To

Prasad maman

who respected my ideas

even as I was young

SMALL GROWERS OF RUBBER CULTIVATION IN KERALA : A SOCIO-ECOLOGICAL IMPACT ANALYSIS

SREEVALSAN J. MENON

DIVISON OF AGRICULTURAL EXTENSION
INDIAN AGRICULTURAL RESEARCH INSTITUTE
NEW DELHI - 110 012

1997

Dr. P. N. Mathur
Joint Director (Extension)

Indian Agricultural Research Institute,
New Delhi 110 012, India

CERTIFICATE

This is to certify that the manuscript of the thesis entitled "**Small growers of rubber cultivation in Kerala : A socio-ecological impact analysis**" submitted to the faculty of the Post - Graduate School, Indian Agricultural Research Institute, New Delhi, in partial fulfilment of the requirements for the degree of **Doctor of Philosophy in Agricultural Extension**, embodies the results of *a bona fide* research work carried out by **Mr. Sreevalsan J. Menon**, under my guidance and supervision and that no part of the thesis has been submitted for any other degree or diploma.

It is further certified that any help or source of information has been duly acknowledged.

(P. N. Mathur)
Chairman
Advisory Committee

Place : New Delhi
Date : November 15, 1997

SMALL GROWERS OF RUBBER CULTIVATION IN KERALA : A SOCIO-ECOLOGICAL IMPACT ANALYSIS

by

SREEVALSAN J. MENON

A Thesis
submitted to the faculty of Post-Graduate School,
Indian Agricultural Research Institute, New Delhi,
in partial fulfilment of the requirements
for the award of degree of

DOCTOR OF PHILOSOPHY

IN

AGRICULTURAL EXTENSION

NEW DELHI
1997

Approved by :

Chairman	:	Dr. P. N. Mathur
Co-chairman	:	Dr. K. Vijayaraghavan
Members	:	Dr. Paramatma Singh
	:	Dr. (Ms.) Seema Jaggi

ACKNOWLEDGEMENTS

A work of this nature could not have been completed without the help of my chairman **Dr. P. N. Mathur**, Joint Director Extension, Indian Agricultural Research Institute. His transparent sincerity and a deep genuine concern for my well being has nurtured in me an abiding love and reverence for his noble self. I hereby express my gratitude to him.

I place on record my indebtedness to the members of my advisory committee - **Dr. K. Vijayaraghavan** (co-chairman), Senior Scientist, Division of Agricultural Extension, IARI, **Dr. Paramatma Singh**, Professor, Division of Agricultural Economics, IARI and **Dr. (Ms.) Seema Jaggi**, Scientist, IASRI.

I am thankful to the following distinguished scientists of the Division of Agricultural Extension, IARI - Dr. Y. P. Singh (Former Professor), Dr. B. P. Sinha (Head of Division), Dr. Baldeo Singh (Professor) and Mr. B. N. Chattopadhyay (Senior Scientist), for their valuable suggestions during the course of the investigation.

I have benefitted immensely from my long-term interactions with Anil Annan, Ramettan, Jiju Annan, Sujith, Rasheed Annan, Murali, Bony, Tyagi and Anandan. My batchmates - Kumaran, Dupare, Burman, Anand, Asokan, Khusyal, Murali and Vipin have generously offered their help at various stages of the work.

Adequate justice cannot be done in few words to the help rendered by Regi who was instrumental in my joining IARI. Warm thanks are also due to Ganesh, Saji, Anith, Patterji, Nakka, Pillai Sir, Sanjiv, Sudheer, Zakeer, Bhinu, Laxmi and Rhitu.

The help rendered by the following is gratefully acknowledged :

Koottikkal

Prince (George Thomas)
Mr. Thomas Sebastian
Mr. George Paikad
Mr. Michael Kallivayalil
Mr. Jiji

Kerala Agricultural University

Mr. Ajith Kumar C.E.
Dr. S. Bhaskaran
Dr. C. Bhaskaran

Rubber Research Institute of India

DR. P. Rajasekharan
Mr. M. Joy

University of Kerala

Dr. Immanuel Thomas

Alakode

Mr. G. Animon
Dr. P. Jayraj
Mr. B. L. Bijulal
Mr. N. M. Joseph
Mr. Kudakkachira Pappachan
Mr. Blaze Jose

Centre for Development Studies

Dr. K. P. Kannan
Mrs. Shobha Kannan

The credit for the typing of the thesis goes to Mrs. Madhu Kapur of M/s. Jagdamba Graphics, Mayur Vihar. My profound thanks to her.

The financial assistance received from the P. G. School, IARI, New Delhi is gratefully acknowledged.

Achan, Amma and Indu have always been with me . . .

New Delhi
November 15, 1997

(SREEVALSAN J. MENON)

CONTENTS

Particulars **Page No.**

Particulars **Page No.**

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ABBREVIATIONS

AGPVR	-	Alakode grama panchayat vikasana report
Al^{3+}	-	Aluminium ion
CAMI	-	Composite agricultural modernity index
CEC	-	Cation exchange capacity
CGR	-	Compound growth rate
C/N	-	Carbon to nitrogen ratio
CDS	-	Centre for Development Studies
EEI	-	Extension effectiveness index
H^+	-	Hydrogen ion
Ha	-	Hectare
HYV	-	High yielding variety
K	-	Potassium
KAU	-	Kerala Agricultural University
KGPVR	-	Koottikkal grama panchayat vikasana report
N	-	Nitrogen
NGO	-	Non-governmental organisation
MPa	-	Mega pascals
P	-	Phosphorus
RPSs	-	Rubber Producers Society (ies)
RRII	-	Rubber Research Institute of India

CHAPTER 1

THE PROBLEM

1. The Problem

Kerala accounts for 86 per cent of area under rubber cultivation and 94 per cent of rubber production in India (Rubber Board 1996a). There has been a significant growth in the rubber plantation sector in Kerala, in contrast to the general stagnation noticed in the agricultural sector of the economy. Further, one third of the agricultural income of the state is accounted by rubber (Roselind 1996). Being a remunerative small holder crop yielding income for a quarter century, leaving very good salvage value for timber and land at the end of one plantation cycle, rubber has contributed significantly to rural development in Kerala. The agro-ecological conditions in Kerala suits well for its cultivation. Rubber cultivation which was introduced in the beginning of the century presently occupies 20 per cent of the net sown area in the state. The growth of rubber plantations has resulted in replacement of food crops, expansion of rubber based industries, development of transport and communication infrastructure, increase in the standard of living of the people and upsurges in organised movement for collective bargaining (Roselind 1996). Thus, rubber created ripples in the society by providing an 'accelerative thrust' (Toffler 1970) in economic activity and change in interrelations between social institutions and value systems.

Impact studies* in rubber by and large have confined themselves to on-farm effects (e.g. increase in yield, fertilizer use etc.) and market dynamics** (e.g. price). Studies on the historical antecedents of rubber cultivation and the structural changes thereafter have been very few (Cicilyamma 1984; Umadevi 1989; Raviraman 1996). Research on the impact of rubber cultivation, as manifested in the social fabric (e.g. consumerism, values, cohesiveness etc.) and that on the agro-ecosystem, though highly

* Studies on rubber based industries are not included.

** For an elaboration of this point see the works of Mani (1982) and Mathew (1991).

warranted are unfortunately scanty. The present study, essentially a qualitative inquiry will therefore focus on the following issues.

Issue 1 : What has been the social impact of rubber cultivation ?

Issue 2. : What ecological changes were brought about by rubber cultivation ?

Issue 3. : How effective has been the extension services of the Rubber Board ?

Issue 4. : What factors have contributed to the spread of rubber cultivation in Kerala?

In order to analyse the above issues, the study has been designed with four specific objectives presented sequentially.

Objective 1 : ***to study the social impact of rubber cultivation***

The socio-psychological patterns of change brought about by rubber cultivation in terms of cohesiveness and integration among rubber growers, consumerism, agricultural modernity, migration, psychological acculturation, value systems, education and development sequences constitute the background of this inquiry. Instead of studying this impact only in terms of fragmented concreteness (e.g. variables like adoption, agricultural modernity in this study etc.) as hitherto being done, an attempt to gauge the impact as contiguous process across temporal and spatial dimensions is envisaged.

Objective 2 : ***To analyse the ecological impact of rubber cultivation.***

In many respects Kerala represents an epitome of the biodiversity profile of the western ghats in India. The state is endowed with diverse types of ecosystems, each supporting unique assemblages of biological community with an impressive array of species and genetic diversity. The introduction of rubber into the State has caused

substantial changes in the econo-ecological systems. Harmonising economic development and environmental conservation is by itself an uphill task. This becomes all the more difficult when one is confronted with conflicting notions on rubber monoculture *vis-a-vis* sustainable agriculture and natural resource use. These claims *inter alia* vary from viewing rubber as an eco-friendly crop to that threatening to endanger system sustainability. The second objective is formulated so as to throw light on this specific area of contemporary relevance.

Objective 3 : ***To study the effectiveness of Rubber Board's extension services.***

Attempts at organised development of the rubber growers started with the setting up of the Rubber Board in 1957. The prime function of the Rubber Board is to promote overall development of the rubber holding and estate sector by measures such as undertaking or assisting scientific, technological and economic research, imparting training in improved methods of cultivation and production, supplying technical advice to rubber growers, improved marketing of rubber, collection and compilation of all relevant statistics etc. (Rubber Board 1996). It is true that the Board has a well structured field establishment (about 450 technical personnel) rendering advisory and extension services free to the rubber growers. The effectiveness of the extension services is being studied here.

Objective 4 : ***To delineate the factors affecting spread of rubber cultivation in Kerala.***

There has been an enormous increase in the area under cultivation of rubber over the last few years in Kerala. Statistics reveal that in 1985-86 the area under rubber was 3.82 lakh hectares, whereas in 1994-95 it increased to 5.15 lakh hectares. (Rubber Board 1996a). It has often been assumed implicitly that economic motive of the farmer has been behind this proliferation, since rubber is a crop known to be giving

high returns to scale. While we do not reject this assumption, it seems more likely that a number of interrelated factors may have bolstered the diffusion of rubber in Kerala. Thus, in order to present the work in its entirety, the above objective is proposed.

The holding sector comprising small growers that contributes 84.86 per cent of the total area under rubber in Kerala forms the basis of our analysis. The study covered only two panchayats and therefore, the findings of the study should be viewed with some degree of tentativeness. Despite all these constraints, every care has been taken to make the study as objective as possible.

In the next chapter, the design of research is discussed. A novel approach synthesising qualitative and quantitative methods of inquiry was undertaken for the study. It would be seen that two cases taking panchayat as unit of analysis were studied to understand the social impact in a more comprehensive manner.

CHAPTER 2

THE RESEARCH DESIGN

2. The Research Design

This chapter deals with the plan and structure of investigation conceived and undertaken for the study. The description of the methods and procedure are presented under the following sections.

1. Methodological Paradigm
2. Locale of research
3. Respondents of the study
4. Procedure involved in data collection
5. Sensitising concepts, variables and their measurements
6. Statistical analysis

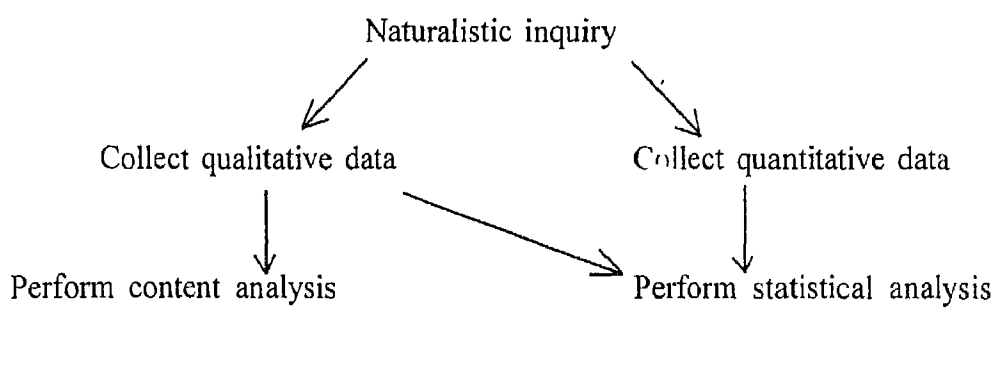
2.1 Methodological paradigm

The governing strategic framework of the study was of a qualitative design and specifically that of a naturalistic inquiry, adopted to understand the naturally unfolding impact of rubber cultivation - the focal point of our study. Naturalistic inquiry is defined as a discovery-oriented approach that minimises investigator manipulation of the study setting and places no prior constraints on what the outcomes of the research will be (Guba 1978). It is non-manipulative, unobtrusive and non-controlling (Patton 1990).

