opportunities available from local and international coconut research results that could address identified poverty issues;

f) Entry points for technology and germplasm introduction interventions that could alleviate poverty;

g) Human, capital and institutional technology/ resource transfer mechanisms required for successful interventions;

h) Technical, institutional and marketing constraints to the deployment of technological interventions which need to be addressed; and

i) Recommended operational activities and organizational and resource requirements to effectively deploy technological interventions.

In the preliminary discussion among the Project Scientists, it was decided to select ten communities from seven states (Table 1.2. and Figure 1.1.) and conduct the study.

Table 1.2. List of communities

Sl. No	Name of the community	State	Name of Scientists involved in the survey
1.	SIULA	Orissa	Dr. S. Arulraj Dr. R. Dhanapal Dr. S. Naresh Kumar
2.	MUKKAMALA	Andhra Pradesh	Dr. S. Arulraj Dr. R. Dhanapal Dr. S. Naresh Kumar
3.	BATIM	Goa	Shri. C. Thamban Dr. R. Dhanapal Dr. George V. Thomas
4.	KEPU	Karnataka	Shri. C.Thamban Dr. V.Hegde Dr. P.M.Kumaran
5.	G. HOSAHALLI	Karnataka	Dr.C.V.Sairam Dr. V.Hegde Dr. K. Subaharan

Fig. 1.1. Location of selected Coconut Communities

Sl. No	Name of the community	State	Name of Scientists involved in the survey
6.	ARIYAN KUPPAM	Pondicherry	Dr. C.V. Sairam Dr. S.J.D. Bosco Dr. K. Subaharan
7.	KASANGAD	Tamil Nadu	Dr. C.V. Sairam Dr. S.J.D. Bosco Dr. K.Subaharan
8.	PATHIYOOR	Kerala	Mrs. P. Anithakumari Dr. George V. Thomas
9.	EDACHERRY	Kerala	Mrs. P. Anitha Kumari Dr. S.J.D. Bosco
10.	PALLIKKARA	Kerala	Shri. C. Thamban and all the other 12 Project Scientists

These communities could be regarded as the social groups representing different coconut growing communities in India. It was further decided that the Project Team shall visit the Research Station/State Department of Agriculture Office in the district and select a representative community in consultation with the officers serving in the area. A list of 100 poor farmers alongwith their socio-economic profile was also to be prepared for each community who will form the core clients for the implementation of the poverty reduction project. The major observations made during the survey are complied and presented in the following chapters.

CHAPTER II

SIULA COMMUNITY (ORISSA STATE)

2.1. Agriculture in Orissa State

Orissa lies on the east-coast of India. It is surrounded by West Bengal on the north-east, Bihar on the north, Andhra Pradesh on the south-east, Madhya Pradesh on the west and Bay of Bengal on the east. The whole state lies in the tropical zone and is divided into four distinct tracts, viz. the northern plateau, the Eastern Ghats, the central tract and the coastal plains. The state is gifted with three great rivers, the Mahanadi, Brahmani and the Baitarani and some lesser rivers, all of which flow into the Bay of Bengal.

Orissa's agro-based economy is frequently upset by natural calamities like flood, drought, tornado or cyclone. Flood and drought are common to many states but only a few states are subject to cyclones and tornado also. Orissa is one among the few. In recent years, cyclone has become a regular feature like flood or drought.

Over 76% of the people are dependent on agriculture. Out of the gross cropped area of 87.46 lakh hectares, 18.79 lakh hectares are irrigated. Rice, pulses, oilseeds, jute, mesta, sugarcane, coconut and turmeric are the important crops. The state contributes one-tenth of the rice production in India. Forests cover nearly 37% of the total area of the state. Orissa is major coconut growing state in the east coast. The state's annual production of coconut is 163.3 million nuts from an area of 0.29 lakh ha.and the average productivity is 5,631 nuts/ha.

2.2. Location and the address of selected site

The village Siula in Puri District was selected for implementation of the project. Puri District is located in Northern side of the East-Coast region. The village Siula comes under the jurisdiction of Pipili Block of Puri district in Orissa State. It is located at 7 km towards southeast of Bhubaneswar.

2.3. Poverty status

Based on the discussions in the group meetings, it was felt that a per capita annual income of less than Rs. 18,000/- (US $ 450) might be defined as poverty line and the families earning less than this amount could be defined as poor families. It was further felt that farmers with this level of income are expected to possess viable livelihood opportunities. Farmers falling under the category of poor families alone are to be included in the project list. The community consists of 250 families of which 200 are farm families. The major sources of income for poor and very poor are daily wage employment, farming, animal husbandry and other manual jobs and for rich and middle class are cultivation, service and animal husbandry. Few of them are in business also. From this community, 90.77% are categorized as poor families with an average annual income of Rs. 11,695/- and 9.23% medium class families with an average annual income of Rs. 60,500/-. Major items of expenditure for rich and middle class are food and clothing, agriculture inputs, education, medicines etc. For the poor and very poor 66% of their income goes for food and clothing and rest is spent on agriculture and allied enterprises. During lean period when employment

opportunities in agriculture are less, they take loan from moneyed class. All the classes spend money on education, showing their interest to educate their children. The very high level of poverty situation in this village is due to the presence of large number of marginal and small farmers.

2.4. Classification of land holdings

It is interesting to observe that 82 percent of the coconut holdings in this community are marginal or small and large farmers account for only 8%, while landless account for 10%. About 58% of land in this community comes under low land category prone to frequent flooding and water stagnation. Mid land account for 35% and the high land 7%.

2.5. Climate

The area in general experiences moist and hot weather. The average maximum temperature is 39.4°C and the minimum is 25.6°C. The relative humidity during June to October is 75-80%. The area receives an average rainfall of 1400 mm. 90% of this rainfall is received during June-October months.

2.6. Soil characteristics

The chemical composition of the predominant soil present in the village is as follows:

Organic Carbon (%)	: 0.27
Total Nitrogen	: 0.043
Available Phosphorus (kg/ha)	: 19.8
Available Potash (kg/ha)	: 210
Soil pH	: 5.4

2.7 Land Utilization Pattern

The percentage distribution of area being utilized for different purposes is presented in Table 2.1.

Table 2.1. Land Utilization Pattern

Sl. No.	Land use type	Percent area
1.	Total geographical area	100.00
2.	Forest area	31.35
3.	Miscellaneous tree crops and groves not included in net area sown	2.48
4.	Permanent pasture and other grazing lands	6.30
5.	Cultivable waste	3.44
6.	Land put to non agricultural uses	6.40
7.	Barren and uncultivable land	4.11
8.	Current fallows	1.33
9.	Other fallows	1.43
10.	Net area sown	4.87
11.	Gross cropped area including fruits	73.04
12.	Gross cropped area excluding fruits	69.59

2.8. Transect analysis

The salient findings of the transect analysis are a) low land occupy a major share of the land holdings b) sandy loam

and clayey loam are the predominant soil types c) the low land is utilized for rice cultivation, whereas the mid land is used for dwelling, rice farming, olericulture and pisciculture and the high land is used as fallows, for horticulture and poultry farming (Table 2.2.)

Table 2.2. Transect analysis

Criteria	High	Medium	Low
Topography	58%	35%	07%
Soil type	Sandy loam	Sandy loam	Clay loam
Land use	Fallow, horticulture, poultry	Dwelling purpose, Vegetable, Fishery, rice	Rice
Crops	Banana, Brinjal, Bhendi, Ground nut	Paddy, Brinjal, Papaya, Vegetable	Rice
Trees	Coconut, Palmyrah, Mango, Banana	Palmyrah, Coconut, Mango, Bamboo, Drumstick, Chakunda	
Livestock	Poultry (broiler)	Cattle, Buffalo, Sheep, Goat, Poultry (backyard rearing)	
Water source	Canal	Tube-well, well, pond, canal	Canal
Problems	Undulated land, insufficient irrigation water	Low productivity of paddy-paddy-veg.	Water stagnation
Opportunity	Lift irrigation for canal, orchard, poultry	Dairy farming, intensive horticulture	Bio fertilizer

2.9. Identification and prioritization of problems in different enterprises

Problems in operating different enterprises as perceived by the farmers are identified through PRA technique. The problems are identified separately for low, medium and upland farming systems; pond systems and animal husbandry operations.

Low land
* Low yield of rice in low lands
* Water logging
* Low cropping intensity
* Difficulty in nutrient management
* Low yield of coconut

Medium land
* Low yield of irrigated transplanted rice
* Low yield of vegetables
* Low yield of fruit crops
* Pest infestation

Upland
* Low yield and poor quality of grass

	* Difficulty in nutrient management * Instability in production * Low yield of rainfed pulses * Soil erosion
Pond system	* High mortality in spawn * Low yield of fingerling * Low yield in composite carp farming * Low yield of freshwater prawn * Low yield of catfishes
Animal husbandry	* Low milk yield in cattle * Low milk yield in buffalo * Low meat production from goat and sheep * Poor draft power of cattle * Low poultry productivity

2.10. General agro-ecological characteristics

- Climate-Seasonal variation in temperature and precipitation
- Rainfall - 1440 mm/annum average

Soil-Depth: Depth of soil>1.5m

Textural classification: Sandy loam

Fertility status - moderate

Reaction-pH 6.5-7.5

- Special problem-water logging in some pockets
- Existing Farming system:
- Crop and cropping system: Rice, Groundnut, Potato, Mustard
- Vegetable crops- Cabbage, Cauliflower, Brinjal, Radish, Amaranthus, Ladies finger, Cucumber, Onion, Colocasia
- Fruit crops-Banana, Papaya, Guava, Cashew
- Livestock and poultry-Cattle, Buffaloe, Sheep, Goat, Poultry, Duck
- Plantation crop- Coconut, Arecanut
- Floriculture-Marigold, Tube rose, Chrysanthemum
- Spices-Coriander, garlic, chilly, ginger
- Fisheries-Carps, Prawn, Catfish, Murrel
- Agroforestry-Eucalyptus, Acacia, Palmyrah

2.11. Seasonal analysis

Seasonal calendar (Table 2.3.) was prepared on the ground by a group of farmers during the PRA exercise. Demand

for labour reaches its peak in June-July as many activities like land preparation, sowing, transplantation and fertilizer application are done during this period. Another peak is observed in November when rabi crops are planted. Demand for labour is less in May, which is a lean agricultural period. The average wage/day/labour is Rs.40/- and the peak season of employment is June-August and December-March every year, with meager wage income during the other months.

Table 2.3. Seasonal Analysis of crops

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Seasamum								———	———	———		
Tomato						———	———	———	———			
Brinjal		———	———	———	———							
Chillies		———	———	———	———	———	———	———	———			
Potato						———	———	———	———			
Rice	———	———	———	———	———							

2.12. Cropping pattern

Paddy-Vegetable/pulses - 30% area
Paddy-groundnut/mustard - 20% area
Paddy-gingelly -10% area

Fruit crops - coconut and other perennial crops with related inter and mixed cropping - 40%

The major crops grown in the village could be grouped under five categories namely Cereals, Vegetables, Oil seeds, pulses and fruit crops.

1. Cereals: Paddy is the major crop in the village. Depending on the availability of water, one or two crops of paddy are cultivated every year.
2. Vegetables: The vegetable crops are usually cultivated in a rotation with paddy. A few farmers grow vegetables as intercrop in coconut gardens and also as homestead crop. Common vegetable crops being cultivated in this village are potato, brinjal, cucumber, pumpkin, cowpea, pointed gourd, bitter gourd, ridge gourd, cabbage, tomato, cauliflower, coriander and chillies. Leafy vegetables are cultivated through out the year.
3. Oil seeds: Gingelly, Groundnut and mustard are the oil seed crops under cultivation in this village.
4. Pulses: Black gram, green gram and horse gram are cultivated as a catch-up crop after paddy.
5. Fruit crops: Coconut, mango, banana, jackfruit, pineapple, papaya and drumstick are the major fruit crops.

2.13. Coconut varieties

East Coast Tall is the coconut variety under cultivation in most of the selected holdings. A few farmers cultivate local genotype Sakhi Gopal type, which are observed to be of high yielding nature. None of the farmers cultivate hybrid coconut varieties. All the farmers sell their products as mature nuts to the merchant. They do not undertake any processing activity consequently cultivation of a variety for specific purpose was not attempted.

2.14. Sources of irrigation

The major sources of irrigation are as follows:

Canal - 35%
Shallow tube wells - 50%
Ponds - 15%

Of the 100 ha under cultivation, 80 ha receive irrigation from canals of major irrigation systems. The balance 20 ha. is irrigated through lift irrigation system. Water is lifted from 30 m depth tube wells using Electric/diesel pumpsets.

2.15. Fisheries and Animal Husbandry

Inland pisciculture is a common occupation in this village. Many of the households possess farm ponds. The total area under such ponds is about four ha under private ownership and six ha under Panchayat (local self government) ownership. The village also maintains about four ha of common cattle pastureland.

The cattle population in the village includes 45 Jersey cows, 150 goats, 50 sheep and 200 local cows.

2.16. Farm implements and machineries

A total number of 25 hand sprayers, 150 iron ploughs and 3 tractors are available in the village. The processing facilities available in the village include five paddy threshers; four rice mills, one oil mill and one small-scale coir industry and four rope making units.

Table 2.4. Occupational status of the households in the community

Sl. No.	Occupation	Percentage of population
1.	Wage employment	37
2.	Share Cropping and wage employment	21
3.	Business and wage employment	3
4.	Business	3
5.	Service	3
6.	Agriculture and service	8
7.	Agriculture and business	5
8.	Agriculture	20

2.17. Livelihood analysis

2.17.1. Occupational status

The target households have 160 adult male and 264 adult female populations. The wage employment, agriculture, services and business are found to be the major occupations of the community either in isolation or in combination (Table 2.4.).

The large segment of the village community works as paid labourers (37%) and sharecroppers and wage workers (21%).

2.17.2. Mobility pattern

The mobility pattern shows the pattern of social mobility of the inhabitants

of the village. Farmers usually purchase their agricultural inputs such as pesticides, fertilizer, seeds, livestock feed, oil cake etc. from Balakati market. Sometimes they go to Orissa University of Agriculture and Technology for advice on agricultural problems and purchase of seed materials. Farmers usually sell their agriculture and livestock products such as rice, vegetables, milk, fish etc. to local vender. For daily wage employment, the poor people go to city on different occasions. Major means of transport are bullock cart, cycle and bus.

2.17.3. Time line analysis

Time line of the village indicates the pace of development and the facilities that has come up on a chronological basis. All the villages are established during early part of 1800's. Significant development started only after the country got independence. Early 1960's has seen the establishment of primary school, post office, introduction of improved coconut variety, diesel pump, canal etc. Then came high yielding varieties of rice and other crops, milk cooperatives were established, cross bred cattle introduced, mould board plough used in 1970's.

Farmers adopted scientific aquaculture in early 1980, though fish farming is a traditional enterprise in the village. Induced breeding was demonstrated, fry, fingerling rearing started. In 1985 animal health services were provided and now villagers possess a fairly good number of crossbred cows. During 1990s, farmers adopted growing of cash crops like potato, cole crops, vegetables like pointed gourd, cucumber etc. This period has also witnessed the introduction of Anganwadi, establishment of Mahila samiti and telephone facilities.

Out of the total population, 10% belong to Scheduled Caste. Over all literacy level in the village is around 70%. However the family literacy level is less than 50%.

2.17.4. Gender issues

a. Demographic particulars

Women participate in farming operations. In addition, they also serve as agricultural labourers and artisans as could be seen from Table 2.5.