However, the extent to which a study is 'naturalistic' in design is also a matter of degree. In practice, the naturalistic approach often involves the process of moving back and forth between inductive open ended and phenomenological encounters, to more hypothetical-deductive attempts to verify hypothesis or solidify ideas which emerged from the experiences (Patton 1987). Thus, the naturalistic

inquiry becomes a mixed strategy *i.e.* an inter-weaving between qualitative and quantitative methods. Our analysis of the problem is essentially built on this 'methodological mix' (Patton 1990) - a practice, increasingly recognised* and adopted by social scientists today. This follows the premise that no single method ever adequately explains the phenomenon under study and that a combination permits the researcher to incorporate checks and balances for a fuller understanding of the problem. The mixed paradigmatic approach of our study is best illustrated in Fig. (2.1)

Fig. (2.1) The methodological mix adopted for the study



Adapted from Patton (1990).

As we proceed we shall discuss how qualitative and quantitative data were linked in our study. Denzin (1978) writes " ... I now offer as a final methodological rule, the principle that, multiple methods should be used in every investigation".

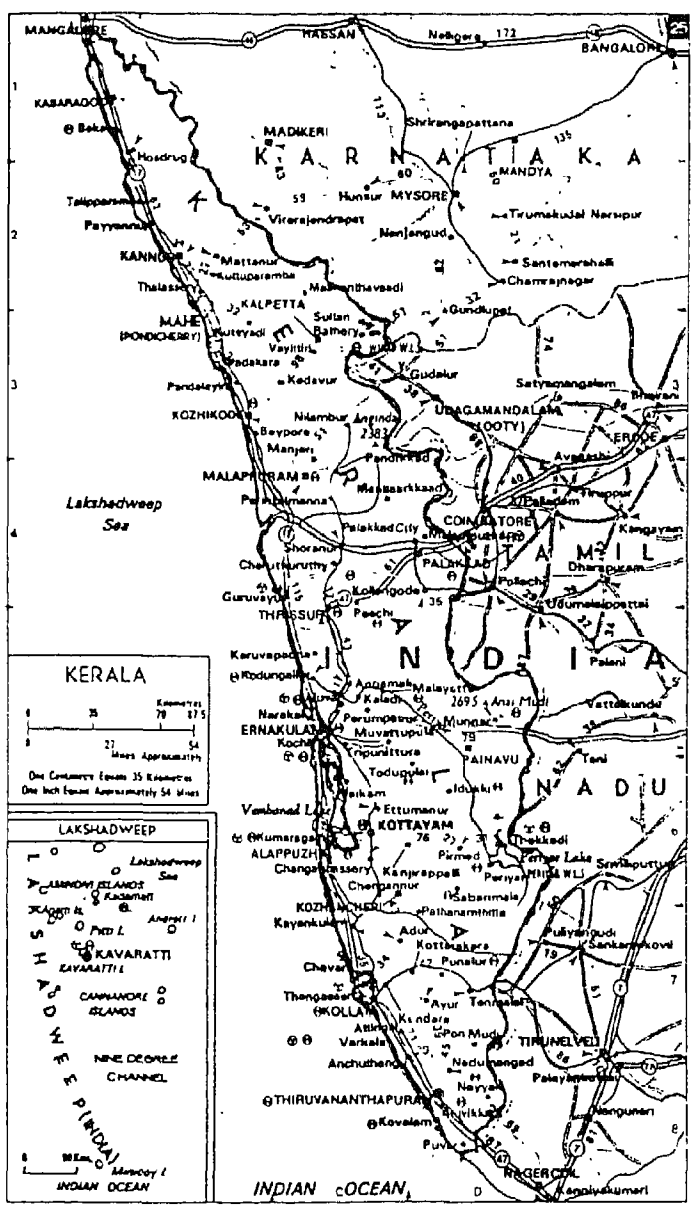
2.2 Locale of research

The study was undertaken in the state of Kerala. The two districts, Kottayam and Kannur were selected as the locale of research for the following reasons. (see Fig. 2.2).

---

* Epistemological and Philosophical differences persist among social scientists regarding the 'purity' of qualitative and quantitative designs - For extensive reviews, see Patton (1990), Miles and Huberman (1994).

Fig. (2.2) Map of Kerala State



The introduction of rubber into the country was through the commencement of its cultivation in **Kottayam** district (in the erstwhile Thiruvithamkur) in 1904. Hence Kottayam was purposefully selected to fulfill the objective of studying the social impact in a traditional rubber growing area. **Kannur** district was randomly selected to study the impact in a non-traditional area.

The unit of analysis was a panchayat. In Kottayam, the selection of **Koottikkal** panchayat was also purposeful, since it was in this panchayat that rubber cultivation was introduced by the Europeans. The second unit in Kannur, was taken, following simple random procedure, from a list of rubber growing panchayats. This procedure, selected **Alakode** panchayat as the second unit of study.

2.3 Respondents of the study

A number of people from different walks of life formed the respondents of the study. For two categories *viz.* small growers and extension officers, sampling procedure was adopted. Apart from these two categories, large growers, scientists of Rubber Board and Kerala Agricultural University (KAU), social scientists, environmentalists, church priests, local politicians, students, merchants, children of small growers and consumers were interviewed to enrich the information base of the study. The sampling procedure adopted for selecting small growers and extension officers is elucidated.

2.3.1 Selection of small growers

The list of rubber growers of Koottikkal and Alakode Panchayat was collected from the Rubber Producers Societies (RPSs) and two criteria were fixed for selection.

(i) The cultivator must be a small grower i.e. the area of rubber under his command should not exceed 5 hectares*.

* Growers having $\leq$5 hectares alone can become members of RPS. The slab fixed by the Rubber Board called slab A is 25 cents to 5 hectare. Therefore growers coming under this category were called small growers.

(ii) The crop must be yielding at least for two years prior to the period of conduct of the investigation.

Based on these criteria, thirty small growers each from Koottikkal and Alakode were selected following simple random sampling procedure. Small growers are sometimes termed 'growers' in this study.

2.3.2 Selection of Extension Officers*

The list of extension officers was collected from the Rubber Board and thirty respondents comprising field officers and assistant development officers were selected following simple random sampling procedure.

2.4 Procedure involved in data collection

Methodological triangulation - the use of multiple methods to study a single problem, was resorted to study the social and ecological impact of rubber cultivation. A variety of methods like direct observation, personal interviews and literature review in different combinations were employed. Lest the study is handicapped by being ahistorical, historical research was employed to place it in a proper context. The two panchayats were studied as two separate cases in order to get in depth information about the impact of rubber cultivation.

Data triangulation - the use of a variety of data sources in a study, was done to take care of the third objective *i.e.* to study the effectiveness of extension services of the Rubber Board. Interviews with the stakeholders and mailed questionnaire (see *Appendix I*) to extension officers were used to triangulate the findings. For the fourth objective *i.e.* to delineate the factors affecting spread of rubber cultivation, a structured interview schedule intended to elicit responses from the growers was employed (refer *Appendix II*).

---

* Here extension officers refer to the 'Field Officers' and 'Assistant Development Officers' of the Rubber Board

A list of factors (henceforth referred to as variables) which affected the spread of rubber cultivation was collected in consultation with literature, experts from the Rubber Board, KAU, change agents of NGO and other organisations, environmentalists and political leaders. Altogether 152 variables were collected and subjected to rigorous scanning. Further discussions with social scientists resulted in deletion of duplications and superfluous variables, and bringing the number of variables down to 62. The list of 62 variables was pre-tested with respondents in a non-study area which after testing again with their self-correlations statistically, was brought down to 43. These 43 variables were given in a five point continuum *viz.* - *'most important'* to *'least important'* with scores ranging from five to one. The final list of 43 variables was then administered to the small growers - the respondents of both the study areas, asking them to check against the continuum. The data were later subjected to factor analysis using the principal component analysis procedure for extraction. The varimax rotation was used for rotation on to a standard axis.

Time series secondary data on the variables *viz.* area, production and yield of rubber in Kerala for the years beginning from 1955-56 to 1994-95 (40 year period) collected from the Rubber Board were utilised to estimate their growth rates (refer *Appendix V*).

2.5 Sensitising concepts, variables and their measurements

Just as variables are utilised for a typical hypothetical - deductive approach to a scientific inquiry, qualitative inductive analyses utilise 'Sensitising concepts' (Patton 1990) to help orient field work. Since it is virtually impossible to 'observe' everything, sensitising concepts give the analyst "a general sense of reference" and provide "directions along which to look" (Blumer 1969).

The **pilot study** brought forth some sensitising concepts, thus providing a basic framework for highlighting the importance of certain kinds of events, activities

Table 2.1 Sensitising concepts and variables

Objectives	Qualitative Sensitising concepts	Quantitative Variables
Objective 1	Case 1 -Cohesiveness and integration -Consumerism -Political climate	-Agricultural modernity -Holding size -Source of labour -Futuristic orientation towards rubber cultivation -Education
	Case II -Migration -Psychological acculturation -Value systems -Development sequences	-Agricultural modernity -Holding size -Source of labour -Futuristic orientation towards rubber cultivation -Education
Objective 2	- Soil - Water holding capacity - Grazing lands - Biomass potential - Biodiversity - Genetic base of crop - Food	
Objective 3	- Growers perception of extension services	-Extension officers' perception on factors affecting spread of rubber
	- Failure and success factors affecting functioning of RPS	-Extension officers' perception on growers' response to extension initiatives in the two areas.
	- Growers perception of RPS	-Frequency of contact -Mode of contact -Extent of assistance of local influential leaders to extension services. -Extension effectiveness -Growers' participation in RPS
Objective 4		-Time series data on area, production and yield of rubber in Kerala -Variables to study factors affecting spread of rubber cultivation (refer *Appendix II* for list of variables)

and behaviour in our study. Similarly, some of the variables had to be dropped and another set added during and after the pilot study. Both the sensitising concepts and the variables used for the study are presented in Table(2.1).

Measurement of variables

The procedure followed for the measurement of each variable is elucidated. First the indices utilised are presented.

2.5.1 Agricultural modernity

The index constructed (composite agricultural modernity index CAMI) by Menon (1995) with necessary modifications was used for the study. By using the component score **'Si'** and weight **'Wi'** for a set of four components CAMI was computed as follows

$$\text{CAMI} = \sum_{i=1}^{4} \frac{S_i W_i \times 100}{\Sigma W_i}$$

$$\Sigma W_i = 100$$

$S_i = \sum_{j=1}^{n_i} X_{ij}$; $1 \leq j \leq n_i$ = number of items under the i^{th} component

; $1 \leq i \leq N$ = number of components = 4

X_{ij} = item score of a respondent for the j^{th} item under i^{th} component

The range of CAMI is from 1 to 100 and four 'levels' were used to distinguish the agricultural modernity which were as follows:

Range	Level
< 25	Very low
25 - 50	Low
50 - 75	High
> 75	Very high

2.5.2 Extension effectiveness

Fifteen extension activities were enlisted and checked in a continuum namely *'least effective', 'less effective', 'questionable', 'more effective', 'most effective'*. The extension effectiveness index constructed, was developed for the study and the procedure is as follows. If n_i is the frequency corresponding to the i^{th} class and x_i is the score assigned to the i^{th} class, then the extension effectiveness index is (EEI) is

$$EEI = \sum_{i=1}^{k} \frac{n_i . x_i \times 100}{(\Sigma n_i) . x_m}$$

k = number of classes

x_m = maximum score assigned

The EEI ranges from 20 to 100 and three levels were used to classify the extension effectiveness

Range	Level
≥ 70	High
51 - 69	Moderate
≤ 50	Low

2.5.3 Participation index

A set of five types of participation (Adnan *et al* 1992) were enlisted and checked in a continuum namely *'very poor', 'poor', 'good'* and *'very good'*. The procedure followed for constructing the participation index was same as that of the EEI. The only difference was in the range of participation *viz* from 25 to 100. The levels are as outlined in the next page

Range	Level
≥ 70	High
51 - 69	Moderate
≤ 50	Low

2.5.4 Holding size

Holding size is the extent of land area under rubber in acres possessed by the small grower.