Table 2.5. Demographic particulars

Main occupation	Sex wise distribution (%)	
	Male	Female
Farming	60	55
Agricultural labourers	22	20
Artisan	8	22
Business	4	1
Service	6	2

b. A success story

Women take greater interest in agriculture, aquaculture and related fields during the recent years. For example, motivated by the scientists from Central Institute of Freshwater Aquaculture (CIFA), "aqua-farming common-interest groups" work together for the development of aquaculture, shouldering joint responsibility irrespective of sex and age. The role of women in rural aquaculture in the village has been well identified. Selected activities, like net weaving, common carp breeding and carp seed raising were implemented by them after obtaining special training from CIFA scientists. Backyard ponds and community ponds were utilized for fry and fingerling rearing by the womenfolk of the village. In this venture, womenfolk shouldered most of the activities like, pond clearance, manuring, assessment of plankton, liming, feeding and harvesting of fry and fingerlings. During

1998-99, they produced 6.8 lakh fry of Indian major carp and 3.00 lakh of common carp. In addition, they also reared 35,430 fingerlings in community rearing ponds and 22,000 fingerlings in private backyard ponds. Initially, there was reluctance from the womenfolk, but with persistent motivation and guidance, it became possible to implement the breeding of common carp and the response was overwhelming. Participatory training on mature brood fish identification, handling of brood fish, hapa fixation, collection of suitable egg collectors, hatching operation and spawn assessment was imparted in the village. Brood fish were collected from composite fish culture pond and reared in a small pond of 0.05 ha. Through controlled breeding of common carp, womenfolk of the village produced 25 lakh common carp spawn during 1999. Similarly, women in this community could be effectively utilized in poverty alleviation programme through coconut development.

However, women in this community has certain disadvantages/ constraints which could be summarized as follows:

- Lack of education
- Poor access to scientific information
- Non availability of credit from organised sources
- Lack of suitable post harvest technologies for value addition of agricultural products
- Drudgery due to farm operation

2.18. Crop management and post harvest technologies

In addition to the implementation of programmes for ensuring adoption of new coconut cultivation technologies for enhancing coconut productivity especially with reference to soil management, nutrient management and pests and disease management, adequate emphasis could be given for intercropping, mixed cropping and mixed farming technologies.

Many farmers maintain old senile palms with low productivity. In addition to this, a few coconut gardens are with close or irregular spacing. This needs a restructuring process.

Programme for introducing a series of intercropping, mixed cropping and mixed farming technologies with adequate addition to the development of pisiculture through the use of farm ponds available in many of the coconut growers' holdings would result in additional returns to selected families. For this purpose, the services of the scientists from OUAT, Central Institute of Freshwater Aquaculture could be utilized

A few farmers cultivate elephant grass and guinea grass as intercrops in coconut gardens. This practice could be promoted to ensure the availability of sufficient fodder for the cattle available in the village.

Rhinoceros beetle, red palm weevil and leaf eating caterpillar are the major pests prevalent in the village causing considerable damage in a few holdings. Management practices for the control of these pests are to be given special attention

Fish seed rearing in backyard ponds could be promoted at a profitable venture for farming women.

Efforts would be made to enhance the returns from coconut cultivation through the sale of products as tender nut using the

tourist potential available in the village and in the nearby Bhubaneswar city.

Efforts would also be made to promote the enterprises like Snowball Tendernut production, coconut shell charcoal production, production of handicrafts using coconut leaves and shell by utilizing the services of farmwomen club. Vermicomposting of the waste material from coconut gardens for own use or for marketing to the nearby residents could be a profitable venture.

Possibility for establishing a small scale-processing unit on a cooperative basis for value addition/by-product utilization is also available in the village.

The following interventions would also be given adequate attention.

1. Providing coconut climbing device and training farmer labourers in using the unit. The cost of the climbing device is Rs. 750/-
2. Providing coconut-husking tool to the needy farmers. The cost of the husking tool is Rs. 150/-
3. Providing facilities for the production of value added products like sweet coconut chips, coconut water vinegar etc. on cooperative basis, simultaneously exploring the market for these products.
4. Since the demand for shell made products like shell charcoal, shell powder, etc. are increasing and no investment is required for the production of shell charcoal, production of shell charcoal may be encouraged. Simultaneously the market for the charcoal should be streamlined. Since high investment is required for the production of shell powder, development of a processing centre on cooperative basis may be thought of.
5. In Sakhi Gopal area (about 30 km from the village) coconut oil mills, Coir Industries and desiccated coconut powder manufacturing unit are available. Farmers in the village would effectively utilize this infrastructure for processing their produce.

2.19. Summary of intervention points for the improving the gross farm income

1. Proper selection of mother palms
2. Parasites are available for sales at Parasite Breeding Centres at Bhubaneshwar, Sakhi Gopal and Konark.
3. East Coast Tall, West Coast Tall, Gangabondam, MOD and Sakhi Gopal are observed to be performing well in this area and could be promoted further.
4. Mulching the coconut basins with coconut leaves or coir pith
5. Vermicomposting for improving the organic manure availability.
6. One or two demonstrations on multistoried cropping system are to be organised.
7. Adequate importance is to be given on value addition.
8. Farmer's clubs could be promoted for the establishment of processing industries.
9. Women forum could be utilized for the preparation of coconut chips. The product could be marketed by Mahila samithi organization.
10. Cultivation of green manure crops is to be promoted in a major way
11. Casurina teak, *Erythrina* etc. could be

grown at appropriate locations in the village to serve as wind- break.

12. Effective campaigns are to be organised to educate the farmers on the adoption of correct method of planting coconut seedlings - especially to avoid surface planting.

2.20. Summary of socioeconomic data for the selected site

Siula community in Orissa state is a cyclone prone area. The coconut farmers in this region often lose their investment in the crop since severe cyclonic storms hit this area during the northeast monsoon season (October-December). The area also suffers due severe drought during summer months. Though the average size of land holdings for in these farms is 2.53 ha, the average area under coconut is 0.4 ha only . The average annual gross farm income in these farms is 147.6 US$. The education level of these farmers is upto primary and their socio-economic status is poor.

None of the farmers is practising intercropping in coconut gardens.However 89 per cent of the farmers are rearing livestock in their farms. In the case of coconut, there exists a wide yield gap in productivity in terms of copra equivalent between yield obtained in the research station and in the farmers' fields (1.09 tonnes/ha). Concerted efforts, if taken at appropriate time in a coordinated manner, would help improve the yield as well as the gross farm income from these farms.

CHAPTER III

MUKKAMALA COMMUNITY (ANDHRA PRADESH STATE)

3.1. Agriculture in Andhra Pradesh

Andhra Pradesh with an area of 275068sq. km has 23 districts. The population is 66 millions with a literacy of 45.11 per cent. Madhya Prasesh and Orissa bound the state in the north, the Bay of Bengal in the east, Tamil Nadu and Karnataka in the south and Maharashtra in the west. Andhra Pradesh forms the major link between the north and the south of India. The northern area of Andhra Pradesh is mountainous. The climate is generally hot and humid. The state receives an annual rainfall of 1250 mm. The Krishna and the Godavari are the major river systems in the state.

Andhra Pradesh consists of three distinct regions: (I) coastal region, made up of nine districts, generally called Andhra, (2) the interior region, consisting of four districts collectively known as Rayalaseema and (3)Telengana region, consisting of the capital city of Hyderabad and nine adjoining districts.

Andhra Pradesh has a widely diversified farming base with a rich variety of cash crops. It is surplus in foodgrains and can rightly claim to be the granary of the south. Agricultural sector accounts for around 50% of the State's income and provides livelihood for 70% of the population. The crops extensively cultivated in the state are paddy, jowal, bajra, ragi, maize, groundnut, chillies, tobacco, cotton, castor and sugarcane. Andhra Pradesh leads all the other states in the production of tobacco with a virtual monopoly of Virginia tobacco. Coconut is usually grown under irrigated conditions and yields recorded in the state are very high. The state with 1.01 lakh ha. under coconut producers 1,051.8 million nuts and the average productivity is 10,342 nuts/ha.

3.2. Location and address of the selected site

The Mukkamala village is located in Ambajipetta mandal of East Godavari district in Andhra Pradesh. The village is located at 8 km from Ambajipetta on the way to Rajamundry and represents the central East-Coast region, wherein coconut is one of the important crops under cultivation.

3.3. Poverty status

Of the total population of 2058, 1021 (49.6%) are males and 1037 (50.4%) are females. Of this, 443 (21.5%) belong to Scheduled Caste and 11 belong to Scheduled Tribe. The village includes 387 households comprising of 465 families.

The major sources of income for the poor, with an average per capita annual income of less than Rs. 18000/- are agricultural labour and work in cottage industries. In addition to this, most of the farmers belong to "marginal farmer" category (86.93%). They get low returns from their work input in farming. The poor families spend 70% of their income on food and clothing.

3.4. Land holding classification

More than 93 percent of the land

holdings are either small or marginal, which are often resource poor and with less marketable surplus.

3.5. Climate

The area experiences tropical climate and the average maximum temperature is 38.5°C and the minimum temperature is 24.7°C. The area receives an average rainfall of 1,158 mm, of which 60 per cent is received during southwest monsoon.

3.6. Soil characteristics

The major soil type of the area is black cotton soil.

3.7. Land type classification

Gross area	–	147.36 ha
Wet land	–	74.49 ha
Irrigated dry land	–	38.46 ha

Govt. land (irrigation channel, drainage channel and other the public utility land) – 34.41 ha

3.8. Cropping pattern

Paddy is the major crop cultivated in the village. Usually two crops of paddy followed by a pulse or a vegetable crop is the common cropping pattern in the wetland. The Kharif rice is sown by April 15th using the filter point water. The seedlings are transplanted in June first week. The Rabi rice is sown in November and harvested by February. A pulse crop - green gram or black gram- sown as a catch crop during February, follows the two crops of rice.

Banana, Papaya, Cabbage, Cauliflower, Chilli, Tomato, Gingelly, Bhendi, Cucurbits, Maize, Onion, Brinjal and Bottle gourd are the other crops cultivated in the village.

Coconut is one of the important horticultural crops being cultivated either as a monocrop or as a mixed crop/border crop. Elephant foot yam, Colacasia, ash gourd, Turmeric, bottle gourd, cinnamon, amaranthus, banana, cabbage and cauliflower and forage crops are the commonly cultivated inter crops in coconut gardens.

3.9. Coconut varieties under cultivation

More than 90 per cent of the farmers cultivate the local variety East Coast Tall and less than one per cent cultivate the hybrid Govdavari Ganga.

3.10. Average yield of coconut

The farmers in the village get an average yield of 60-80 nuts/palm/year i.e. 10,000 to 15,000nuts/ha/annum. Most of the farmers adopt normal spacing for planting with a planting density of 150-200 palms/ha.

3.11. Processing and Marketing

At present, farmers do not undertake at any of the processing activities for coconut. They sell ungraded coconuts to traders @ Rs.2200/- per thousand nuts. However, the traders classify these nuts into the following three groups.

1. Good nuts	-	sent to Bombay or Gujarat markets
2. Medium sized nuts	-	sold in the local market after partial dehusking (husk used for coir and copra production
3. Small sized nuts	-	sold for religious purposes.

3.12. Irrigation sources

39.05 ha of low land and 42.18 ha of midland are getting irrigation from first class canals of major irrigation projects. In addition to the Canal irrigated area, about 80 ha of midland are irrigated from the 20 filter point wells present in the village.

3.13. Agricultural implements and machineries

The following machineries are available in the village for agricultural operations.

1. No. of tractors - 3
2. No. of power tillers - 6
3. No. of irrigation pumps - 14
4. No. of Diesel Engines - 8
5. Electric motors - 6

3.14. Agro based industries

The village has the following agro-based/Agri Process Small Scale Industries.

1. Rice Mills - 4 Nos.
2. Oil expeller - 2 Nos.
3. Flour mills - 2 Nos.
4. Saw mill - 1 No.

3.15. Livelihood analysis

3.15.1. Occupational status

More than 52 per cent of the male population and 79 per cent of the female population are depending on agriculture. Further, it was observed that 605 males (58%) and 488 females (47%) come under literate groups. The low literacy level also adds to their miseries.

Occupation	Male (%)	Female (%)
Agriculture	21.2	0.8
Agricultural Labour	31.5	79.1
Cottage industries	8.4	7.2
Other workers	38.9	12.9

3.15.2. Gender issues

Around 80% of the women are engaged in agricultural operations as labour. Consequently, they face the dual constraints of hard labour and low wages.

3.15.3. Labour availability

Though sufficient labour is available during the off-season, the farmers face labour scarcity problem during the months of rice planting and harvesting. At present, the labour wages are Rs. 55/men and Rs. 40/women. However, for weeding in coconut gardens, they are paying @ Rs. 30/day and for coconut harvesting operations, they pay in cash @ Rs. 100/day for sixty trees or in kind @ 5 nuts per 100 nuts harvested.

3.16. Time line analysis

The village was affected by a severe cyclone during the year 1996. The cyclone caused heavy damage to the crown and leaves and also resulted in the uprooting of a number of trees resulting in heavy losses to the farming community. From the year 2000 onwards, most of the trees in the village are affected by the severe incidence of Eriophyid mite. Root feeding of coconut with nutrient solutions or insecticide (for the control of Eriophyid mite) is followed by a few farmers indicating the progressiveness of the community. A few farmers spray Neem oil + Garlic extract for the control of Eriophyid mite, while a few others attempt root feeding with monocrotophos.

The problems of the farmers got aggravated due to the low price for the coconut in the market. Thus the coconut farmers in this village are in a highly depressed condition and need encouragement for improving the coconut productivity and also the returns from coconut cultivation.

3.17. Problem – cause analysis for coconut cultivation

The following constraints were observed to in operation in the village affecting the coconut productivity.

- Unscientific cultural practices
- Irrational use of pesticides and fertilizers
- Giving more value to the practices followed by the fellow farmers
- Negative attitude towards accepting new technologies
- No regular soil testing
- Irregular spacing
- Own seed use
- Monocropping
- Non adoption of recommended fertilizer schedule
- Fully exhausted soil due to intensive cultivation over centuries resulting in low soil fertility
- Farmers mostly use own seedlings or seedlings produced by the neighbours in the village. (However, two farmers have recently planted the coconut hybrid, Godavari Ganga by obtaining seedlings from Agricultural Research Station, Ambajipetta)
- Many farmers opt for under planting in coconut gardens at an early stage. However, removal of old trees is delayed even beyond 10 years, thus affecting the normal growth of the newly planted seedlings
- Surface planting of coconut seedlings is a common practice in this village. Depth of the pits taken for coconut planting is less than 30 cm
- Many farmers resort to indiscriminate use of fertilizers, which is normally far below or far excess than the recommended fertilizer schedule
- Quantity of farm yard manure or green manure applied as organic manure to coconut gardens is very low
- The following pests and diseases at various degrees affect the coconut crop

Eriophyid mite	- very severe
Rhinoceros beetle	- severe
Red palm weevil	- occasional
Leaf eating caterpillar	- occasional
Bud rot	- very severe
Ganoderma	- occasional
Rodents	- severe

- Coconut crop suffers heavily, especially in the upland areas, due to water scarcity that prolongs upto five months
- Productivity in a few coconut gardens was brought down due to the large-scale presence of old senile palms
- Farmers face severe problems in marketing the products of papaya, cabbage and cauliflower grown as intercrops in coconut gardens

3.18. Opportunities available

The Agricultural Research Station, Ambajipetta, one of the Coconut Research Centres under the All India Coordinated Research Project on Palms is situated 7 km away from the village. The Agricultural Research Station is organising trials on the performance of new varieties in the as a part of the programme for location testing of coconut varieties through All India Co-ordinated Research Project. Positive indications are available about the performance of a few of these genotypes. Similarly, technologies for intercropping,

mixed cropping, mixed farmin and post harvest technologies with high production/ returns potential are also available

3.19. Entry points for technology

Vast potential is available to improve the coconut productivity and returns from coconut cultivation by solving problems. The following interventions could be introduced in the community for achieving poverty reduction through coconut development.

a. Germplasm introduction intervention

The local germplasm types viz., East Coast Tall and Gangabondam are performing well in this area and could be promoted further with adequate emphasis on mother palm selection and also for the selection of seednuts and seedlings for obtaining better results.

The local Farmers Club needs to be encouraged to produce quality seedlings using the elite palms of East Coast Tall and Gangabondam cultivars available in the village. They may also be trained in the methodology for the production of hybrid coconut seedlings

b. Crop management and post harvest technologies

In addition to the implementation of programmes for ensuring adoption of new coconut cultivation technologies for enhancing coconut productivity especially with reference to soil management, nutrient management and pests and disease management, adequate emphasis could be given for intercropping, mixed cropping and mixed farming technologies. Application of borax @ 50g/palm could be recommended, wherever boron deficiency is observed. Adequate thrust is to be given for popularization of integrated management measures for the pests and diseases.

Programmes for introducing a series of more profitable combinations of intercropping, mixed cropping and mixed farming technologies with adequate attention to market potential are to be implemented. Intercrops are to be sown only after the monsoon. Flower crops such as Crossandra and gladioli could be cultivated as a profitable intercrop in coconut gardens.

Special emphasis is to be given on the introduction of following interventions for improving coconut productivity.

- Proper selection of mother palms, seed nuts and seedlings
- Correct method of planting
- Adoption of recommended spacing
- Frequent root chopping is to be avoided
- Instead of pruning leaves in young palms, farmers may resort to tying of leaves conveniently to enable them to take up ploughing or other intercultural operations for manuring or intercropping.
- Removal of dead palms and replanting with HYV/hybrids
- Adequate emphasis is to be given to the adoption of integrated nutrient management technology
- Excess irrigation (by flooding the entire gardens) is to be avoided. Instead, drip irrigation could be promoted to economize the irrigation water and also to promote ideal microclimate.
- Integrated Pest and disease management measures are to be undertaken.

Efforts could be made to enhance the returns from coconut cultivation through the sale of products such as tender nuts in the nearby urban centres. Sale of mature nuts after grading would ensure more returns to

farmers.

Efforts could also be made to promote the smallscale enterprises for the production of coconut shell charcoal production. Vermicomposting of the waste material from coconut gardens for own use or for marketing to the nearby residents could be a profitable venture.

Possibility for establishing a small-scale processing unit on a cooperative basis for value addition/by-product utilization is also available in the village.

In addition to these programmes, the following interventions could also be given adequate attention.

- Providing coconut climbing device and offering training in using the unit. The cost of the climbing device is Rs. 750/- per unit. Agricultural Labourers are to be trained in climbing the coconut trees using coconut tree climbers
- Providing coconut husking tool to the needy farmers. The cost of the husking tool is Rs. 150/-
- Providing facilities for the production of value added products like sweet/hot coconut chips, coconut water vinegar etc. on cooperative basis, simultaneously exploring the market for these products.
- Since the demand for shell made products like shell charcoal, shell powder, etc. are increasing and no investment is required for this enterprise, production of shell charcoal, production of shell charcoal could be encouraged. Simultaneously the market for the charcoal should be streamlined. Since high investment is required for the production of shell powder, development of a processing centre on cooperative basis could be thought of.

Summary of socioeconomic data for selected site

Mukkamala community in Andhra Pradesh is a typical small holder's coconut belt of the east coast where the average size of land holdings is 0.93 ha and the annual gross farm income in these farms is 91.42 US$. The education level of these farmers is upto secondary level and their socio-economic status is poor.

Sixty two percent of the farmers are practising intercropping in coconut gardens and 35 per cent of the farmers are rearing livestock in their farms. In the case of coconut, an yield gap of 2.30 tonnes/ha in terms of copra equivalent exists between the research station yield and the yield in farmers' fields. Sustained developmental efforts would improve the yield as well as the gross farm income from these farms.

CHAPTER IV

BATIM COMMUNITY (GOA STATE)

4.1. Agriculture in Goa

Goa State lying in the West Coast of India is known for its natural scenic beauty and the architectural splendors in its churches and temples. The geographical area of the state is 3701 sq.km, out of which 3611 sq.km.is land. The cultivated area is 1,38,015 ha with 16,460 ha being irrigated. As per the 1991 census report, Goa has a population of 11,69,793. The literacy ratio is high with rural male literacy at 79.32% and female literacy at 77.54%.

Essentially export-oriented because of iron ore and manganese deposits, Goa is making a determined bid to stand on its own with reference to agricultural production. Paddy is the main agricultural crop, followed by ragi, cashew and coconut. Rice is the staple food of Goans. Fish, like rice, is an important component of the Goans' food. A fleet of 1551 trawlers and 2450 country craft are engaged in fishing, which sustains a work force of 40,000 people. Goa state produces 121.6 million coconuts per annum from an area of 0.25 lakh ha. and the average productivity is 4,864 nuts/ha.

4.2. Location of the selected site

The present proposal under IPGRI/ DFID project on poverty alleviation through coconut interventions is confined to Batim village and nearby areas in Goa State. Batim is one of the 38 villages in Tiswadi taluk in North Goa district of Goa State. The village set up is typical with "Wado", a local term for cluster of houses surrounded by fields and orchards. The selected village is located in Old Goa region about 10 km away from the ICAR Research Complex for Goa (ICAR).

4.3. Poverty status

Based on the discussions in the group meetings, it was felt that a per capita annual income of less than Rs. 18,000/- (US $ 450) might be defined as poverty line and the families earning less than this amount could be defined as poor families. It was further felt that farmers with this level of income are expected to possess viable livelihood opportunities. Farmers falling under the category of poor families alone are to be included in the project list.

4.4. Topography

The Tiswadi taluk is a typical coastal ecosystem with tributaries of two main rivers Mandovi and Zuari intersecting in the north. The Taluk comprises of many islands.

4.5. Soil type

The soils are predominantly laterite and lateritic (73.40%) followed by alluvial and marshy soils (11.7%), coastal sandy soils (10.11%) and saline soil (4.79%). Soils are deep to very deep. Majority of the soil series are coarse, medium texture soils, while a few are medium to fine textured soils. The soils are medium in available nitrogen and deficient in available phosphorus and potassium.

4.6. Climate

The selected village receives an average annual rainfall of 3000 mm; commencing from first week of June to September. The climate is humid during monsoon season with humidity levels reaching up to 95%.

4.7. Size of holding

The average size of the land holdings is 1.1 ha. 56% of the holdings are below 0.5 ha and account for only 12% of the operational area while less than 1% of the holdings are above 5.0 ha but account for 23 % of the operational area.

4.8. Cropping pattern

Rice is the principal field crop, which accounts for about 35 % of the total cropped area. Rice cultivation is confined to three typical land types viz, khazan (coastal sandy), kher (alluvial sandy), and morod (lateritic uplands). Sugarcane, ragi and maize are the other major crops and cowpea is the most important pulse crop. Groundnut is becoming popular as an oilseed crop. Among the horticultural crops, cashew is the most important crop cultivated over an area of 53,292 ha. Coconut is cultivated in 24,975 ha in the state. Mango is an important fruit crop of the state. Banana is cultivated in an area of 1,379 ha. Papaya, sapota, jack fruit, pineapple, and guava are the other fruit crops cultivated in the state. Bhendi, brinjal, chillies, amaranthus, radish and knol khol are the major vegetable crops cultivated. Pepper is the important spice crop usually trailed on areca palms and mango trees. Clove, nutmeg and cinnamon are also cultivated to a limited extent.

4.9. Irrigation

Lack of irrigation facilities is one of the major constraints in improving productivity of crops. Mostly the crops are rainfed. Only 14 per cent of the area under coconut receives irrigation.

4.10. Status of women and their involvement in coconut farming

In the village Batim and nearby areas, more than 70 per cent of the farmwomen carry out farm work. Farming activities like transplanting, pot watering through scooped wells within the field, harvesting and threshing is done mainly by women. In households having coconut cultivation, women are actively involved in subsidiary farm enterprises like pig rearing, backyard poultry and estuarine fishery. They are also involved in marketing of their farm produce in the nearby towns. In coconut farming, their involvement is confined to agricultural operations such as transporting and application of manures and fertilizers, transporting the harvested nuts, management and milking of buffalo where mixed farming is followed and other minor activities. In a few families, women are actively involved in vinegar making from coconut toddy. Interventions such as development of coconut based farming system to increase the income and to enhance the nutritional status of the household and promotion of women's groups for processing at the farm household and community levels will be beneficial to strengthen the women's participation in coconut farming.

4.11. Problem-cause analysis for low coconut yield

The problem-cause analysis for low coconut yield realized by the farmers of the area revealed the following factors:

4.11.1. Socio-economic

- Fragmented holdings
- unorganized marketing

- lack of product diversification
- low price for produce and
- poor research-extension-farmer linkage

4.11.2. Biophysical

- lack of irrigation
- poor soil fertility
- lack of adoption of soil and water conservation measures
- inadequate use of organic manures
- imbalanced application of fertilizers
- incidence diseases like bud rot and stem bleeding
- incidence of pests like leaf eating caterpillar, rhinoceros beetle and red palm weevil
- lack of adoption of integrated pest and disease management practices
- less farm intensification and
- non-availability of quality planting materials

4.12. Livelihood analysis and poverty situation

Livelihood analysis of the farmers revealed that horticulture is the most important source of income, which provides 55 per cent of the income.20 per cent of the income is earned through wage labour. Livestock rearing fetches 15 per cent of the income while other activities provide 10 per cent of income. On the expenditure side, 40 per cent is towards food. 30 per cent spending is for horticulture. Clothing requires 10 per cent. 5 per cent each is spent for livestock rearing, social functions, education and other miscellaneous activities.

There is a general feeling among the cultivators that income from farming sector is on the decline during the last few years due to various reasons among which the low price for agricultural produce is a major factor. Participants of the wealth ranking exercise conducted as part of the PRA in the study area opined that size of holding, cropping pattern, availability of irrigation facility, on and off- farm income were the criteria to be considered for categorizing the farmers. Accordingly, it was revealed that a majority (75 per cent) of the farmers belonged to poor category. Lower middle class and middle class farmers were 20 per cent and 5 per cent respectively. It was generally observed that the coconut holdings belonging to poor farm families fetch them poor returns. There is scope for enhancing their income level by intervening with appropriate coconut production technologies.

4.13. Scope for improving the coconut situation and enhancing income level of farmers

The level of technology use by the coconut growers and the availability of technologies for increasing coconut productivity clearly indicate the production potential for improving the coconut scenario in the selected village. A substantial number of appropriate technologies related to the production, protection and processing of coconut are available for increasing productivity and income. The techno-economic viability of such technologies has been amply demonstrated under field conditions. Poor coconut farmers, who mainly constitute the small and marginal farmer category, have the option of choosing appropriate technologies for enhancing their income from coconut farming and thereby improve their standard of living.

4.14. Technological interventions proposed

4.14.1. Cultivars

- Use of quality planting materials of high yielding hybrids/improved cultivars
- Identification of elite palms in the locality for production of quality seedlings

4.14.2. Farm intensification

- Intercropping with banana, pineapple, vegetables, etc. and mixed cropping with pepper
- Introduction of fruit plants such as mango, sapota, jack, West Indian Cherry etc in the coconut based homesteads
- Mixed farming with livestock, poultry etc.
- Restructuring coconut gardens for optimum plant density through systematic underplanting

4.14.3. Improved crop management technologies

- Increasing knowledge and adoption of improved coconut production technologies
- Balanced use of chemical fertilizers
- Organic recycling in coconut gardens
- Increase the availability of organic manures for coconut through coconut basin management with leguminous green manure plants, border planting of glyricidia, vermicomposting etc.
- Improved soil and water conservation practices such as husk mulching, improved irrigation methods etc.

4.14.4. Integrated pest and disease management

- Adoption of integrated disease management techniques against budrot and stem bleeding diseases
- Adoption of integrated pest management techniques against leaf eating caterpillar, rhinoceros beetle and red weevil
- Mass multiplication and field release of biocontrol agents against leaf eating caterpillar and rhinoceros beetle

4.14.5. Pre and post harvest processing

- Introduction of palm climbing device
- Popularisation of harvesting and marketing tendernuts
- Quality copra production through the use of copra dryers
- Production of coconut chips
- Preparation of vinegar from coconut water

4.15. Summary of socioeconomic data for selected site

In the Batim community in Goa, the average size of land holdings is 1.96 ha, and the annual gross farm income from these farms is 289.79 US$. The education level of these farmers is upto secondary level and their socio-economic status is mostly poor. Ten per cent of the farmers are practising intercropping in coconut gardens and 33 per cent of the farmers are rearing livestock in their farms. A yield gap of 2.31 tonnes/ha in terms of copra equivalent exists between the research station and farmers' fields. Implementation of a well planned coconut development plan in this village would help in increasing the productivity per unit area as well as the gross farm income.

CHAPTER V

KEPU COMMUNITY (KARNATAKA STATE)

5.1. Agriculture in Karnataka

Karnataka is the eighth largest state in India both in area and population. The state is situated on the western edge of the Deccan plateau and has for its neighbours Maharashtra and Goa on the north, Andhra Pradesh on the east and Tamil Nadu and Kerala on the south. On the west, it opens out on the Arabian Sea.

The two important river systems of the State are the Krishna and its tributaries (Bhima, Ghataprabha, Malaprabha, Tungabhadra and Vedavati) in the north, and the Cauvery and its tributaries (Hemavati, Shimsha, Arkavati, Lakshmana Thirtha and Kabini) in the south.

Karnataka is predominantly rural and agrarian. About 76% of its population lives in rural areas while about 71% of its working force is engaged in agriculture and allied activities which generate 49 % of the state income.

Among the agriculture crops, Karnataka accounts for 59% of the country's coffee production and 47% of the country's ragi production. Rice, jowar, ragi, millet, groundnut and sesame are other crops. The state is fifth in oilseed production. Karnataka is the third largest producer of coconut in India with an annual production of 1,670.3 million nuts from an area of 3.2 lakh ha. However the productivity level in the state countinues to be lower (5210 nuts/ha.).

5.2. Location of the selected site

Dakshina Kannada district of Karnataka state is located almost in the mid-way between Bombay and Kanyakumari. It is a narrow strip of territory stretching 60 km from North to South and it spreads 70 km from East to West in the form of a low lying, broken plateau from the Western Ghats to the Arabian Sea. The district has two distinct geographical regions viz, the Coastal region consisting of Mangalore taluk with a coastal line of 60 km and the Malnad region consisting of Belthangady, Puttur, Suliya and Bantwal taluks. The present study is confined to Kepu village and nearby areas in Bantwal taluk. The geographical area of the taluk is 735 sq.km. The net cultivated area is 25,913 ha out of which 15,110 ha are irrigated. As per the 1991 census report, Bantwal taluk has a population of 3,23,005. The literacy rate is 81% for the rural male and 62% for the female. Kepu is one of the 80 villages in Bantwal taluk. The selected site for the project is located 6 km away from the CPCRI Regional Station at Vittal.

5.3. Topography and Soil type

The project area is typical of the Malnad region. It has an undulating topography. The soils are predominantly laterite characterized by high aluminium and iron contents. The water retention capacity of the soil is poor and they are deficit in lime, phosphate and other nutrients due to excessive leaching. The high plain of the interior part of the village is endowed with

laterite rocks, which are mostly used for the construction of buildings.

5.4. Climate and rainfall

The selected village receives an average annual rainfall of 3000 mm. The average maximum temperature is 34°C and the minimum temperature is 22°C. The climate is humid during monsoon with humidity levels reaching up to 95%.