2.5.5 Source of labour

The small grower was asked to identify whether (s)he utilised family labour or hired labour or both.

2.5.6 Futuristic orientation towards rubber cultivation

The small growers were asked about their future orientation towards rubber cultivation as a primary occupation and secondary occupation. The children of small growers were also asked regarding their willingness to take up rubber cultivation as a primary occupation. The qualitative data was then quantified.

2.5.7 Education

Education of the small grower's children was measured by merely asking their educational qualification.

2.5.8 Extension officers' perception on factors affecting spread of rubber cultivation

Four broad factors were given and the officers were asked to score each so that the total adds up to hundred (refer *Appendix 1*).

2.5.9 Perception of extension officers on growers' response to extension initiatives in traditional and non-traditional areas*

The extension officers were asked about the response of growers towards extension initiatives in the past and present in traditional and non-traditional areas.

2.5.10 Frequency of contact with small growers by extension officers*

The extension officers were asked about the frequency of contact with small growers in a week.

2.5.11 Mode of contact with small growers by extension officers*

The extension officers were asked to rank the different modes of contact listed.

2.5.12 Extent of influence of local influential leaders to extension services*

The extension officers were requested to assign ranks to local influential leaders who assisted them.

2.6 Statistical analysis

2.6.1 Computation of growth rates by semi-log quadratic trend equation

A semi-log quadratic trend equation of the following form was fitted to the area, production and yield of rubber.

$$\text{Log } Y_t = a_o + bt + ct^2 + u_t$$

Where

Y_t = area, production and yield of rubber in year t

'a' , 'b' and 'c' are parameters estimated

u_t = random term

---

* Refer *Appendix I*

If 'b' and 'c' are significantly different from zero, then the growth rate is not constant. From 'b' we can derive the compound growth rate (CGR) using the formula r = (antilog b-1) x 100. If C > 0, then the growth rate is accelerating and if C < 0, the growth rate is decelerating.

The problem of multicollinearity, arising out of correlation between t and t^2, was taken care of by using transformed t ($\overline{t}$) (Mukherjee and Vaidyanathan 1980).

$$\overline{t} = t - (n+1) / 2$$

Where t - time period in years

n - number of years in the time series data.

2.6.2 Computation of growth rate by exponential trend equation

Decadel-wise growth rates were computed to know the growth pattern in area, production and yield of rubber in Kerala, by fitting the exponential trend equation of the following form.

$$Y_t = ab^t$$

or $\text{Log } Y_t = \text{Log } a + t \log b$

$$r = (\text{antilog } b-1) \times 100$$

where

Y_t = area, production and yield of rubber in year t

'a' and 'b' are parameters estimated

r = compound growth rate expressed in percentage

The growth rates have been studied across five phases classified as

Phase I	1955-1964
Phase II	1964-1973
Phase III	1973-1982
Phase IV	1982-1991
Phase V	1991-1994

2.6.3 Decomposition of total production in terms of area and productivity.

In order to isolate and ascertain the contribution of area and yield towards change in total production (over a period of 10 years starting from 1955-56) of rubber in Kerala, a decomposition analysis of the change in total production was carried out as follows:

$$P_t - P_o = (A_t - A_o)\, Y_o + (Y_t - Y_o)\, A_o + (Y_t - Y_o)(A_t - A_o)$$

$$\Delta P_t = \Delta A_t . Y_o + \Delta Y_t . A_o + \Delta A_t . \Delta Y_t$$

To get the share of each term,

$$100 = \frac{\Delta A_t . Y_o \times 100}{\Delta P_t} + \frac{\Delta Y_t . A_o \times 100}{\Delta P_t} + \frac{\Delta A_t . \Delta Y_t \times 100}{\Delta P_t}$$

= Percentage contribution of area + Percentage contribution of yield + Percentage contribution of interaction

Where

ΔP_t = Change in production
ΔA_t = Change in area
ΔY_t = Change in Yield
A_o = Base year area
Y_o = Base year yield
$\Delta A_t . \Delta Y_t$ = Interaction

Other statistical tools like frequency distribution, percentage analysis, chi-square test, and factor analysis were employed. The factors obtained from the factor analysis were re-administered to small growers of both the regions in a continuum ranging from *'most important'* to *'least important'*. The summed up score obtained for each factor was used for a student's 't' test. The SPSS package was utilised for all the analyses.

In the next two chapters, an analysis of the social impact of rubber cultivation is presented. Two cases are furnished so as to provide indepth information. The first case will be that of **Koottikkal** followed by the **Alakode** case.

CHAPTER 3

THE CASE OF KOOTTIKKAL

3. The case of Koottikkal

This section places the rubber cultivation of Koottikkal on a historical continuum and tries to articulate some of the consequences it has made in the social fabric. First we describe the present situation of study area, then examine the historiography of rubber cultivation in Koottikkal, so as to study the impact from a historical point of view. Finally the specific socio-psychological impact is also presented.

3.1 Description of the study area

3.1.1 Geographic Location

Koottikkal Panchayat in Kanjirappally taluk, lies in the Kottayam district of Kerala, four kilometers away from Mundakkayam town. The panchayat is characterised by hills and hill slopes. Plains and wet lands are practically absent. Koottikkal panchayat constituted in 1969 has eight wards (see Fig. 3.1).

3.1.2 Etymology of Koottikkal

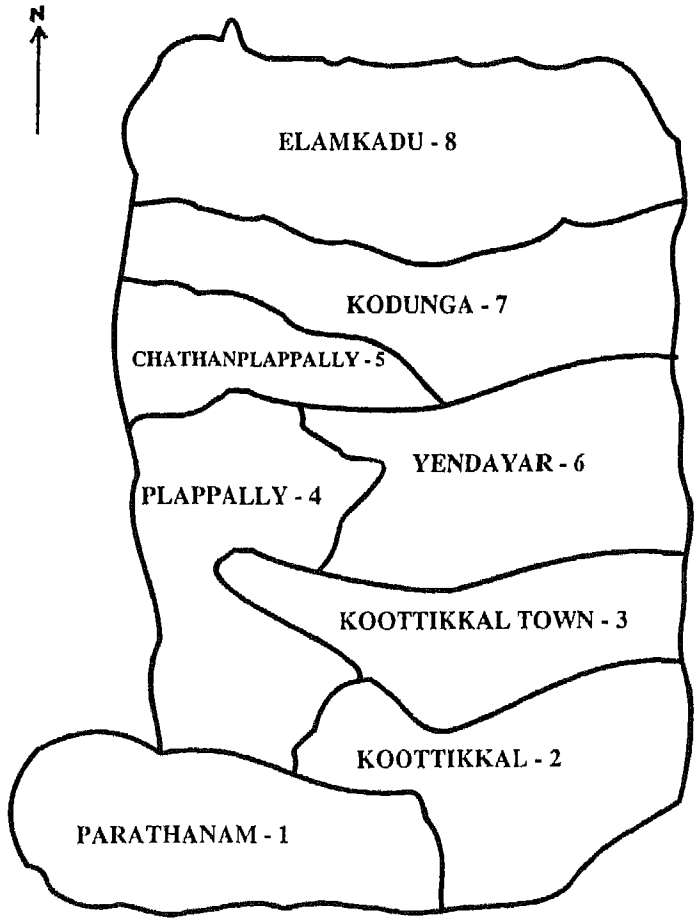
The term Koottikkal owes its origin to "Kootti" - the convergence of the two rivers Pullagayar and Kokkayar and the rivulet Talungal todu, which in due course became "Koottiyil" and later "Koottikkal". That the Europeans, reminiscent of "Kuttikkul" a holiday resort in England, named the place thus, has also been put forth (Koottikkal Grama Panchayat Vikasana Report henceforth referred to as KGPVR 1996).

3.1.3 Bio-physical Environment

Koottikkal receives a good amount of rainfall with an annual average of 3000 mm*. The mean temperature is 27.15^0 C. June to August and October to December are the

* Taken for the year 1988-1993

FIGURE 3.1 MAP OF KOOTTIKKAL GRAMA PANCHAYAT



peak rainy months, thus, receiving both southwest and northeast monsoons. The main source of water is the Pullakayar river. Three kinds of soils can be distinguished (a) soils on hill tops which are least fertile and unfit for cultivation (b) soils in the slopes with medium fertility (c) soils in the valleys which are highly fertile.

3.1.4 Land use pattern

The total geographic area of the village is 33.82 square kilometers. A detailed landuse pattern is given in the table below.

Table 3.1 Land use pattern in Koottikkal panchayat

No.	Category	Landuse	Area in (hectares)
1.	Agriculture	Rubber	2756
		Tea	65
		Coconut, Arecanut, Cashew, pepper, coffee, cocoa as interplants	550
		foodcrops, tubers, banana, ginger and turmeric	102
		spices and condiments	50
2.	Forests		409
3.	Barren and uncultivable land		188
	Total		**4120**

Source : KGPVR 1996

3.1.5 Cropping Pattern and Agrarian relations

The natives and the early migrants from nearby Meenachil taluk cultivated traditional crops like coconut, arecanut, pepper, coffee, food crops, jack and mango till the early 1950s. After independence some estate lands of the British and those of Poovarani Devaswom came under small farmers. An approximate areawise categorisation of cropping pattern as was in 1960-61 is given in the next page.

Table 3.2 Cropping pattern of Koottikkal Panchayat in 1960-61

NO.	Name / category of crops	Estates (in percentage)	Holdings (in percentage)
1.	Plantations (Rubber, tea)	30	10
2.	Pepper, coffee, cardamum, turmaric, coconut, arecanut	3	12
3.	Fruit trees		15
4.	Food crops (cereals & pulses)		20
5.	Barren lands		10

Source: KGPVR 1996

After 1960, a shift in cropping pattern in favour of rubber occurred, the factors responsible for which will be examined in chapters four and seven. Today rubber is the predominant crop in Koottikkal in terms of area under cultivation.

At present, most of the farmers are marginal with an average holding size of 0.2 ha. Homegarden is the major agricultural production system of these farmers. The distribution of area under the different classes of farmers is given below.

Table 3.3 Distribution of area under different classes of farmers in Koottikkal

Agrarian Class	Land Holders	Area (hectares)
Marginal farmers (< 1 ha)	3554 (75.76)	730
Small farmers (1 - 2 ha)	930 (19.83)	1175
Large farmers (> 2 ha)	207 (4.41)	1618
Total	**4691 (100)**	**3523**

Source : KGPVR 1996
Percentages are given in parentheses

3.1.6 Demographic profile of Koottikkal

The total population of Koottikkal in 1991 was 13949 distributed over 2840 households. Table (3.4) depicts the demographic profile of Koottikkal.

Table 3.4 Demographic Profile of Koottikkal in 1991.

No.	Categories		Number
1.	Occupied residential houses		2839
2.	Households		2840
3.	Total population including institutional and houseless population		13949
		Male	7059
		Female	6890
4.	Scheduled caste	Male	845
		Female	822
5.	Scheduled tribe	Male	161
		Female	169
6.	Literates	Male	6039
		Female	5647
7.	Cultivators	Male	137
		Female	6
8.	Agricultural labourers	Male	86
		Female	16
9.	Livestock, forestry, fishing, hunting, plantation orchards and allied activities		
		Male	2083
		Female	381

Source: Census Report 1991

3.1.7 Religion and Community influences

The christian community which had close liaison with the European planters right from the beginning benefitted substantially from the land reforms measures introduced in Thiruvithamkur and started opening up private plantation with their own capital

(Varghese 1975). The conspicuous absence of a trading caste within the hindu caste structure, gave advantage to the christians who involved themselves zealously in agriculture and trade (Jeffrey 1976). The roman catholics were enterprising agriculturists traditionally. Most of the lands in Koottikkal were in their possession and due to their assiduous nature, the catholics and their agriculture, predominantly rubber, made considerable progress. On the other hand, the writers, clerks, and supervisors of both Yendayar and Koottikkal estates were from the CSI and jacobites whom the Europeans favoured and patronised. These sections showed least interest in rubber cultivation or agriculture in general. When indigenous estate owners took over they continued to hold supervisory and administrative posts. However, of late, a few of them have started showing interest in cultivation of rubber. Likewise, the hindu nairs also preferred government jobs and did not take up rubber cultivation until recently. A study on rural life in Kuttanad showed that nairs wanted their children to take up Government jobs (Verghese, 1982). The muslims who were traders all along, are also present in a minority and they are involved more in merchandise even as rubber dealers than in rubber cultivation. A critical analysis of the muslims and hindus *vis-a-vis* rubber cultivation is presented in the next case.