5.5. Crops and cropping pattern

Rice is the principal cereal crop in Bantwal taluk, which is cultivated in a gross area of 17,122 ha. The yield of paddy ranges between 2.0 to 4.5 tonnes per hectare under varied levels of intensive cultivation. Banana, sapota, jackfruit, mango, pineapple and guava are the fruit crops cultivated in the taluk. Pulses like cow pea, horse gram, green gram and beans and vegetables like brinjal, bhendi are also cultivated to a limited extent. Arecanut is a major commercial crop in the taluk. It is cultivated in an area of 4,693 ha. with an average yield of 1.5 tonnes per ha. Though the taluk has an area of 5,166 ha. under cashew its productivity is rather low, only around 2 kg per tree. Coconut is cultivated in 2,777 ha. in the taluk. Pepper is the important spice crop grown as a mixed crop in areca gardens. Cocoa is also cultivated by a few farmers as a mixed crop in areca plantations.

5.6. Irrigation

The taluk has an irrigated area of more than 15,000 ha. Tanks and wells are the important sources of irrigation water. Arecanut is mainly grown as an irrigated crop while only about 25 per cent of the area under coconut receives irrigation. Lack of irrigation facilities is one of the major constraints in improving productivity of coconut.

5.7. Size of holding

More than 65 per cent of the holdings are less than 1 ha in size. 20 per cent of the holdings belong to 1-2 ha category and the remaining 15 per cent are above 2 ha in size.

5.8. Status of women and their involvement in coconut farming

In rice cultivation, women mainly do the farming operations like transplanting, transportation and application of manures, weeding, harvesting and threshing. In coconut farming, their involvement is confined to operations such as transporting and application of manures and fertilizers and transporting the harvested nuts. In households where coconut based mixed farming is followed, women are actively involved in management and milking of cow. They also look after the subsidiary farm enterprises like backyard poultry. Interventions such as development of coconut based farming system to increase the income and to enhance the nutritional status of the household and promotion of women groups for processing at the farm household and community levels would be beneficial to strengthen the women's participation in coconut farming.

5.9. Problem-cause analysis for low coconut yield

The problem-cause analysis for low coconut yield realized by the farmers of the area revealed the following factors:

5.9.1 Socio-economic factors

- Fragmented holdings
- lack of product diversification
- low price for produce and
- poor research-extension-farmer linkage

5.9.2 Biophysical factors

- Lack of irrigation

- poor soil fertility
- lack of soil and water conservation measures
- inadequate use of organic manures
- imbalanced application of fertilizers
- incidence of diseases like bud rot and stem bleeding
- incidence of pests like rhinoceros beetle and red palm weevil
- lack of adoption of integrated pest and disease management practices
- less farm intensification and
- non-availability of quality planting materials

5.10. Livelihood analysis and poverty situation

The participatory rapid analysis revealed that agriculture is the important source of income, which provides livelihood to 55 per cent of the population. 15 per cent of the population is engaged in the agricultural labour sector. Over the years, there is a decline in the number of agricultural labour available in the village mainly because of the fact that there is a reduction in paddy area and that the labour do not get employment through out the year. 10 per cent of the population depends on service sector for their livelihood.

There is a general feeling among the cultivators that income from farming sector is on the decline during the last few years, because of low price for agricultural produce and other factors. Participants of the wealth ranking exercise conducted as part of the PRA in the study area opined that size of holding, cropping pattern, availability of irrigation facility, on and off- farm income were the criteria to be considered for categorizing the farmers. Accordingly, it was revealed that a majority (65 per cent) of the farmers belonged to poor category. Lower middle class and middle class farmers were 25 per cent and 10 per cent respectively. It was generally observed that the coconut holdings belonging to poor farm families fetch them a poor income. There is scope for enhancing their income level by intervening with appropriate technologies.

5.11. Scope for improving productivity

The level of technology use by the coconut growers and the availability of technologies for increasing coconut productivity clearly indicate the potential for improving the coconut scenario in the village. A substantial number of appropriate technologies related to the production, protection and processing of coconut are available for increasing productivity and income. The techno-economic viability of such technologies has been amply demonstrated under field conditions. Poor coconut farmers who mainly constitute the small and marginal category have the option of choosing appropriate technologies for enhancing their income from coconut farming and thereby improve their standard of living. The outline of technological interventions proposed is as follows:

5.11.1. Crop improvement

- Use of quality planting materials of high yielding hybrids and improved cultivars
- Identification of elite palms in the locality for production of quality seedlings

5.11.2. Farm intensification

- Intercropping with banana, pineapple, vegetables, etc. and mixed cropping with pepper
- Introduction of fruit plants such as

mango, sapota, jack, West Indian Cherry etc in the coconut based homesteads

- Mixed farming with livestock, poultry etc.
- Restructuring coconut gardens for optimum plant density through systematic underplanting

5.11.3. Improved crop management technologies

- Increasing the knowledge and adoption of improved production technologies
- Balanced use of chemical fertilizers
- Organic recycling in coconut gardens
- Increase the availability of organic manures for coconut through coconut basin management with leguminous green manure plants, border planting of glyricidia, vermicomposting etc.
- Improved soil and water conservation practices such as husk mulching, improved irrigation methods etc.

5.11.4. Integrated pest and disease management

- Adoption of integrated disease management techniques against bud rot and stem bleeding diseases
- Adoption of integrated pest management techniques against rhinoceros beetle and red palm weevil
- Mass multiplication and field release of bio-control agents against leaf eating caterpillar and rhinoceros beetle

5.11.5. Pre and post harvest processing

- Introduction of palm climbing device
- Popularization of harvesting and marketing tender nut
- Quality copra production through the use of copra dryers
- Production of coconut chips
- Mushroom culture using palm wastes

5.12. Summary of socioeconomic data for selected site

Kepu community in Karnataka has an average land holding size of 0.42 ha and the annual gross farm income from these farms is 229.96 US$. The education level of these farmers is upto primary and their socio-economic status is poor.

Fifty six percent of the farmers are practicing intercropping in coconut gardens and 45 per cent of the farmers are rearing livestock in their farms. In the case of coconut yield, a gap of 2.19 tonnes/ha in terms of copra equivalent exists between the research station and farmers' fields. Concerted efforts would help in improving the yield as well as the gross income from these farms.

CHAPTER VI

TUMKUR COMMUNITY (KARNATAKA STATE)

6.1 Location

The selected community is spread over as a contiguous area in Tumkur and Gubbe taluks of Tumkur district in Karnataka state. It is located in the maidan part of eastern Karnataka State classified under the semiarid zone, about 55 km north of Bangalore.

6.2. Climate

The area experiences semi arid climate and the maximum temperature is 29.8°C and the minimum is 22.1°C. The area experiences only a mild summer. The relative humidity is 55-65%. The area receives a total rainfall of 755 mm. 90% of this rainfall is received during June-October months.

6.3. Land Utilization Pattern

The percentage distribution of area being utilized for different purposes is presented in Table 6.1.

It could be inferred from the table that the region has a little area under the forest, whereas the barren and uncultivable area extends upto 14.02 per cent of the total geographical area and the net area sown accounts for 48.17 per cent.

6.4. Transect analysis

The transect analysis indicated that the topography in general is plain with assorted type of soils ranging from sandy loam to gravelly. Cereals and groundnut are the major annual crops of the region, whereas coconut is an important horticultural crop widely cultivated. Tube wells and open wells are the major source of irrigation and there exists wide scope for dairy farming and intensive horticulture.

In this region, sericulture is a common allied enterprise for rural women,

Table 6.1. Land Utilization Pattern

Sl. No.	Land use classification	Per cent area
1.	Total geographical area	100.00
2.	Forest area	4.22
3.	Miscellaneous tree crops and groves not included in net area sown	2.42
4.	Permanent pasture and other grazing lands	9.53
5.	Cultivable waste	6.23
6.	Land put to non agricultural uses	4.34
7.	Barren and uncultivable land	14.02
8.	Current fallows	5.00
9.	Other fallows	6.07
10.	Net area sown	48.17

which provides regular supplementary income to meet their family expenses. A segment of their cultivable land is allotted for mulberry cultivation and the cocoons are reared within their farm and are sold for the spinning units.

6.5. Problem Identification

Problems in operating the different enterprises as perceived by the farmers are identified through PRA technique. The problems are identified separately for cereals and horticulture crop based farming systems and animal husbandry operations.

6.5.1. Cereal crop based farming systems

- Low yield of rice
- Arid farming
- Low cropping intensity
- Difficulty in nutrient management
- Low yield of millets

6.5.2. Horticulture crop based farming systems

- pest incidence in coconut
- disease incidence in coconut
- Low yield of fruit crops
- Low yield of arecanut

6.5.3. Animal husbandry

- Low milk yield in cattle
- Low milk yield in buffalo
- Low meat production from goat and sheep
- Poor draft power of cattle
- Low poultry productivity

6.6. Seasonal analysis

Demand for labour reaches its peak in June-July as many activities like land preparation, sowing, transplantation and fertilizer application are done during this period. Another peak is observed in November when Rabi crops are planted. Demand for labour is less in April, which is a lean agricultural period.

6.7. Poverty status

Based on the discussions in the group meetings, it was felt that a per capita annual income of less than Rs. 18,000/- (US $ 450) may be defined as poverty line and the families earning less than this amount could be defined as poor families. It was further felt that farmers with this level of income are expected to possess viable livelihood opportunities. The farmers falling under the category of poor families alone are to be included in the project list. The community consists of 1000 families of which 900 are farm families. The major sources of income for poor and very poor are daily wage employment, farming, animal husbandry and other manual jobs and for rich and middle class are cultivation, service and animal husbandry. Like in other communities, few of them are in business also. Major items of expenditure for rich and middle class are food and clothing, agricultural inputs, education, medicines etc.

Seasonal analysis of crops

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rice	———	———	———									
Groundnut							———	———				
Ragi							———	———				
Sorghum	———	———	———									
Vegetables	———	———	———									

For the poor and very poor 64 per cent of their income goes for food and clothing and rest is spent on agriculture and allied enterprises. During the periods, when employment opportunities in agriculture are less, they take loan from higher income groups. All the classes spend money on education, showing their interest to educate their children.

6.8. Classification of land holdings

Small and marginal farmers predominate the coconut farming in this community accounting for 85 percent and the share of big farmers is eight percent. About seven percent of the community people are landless.

6.9. Farm implements and machineries

With the rapid commercialization of agriculture in this region, there has been increased use of farm machineries like tractors and power tillers. This helps to overcome the shortage of seasonal labour. These facilities are being utilized by all the categories of the farmers including the small and marginal farmers through the custom hiring for rent since it leads to increased operational efficiency. The use of other farm equipments such as improved ploughs, sprayers, dusters, seed cum fertilizer driller etc. are also most commonly used in the annual crop based farming systems.

6.10. Occupational structure

From this community, 90% are categorized as poor families with an average annual income of Rs. 12,000/- and 10% as medium class families with an average annual income of Rs. 60,000/-. The wage employment, agriculture, services and business are found to be the major occupations of the community either in isolation or in combination. The large segment of the village community works as paid labourers (37%). The average wage/ day/labour is Rs.40/- and the peak season of employment is June-August and December-March every year, with meagre wage income during the other months.

6.11. Gender issues

The women in the coconut farm families actively involve themselves in the application of manures and fertilizers, dairying and sericulture. In those coconut farms especially such as the one owned by the agricultural labourers, the importance of farm intensification through cultivation of inter and mixed crops such as banana, other fruit trees such as West Indian Cherry (*Malphigina sp.*), sapota, mango, citrus, pineapple etc., are stressed. Though the marketable surplus realized from these farms is not sufficient to increase their income, the additional total productivity from the fruits and vegetables grown as inter and mixed crops in the coconut farms, would ensure a better nutritional status to the poor farmers and agricultural labourers. Moreover the women in these farms can manage these plants using the locally available resources and waste materials.

6.12. Time line analysis

Time line of the village indicates the pace of development and the facilities that has come up on a chronological basis. All the villages in the zone are established during 1850's. Significant development started only after the independence. Early 1960's have seen the establishment of primary school, post office, introduction of improved coconut variety, diesel pump, canal etc. Then came high yielding varieties of rice and other crops, milk cooperatives were established, cross bred cattle introduced, mould board plough used in

1970's. From 1980's onwards modern agricultural practices are being increasingly used.

6.13. Well being analysis

Wealth categorization was done by the key informants based on their own perception. The criteria include assets such as land, house, livestock, Television, vehicle, crop farming, fish farming, dairy husbandry etc. About 100 families possess electricity connection to their houses/farms and 35 families possess television sets. There are four categories in the village, upper middle, middle, poor and very poor. Nearly 50 percent of the villagers are poor and very poor, thirty percent are in middle-income group and only twenty percent are belonging to upper middle class.

6.14. Mobility map

The mobility map shows the pattern of social mobility of the inhabitants of the village. Farmers usually purchase their agricultural inputs such as pesticides, fertilizer, seeds, livestock feed, oil cake etc. from Tumkur town market. Sometimes they go to CPCRI Research Centre, Hirehalli for advise on agricultural problems and purchase of planting materials. Farmers usually sell their agricultural and livestock products such as rice, vegetables, milk, fish etc. to local vender. For daily wage employment, the poor people go to city on different occasions. Major means of transport are bullock cart, cycle and bus.

6.15. Coconut varieties

The common coconut varieties used are Arsikere Tall (also known as local variety). This variety is cultivated in more than 95 per cent of the coconut gardens in the project site. The variety has multiple uses such as raw nut, tender coconut and raw nut converted to copra. This variety is mostly grown under irrigated/restricted-irrigated conditions and the annual average yield varies from 80-100 nuts/palm under well-managed conditions to 45-60 nuts under poor management. Since the project area falls under the semi arid agro-climatic zone, rainfed coconut cultivation is not common. The released hybrids such as TallXDwarf and Dwarf XTall are not commonly used.

6.16. Suggested intervention points

Sl. No.	Particulars
01	Cultivation/under planting with high yielding cultivars and hybrid coconut seedlings
02	Cultivation of drought tolerant coconut varieties
03	Stress on the importance of optimum management in the pre bearing period
04	Balanced dose of chemical fertilizers
05	Water management using husk burial/mulching/pot irrigation/ drip /sprinkler irrigation
06	Stressing the importance of inter cultivation
07	Managing the incidence of eriophyid mite
08	Managing the incidence of bud rot and stem bleeding diseases of coconut
09	Managing the incidence of

	major pests of coconut
10	Organic farming technology including vermi-composting
11	Coconut based inter cropping system with banana
12	Coconut based inter cropping system with pineapple
13	Inter cropping of groundnut in coconut gardens during the pre bearing phase
14	Coconut based mixed cropping system with cocoa
15	Coconut based mixed cropping system with mango
16	Coconut based mixed cropping with sapota
17	Coconut based mixed cropping system with West Indian Cherry
18	Coconut based farming systems integrating the above systems with dairying and or poultry and sheep rearing
19	Encouraging the farmers to harvest and market as tender coconuts
20	Small scale manufacture of snow ball tender nut and grated coconuts

6.7 Summary of socioeconomic data for selected site

Tumkur community in Karnataka is another small holder's coconut belt of maidan part of Karnataka state, where the average size of land holdings is 1.70 ha and the annual gross farm income is 213.70 US$. The education level of these farmers is upto secondary level and their socio-economic status is poor.

Twenty seven percent of the farmers are practising intercropping in coconut gardens and 93 per cent of the farmers are rearing livestock in their farms. A yield gap of 2.07 tonnes/ha in terms of copra equivalent exists between the research station and farmers' fields. Location specific developmental activity plans for competitiveness through productivity improvement would improve the yield as well as the gross income in these farms.

CHAPTER VII

ARIANKUPPAM COMMUNITY (PONDICHERRY UNION TERRITORY)

7.1. Agriculture in Pondicherry

The Union Territory of Pondicherry encompasses an area of only 492 sq. km with Pondicherry town and its villages covering 293 sq.km surrounded by the Cuddalord and Vallupuram districts. Karaikal town and its villages covering 160 sq.km is surrounded by Thanjavur district.

Nearly 45% of the population is engaged in agriculture and allied pursuits. Ninety per cent of the cultivated area is irrigated. The main food crop is rice. Foodgrains production is 67,067 tonnes. The annual production of coconut in this union territory is 31.2 million nuts from an area 0.02 lakh ha. and the average productivity is 14,182 nuts/ha.

7.2. Location of the select site

Ariankuppam commune panchayat of Pondicherry district in Pondicherry Union Territory includes the selected villages viz., Pooranankuppam and Nonankuppam spread over as a contiguous area. The selected project site is located in the coastal belt of the Union Territory and classified under the coastal ecosystem. It is located about 10 km south of Pondicherry Town.

7.3. Climate

The area experiences coastal tropical climate and the mean maximum temperature is 33.4°C and the mean minimum is 24.5°C. The relative humidity is 75-85%. The area receives a total rainfall of 1249 mm. 80% of this rainfall is received during September to December months.

7.4. Land utilization pattern

The percentage distribution of area being utilized for different purposes is presented Table 7.1. It could be inferred from the table that the net area sown accounts for 50 per cent and the land put to non-agricultural uses as well as barren and

Table 7.1. Land Utilization Pattern

Sl. No.	Land use classification	Percent area
1.	Total geographical area	100.00
2.	Forest area	1.22
3.	Miscellaneous tree crops and groves not included in net area sown	1.42
4.	Permanent pasture and other grazing lands	1.53
5.	Cultivable waste	3.23
6.	Land put to non agricultural uses	13.34
7.	Barren and uncultivable land	16.02
8.	Current fallows	6.00
9.	Other fallows	7.07
10.	Net area sown	50.17

uncultivable land account for more than 29 percent of the total geographical area.

7.5. Poverty status

Based on the discussions in the group meetings, it was felt that a per capita annual income of Rs. 18,000/- (US $ 450) may be defined as poverty line and the families earning less than this income could be defined as poor families. It was further felt that farmers with this level of income are expected to possess viable livelihood opportunities. The farmers falling under the category of poor families alone are to be included in the project list. The community consists of 850 families of which 90 percent are farm families. The major sources of income for poor and very poor are daily wage employment, farming, animal husbandry and other manual jobs and for rich and middle class are cultivation, service and animal husbandry. Major items of expenditure for rich and middle class are food and clothing, agriculture inputs, education, medicines etc. For the poor and very poor, 60% of their income goes for food and clothing and rest is spent on agriculture and allied enterprises. During the periods, when employment opportunities in agriculture are less, they take loan from higher income groups. All the classes spend money on education, showing their interest to educate their children.

7.6. Classification of land holdings

Like in the case of other communities,in Ariankuppam community too, marginal and small farmers predominate coconut farming, accounting for 85 percent, while the large farmers accounts for only five percent. 10 percent of the community is landless.

7.7. Transect analysis

Transect analysis indicated that in the levelled topography, the soil types varies from sandy loam to clayey loam. Cereals and oilseed crops predominate the cropping pattern, while coconut, guava, mango are the major horticultural crops cultivated in this community. The major sources for irrigation are tube wells and open wells. Out of the total irrigated area, 98 per cent is through tube wells and 2 per cent is through open wells. Milch cows and draught animals are reared since farming is a predominant enterprise for major section of the society. Fisheries are also a major enterprise for non-farming members of the society. There is immense scope for undertaking intensive horticulture.

7.8. Seasonal analysis

Unlike in other communities, the peak demand for labour is evenly distributed throughout the year, depending upon the cropping pattern. Demand for labour reaches its peak in June-July months as many activities like land preparation, sowing, transplantation and fertilizer application are done during this period. Another peak is observed in November when rabi crops are planted. Demand for labour is less in April, which is a lean agricultural period

7.9. Farm implements and machineries

With the rapid commercialization of agriculture in this region, there has been increased use of farm machineries like power tillers. This helps to overcome the shortage of seasonal labour. These facilities are being utilized by all the categories of farmers including the small and marginal farmers through the custom hiring for rent since it leads to increased operational efficiency. Other farm equipments such as improved ploughs, sprayers, dusters, seed cum fertilizer driller etc. are also commonly

Seasonal Analysis of crops

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rice												
Groundnut												
Sorghum												
Vegetables												

used in the annual crop based farming systems.

7.10. Occupational structure

From this community, 90% are categorized as poor families and 10% as medium class. The wage employment, agriculture, services and business are found to be the major occupations of the community either in isolation or in combination. A major segment of the village community works as paid labourers (30%). The average wage/day/labour is Rs.100/- and the peak season of employment is June-August and December-March.

7.11. Gender issues

The women in the coconut farm families actively involve themselves in the application of manures and fertilizers and dairying. In those coconut farms especially such as the one owned by the agricultural labourers, the importance of farm intensification through cultivation of inter/mixed crops such as banana and other fruit trees such as West Indian Cherry (Malphigina sp.), sapota, mango, citrus, pineapple etc., are stressed. Though the marketable surplus realized from these farms is not sufficient to increase their income, the additional total productivity from the fruits and vegetables grown as mixed/inter crops in the coconut farms, would ensure a better nutritional status to the poor farmers/agricultural labourers. Moreover the women in these farms can manage these plants using the locally available resources and waste materials.

7.12. Time line analysis

Time line analysis of the village indicates the pace of development and the facilities that has come up on a chronological basis. All the villages are established during 1825's. Significant

Occupational status of the households in the community

Sl. No.	Occupation	Percentage of population
1.	Agriculture	61
2.	Agriculture and service	5
3.	Agriculture and business	2
4.	Wage employment	25
5.	Business and wage employment	2
6.	Business	4
7.	Service	1

development started only after the country got independence. Early 1960's has seen the establishment of primary school, post office, introduction of improved coconut variety, diesel pump, canal etc. Then came high yielding varieties of rice and other crops, milk cooperatives were established, cross bred cattle introduced, mould board plough used in 1970's.

7.13. Well being analysis

The criteria include assets such as land, house, livestock, TV, vehicle, crop farming, fish farming, dairy husbandry etc. About 650 families possess electricity connection to their houses/farms and 100 families possess television sets. There are four categories in the village, upper middle, middle, poor and very poor. Nearly 60 percent of the villagers are poor and very poor, thirty percent are in middle-income group and only five percent belong to upper middle class.

7.14. Mobility map

The mobility map shows the pattern of social mobility of the inhabitants of the village. Farmers usually purchase their agricultural inputs such as pesticides, fertilizer, seeds, livestock feed, oil-cake etc. from Ariankuppam market. Farmers usually sell their agricultural and livestock products such as rice, vegetables, milk, fish etc. to local vender. For daily wage employment, the poor people go to city on different occasions. Major means of transport are bullock cart, cycle and bus.

7.15. Problem identification

Problems in operating different enterprises as perceived by the farmers are identified through PRA technique. The problems are identified separately for cereals and horticulture crop based farming systems and animal husbandry operations.

7.15.1. Cereal crop based farming systems

- Low yield of rice
- Low cropping intensity
- Difficulty in nutrient management
- Low yield of millets

7.15.2. Horticulture crop based farming systems

- Pest incidence in coconut
- Disease incidence in coconut
- Low yield of fruit crops

7.15.3. Animal husbandry programmes

- Low milk yield in cattle
- Low milk yield in buffalo
- Low meat production from goat and sheep
- Poor draft power of cattle

7.16. Coconut varieties

The common coconut varieties cultivated are East Coast Tall (also known as local variety). This variety is cultivated in more than 95 per cent of the coconut gardens in the project site. The variety has uses such as raw nut and tender coconut. This variety is mostly grown under irrigated/ restricted-irrigated conditions and the annual average yield varies from 80-100 nuts/palm under well-managed conditions to 55-60 nuts under poor management. The released hybrids such as TallXDwarf and DwarfXTall are not commonly grown.

7.16. Suggested intervention points

Sl.No.	Particulars
01	Cultivation/under planting with high yielding cultivars and hybrid coconut seedlings
02	Cultivation of drought tolerant coconut varieties
03	Stress on the importance of optimum management in the pre bearing period

04	Balanced dose of chemical fertilizers
05	Water management using husk burial/mulching/pot irrigation/drip /sprinkler irrigation
06	Stressing the importance of inter cultivation
07	Managing the attack of eriophyid mite
08	Managing the attack of bud rot and stem bleeding diseases of coconut
09	Managing the attack of major pests of coconut
10	Organic farming technology including vermi-composting
11	Coconut based inter cropping system with banana
12	Coconut based inter cropping system with pineapple
13	Inter cropping of groundnut in coconut gardens during the pre bearing phase
14	Coconut based intercropping with vegetable crops
15	Coconut based mixed cropping system with mango
16	Coconut based mixed cropping with sapota
17	Coconut based mixed cropping system with West Indian Cherry
18	Coconut based farming systems integrating the above systems with dairying, poultry and sheep rearing
19	Encouraging the farmers to harvest and market as tender coconuts
20	Small scale manufacture of snow ball tender nut and grated coconuts
21	Climbing device for farmers
22	Coconut dehusking tools
23	Coconut based value added products like sweet coconut chips, coconut water vinegar etc.
24	Manufacture of coconut shell based products

7.6. Summary of socioeconomic data for selected site

Ariankuppam community in Pondicherry is a small holders' coconut belt on the east coast, which is a highly fertile belt for coconut cultivation. However, as in the case of Siula community of Orissa state, this community too is facing the problem of cyclone, which damages the crops during the northeast monsoon season. The average size of land holdings is 0.40 ha and the annual gross farm income in these farms is 228.60 US$. The education level of these farmers is upto primary and their socio-economic status is poor.

Twenty two percent of the farmers are practicing intercropping in coconut gardens and 23 per cent of the farmers are rearing livestock in their farms. An yield gap of 1.63 tonnes/ha in terms of copra equivalent exists between the research station and farmers' fields. Augmenting farm income through coconut based farming systems needs to be the prime focus in the development process for coconut in this community.

CHAPTER VIII

KASANKADU COMMUNITY (TAMIL NADU STATE)

8.1 Agriculture in Tamil Nadu

Tamil Nadu is situated on the southeastern side of the Indian peninsula. It is bounded on the east by the Bay of Bengal, in the south by the Indian ocean, in the west by the States of Kerala and Karnataka and in the north by Karnataka and Andhra Pradesh. The landmass of the state can be divided into two natural divisions (i) the eastern coastal plain (ii) the hilly region along the north and the west.

Tamil Nadu accounts for nearly one fourth of the spinning capacity in India, one fifth of cement, caustic soda and nitrogenous fertilizers and one tenth of the nation's production of sugar, bicycles and calcium carbide. Tamil Nadu produces 60% of safety matches and 77% of finished leather. Agriculture is the mainstay of the economy. The yield of rice amounting to 2.5 tonnes per hectare is among the highest in India. Coconut is predominantly grown as an irrigated crop. Tamil Nadu's sugarcane yield of 112 tonnes per ha is a world record. The principal plantation crops are tea and coffee. The states annual production of coconut is 3,222 million nuts from an area of 3.0 lakh ha. and the average productivity is 10,599 nuts/ha.

8.2. Location of the Selected site

The Kassankadu community is spread over as a contiguous area in Pattukottai taluk of Thanjavur district in coastal Tamil Nadu State and classified under the coastal agro-eco-system. It is located about 8 km away from Pattukottai Town.

8.3. Climate

The area experiences coastal tropical climate and the maximum temperature is 34.5°C and the minimum is 24.2°C. The relative humidity is 72-85%. The area receives a total rainfall of 1200 mm. 80% of this rainfall is received during September to December months.

8.4. Land utilization pattern

The nine fold classification of geographical area indicates that the net area sown accounts for 48.17 percent, while the barren and uncultivable land and the land put to the non agricultural uses together account for more than 27 percent of the total geographical area of this community (Table 8.1).

8.5. Poverty status

Based on the discussions in the group meetings, it was felt that a per capita annual income of Rs. 18,000/- (US $ 450) may be defined as poverty line and the families earning less than this amount could be defined as poor families. It was further felt that farmers with this level of income are expected to possess viable livelihood opportunities. The farmers falling under the category of poor families alone are to be included in the project list. The community consists of 900 families of which 90 percent are farm families. The major sources of income for poor and very poor are daily wage employment, farming, animal husbandry and other manual jobs and for rich and middle class are cultivation, service and animal husbandry. Like in other communities, few of them are in business also. Major items of expenditure for rich and

Table 8.1. Land Utilization Pattern

Sl. No.	Land use classification	Percent area
1.	Total geographical area	100.00
2.	Forest area	1.20
3.	Miscellaneous tree crops and groves not included in net area sown	1.10
4.	Permanent pasture and other grazing lands	5.60
5.	Cultivable waste	1.91
6.	Land put to non agricultural uses	15.43
7.	Barren and uncultivable land	12.02
8.	Current fallows	6.50
9.	Other fallows	8.07
10.	Net area sown	48.17

middle class are food and clothing, agricultural inputs, education, medicines etc. For the poor and very poor, 70% of their income goes for food and clothing and rest is spent on agriculture and allied enterprises. During the periods when employment opportunities in agriculture are less, they take loan from higher income groups. All the classes spend money on education, showing their interest to educate their children.

8.6. Classification of land holdings

Eighty five percent of the total land holdings in this community falls under the category of small and marginal farmers, while the large farmers account for five percent. The share of landless is 10 percent.

8.7. Transect analysis

The transect analysis indicated that in the levelled topography of this community, the soil type varies from sandy to clayey loam and the land in general is fertile. Paddy and groundnut are the major annual crops cultivated in this region, while coconut, mango, sapota and guava are the major horticultural crops. Out of the total irrigated area, 90 per cent is through bore wells and tube wells and 10 per cent is through open wells. Milch cows and draught animals are reared since farming is a predominant enterprise for major section of the society. The use of farm equipments such as improved ploughs, sprayers, dusters, seed cum fertilizer driller etc. is common in this community.

8.8. Problem identification

Problems in operating different enterprises as perceived by the farmers are identified through PRA technique. The problems are identified separately for cereals and horticulture crop based farming systems and animal husbandry programmes.

8.8.1. Cereal crop based farming system

* Low yield of rice
* Low cropping intensity
* Difficulty in nutrient management
* Low yield of millets

8.8.2. Horticulture crop based farming system

* pest incidence in coconut
* disease incidence in coconut
* Low yield of fruit crops

8.8.3. Animal husbandry

* Low milk yield in cattle
* Low milk yield in buffalo
* Low meat production from goat and sheep
* Poor draft power of cattle
* Low poultry productivity

8.9. Seasonal analysis

Demand for labour reaches its peak in June-July as many activities like land preparation, sowing, transplantation and fertilizer application are done during this period. Another peak is observed in November when rabi crops are sown. Demand for labour is less in April, which is a lean agricultural period.

8.11. Gender issues

The women in the coconut farm families actively involve themselves in the application of manures and fertilizers and dairying. In those coconut farms especially such as the one owned by the agricultural labourers, the importance of farm intensification through cultivation of inter and mixed crops such as banana, other fruit trees such as West Indian Cherry (*Malphigina sp.*), sapota, mango, citrus, pineapple etc., are stressed. Though the marketable surplus realized from some of these crops is not sufficient to increase their income, the additional total productivity from the fruits and vegetables grown as mixed and inter crops in the coconut farms, would ensure a better nutritional status to

Seasonal Analysis of crops

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Rice												
Groundnut												
Sorghum												
Vegetables												

8.10. Occupational structure

From this community, 75 % are categorized as poor families and 20% as medium class families. The wage employment, agriculture, services and business are found to be the major occupations of the community either in isolation or in combination. A major segment of the village community works as paid labourers (35%). The average wage/ day/labour is Rs.80/- and the peak season of employment is June-August and December-March.

the poor farmers and agricultural labourers. Moreover the women in these farms can manage these plants using the locally available resources and waste materials.