In Koottikkal the temple or the mosque as institutions never cherished the idea of a purposeful intervention among their communities to promote development of agriculture in general and rubber cultivation in particular. The panchayat has eight temples, six churches, two mosques and one guru mandiram. However, the church as an institution has acted as an important agent of social change in this region. Rosamma (1989) observes "to poverty and want, the church has tried to respond in words and deeds". In the past, the educated priests of the catholic churches, were the first to seek assistance from the Rubber Board offices, to help improve the living conditions of their community. The church priest is an acceptable leader to all religious groups. So even now, the Rubber Board utilises the services of the church for communicating* important messages and conducting meetings.

The messages are announced in all three prayer masses on sundays. The non-christians also come to know by word of mouth.

3.1.8 Development indicators

A qualitative assessment of the indicators regarding their access and adequacy is made

Table 3.5 Some Development indicators of Koottikkal

No.	Indicators	Access	Adequacy	Constraints
1.	Primary school	✓	+	
2.	High school	✓	+	
3.	College	x		Travel 15 Km
4.	Parallel college	✓	+	
5.	Anganwadis	✓		Lack infrastructure
6.	Government hospital	✓	—	Doctors do not remain permanently
7.	Private hospital	✓	—	
8.	Ayurveda/Homeopathic hospital	x		
9.	Water supply	✓	—	No panchayat water supply
10.	Rural electrification	✓	—	Most of the time there will be failure in supply
11.	Co-operatives	✓	+	
12.	Banks	✓	+	
13.	Post office	✓	—	
14.	Telegraph office	x		Travel 4 Km.
15.	Cultural institutions	x		
16.	Libraries	✓	+	
17.	Mahila mandals	✓	+	
18.	Land for SC / ST	✓	—	Land for crop production is less
19.	House for SC / ST	x		
20.	Public market	x		
21.	Grocery/vegetable/textile shop	✓	—	Quality and quantity supplied is poor
22.	Rubber market depots	✓	+	
23.	Restaurants and tea shops	✓	—	
24.	Transportation	✓	+	
25.	Main roads		+	
26.	Sub roads		+	
27.	Places for boarding/lodging	x	—	

Legend : Access ✓ Have access; x No access. Adequacy + Satisfactory; — Unsatisfactory

3.2 A historiography of rubber cultivation in Koottikkal

The aborigines of Koottikkal and adjoining territories were the hill tribes - *'Malayarayans, Ulladans* and *Koikkars'* known to have lived as early as 12th century on either sides of the Pullagayar. By 1850, European christian missionaries* converted most of the hill tribes and other inhabitants of the region to christianity. They then acquired vast areas of the present Koottikkal, from the Poonjar royal family for habitating the christian neophytes. (KGPVR 1996). The colonialist intrusion into this region by way of acquisition of the most fertile soils of the region and planting the seeds of monoculture and plantation were the immediate consequences of the missionary activities. The Europeans possessing the choicest lands, were careful enough to leave only the "left overs" (mostly hilly areas) to the natives and migrants for their livelihood. Till the 20th century, rubber had been extracted ruthlessly from *Ficus elastica* resulting in the wholesale destruction of the jungle trees of this species. The later part of the 19th century, witnessed several attempts of growing *Hevea* in various places. In 1872 and 1875, the Indian office of the British Government attempted to establish *Hevea* plants in India but failed. In 1877, the IlayaRaja of Thiruvithamkur received rubber plants from the Royal Botanical Garden in Ceylon and in 1879, 28 plants were planted in Nilambur in Malabar. In 1887, G. Anderson planted rubber at the Shalliakarra estate in South Thiruvithamkur which was later planted at Vandiperiyar in Chenkara and Wallardi estates. In 1902, the first *Hevea* rubber estate in South India came into existence near Aluva on the banks of the river Periyar. This was initiated by the " Periyar Syndicate " consisting J. J. Murphy, J.A. Hunter, K. E. Nicoll, C. M.F Rose, and G. Nicoll Thompson. (Kershaw 1957, Uma Devi 1989).

In 1903, John Joseph Murphy, an Irish man born in Dublin started the first rubber estate in Yendayar** along the banks of the Pullagayar. Murphy's planting of *Hevea* rubber

* Prominent among the missionaries were the Henry Bakers. For details see Umadevi (1989).

** Etymology - This word is widely believed to have originated from the Tamil connotative ' *Yen thaiar* ' meaning "my mother". Some villagers also feel that Yendayar could have originated from the English word 'Entire'.

in 1904 in the virgin forests of Koottikkal, heralded the beginning of rubber plantation in India on a commercial basis. Lands for rubber estates were acquired from the government and (or) the Vanjipuzha chief in Mundakkayam. By 1906, various rubber companies were formed in and around Koottikkal. The following table portrays the estate wise area under rubber in Mundakkayam (1904 - 1906).

Table3.6 Major anecdotes in the proliferation of rubber estates in Mundakkayam (1904 - 1906).

Year	Proprietor	Estate name	Area in acres
1904	J. J. Murphy H. Drummond Dean R. S. Imray	Yendayar* Eldorado Mundakkayam	240
1905	Owned by a private syndicate	Kadamankulam	728
1906	Central Travancore Rubber company bought from H - Drummond Dean	Kuppakkayam	
	Mundakkayam Valley Rubber company (planted by J.R.Vincent)	Koottikkal*	460
	Paloor Rubber Company Owned by J.A.Richardson & Gordon.		763
	Peruvanthanam purchased by H.B. Kirk		
	Kadamamkulam was finally sold to Travancore rubber company in the same year		

Source: Uma Devi (1989)

* Yendayar estate & Koottikkal estate are at present in Koottikkal panchayat.

The massive flow of metropolitan capital increased further as several companies big and small, started sprouting in and around Koottikkal Thus by 1910 this region became the epicentre of the expanding world of South Indian rubber. Raviraman observes "with the establishment of plantation monoculture, western Ghat regions were incorporated to the dynamics of the world market". As we have to focus to Koottikkal panchayat, a brief account of J. J. Murphy and his Yendayar estate, the contextual importance of which we shall see, is furnished.

3.2.1 John Joseph Murphy - *A biographical account*

John Joseph Murphy, known as 'J.J' was born in Dublin on 1st August 1872 into a catholic family of well to do shippers and bankers. J.J's planting carrier began in 1893, when he became a creeper on Frotoft estate in the Ramboda district of Ceylon. In 1897, he migrated to South India to join Messrs Finlay Muir & Co; who at the time were recruiting planters with Ceylon experience for the development of tea in the high range. He quit the firm after a short stint, purchased a large tract of virgin jungles in Pampadumpara, and became a private owner. " Pampadumpara where he planted Cardamom on a plantation basis was the first cardamom estate of its size in south India - probably in the world, as the spice was then looked upon as a cash crop of peasant agriculture". (Kershaw 1957)

It was from a coffee shop in Madras that J.J. 's entourage encouraged him to go to Malabar and plant tea and rubber. This apparently had motivated Murphy and it is said that he left for Malabar with 5000 pounds. (M. K. George*). Both Malabar and Bodinaikkannur having brought failures, J.J. reached Yendayar# which provided him with the scope of the use of his initiative and dynamism and with which his name in planting

* Personal communication with Mr. M. K George Paikad, Paikad House, Mundakkayam.

#The Yendayar estate area was earlier under the Trissur based Poovarani Dewaswom. This was leased out to Mr. Krishna Iyer, an advocate in Kottayam. When the Thiruvithamkur Government under Diwan Sir C.P. Ramaswamy Iyer introduced a taxation of one rupee per acre, Krishna Iyer incurred losses. Murphy negotiated with the Diwan and purchased around 1250 acres of that land in Yendayar.

circles would be ever remembered. J.J. brought half of his land area under tea and the remaining under rubber. The economic collapse of 1930, hit J.J. hard but he refused to shut down, as all neighbouring sterling companies had done. Instead he turned to rehabilitating his older trees with high yielding clones imported from Malaya.

3.2.1.1 Employer - employee Relationships

J. J. Murphy was a visionary par excellence who set standards of living conditions for his staff and labourers. He paid higher wage rates to his labourers than the MRPA* rates. J.J. 's views on labour welfare and amenities were, progressive and far ahead of the times. Permanent family lines, piped water, sanitation , scavengers, creches, mid-day meal for children, separate schools for different vernacular languages like Malayalam, Tamil and Kannada were provided, (since he had brought labourers from Tamil Nadu, Mangalore and Malabar). He had constructed places of worship for every religion in the estate and employed priests in each of them. Murphy also built a fifty bed hospital in his estate, where his labourers received good medical attention. All these facilities were in existence in Yendayar many years before legislation (*Plantation labour act 1952*) was ultimately enacted. J.J. knew his employees personally. When they became too old for work, he placed them on liberal gratuity/pensions. J.J. personally went to the post office to send family pension to his labourers, some of them he knew had already died (Thomas 1968).

3.2.1.2 Scientific management of rubber cultivation

Murphy is known to have tried several innovative experiments to improve the productivity of rubber trees. He introduced the technique of budding local rubber stocks with High Yielding Varieties (clones). A well managed nursery of budded plants was

* Murphy himself was the founder member of MRPA (Mundakkayam Rubber Planters Association) which was formed in 1905. In 1912 this was renamed Mundakkayam Planters Association (MPA).

maintained in the estate and Murphy experimented with crown budding, night tapping, simultaneous tapping of all trees, scheduled tapping, time of tapping etc. J.J. established the Mycologist station - a research station for the systematic study of the science of rubber cultivation - near Puthenchanta, Mundakkayam, wherein he employed soil scientist, agronomist, pathologist and others. Yendayar estate was the first rubber property to adopt full scale spraying of bordeaux mixture against *Phytophthora meadii*. This was experimented by Mr. H. Ashplant, a scientific officer of the Mycologist station. J.J. started a rubber factory (still in operation) for the manufacturing and exporting of sole crepe. A tea factory which he opened was later closed down. In its place stands the Velankanni Matha church.

3.2.1.3 Social development efforts

Murphy is often remembered for the road he constructed between Mundakkayam and Yendayar. This main road with gentle slopes and flowering trees on either side, and other subroads were constructed and maintained by a works department of his estate. Murphy had in his will earmarked some amount of money for constructing a high school at Yendayar. The high School at Yendayar later constructed was named J.J. Murphy Memorial High School (see Plate 3.1). The catholic church in Mundakkayam was built by him in 1926. The then Viceroy Lord Irwin and Lord Wellington are said to have visited this church. The Mycologist station that he purchased in 1937 was handed over to the Diocese of Vijayapuram for use as a convent and orphanage. Later a weaving school was started in the place. He also built a primary school near the convent. He is said to have contributed liberally* to seminaries, convents, schools, orphanages and to local catholic parishes. In 1956, Murphy 's estate was bought by two big christian families - Kallivayalil and Pottamkulam as three shares each. By then, Murphy had lost interest

* His holiness Pope Pius XI conferred on him the papal honour of *Pro Ecclesia Et Pontifice* in 1927, as some recognition of his generous contribution to the spread of christianity and catholicism in India. (Kershaw 1957).