8.12. Time line analysis

Time line analysis of the village indicates the pace of development and the facilities that has come up on a chronological basis. All the villages included in the project are established during 1500's. Significant development started

Occupational status of the households in the community

Sl. No.	Occupation	Percentage of population
1.	Agriculture	51
2.	Agriculture and service	5
3.	Agriculture and business	2
4.	Wage employment	35
5.	Business and wage employment	2
6.	Business	4
7.	Service	1

only after the country got independence. Early 1960's has seen the establishment of primary school, post office, introduction of improved coconut variety, diesel pump, canal etc. Then came high yielding varieties of rice and other crops, milk cooperatives were established, cross bred cattle introduced, mould board plough used in late 1960's.

8.13. Coconut varieties

The common coconut variety used is East Coast Tall (also known as local variety). This variety is cultivated in more than 95 per cent of the coconut gardens in the project site. The variety has uses such as raw nut and tender coconut. This variety is mostly grown under irrigated or restricted-irrigated conditions and the annual average yield varies from 80-100 nuts/palm under well-managed conditions to 55-60 nuts under poor management. The released hybrids such as VHC 1 and VHC 2, TallXDwarf and DwarfXTall are not commonly used.

8.14. Suggested interventions

Sl.No.	Intervention particulars
01	Cultivation/under planting with high yielding cultivars or hybrid coconut seedlings
02	Cultivation of drought tolerant coconut varieties
03	Stress on the importance of optimum management in the pre bearing period
04	Balanced dose of chemical fertilizers
05	Water management using husk burial/mulching/pot irrigation/ drip /sprinkler irrigation
06	Stressing the importance of inter cultivation
07	Managing the attack of eriophyid mite
08	Managing the attack of bud rot, stem bleeding and Thanjavur wilt diseases of coconut
09	Managing the attack of major pests of coconut
10	Organic farming technology including vermi-composting
11	Coconut based inter cropping system with banana
12	Coconut based inter cropping system with pineapple
13	Intercropping of groundnut in coconut gardens during the pre bearing phase
14.	Intercropping of vegetables in coconut gardens

15	Coconut based mixed cropping system with mango
16	Coconut based mixed cropping with sapota
17	Coconut based mixed cropping system with West Indian Cherry
18	Coconut based farming systems integrating the above systems with dairying, poultry and sheep rearing
19	Encouraging the farmers to harvest and market as tender coconuts
20	Small scale manufacture of snow ball tender nut and grated coconuts
21	Climbing device for farmers
22	Coconut dehusking tools
23	Coconut based value added products like sweet coconut chips and coconut water vinegar.
24	Manufacture of coconut shell based products

8.15. Summary of socioeconomic data for selected site

Kasangad community in Tamil Nadu is another coconut belt in the east coast region of Peninsular India, which is also a highly fertile belt in the region. This community is also a cyclone prone area during the northeast monsoon season. The average size of land holdings is 0.69 ha, and the annual gross farm income in these farms is 368.23 US$ The education level of these farmers is upto primary level and their socio-economic status is poor.

None of the farmers are practising intercropping in coconut gardens, however 87 per cent of them are rearing livestock in their farms. A yield gap of 1.6 tonnes/ha in terms of copra equivalent exists between the research station and farmers' fields. Concerted efforts through coconut based farming systems, if taken at appropriate time in a coordinated manner, would help improve the yield as well as the gross farm income from these farms.

CHAPTER IX

PATHIYOOR COMMUNITY (KERALA STATE)

9.1 Agriculture in Kerala

Kerala is a small state, tucked away in the south west corner of India. It represents only 1.18 per cent of the total gographical area of India but 3.43% of the total population of the country is in Kerala. The state may be divided into three geographical regions: (1)Highlands,(2) Midlands and (3) Lowlands. The highlands slope down from the Western ghats which rise to an average height of 900 m, with a number of peaks well over 1800 m in height. This is the area of major plantation crops like tea, coffee, rubber, cardamom and other spices.

The midlands, lying between the mountains and the low lands, is made up of area under intensive cultivation. Cashew, coconut, arecanut, cassava, banana, rice, ginger, pepper, sugarcane and vegetables of different varieties are grown in this area.

The lowlands of the coastal area, which is made up of river delta, backwaters and the shore of Arabian Sea, is essentially a land of coconut and rice. Fisheries and coir industry constitute the major industries of this area.

Kerala with its high population is 50 per cent short of food. Owing to historical and climatic reasons the state has developed commercial agriculture more than food crops. Consequently, the state is short of foodgrains, especially rice which is the staple food of the people.

Kerala has an unique cropping pattern. It accounts for 92 per cent of India's rubber, 70 per cent of coconut, 60 per cent of tapioca and almost 100 per cent of lemon grass oil. Kerala is the single largest producer of number of other crops like banana and ginger, besides tea and coffee in abundance. Coir and cashew are two of the largest traditional industries in the state. Handloom and bamboo-based industries are well developed. Kerala accounts for about 1/3 of India's marine exports.

The living situation of Kerala state is distinctly different from other states of India due to its high socio- personal characteristics like more than 95% literacy of men and women, low birth to death rates and growth in social service sectors. More over the people had homestead based small and marginal holdings with coconut as the main crop and a house in the plot.

Kerala is the largest producer of coconut in India with an annual production of 5,167 million nuts from an area of 9.0 lakh ha. and the average productivity is 5,747 nuts/ha.

9.2. Location of the selected site

The village Pathiyoor panchayat in Alappuzha District was selected for implementation of the project. The panchayat comes under the Muthukulam Block of Alappuzha District in Kerala State. It is located 100 km towards south of Cochin. Alappuzha district is very famous for its backwaters and boat races.

9.3. Climate

The area receives both Southwest and Northeast monsoons and does not experience much moisture stress, but there are flood situations during peak rainy season. The temperature ranges from 21 to 35 ^{0}C. The area receives average rainfall of

3500 mm/year with major portion from Southwest monsoon during May-June to August. Maximum rainfall is being received in June and July months and summer showers in December, April and May.

9.4. Soil characters

The predominant soil type of this area is sandy loam. The area comes under the unique "Onattukara Region" famous for its predominant sandy loam nature of soil, fertility, diverse agriculture models, sesame cultivation and groves which are unique in ecological conservation of soil, local flora and fauna.

9.5. Cropping pattern

The major crops grown in the village could be grouped under the following seven categories

1. Plantation crops: Coconut, Arecanut.
2. Oil seeds: Sesame
3. Cereals: Paddy. Usually three crops were taken such as viruppu, mundakan and puncha. But due to several socio-economic constraints puncha crop is scarcely cultivated.
4. Vegetables: Vegetables are grown as kitchen garden or mostly as intercrops in coconut gardens as a homestead crop. Common vegetable crops cultivated are brinjal, bitter gourd, chillies, drumstick etc.
5. Tuber crops: These are the common intercrops in homesteads. They include diascorea, amorphophallus, colocasia, yams and tapioca.
6. Pulses: Green gram is grown as a catch crop by a few farmers.
7. Fruit trees: Mango, Jack, Banana and Papaya are also grown.

9.6. Sources of irrigation

- Open wells for drinking as well as for irrigation.
- Canals are cutting through the Panchayat area, but not useful for irrigation due to lack of enough branch canals and sub ways.

9.7. Fisheries and Animal Husbandry

Even though small homestead ponds and water bodies are available, fisheries is not being done as an enterprise. Cattle population includes cows and goats.

9.8. Farm implements and machineries

Farm implements like knapsack and rocker sprayers, tractors, tillers and paddy threshers are available with the farmers group organizations for coconut farmers (Kera samithies) and paddy farmers (Padasekhara samithies). Rice mill for small-scale post harvest operation and coconut oil mills are present in the area.

9.9. Poverty status

In this panchayat, the poverty line can be defined as the households/family with less than Rs 18,000/-as per capita annual income and these families could be defined as poor families. The farmers under this category with opportunities for improvement were selected and included in the project list. The major sources of income are from agriculture, daily wage employment, animal husbandry, private small scale business/shops, government services and other enterprises like tailoring, driving , masons and other rural labour works. Majority of the poor and very poor are engaged as daily wages labourers and small-scale farming. The income is found to be spent on food, agriculture, health,

education etc by the middle class families. There are no families, which can be classified as 'rich' in the area. It is very interesting to note that medium and poor families spent a major chunk of their expenditure on education, food and health due to their awareness about health and literacy.

9.10. Classification of land holdings

Ninety nine per cent of the farmers are small and marginal with an average land holding size of less than one hectare. The mid land accounts for 65 percent in the community and the rest are the low lands. The land use pattern was found to be on various combinations of cropping system and basically homesteads which is the unique farming system of Kerala State. This area is known as "Onattukara Region", which is famous for its agricultural background, fertility and prosperity, sandy loam soil characters and sesamum cultivation.

9.11. Transect Analysis

The salient findings through the transect analysis are as follows

Criteria	Midland	Low land
Topography	65%	35%
Land use	Dwelling purpose, Horticulture,Livestock, Poultry	Paddy, Sesame, Duck rearing
Crops	Tubers,Spices, Vegetables, Pepper	Paddy, Sesame
Livestock	Cow, Goat, Poultry	Duck
Water source	Well, Canal, Ponds	Canals
Problem	Low productivity of coconut, Pest and diseases of coconut and in the intercrops, Low price	Low price, high costs, high cost of labour, Water stagnation
Opportunities	Adopting scientific Management Practices, Intensifying intercropping, Product diversification	Mechanization, Preventing water stagnation for ensuring successful sesamum cultivation.

9.12. Problem identification

Problems of the farmers were identified and prioritized using PRA techniques .The problems identified are furnished in terms of garden land/ Homestead farming, low land farming and animal husbandry/Poultry rearing.

9.12.1. Garden land /Homestead farming

- Low yields of coconut and intercrops
- Prevalence of pests and diseases which affects yield/profit from crops
- High labour cost and shortage of labour.
- Difficulty in balanced nutrient management.
- Small/marginal holding provides less scope for commercial cultivation.

9.12.2. Lowland farming

- Drainage problem / water stagnation
- Low yield of rice / sesame
- Labour scarcity
- high labour cost
- Low yield
- Low profit

9.12.3. Animal husbandry/Poultry rearing

- High cost of inputs
- Low milk yield
- Low poultry productivity
- Non-availability of better poultry breeds

9.13. Seasonal analysis

The month wise salient pest and disease problems related to agriculture are as follows

Months	Crops	Pests and diseases
January	Sesame	No major ones
February	Paddy (I season)	Rice bug, Stem borer
March	Vegetables, Tubers	Rodents
April	Banana	Pseudo stem weevil, Bunchy-top, Rhizome weevil
May	Coconut	Rhinoceros beetle, Red weevil, Leaf rot, Stem bleeding
June	Pepper	Pollu beetle,Wilt
September	Paddy(II Season)	Rice bug, Stemborer

9.14. Gender issues

Women in this area are engaged in vegetable farming / kitchen gardening and household agricultural activities. Backyard poultry is also a common venture in small scale among women. Women leaders taking active participation in local administration and development activities is a common feature.

More than 75 Self-Help Groups (SHG) for women already exist in the area which can be utilized in the implementation of poverty alleviation programme.

9.15. Time line analysis

The landmarks in development activities in Panchayat and the importance given by the local people to them are being reflected in the time line analysis.

- 1950 – Panchayat office established. Paddy fields had more value than garden land.
- 1953 – Farmers co-operative society established.
- 1955 – Social education department with an organizer for agricultural development.
- 1956 – Gramasevaks of development block for transfer of agricultural technology
- 1960 – TXD hybrids introduced from development blocks .
- 1965 – Adoption of chemical fertilizers/pesticides started.
- 1975 – Krishi Bhavans established , paddy land conservation started .
- 1980 – First farmers co-operative society of Alappuzha district established in Pathiyoor.
- 1981 – Pampa Irrigation Project canal established which was detrimental to local agriculture due to water stagnation problems.
- 1995-1996 – Establishment of Kera Samithies, Peoples' planning programme.
- 1998 – Eriophyid Mite incidence in coconut.
- 2000 – Diminishing sesamum cultivation/large scale conversion of paddy lands/ low yield of crops/low returns from agriculture.

9.16. Seasonality of labour

The labour requirement during different seasons are as follows

January/February	Less labour demand.
March, April, May	Labour demand more for intercrop planting.
June, July	Peak labour demand during this period. (basin opening of coconut, banana, fertilizer application , sowing / transplanting of paddy).
August, September	Labour demand – medium.
November, December	Labour demand – medium.

9.17. Well being analysis

The well being perception analysis was done in consultation with the key

informants. The usual assets included for categorization are land, house, livestock, television, vehicle, crops, animal husbandry/ poultry etc. The three categories of families in the village are middle, poor and very poor. Majority of the farm families (70%) falls under the category of poor and very poor and 30% only comes under middle category.

9.18. Mobility map

Major means of transport are bicycles and auto-rickshaw and by walk. The farmers usually buy inputs like pesticides and fertilizers from co-operative societies/ farmers' societies. Organic fertilizers and coconut seedlings are produced in their own households or purchased from other farmers. For technical advice/purchase of seeds/ inputs, the farmers go to Krishi Bhavan of the State Department of Agriculture. Coconuts are being sold to middle men in the local area as whole nut and vegetables and intercrops are usually used for own consumption purpose.

9.19. Problem identification

9.19.1. Socio – Economic

- Lack of awareness and knowledge about plant protection
- Price fluctuation
- Scarcity and high cost of skilled labour for plant protection
- Low adoption of management practices
- High cost of production
- Lack of interest in agriculture
- Absentee farming
- Existence of homestead farming instead of commercial farming
- Marketing problems
- Lack of conviction on technologies
- Fragmented holdings

9.19.2. Bio – physical

- Eriophyid Mite – yield loss and low adoption of control measures
- Existing low quality of genetic stock
- Incidence of root(wilt) , red weevil and other pests and diseases
- Scarcity of organic manure
- Lack of awareness about possible avenues for organic manure production
- Non availability of good planting materials
- Lack of processing units
- Lack of irrigation facilities
- Lack of adequate drainage facilities
- Lack of correct spacing and shade problems
- Lack of low cost production technologies and simple practices of plant protection
- Ecological consequences of development activities

9.20. Coconut Varieties

West Coast Tall (WCT) is the common variety under cultivation in almost all the households. The other varieties found in the community are Chowghat Orange Dwarf (COD) and Chowghat Green Dwarf (CGD) and less than 1% grow TXD or DXT hybrids. Very few farmers sell copra after processing, but majority sells as mature nuts to local merchants.

9.21. Suggested interventions

Sl.No.	Intervention particulars
01	Cultivation/under planting with high yielding cultivars or hybrid coconut seedlings
02	Cultivation of drought tolerant coconut varieties

03	Stress on the importance of optimum management in the pre bearing period
04	Balanced dose of chemical fertilizers
05	Water management using husk burial/mulching/pot irrigation/ drip /sprinkler irrigation
06	Stressing the importance of inter cultivation
07	Root (wilt) disease management
08	Leaf rot disease management
09	Managing the attack of eriophyid mite
10	Managing the attack of bud rot and stem bleeding diseases of coconut
11	Managing the attack of major pests of coconut
12	Organic farming technology including vermi-composting
13	Intercropping of tubers in coconut gardens during the pre bearing phase
14	Intercropping of vegetables in coconut gardens
15	Coconut based mixed cropping system with pepper
16	Coconut based mixed cropping with clove
17	Coconut based mixed cropping system with West Indian Cherry
18	Coconut based farming system integrating the above systems
	with dairying, poultry and sheep rearing
19	Encouraging the farmers to harvest and market as tender coconuts
20	Small scale manufacture of snow ball tender nut and grated coconuts
21	Climbing device for farmers
22	Coconut dehusking tools
23	Coconut based value added products like sweet coconut chips and coconut water vinegar.
24	Manufacture of coconut shell based products

9.22. Summary of socioeconomic data for selected site

Pathyioor community in Kerala is a small holder predominated coconut belt in the west coast. The average size of land holdings is 0.21 ha and the annual gross farm income in these farms is 68.45 US$. The education level of these farmers is upto secondary level and their socio-economic status is poor.