Plate 3.1 The Murphy Memorial High school at Yendayar

Plate 3.2 Murphy laid to rest atop Mundappaally hill


JJMURPHY MEMORIAL
HIGH SCHOOL
VENEVIR

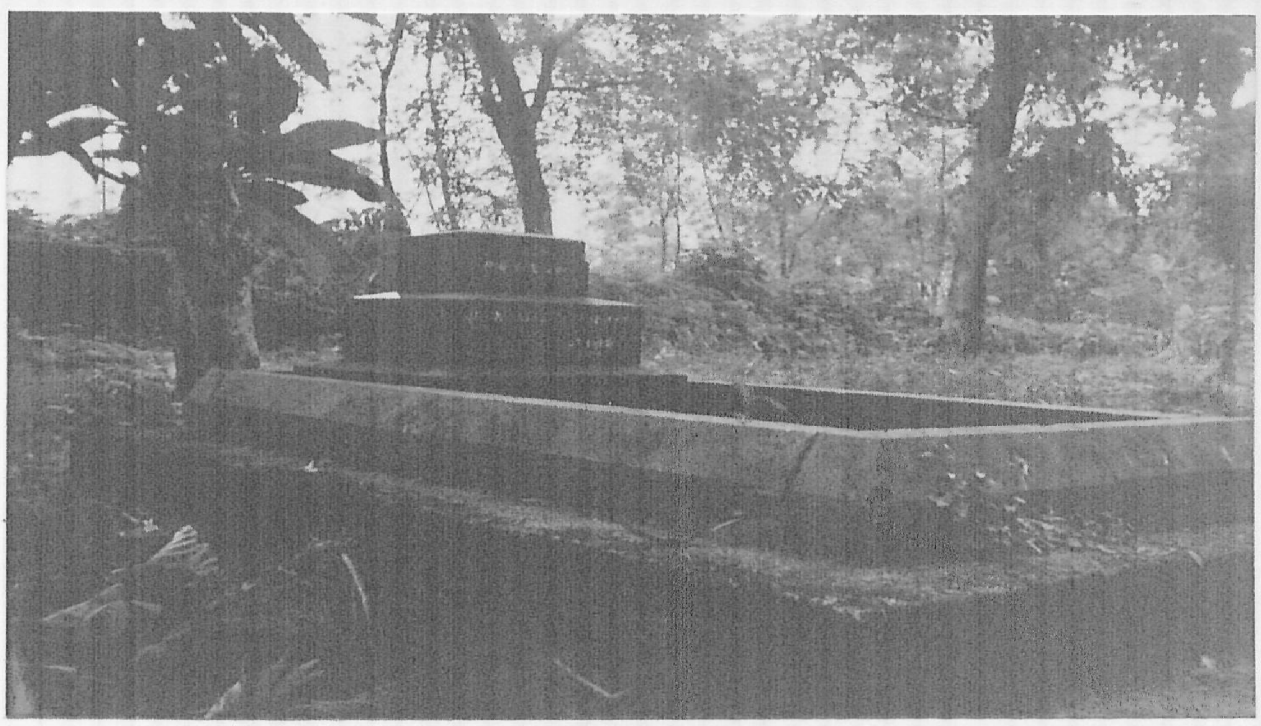


Plate 3.3 Murphy's bungalow in Yendayar

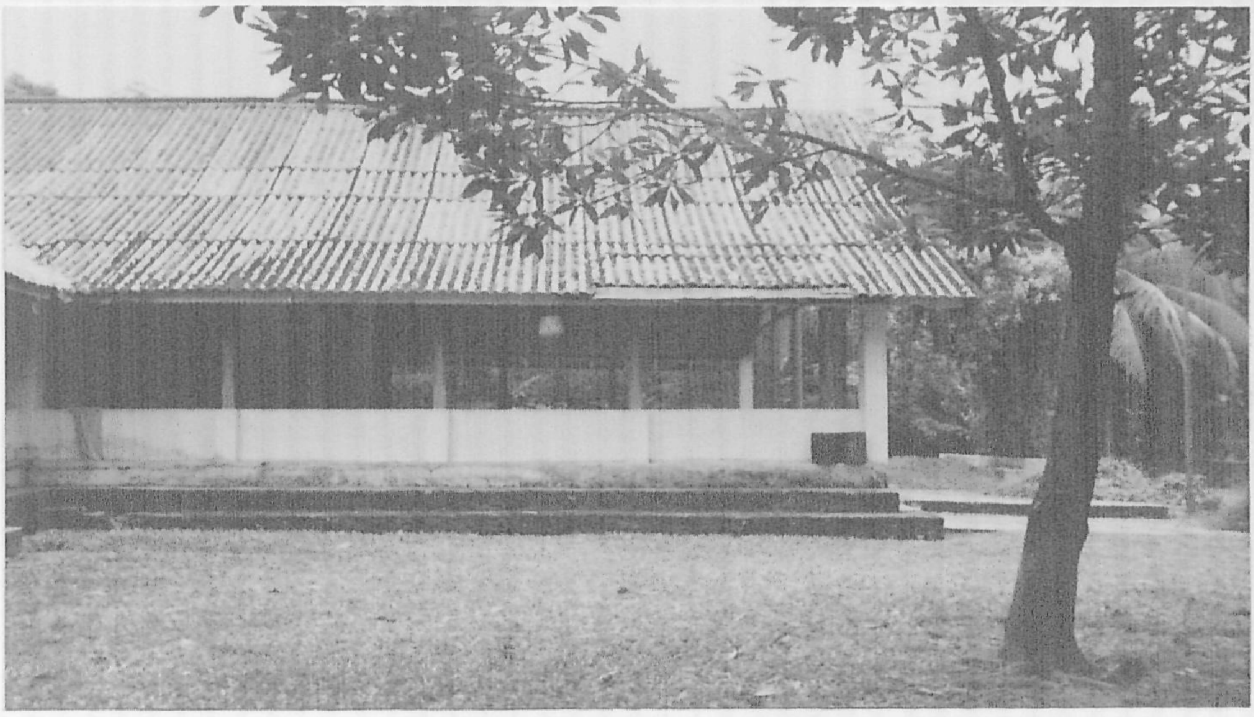
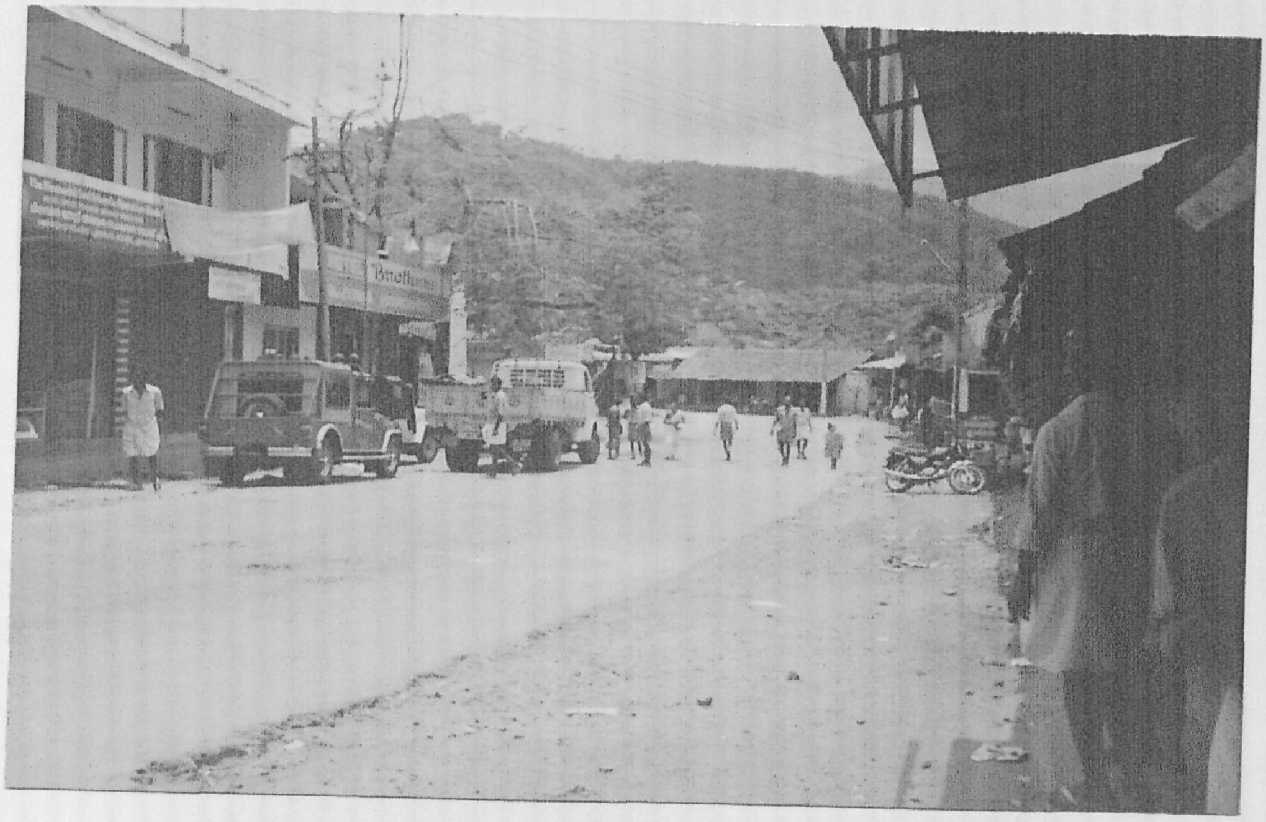
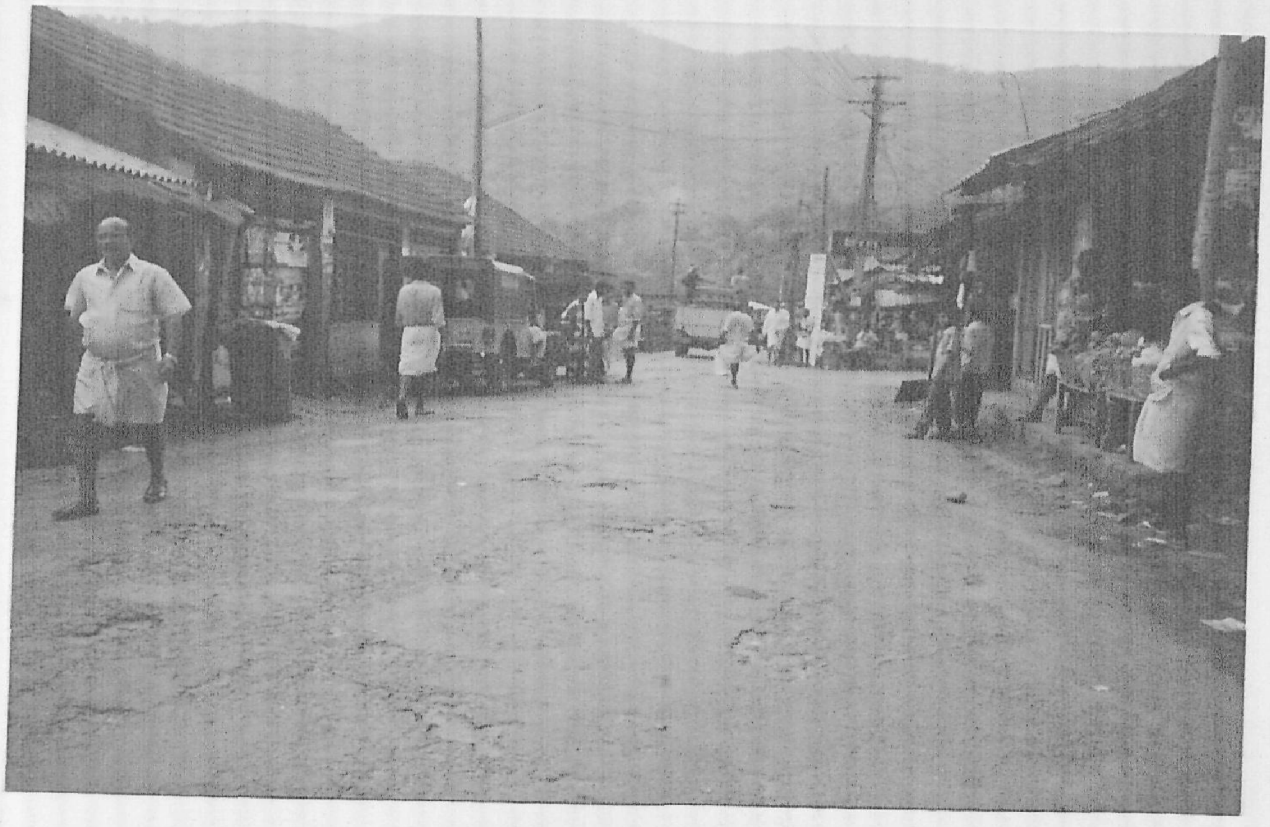


Plate 3.4 Yendayar town

Plate 3.5 Koottikkal town





in planting, as his health was deteriorating. He died on May 8th 1957 and was buried on May 9th atop Mundappally hill in Yendayar as he had expressed his desire to be buried along with his fellow labourers (see Plate & 3.3).

3.2.2 Structural changes in rubber plantations

Proliferation of small holdings in the rubber plantation industry was a significant landmark in the history of rubber plantation industry in Kerala. (Chandy 1974). "The rubber economy which was concentrated in the hands of a few big planters became a small growers crop . . . As a result, except few estates all others fragmented " (Menon 1990). A large number of small farmers of Thiruvithamkur thus started cultivating rubber and other plantation crops. Both the families Pottamkulam and Kallivayalil sold away 85 percent of the Yendayar estate area to the native small farmers. The Kallivayalil family* also donated land for poor homes, orphanages, temple, a public library and the village office in Yendayar. The fragmentation of the Yendayar estate in the late 50's thus symbolized the process of structural change in the rubber plantation sector in Kerala. Even as the mid-eastern regions of the Panchayat (i.e Yendayar) under went structural transformations in rubber cultivation, the Koottikkal estate** in the southern end remained intact and untouched. From its inception till today, the estate was owned and passed over to private planters and companies. (Presently A .V. George and Company owns the estate).

The structural changes at Yendayar made district transformations in the social fabric, as small growers moving towards self reliance began to make visible imprints in Yendayar through a proliferation of marketing agencies, increased trade, and organised institution building (see Plates 3.4 & 3.5).

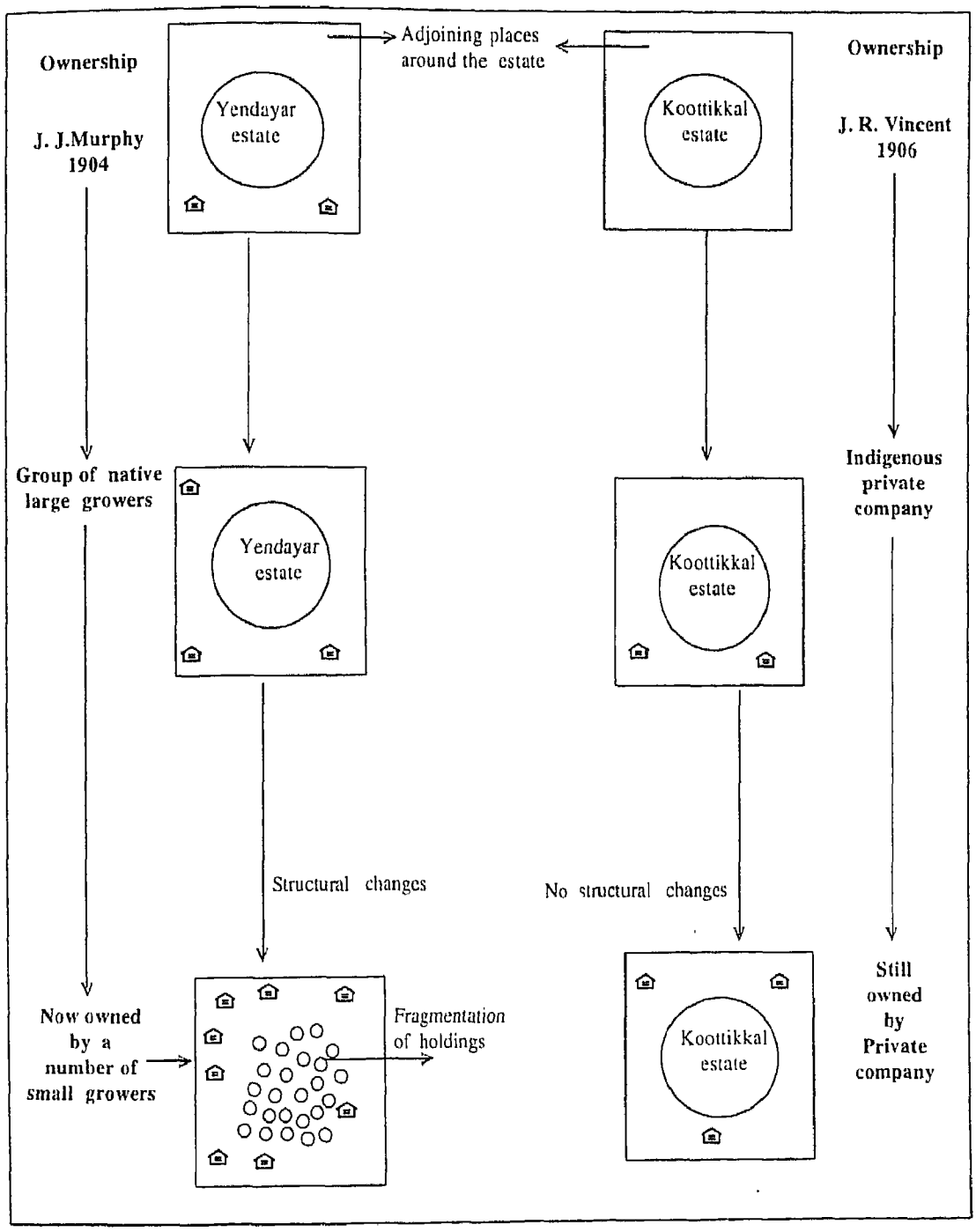
In contrast, the proximity of Koottikkal estate to its small town has made little impact on it as the estate largely remains as an unshared private property. By and large

---

* Personal communication with Michael Kallivayalil, Mundakkayam

** Now also referred to as Talungal estate

Figure 3.2 Structural changes in rubber plantations and consequent development in Koottikkal panchayat



Legend

: Institutions and infrastructure

the Koottickal town remains what it had been fifteen years before, in terms of the aforesaid effects noticed in Yendayar. The excessive dependency by the people of Koottickal on the boomtown Mundakkayam has also subjugated the development efforts in the town. It is evident from the Fig. (3.2) that the consolidated land of Koottikkal estate was transferred from the ownership of the Europeans to native private owners without any fragmentation. It is also shown how private owners sold out the Yendayar estate as fragmented holdings to the native small growers. The difference in institution and infrastructure development in the two regions is also illustrated.

3.2.3 Rubber cultivation : an imitation theory perspective

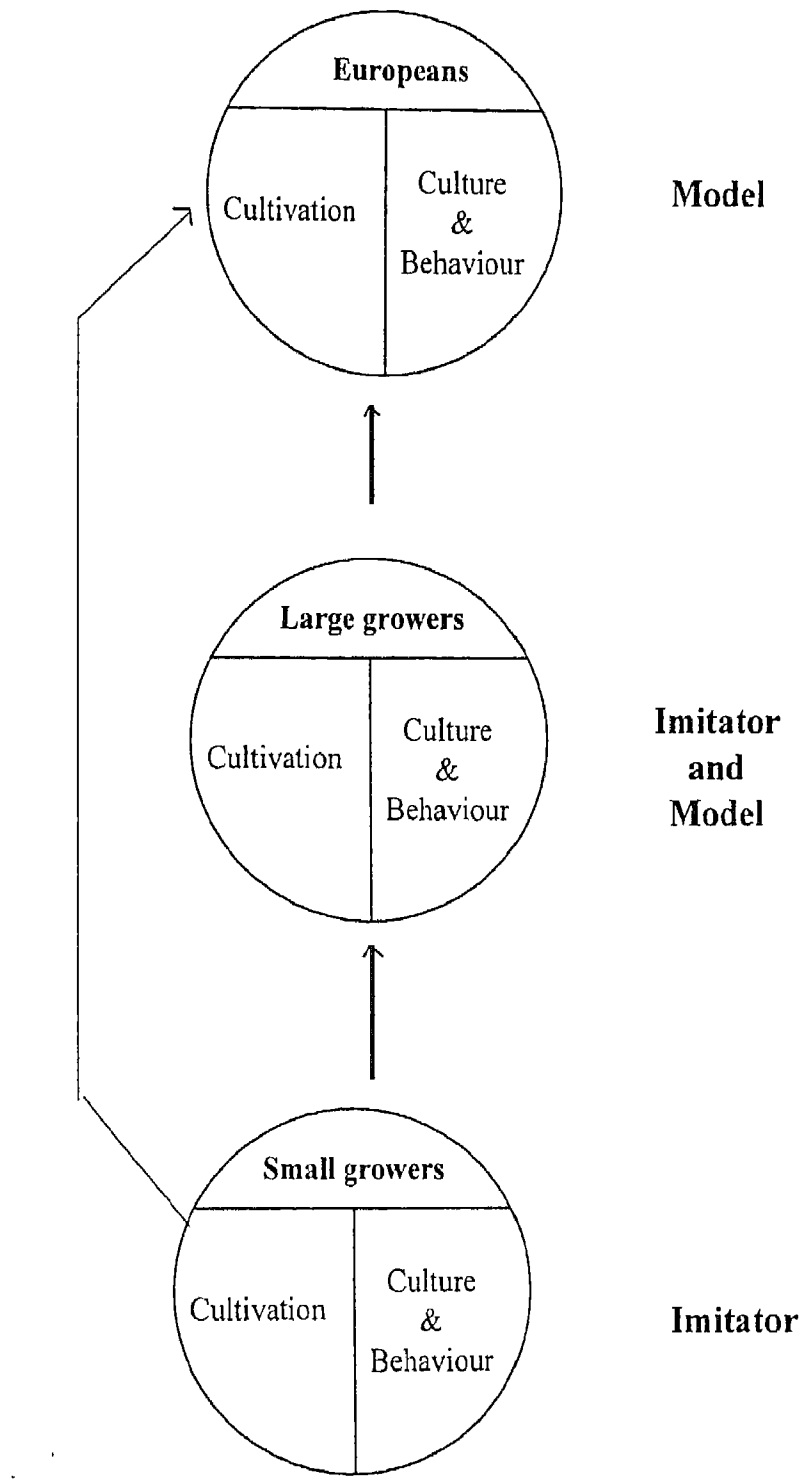
Closely following the British efforts, native influential families* coaxed the Poonjar royal family and acquired prime lands for cultivation of rubber. " Big farmers from Meenachil, Thodupuzha, and other midland taluks of Thiruvithamkur (Kallivayalil K. C. Abraham, K. V. Zacharia Pottamkulam and Vallat Raman) also started cultivating rubber and mixed products with considerable skill and agricultural ability " (John 1966). Both the Europeans and natives encroached and acquired larger areas than granted to them because negotiations were mostly through verbal agreements. The natives' struggles against the European planters over territorial rights were widespread. Cases of encroachment of villages by the planters partially or even wholly, were not uncommon; this invited conflicts between planters and the natives (Raviraman 1996). These conflicts gradually died and the large farmers began cultivating rubber even though they lacked knowledge of its cultivation. However, these large farmers employed themselves as supervisors and fieldmen in the European plantations and began replicating** the cultivation aspects of the Europeans in their own lands. Natives and migrant farmers also started cultivating rubber in the hilly areas of Kawali, Plappally, Mundappally, Parathanam, Chattanpally,

---

* Pottamkulam, Karanthanam, Kuttiyanikkal, Madikkangel are some of the families

** people are said to have smuggled out budwoods, seeds etc., from the European plantations

Fig 3.3 Observational learning model



Olayanad, Njarakkal, Koonnad, Kodunga, Valientha, Melathedom, Mlakkara, Muppathonpadu, which were mostly the lands found unfit for cultivation by the Europeans and native big farmers, and hence remained left overs. Thus, the rubber growers seem to have followed the 'observational learning' (Bandura and Walters, 1963) or imitation form of learning. Observational learning generally takes place in a social situation involving a model and an imitator. The imitator observes the model and experiences the model's behaviour and its consequences vicariously; this process is called Vicarious reinforcement.