Eighty eight percent of the farmers are practicing intercropping in coconut gardens, however 53 per cent of them are rearing livestock in their farms. A yield gap of 1.36 tonnes/ha in terms of copra equivalent exists between the research station and farmers' fields. Location specific developmental activity plans based on systems approach with an aim to increase the productivity would improve the yield as well as the gross income in these farms.

CHAPTER X

EDACHERY COMMUNITY (KERALA STATE)

10.1 Location

The Edachery panchayat in Calicut district is in the Northern part of Kerala state. It is situated 14 km from Badakara Town and 60 km from Calicut city. The panchayat comes under Thuneri block administration.

10.2 Climate

The average rainfall in this community is 3000 mm with more than 80 percent of the rainfall during the southwest monsoon period. The mean temperature ranges from 21 to 35°C.

10.3. Cropping pattern

Mid land/Garden land	Low land / Paddy land
Coconut – Monocrop Varieties cultivated are local West Coast Tall (98%) and hybrids like COD, TXD and DXT sparsely. Coconut + intercrops. 1. Inter crops Banana Pepper Vegetables Tapioca Amorphophallus Yams Diascorea Ginger Turmeric 2. Mixed crops Arecanut Pepper Nutmeg Jack Mango Moringa Papaya Other local fruit crops 3. Coconut + mixed farming with Cow / goat / hen. (20 - 40%)	Viruppu — Jyothi, Triveni, Athira Mundakan, Puncha } Jaya and local varieties Many varieties cultivated Cultivation of vegetables and cowpea as summer/ catch crops during summer season in paddy fields.

10.4. Agro -ecological characteristics

Soil type	Laterite soil
Soil nutrient status	Medium – high
Crops cultivated	Coconut, Arecanut, Banana, Pepper, Tapioca, Yams, Mango, Jack, Turmeric, Ginger, Nutmeg, Cashew
Adoption	Medium
Knowledge	Low to medium
Inter crops	Vegetables, Tapioca, Colocasia, Turmeric, Ginger, Arrowroot, Pineapple, Yams, Banana
Livestock	Cow, Goat, Hen
Water sources	Wells, Canals
Pests	Rhinoceros beetle, Eriophyid Mite, Red palm weevil
Diseases	Root rot, Bud rot, Stem bleeding
General crop stand	Fair – Good
Planting material/ variety coconut	Local/own nursery – WCT variety, T X D (1to2 %)
Green manure/leaf	Local green leaf source – "Vatta"
Processing/Coconut products	Ball copra, Copra for oil
General Observations	Rural pathways-narrow to each households/Hilly and undulated terrain, farmers very much co-operative/ women folk engaged in livestock rearing
Other socio – economic status	Education – Literate to High school (majority) Houses – Moderate construction Livelihood – Agriculture and labourers Family size – small to medium (4 to 7 members) Religion– Hindus and Muslims Farmers groups – Paddy farmers groups (Padasekhara Samithies) Coconut farmers group (Kera sanghams)

10.5. Seasonal analysis

Months	Crops	Pest / Diseases
January	Vegetables in paddy fields	Leaf spot/mosaic/fruit borers leaf eating caterpillar
February	Paddy – I-Season	Rice bug/Stem borer/leaf roller
March	Vegetables/Tubers/Turmeric/ Ginger	Rodents/Fungal diseases/ soft rot
April	Banana	Psuedostem weevil/Kokkan disease
May	Coconut ,Arecanut	Eriophyid Mite/Rhinoceros beetle/Red weevil/Bud rot/Root rot
June	Pepper	Wilt
September	Paddy II Season	Leaf roller
December	Cowpea in paddy fields	Nil

10.6. Cropping pattern

Paddy and coconut are the major crops grown in this area. The major crops can be classified as cereals, plantation crops, vegetables, tubers, spices, pulses and others.

1. Cereals : Paddy is cultivated in 132 ha.

   The main crops are Viruppu, Mundakan and Puncha with mundakan (80 ha) and puncha in only 12 ha. High yielding as well as local varieties are being cultivated.

2. Plantation crops: Coconut and arecanut are the major plantation crops. Coconut is the major crop and arecanut is being cultivated as intercrop.

3. Vegetables: Vegetables are grown as intercrops in coconut gardens as well as in summer fallow paddy lands as a rotation crop. Common vegetables cultivated are snake gourd, brinjal, cucumber, bitter gourd, little gourd and leafy vegetables

4. Tuber crops: Tuber crops are commonly grown as intercrop in homestead gardens. Tapioca, amorphophallus, dioscorea and yams are cultivated by the farmers.

5. Spices: Common spices cultivated are turmeric, ginger and pepper

6. Pulses: vegetable cowpea grown in paddy land as a catch crop.

7. Other crops: Cashew also is a major crop

8. Fruit crops: Banana, Pineapple, Jackfruit and Papaya.

10.7. Sources of irrigation

- Wells – 110 Nos.
- Tanks – 10 Nos.
- Rivers – 5 Nos.

Community irrigation from Chalode river for coconut

- Kunnanchira – 7.56 ha
- Chalode – 8.76 ha
- Chichipavilathu – 6.41 ha
- Varekkaduthilthara – 5.00 ha
- Kulangarathuthazha – 5.00 ha

10.8. Animal husbandry and poultry

Most of the households had cow/goat and backyard poultry as components of homestead farming. Most of them are of local breeds.

10.9. Farm implements and machineries

The common farm implements are hand sprayers, iron plough, hand hoe, pickaxe etc. The area has land area for intensification with appropriate inter and mixed crops. The geographical specialities do not allow the use of tractors etc. for land preparation.

10.10. Poverty status

In the farmers meeting, during discussions, it was felt that a per capita annual income of less than Rs.18, 000 /- may be defined as the poverty line for defining poor families. The farmers/farm families can be subdivided based on their income as middle, poor and very poor. Unlike in other states, we could not find a dwelling site and cultivated area separately since homestead farming with a house surrounded by multiple crops with coconut as the main base crop can be seen. The major source of income are agriculture, gulf employment, working in co-operative societies, government services, agricultural labourers, handloom workers, and other enterprises like tailoring, coir making, construction labour works etc. More than 70% of the farm families fall under poor to very poor category and others in middle class category. All the families spend a sizeable part of their income for education of their children. Even though the income level in general is poor, there are ample viable opportunities to intervene and raising the income level.

10.11. Classification of land holdings

Ninety percent of the farmers in the community are marginal, with an average holding size of less than 0.5 ha, while the remaining 10 percent are small with a holding size of less than two hectares

10.12. Occupational status of the households in the community

The major livelihood avenues of the members of the panchayat are as below:

Agriculture	-	50%
NRI (Gulf based)	-	10%
Working in co-operative societies	-	5%
Government service	-	5%
Labourers in agriculture	-	10%
Other enterprises (tailoring, coir making, construction labour etc.)	-	18%
Handloom	-	2%

10.13. Gender issues

The women folk of the region are found to be engaged in activities like household works, attending their children and family members, engaged in livestock, poultry, and other small agricultural activities. Women engaged in agricultural labour are now shifting to construction works due to the large-scale conversion of paddy lands, uneconomic nature of family and the changing social scenario. Women groups can be engaged in coconut processing like vinegar preparation from coconut water, chips preparation from coconut kernel, vegetable gardening, nursery management, livestock/poultry rearing, coir pith composting and agricultural product based small scale processing/preservation.

10.14. Time line analysis

1900 and before - Ball copra making

1953 - Road Development started

1957 - Land reforms law enforced/first school i.e., Edachery north UP school.

1960s - Agricultural section in development block started/first co –operative society started.

1963 - T X D hybrid introduced.

1967 - Agricultural land reforms enforced.

1969 - Post Office started.

1970 - HYV of paddy IR8 introduced/ Panchayat Office started.

1983 - Krishibhavan started.

1990 - Minor irrigation project for paddy.

1995 - Community irrigation started.

2000 - Primary health centre started / Govt.Ayurveda dispensary

1970-2000- 75% of the paddy lands were converted as garden lands.

10.15. Seasonality of labour

The labour wage per day is Rs. 150 – 175. But the usual practice is labourers work for half-a- day only at the rate of Rs. 95 for half-a- day. The peak labour demand is during May – June as farm operations for major crops like paddy, coconut and intercrops come during this month. The next peak period for labour is in October – November. The demand is less during January - February.

10.16. Well being analysis

The key informants of the PRA team assisted in categorizing the wealth status as per their perception. The criteria taken were employment status, number of family members, house, total land, livestock, vehicle, agricultural enterprises etc. All the households had electricity and well with pumpset for drinking water purposes and 90 % of them possess television sets also. The farmers can be classified as middle, poor and very poor families. As such there are no rich families in this area.

10.17. Mobility map

Farmers usually purchase their agricultural inputs and daily needed items from co – operative societies/farmers co-operative societies/banks. They sell farm products to locally existing middle men or produce for self consumption only. Labourers go to cities or adjacent work available sites like road/building construction. Major means of transport are cycle, auto-rickshaw and bus.

10.18. Problem cause analysis for coconut cultivation

10.18.1. Socio – Economic

- Low price of coconut.
- Scarcity of labour
- High cost of skilled labourers.
- Wide disparity between input and output cost.
- Existence of homestead farming instead of commercial farming.
- Fragmented holdings.
- Diminishing interest in farming
- Low level of technology transfer
- Lack of simple technologies.

10.18.2. Bio – Physical

- Eriophyid Mite – high yield loss and difficulty in adopting control measures
- Incidence of root rot as a new disease and bud rot disease.
- Scarcity of organic manure
- Lack of water for irrigation in summer months
- Environmental degradation leading to moisture stress and soil

degradation

- ❖ Non – availability of hybrid seedlings
- ❖ Soil erosion
- ❖ High cost of inputs
- ❖ Lack of knowledge about incidence of pests and diseases
- ❖ Low intensity of inter / mixed cropping

10.19. Coconut varieties

West Coast Tall is cultivated in all the plots. A few farmers have Chowghat Orange Dwarf (COD) and hybrids like T X D / D X T, that too one or two numbers only in each plot. Majority of the farmers process their nuts to "ball copra" in traditional methodology and sell them in Badakara market.

CPCRI had released 5 varieties and four hybrids for general cultivation in the country. The farmers opined that the performance of hybrids was good in the area. Besides this, quality seedlings of local varieties suited for ball copra manufacturing can also be tried in this area.

10.20. Suggested interventions

S.No.	Intervention particulars
01	Cultivation/under planting with high yielding cultivars or hybrid coconut seedlings
02	Cultivation of drought tolerant coconut varieties
03	Stress on the importance of optimum management in the pre bearing period
04	Balanced dose of chemical fertilizers
05	Water management using husk burial/mulching/pot irrigation/ drip /sprinkler irrigation
06	Stressing the importance of inter cultivation
07	Managing the attack of eriophyid mite
08	Managing the attack of bud rot and stem bleeding diseases of coconut
09	Managing the attack of major pests of coconut
10	Organic farming technology including vermi-composting
11	Coconut based inter cropping system with banana
12	Coconut based inter cropping system with pineapple
13	Intercropping of yams in coconut gardens during the pre bearing phase
14.	Intercropping of vegetables in coconut gardens
15	Coconut based mixed cropping system with clove
16	Coconut based mixed cropping with pepper
17	Coconut based mixed cropping system with West Indian Cherry
18	Coconut based farming systems integrating the above systems with dairying, poultry and sheep rearing
19	Encouraging the farmers to harvest and market as tender coconuts
20	Small scale manufacture of snow ball tender nut and grated coconuts
21	Climbing device for farmers

22	Coconut dehusking tools
23	Coconut based value added products like sweet coconut chips and coconut water vinegar.
24	Manufacture of coconut shell based products

10.21. Summary of socioeconomic data for selected site

In Edacherry community, the average size of land holdings is 0.75 ha and the annual gross farm income in these farms is 130.60 US$. The education level of these farmers is upto primary level and their socio-economic status is poor.

Fifteen percent of the farmers are practicing intercropping in coconut gardens and 40 per cent of them are rearing livestock in their farms. A yield gap of 1.79 tonnes/ ha in terms of copra equivalent exists between the research station and farmers' fields. Concerted efforts, if taken in appropriate manner would help to improve the yield as well as the gross farm income in these farms.

CHAPTER XI

PALLIKKARA COMMUNITY (KERALA STATE)

11.1. Location

Pallikkara grama panchayat is one among the 39 grama panchayats in Kasaragod district of Kerala State. It comprises of three revenue villages, viz, Keekan, Pallikkara and Panayal. The geographical area of the panchayat is 39.09 sq. km. As per the 1991 census, it has a population of 34,696 out of which 16,631 are male and 18,065 are female. Population density of the panchayat is 888 per km and the literacy rate is 77 per cent. The selected communty is located 20 km away from the Central Plantation Crops Research Institute Main Campus.

11.2. Topography

As per the agro climatic classification of zones in Kerala State, the panchayat is coming under the sub humid laterite zone. Depending on the topography, the panchayat can be divided into upland, midland, lowland and coastal land, which comprises 25, 35, 30 and 10 per cent respectively of the total geographical area.

11.3. Soil type

In the upland and midland, the soil type is predominantly laterite, while it is clayey in the low land. Sandy soil is found in the coastal land.

11.4. Climate

Average annual rainfall in the panchayat is 3500 mm, a lion's share of which is received during three months viz., June, July and August. The Northeast monsoon is very weak and as such there is a long dry spell from November to May. The average monthly maximum temperature ranges from 28.7°C to 34.2°C.

11.5. Cropping pattern

Coconut is the most important crop cultivated in the panchayat. It is cultivated in about 1410 ha. Paddy, vegetables, cashew, arecanut and tobacco are the other important crops.

Coconut is mainly cultivated in the midland and upland. In the lowland, paddy and arecanut are the major crops. Paddy cultivation is mainly taken up in the virippu and mundakan seasons i.e. from April-May to September-October and September-October to December- January. Due to lack of irrigation facilities, during punja season (from December-January to April-May) paddy fields are kept fallow. There is a large-scale reclamation of paddy fields for planting arecanut. Cow pea, cucumber, bitter gourd, chillies and amaranthus are the major vegetable crops cultivated in limited area mainly in the homesteads and paddy fallows. Tobacco is cultivated in the paddy fields, which are single cropped, during the period from September to January. Pepper is grown in a limited area as a mixed crop in coconut and arecanut garden.

11.6. Irrigation

Lack of irrigation facilities is one of the major constraints in improving productivity of crops. Mostly the crops are rainfed. Only 17 per cent of the area under coconut receive irrigation. Open wells, ponds, small rivers and streams are the sources of irrigation.

11.7. Size of holding

About 93 per cent of holdings are of less than one ha in size, and 5.5 per cent are small holdings with 1-2 ha size, while only 1.5 per cent of the holdings are having an area of more than 2 ha. Small size of holdings is one of the constraints experienced in the adoption of improved production technologies.

11.8. Gender Issues

According to 1991 census, the panchayat has a male, female ratio of 1000:1086, which is higher than the state average (1000:1036). The literacy rate is low among female population (71 per cent) compared to male (84 per cent). There is discrepancy in the wage rate among men and women engaged in the same nature of work. Women get lower wage only. Beedi rolling, sieving, laterite quarrying and construction work are the major avenues for job for the women labourers in the panchayat. Number of women agricultural labourers is on the decline, mostly because of the low wages and shift to sectors like construction work and laterite stone quarrying. The involvement of women in the coconut farm families is confined to agricultural operations such as transporting and application of manures and fertilizers, copra drying, transporting the harvested nuts, management and milking of cattle where mixed farming is followed and other minor activities. Interventions such as development of coconut based farming system to increase the income and to enhance the nutritional status of the household and promotion of women's groups for processing at the farm household and community levels will be beneficial to strengthen the women's participation in coconut farming.

11.9. Livelihood analysis and poverty situation

The participatory rapid analysis revealed that agriculture is the important source of income, which provides livelihood to 55 per cent of the population. 15 per cent of the population is engaged in the agricultural labour sector. There is a declining trend in the number of agricultural labourers because of the reduction in paddy area. A sizeable segment ie, 20 per cent of the population depends on service sector for their livelihood. Also a large number of families in the panchayat depend on their NRI relatives in Gulf countries as the major source of income.

There is a general feeling among the cultivators that income from farming sector is on the decline due to declining prices for the agricultural produce like coconut. Participants of the wealth ranking exercise conducted as part of the PRA in the study area opined that size of holding, cropping pattern, availability of irrigation facility and on and off- farm income were the criteria to be considered for categorizing the farmers. Accordingly, it was revealed that a majority (60 per cent) of the farmers belonged to poor category. Lower middle class and middle class farmers were 30 per cent and 10 per cent respectively. The expenditure analysis showed that farmers spend 50 per cent of their income for food, 25 per cent for non-food essential items, 10 per cent each for health care and education and the remaining 5 per cent for other miscellaneous items of expenditure. It was generally observed that the coconut holdings belonging to poor farm families fetch them a per capita income of only Rs.18000 or less per year.

11.10. Problem-cause analysis for low coconut yield

The problem-cause analysis for low coconut yield realized by the farmers of the area revealed the following factors:

11.10.1. Socio-economic

- Unorganized marketing
- lack of product diversification
- low price for produce
- scarcity of skilled labour and
- poor research-extension-farmer linkage.

11.10.2. Bio-physical

- Lack of irrigation
- poor soil fertility
- lack of soil and water conservation measures
- inadequate use of organic manures
- imbalanced application of fertilizers
- less farm intensification and
- non-availability of quality planting materials.

11.11. Suggested interventions

Sl.No.	Intervention particulars
01	Cultivation/under planting with high yielding cultivars or hybrid coconut seedlings
02	Cultivation of drought tolerant coconut varieties
03	Stress on the importance of optimum management in the pre bearing period
04	Balanced dose of chemical fertilizers
05	Water management using husk burial/mulching/pot irrigation/ drip/sprinkler irrigation
06	Stressing the importance of inter cultivation
07	Managing the attack of eriophyid mite
08	Managing the attack of bud rot and stem bleeding diseases of coconut
09	Managing the attack of major pests of coconut
10	Organic farming technology including vermi-composting
11	Coconut based inter cropping system with banana
12	Coconut based inter cropping system with pineapple
13	Intercropping of yams in coconut gardens during the pre bearing phase
14.	Intercropping of vegetables in coconut gardens
15	Coconut based mixed cropping system with pepper
16	Coconut based mixed cropping with clove
17	Coconut based mixed cropping system with West Indian Cherry
18	Coconut based farming systems integrating the above systems with dairying, poultry and sheep rearing
19	Encouraging the farmers to harvest and market as tender coconuts
20	Small scale manufacture of snow ball tender nut and grated coconuts

21	Climbing device for farmers
22	Coconut dehusking tools
23	Coconut based value added products like sweet coconut chips and coconut water vinegar.
24	Manufacture of coconut shell based products

11.12. Summary of socioeconomic data for selected site

Pallikkara community in Kerala is an area with smallholder predominant farming system. More than 80 per cent of the area in this community is under rainfed farming. The average size of land holdings is 0.88 ha and the average annual gross farm income is 151.28 US$. The education level of these farmers is upto primary level and their socio-economic status is poor.

Only five percent of the farmers are practising intercropping in coconut gardens, while 63 per cent of them are rearing livestock in their farms. Like in other communities, there exists a wide yield gap in coconut in terms of copra equivalent between the research station and farmers' fields (2.26 tonnes/ha). Long-term strategies with a perspective vision needs to be formulated and effectively implemented for sustained progress of the farmers in this community.

CHAPTER XII

ACTION PLAN

The interventions suggested for improving the coconut productivity and returns from coconut cultivation among the selected communities are proposed to be introduced under a three year poverty reduction project. This multi-country project is being coordinated by the COGENT scientists who would serve as the Project Leader for the programme. The project would be implemented from 2002 onwards with the financial assistance from Asian Development Bank, Department for International Development and other multinational funding agencies. Financial assistance from government organizations like Coconut Development Board could also be availed for implementing a few of the interventions. CPCRI would be taking the lead role in implementing this project in collaboration with scientists from State Agricultural Universities and officers from the State Department of Agriculture/ Horticulture as available in different states. While implementing the project, the following approaches are envisaged.

12.1. A Systems Perspective

The usefulness of a system approach for understanding and analysing agricultural technology generation and dissemination is widely acknowledged. Although they are sometimes criticised because they are so abstract, systems analysis offer holistic vantage points for understanding the factors that impede or enhance the two-way flow of technology and information between farmers and the public organizations that constitute the system. The model used here identifies an agricultural knowledge system consisting of four components set in a larger context (Figure 1). The components are technology generation, technology transfer (knowledge and input transfer), technology utilization and agricultural policy. The organizations that constitute the components, as well as others in the system environment, influence each other in complex ways.

Technology generation consists of planning, administration and implementation of research activities that develop, assess, adapt and test improved agricultural technology for farmers and other users. In the public sector, these tasks, as well as some dissemination work, are carried out by agricultural research organizations.

Technology transfer further evaluates and adapts research output for users and then widely disseminates the knowledge and inputs to different target adopters ie farmers of different categories. The Figure 1 shows two parts of the transfer component, namely, knowledge and inputs. In all the stages, government extension does both types of transfer, although the emphasis is on knowledge. Private organizations are also involved in both types of transfer, although farmer coverage is more limited and input transfer may play a bigger role.

The technology utilization component encompasses the users of the agricultural technology, mainly farmers. User awareness, adaptation and adoption of improved technology from various sources affect farm-level productivity and profitability and, ultimately, economic growth at the national level. Interaction and

feedback between users and research and transfer organizations improve cooperation and the relevance of technology.

The policy component relates to government development goals and strategies, market and price policies and the levels of resource investments in the system. Various government bodies play a role in setting development policy. Technology development and transfer organizations are affected by the policy in fundamental ways.

The agricultural technology system context in which government extension organizations operate can be described under two headings: macro-factors and institutional factors. Any of these factors can impede or influence the flow of technology and information between farmers and extension. Hence efforts would be made to involve all the concerned research and development organizations for implementation of the proposed coconut development plan in each community.

12.2. From Directive to Participatory Extension

While implementing the proposed coconut development programme, emphasis would be given on the use of participatory extension methodology. The farmers in the selected communities would be encouraged to form voluntary Self Help Groups (SHG). These groups shall take the initiative in implementing/introducing various interventions proposed in the action plan. The scientists and other officers of the public organizations shall serve as the facilitators. This approach is proposed due to the strong conviction that extension will need to build on traditional communication systems and involve farmers themselves in the process of extension. Participation as a part of extension, will clearly be interactive and empowering.

The traditional approaches of organizing farmers and forming cooperatives will be modified into a Self Help Group concept to meet the following development challenges of the twenty-first century:

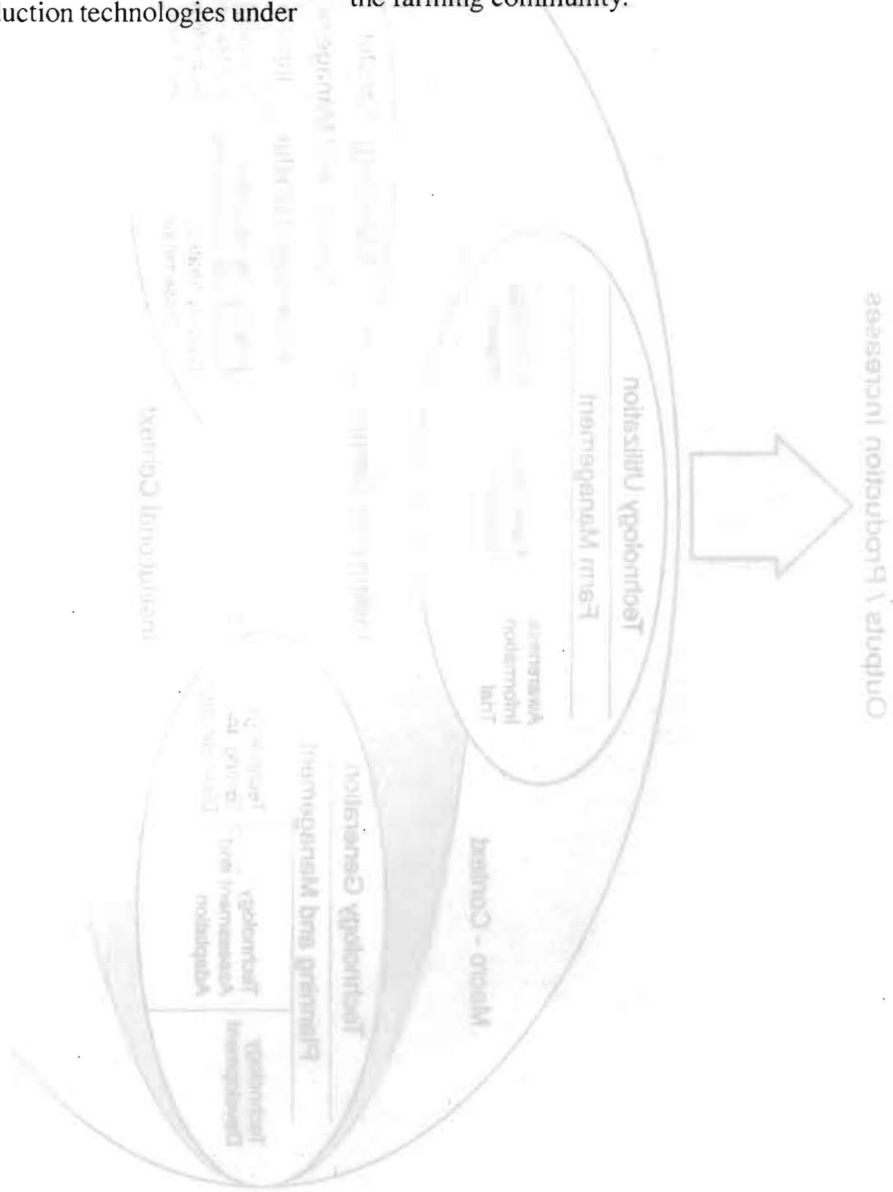
- The increasing absolute and relative poverty in many states
- The degradation of natural resources such as soil, water, flora and fauna
- The low involvement of women in health, agriculture and other development programmes
- The increasing socio-political unrest among the communities.

12.3. Holistic approach

In the context of sustainable agricultural development, agricultural extension has a very crucial role to play. The tasks and responsibilities of research and extension service will need to be broad-based and holistic in contents and scope, thus beyond agricultural technology transfer. Its normal task of transfer and dissemination of farmers' appropriate agricultural technologies and good farm practices would not be sufficient. Research and extension agencies, services and workers will need to exercise a more proactive and participatory role and serve as knowledge/information "brokers", initiating and facilitating mutually meaningful and equitable knowledge-based transactions among agricultural researchers, trainers and primary producers. To improve its cost-effectiveness, appropriate strategies to advocate favourable and explicit agricultural extension policies would be adopted.

12.4. Anticipated results

It is optimistically expected that the project would result in improving the coconut productivity concurrently ensuring higher returns from coconut cultivation. This action research programme would enable the scientists to assess the impact of new coconut production technologies under varying agro-climatic situations. The project would also serve as models for planning and implementation of coconut development programmes in different parts of the country on a larger scale and in the formulation of similar agricultural development programmes for betterment of the farming community.



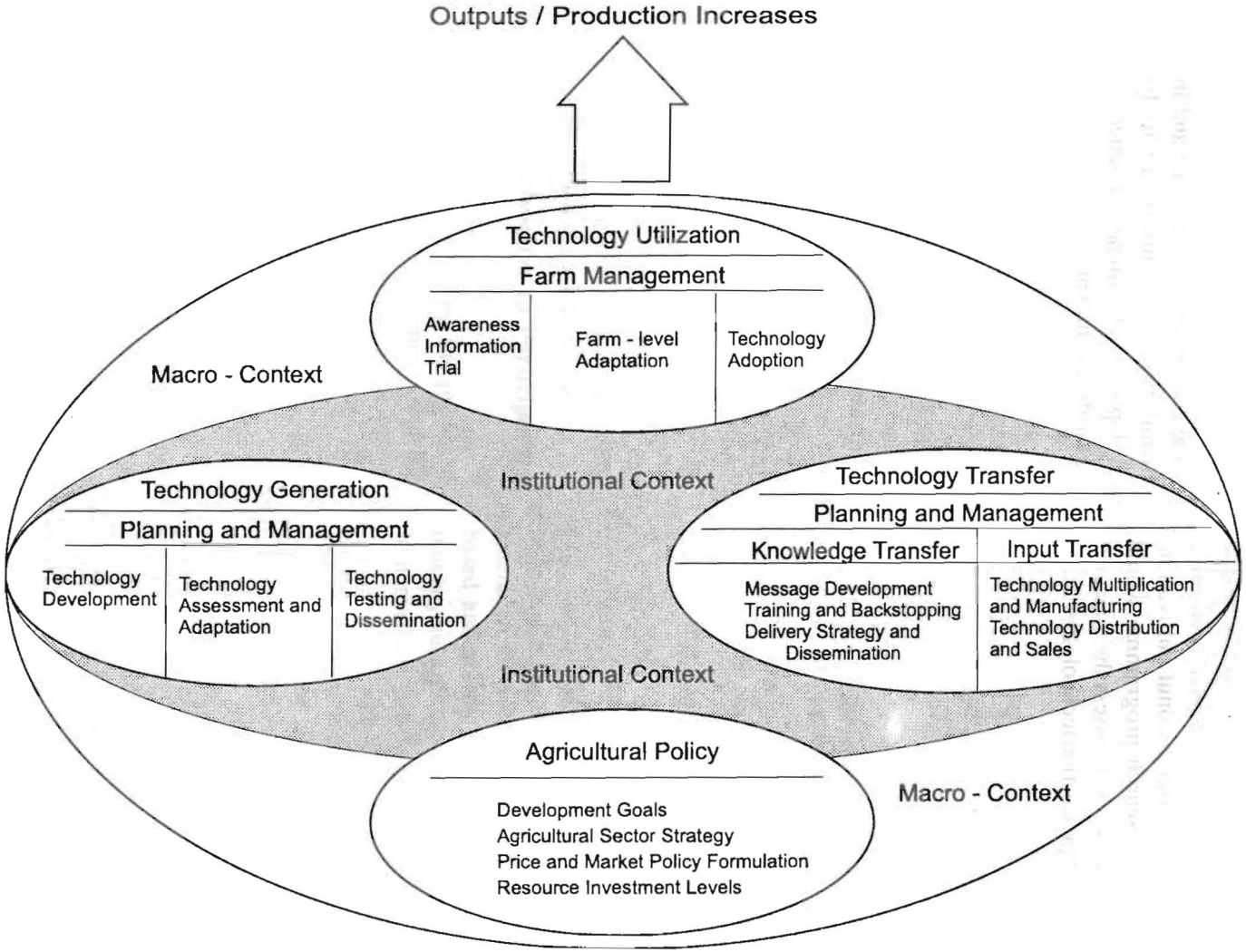


Fig. 12.1. Optimum Agricultural Knowledge System

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