The powerful influence of observational learning or imitation is perceptible in the various classes of rubber growers (see Figure 3.3). This colonial hangover has been one of the major reasons for the (a) increased adoption of rubber by the different classes of farmers and (b) alteration in their cultural schemas (e.g. consumerism). Roselind's (1996) observations on the growers of Kanjirappally is worth mentioning. "The life style of the planter is quite different from those in the holding sector. The area of rubber plantation in the planters' possession has diminished as compared to that of their ancestors. Yet they try to maintain the life style of their forefathers - a sort of ratchet effect". But as Srinivas (1966) observed "it is patently absurd to assign a purely 'blotting-paper role' to the Indians ... Some elements were borrowed from the British culture, while others were rejected and the borrowed elements in turn underwent a transformation". A discussion on the various socio-psychological impact is furnished in the ensuing pages.

3.3 Impact of rubber cultivation in Koottikkal

The impact of rubber cultivation is discussed below under the following major heads.

1. Agricultural modernity of small growers
2. Cohesiveness and integration among growers
3. Consumerism
4. Education and rubber cultivation
5. Political climate

3.3.1 Agricultural modernity of small growers

Through the historiography of rubber cultivation in Koottikkal, it is seen that small growers observed and imitated the European cultivators and large growers. As a result, in a traditionally rubber cultivating area such as Koottikkal, growers were exposed to rubber cultivation from the early 1950s. Most of the small growers had knowledge about the different aspects of rubber cultivation. But since knowledge forms only a component of a wider construct like agricultural modernity (see *Appendix II*) the agricultural modernity of small growers was studied.

The agricultural modernity of growers, their use of labour, and their futuristic orientation towards rubber cultivation as primary occupation was studied here. Agricultural modernity of farmers is a dynamic and complex multi-dimensional construct embracing a wide gamut of his attitudes, values and ways of acting towards agriculture (Menon 1995). The distribution of small growers of rubber cultivation according to their level of agricultural modernity is furnished in Table (3.7).

Table 3.7 Distribution of small growers according to their level of agricultural modernity in rubber cultivation (n=30)

Composite Agricultural Modernity Index	Agricultural Modernity level	Number of Growers	Percentage
0 - 25	Very low	0	0
25 - 50	Low	5	16.67
50 - 75	High	11	36.67
75 - 100	Very high	14	46.67

A perusal of the above table demonstrates the extraordinary high levels of agricultural modernity of the small growers. More than three fourth of the growers had greater levels (high and very high levels put together) of agricultural modernity. While less than one fifth of the growers' modernity levels were 'low', none had 'very low' level of agricultural modernity.

3.3.1.1 Source of labour and holding size

The employment of wage labour is often considered as a manifestation of capitalism in the Marxist-Leninist sense (Oommen 1977). However, more use of family labour has not substantially increased the productivity in the rubber sector (Namboothiri 1993). The distribution of small growers classified by source of labour and size of holding is given in Table (3.8). The chi-square value is significant at 0.01 level of probability ($\chi^2 = 13.68$) which proves the existence of an association between source of labour and holding size. The table portrays the importance of family labour, which is highly skewed towards the growers who have holding size of less than two acres. Use of hired labour is spread across higher holding sizes. The land resource endowment thus acts as a pivotal variable in determining the utilisation of wage labour employment.

Table 3.8 Small growers classified by source of labour and size of holding (n=30)

Holding size in acres	Growers utilising	
	Family labour	Hired labour
	Frequency	Freauency
< 2	16	0
	(53.34)	(0)
2 - 4	1	7
	(3.33)	(23.74)
4 - 6	0	4
	(0)	(13.33)
⩾ 6	0	2
	(0)	(6.66)

3.3.1.2 Small growers' futuristic orientation towards rubber cultivation as primary occupation

The table (3.9) given below depicts the distribution of small growers' classification by religion and their futuristic orientation towards rubber cultivation as primary occupation.

Table 3.9 Small growers classified by religion and their futuristic orientation towards rubber cultivation as primary occupation (n=30)

Religion	Primary Occupation Frequency	Secondary Occupation Frequency
Christians	4	20
	(13.33)	(66.67)
Hindu	2	2
	(6.67)	(6.67)
Muslims	2	0
	(6.67)	(0)
Total	**8**	**22**
	(26.7)	**(73.3)**

Percentages are in the parentheses

A significant chi-square value at 0.05 level of probability ($\chi^2 = 3.85$) established an association between the small growers' religion and their futuristic orientation towards rubber cultivation. However, an analysis of the above table reveals that a high percentage of christians (66.67%) considered rubber cultivation only as a secondary occupation even when they were primarily rubber cultivators. It is indeed a paradox that christians who have been time-honoured cultivators with high agricultural modernity were being apprehensive in advocating rubber cultivation as a primary occupation. It is also seen that all muslims were ready for taking up rubber cultivation (6.67%). But majority of the growers (73.3%) felt that rubber cultivation was best only as secondary occupation .

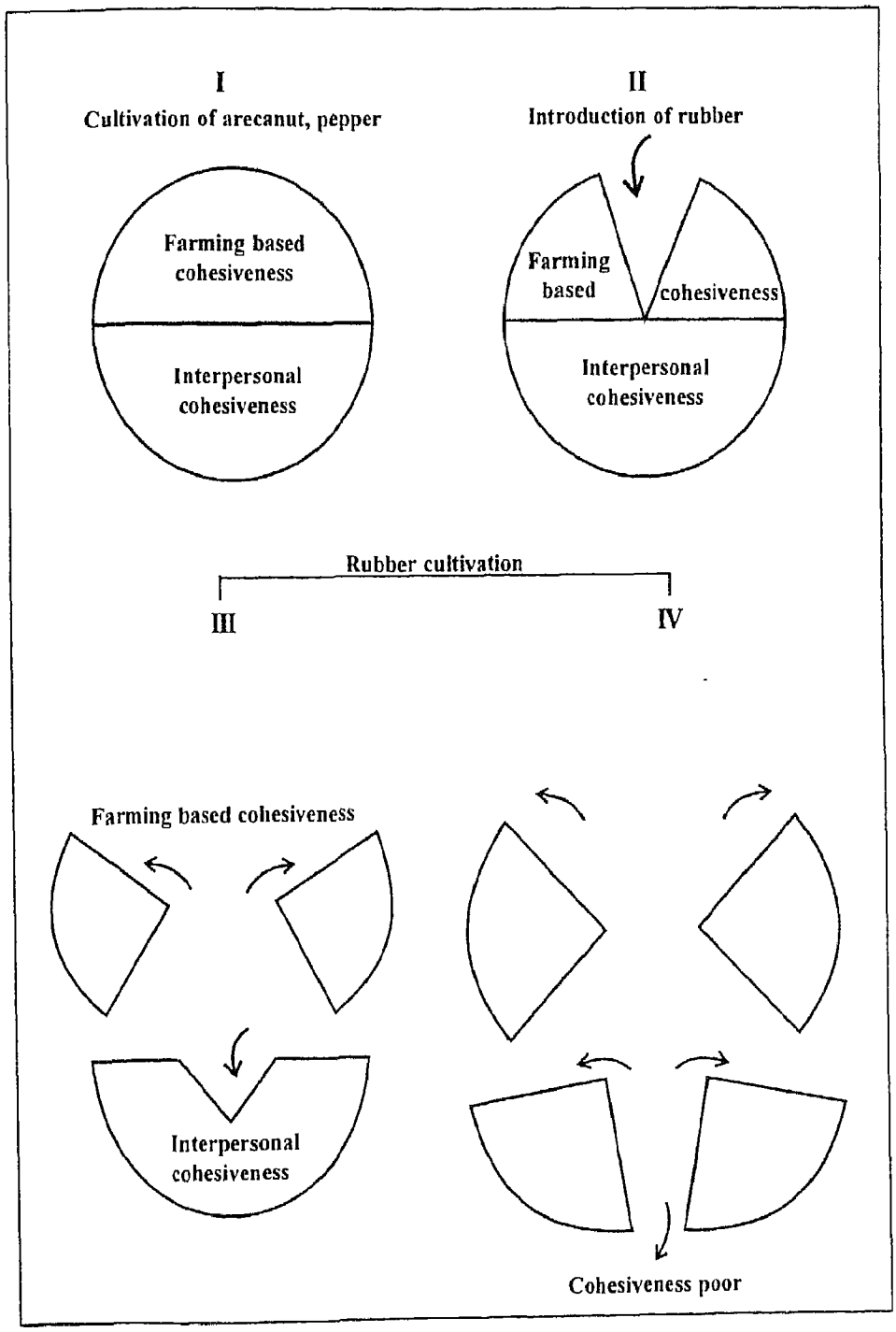
3.3.2 Cohesiveness and integration

As mentioned earlier, in the beginning of the 20th Century, a large number of farmers had migrated from Meenachil Taluk to this region in search of agricultural lands. Crops of the settlers was mainly arecanut and pepper besides coconut, jack etc. Being migrants in the new land, they exhibited a high degree of social integration and maintained a relatively stable relationship amongst themselves. The system of agriculture then was such that all head of families in a particular geographic area (sometimes family members also joined) jointly worked in a farm for select agricultural operations, then worked in the next farm and so on until the entire farm lands under them were covered. Such voluntary group activities were carried out in harvesting, drying, dehusking (in which the women folk also participated) and marketing of arecanut. This was called *'Mattappani' or 'Mattal pani'*. This mutual co-operation and relationship went beyond the boundaries of the farm and increased the network density* (Blomkvist 1997) within the groups. Thus, we find two distinct inseparable dimensions of cohesiveness (Zaccaro and McCoy 1988) among the early settler farmers. (a) *Interpersonal cohesiveness* - the degree to which members like each other and (b) *farming based cohesiveness* - the extent to which group membership provides for the attainment of farm goals (see Fig. 3.4).

The high disease severity in arecanut (Mahali disease) and pepper (Quick wilt) compelled the farmers to introduce rubber into the family farm. Rubber cultivation gradually began to transform the lives of the farmers mainly by improving their purchasing power. But what it also created was a disturbance in the dimensions of cohesiveness among the farmers. First, rubber cultivation which in itself demanded very little group effort and gave high returns to investment, conflicted with the farming based cohesiveness. An interference in the farming based cohesiveness gradually resulted in the drastic decline in the network density, within the farmer groups. Therefore, today weak interpersonal

* For a theoretical understanding of the concept of 'network density' see Blomkvist 1997.

Figure 3.4 Changes in cohesiveness among farmers of Koottikkal



cohesiveness is noticed among the small rubber growers, when compared to what they had 30 or 40 years ago. Their ability in organised activities (See Rubber Producers Societies in Chapter (6), for collective bargaining is however a contradiction to this lack of integration amongst themselves.

3.3.3 Consumerism

An analysis of National Sample Survey data from 1968 to 1983 showed that in Kerala, expenditure on food items had fallen from 74 per cent to 61 per cent which confirmed the Engel's law of consumption* (Sunny, 1988). Even when the economic growth of the state remained low, consumption gradually varied from essential to non-essential requirements, - a practice so typical of only developed nations (Sooryamoorthy 1994). Some of the explanatory variables that are responsible for the unique character of consumer behaviour in Kerala can be identified as the inflow of foreign remittance to the state and the commercialisation of agriculture (Sunny 1994). Roselind has confirmed the Engel's law of consumption among the different classes of rubber growers (Roselind 1996). Consumerism in Koottikkal is a legacy of colonial lifestyle also explained by the imitation theory of learning. More importantly, the economic transformation due to rubber cultivation, resulted in concurrent changes in people's attitudes and aspiration levels making deep inroads into the entire socio-cultural mileu. Consumerism is consumption which is not necessitated entirely by absolute utility consideration, but predominantly by the aspiration of consumers for a better standard of living and as a means of vertical social mobility (Sooryamoorthy 1994).

---

* Engel's law of consumption states that the proportion of expenditure on food items decreases with increase in income of consumers. This law implies that the rising standards of living caused by increase in income will lead to a lower proportion of consumption expenditure on food items, while the expenditure on luxuries increases with increase in income of the household. For more details see Roselind (1996) and Sunny (1988).

3.3.3.1 Indicators of consumerism

Some generalisations regarding changing attitudes and consumeristic tendencies among the different classes of rubber growers are displayed in the table. A thorough study of different classes would yield rich insights regarding the quantitative changes, which are beyond the scope of this study.

Table 3.10 Changing patterns of consumerism

No.	Indicators of Consumerism	Changing Attitudes of small rubber growers From	------> To
1.	Life Style	Belongers*	Emulators*
2.	Cosmopoliteness	Less cosmopolite	More cosmopolite
3.	Advertisement stimuli	Less prone	Highly prone
4.	Automobiles	Conveyance	Luxury than conveyance
5.	Housing	Intrinstic utility	Symbolic function
6.	Leisure time activity	Very little leisure time	indulgence in visual and audio gadgets.
7.	Allegiance	Indegenous	Foreign
8.	Food habits		
	a Frequency of taking food	Twice a day	Thrice a day and more
	b Quality of food	Tapioca, rice, gruel and fish	Rice, wheat based and other processed food
	c Food storage	Prepared and consumed	prepared and stored for longer times.
9.	Clothing pattern		
	a Frequency of purchase	Comparatively low	High in frequency
	b Dress code	Ordinary dhoti without shirt	Dhoti, trouser and 'brand' shirt

* Belongers are people who are conventional, conservative, nostalgic and unexperimental and who would rather fit in than stand out. Emulators on the other hand are ambitious, upwardly mobile, status conscious and they want to "make it big" (Kotler 1995).

Whether consumerism, in a not so economically advanced state like Kerala is a desirable practice or not is a much debatable issue but what it poses is that Kerala's earnings from cash crops and remittances flow out for payment to the imported consumption goods, leaving pretty little for capital formation in the state (Mahesh 1994). Other social pathologies due to increased consumerism have also been pointed out (Sooryamoorthy 1991).

3.3.4 Education and rubber cultivation

Kerala's education system is marked by two features unique in India. First, unlike all other States, Kerala has focused educational expenditure on the lower levels, spreading basic literacy farther, but resulting in higher educations being relatively less advanced (Nair 1979). This seems to be true in the case of Thiruvithamkur also, where a large part of the income from the export of plantation crops was spent on education and yet remained incapable of producing a managerial or an administrative elite in any sizeable number (Umadevi 1989). The findings from Koottikkal presented in Tables (3.11 & 3.12) support Eapen's claim that the character of unemployment in Kerala appears to be changing with a growing preference among the young job seekers for non-agricultural and non-manual type of occupation (Eapen 1994).

Table (3.11) shows the distribution of sons of small growers classified by education level and orientation towards rubber cultivation as primary occupation. A low chi-square value (χ^2 = 0.049)indicates absence of an association between the above two variables. Majority (67%) of the boys showed lack of interest in undertaking rubber cultivation for a living.

Table 3.11 Educational level of small growers' sons and their orientation towards rubber cultivation

Educational* level	Boys	Orientation towards rubber cultivation	
		Primary occupation	Never as primary occupation
		Frequency	Frequency
Illiterate	0	0	0
	(0)	(0)	(0)
Primary school	1	0	1
	(1.67)	(0)	(1.67)
High school	35	12	23
	(58.33)	(20)	(38.33)
Higher Secondary	8	3	5
	(13.33)	(5)	(8.33)
Collegiate	16	5	11
	(26.69)	(8.3)	(18.33)
Total	60	20	40
	(100)	(33.34)	(66.67)

Table 3.12 Educational level of small growers daughters and their orientation towards rubber cultivation

Educational* level	Girls	Orientation towards rubber cultivation	
		Primary occupation	Disinterest in rubber cultivation
	Frequency	Frequency	Frequency
Illiterate	0	0	0
	(0)	(0)	(0)
Primary School	2	0	2
	(6.67)	(0)	(6.67)
High School	11	2	9
	(36.67)	(6.67)	(30)
Higher Secondary	1	0	1
	(3.33)	(0)	(3.33)
Collegiate	16	2	14
	(53.33)	(6.67)	(46.67)
Total	**30**	**4**	**26**
	(100)	**(13.34**	**(86.66)**

Percentages are given in parentheses

* This Educational level denotes those currently studying as well as those who have completed the particular level. For those below the high school level, their parents were asked what they wanted their children to be

In Table (3.12) also there exists no association between the education level of the girls and their orientation towards rubber cultivation as primary occupation (χ^2 = 0.064). Here again, a very high percentage (87%) of girls showed disinterest in taking up rubber cultivation as primary occupation.

Most youngsters felt that, given the massive unemployment level in the state, higher education would not render them anything to satisfy their vocational aspirations. On the other hand, by shying away from the practice of agriculture, they are denying themselves a means of livelihood. Further probing also revealed that the youngsters' modest knowledge of the ecological problems associated with rubber cultivation was not a deterrent in their not taking up rubber cultivation as an occupation. The sheer reluctance on their part to do manual and agricultural jobs have prompted them to shift their focus on non-agricultural jobs. Higher education in Kerala is thus considered as an ornamental object instrumented only to get lower grades of employment (George 1994).

3.3.5 Political Climate

Most of the small growers in general and christians in particular are staunch supporters of the Kerala Congress (Mani) group (Kerala Congress (M)). The level of political participation of the growers, though not uniformly distributed, are nevertheless, high. The local unit of the party carries out organised activities and campaigns in and around Koottikkal town and maintains a symbiotic relationship with the growers. The organised activities in Koottikkal, made possible by a strong youth following, include convening periodic general bodies, membership drive campaigns, fund mobilisation campaigns, planning agitations during slump in rubber prices, pressurising the district committees to act upon the small growers problems etc. Much of the 'political activism' seem to revolve around the price fluctuations of rubber in the market which underpins Marx's conception of economic and political power being closely, although not inseparably, linked (Giddens 1971).

As explained earlier, family labour is more utilised by farmers of smaller holdings. However, a significant number of small growers also employ wage labour. Labourers are employed for a period of one year or two years by the growers and usually their economic relationship (liberal payment through bonus, gratuity etc.) tended more in favour of the labourer. Still, frictions and disputes are prevalent between the two classes. These temporary labourers unlike their counterparts in estates have no organised bodies for collective bargaining; nor do they have the support from established national unions like CITU, AITUC and INTUC (INTUC, in particular, is reluctant to deal with small growers' issues as they sustain on the latters' support). These plantation unions intervene in labour disputes of permanent workers in large estates alone. Inspite of this, the left wing labour plantation unions (CITU and AITUC) have a profound political base among the labour class. The left wing unions are currently working on a proposal to start a "Small Growers' Plantation Labour Welfare Fund*" which if becomes operational, is expected to give a balance to the otherwise unstable equilibrium existing between the small growers and the labourers.

It would be erroneous to state that rubber cultivation produced uniform effects in all parts of Kerala. Having analysed the socio-psychological impact of rubber in a traditional rubber cultivating area like Koottikkal, it would be interesting to study the consequences of rubber cultivation in a non-traditional area like Alakode which is located in the northern part of Kerala. This is discussed in the next chapter.

---

* For this fund it is suggested that the small growers and the labourer he employs will contribute Rs. 2/- each to the fund. If this materialises, it is expected to rake in more funds than the Toddy Tappers Labour Welfare Fund.

CHAPTER 4

THE CASE OF ALAKODE

4 . The case of Alakode

This chapter analyses the rubber cultivation in Alakode. First we describe the present situation of the study area followed by an analysis on the changes brought about by rubber cultivation in Alakode. The pattern of change studied as an agricultural historiography of Alakode is compartmentalised into three phases *viz.* (a) Pre-migration phase (b) migration phase and (c) post-migration phase. Finally a comparison between the Alakode and Koottikkal cases is attempted.

4.1 Description of the study area

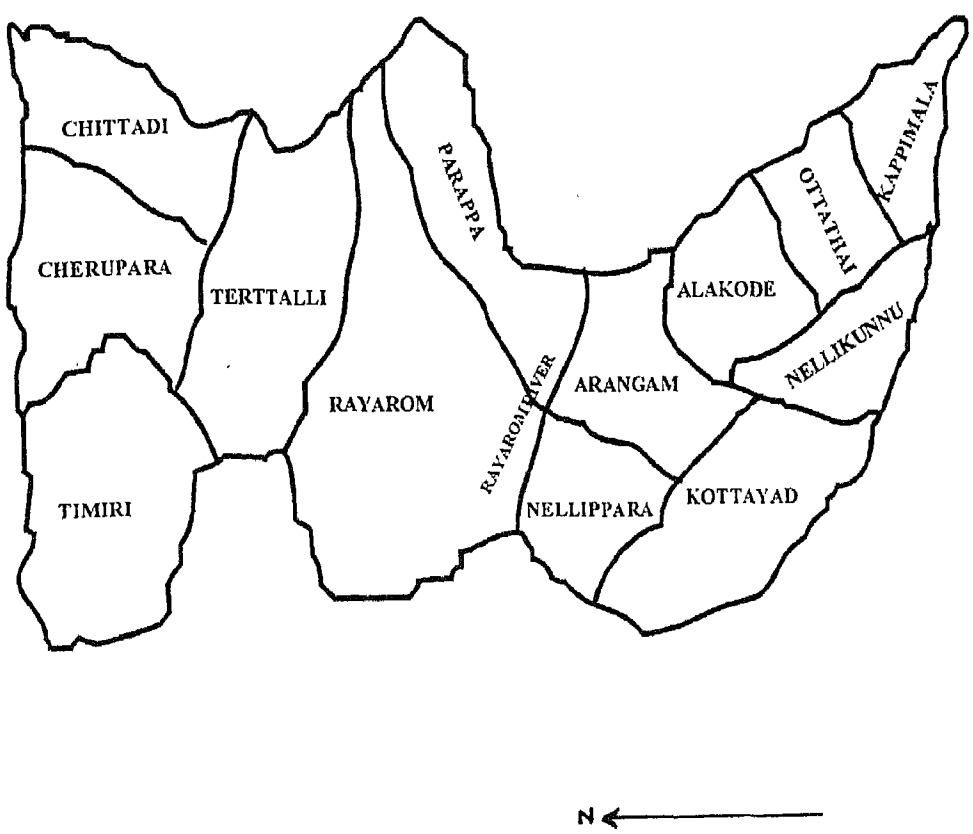
4.1.1 Geographic location

Alakode panchayat, a highland region along the Karnataka border of the Western Ghats, is situated in the northern end of Kannur district of Kerala. The Panchayat has 13 wards and is under the Tirikkur constituent assembly (see Fig. 4.1).

4.1.2 Bio-physical Environment

Alakode receives a fairly good amount of rainfall usually exceeding the district average. Maximum rainfall is obtained from the south west monsoon, the peak rainy period being July-August. The temperature varies from a mean minimum of 21.4^0 C to a mean maximum of 34.1^0 C (Alakode Grama Panchayat Vikasana Report, 1996 henceforth referred to as AGPVR 1996). The main rivers of the region are Rayarom, Alakode, Marrathani and the Karuvanchal. Topography of the land can be divided into (a) steep mountain slopes (b) hillocks

FIGURE 4.1 ALAKODE GRAMA PANCHAYAT



and (c) plains. The slopes and hillocks are endowed with well drained laterite soils and intermittent hard rocks. In the plains, a mixture of laterite soils and gravel are dominant.

4.1.3 Land Use Pattern

The total geographical area of the panchayat is 77.79 square kilometers. A detailed land use pattern of the panchayat is given in Table (4.1).

Table 4.1 Land Use Pattern of Alakode Panchayat

No.	Land Use	Area in (hectare)
1.	Total geographical area	7779
2.	Agricultural lands	7004
3.	Roads and Buildings	674.5
4.	Barren and uncultivated lands	95.5
5.	Puramboke lands	5

Source : AGPVR 1996.

4.1.4 Cropping Pattern and Agrarian relations

Rubber is the predominant crop of Alakode, followed by coconut and arecanut. Nevertheless, the total area under other crops exceeds that of the area under rubber which extols the multi cropping system characteristic of this region. Presently in Alakode, rubber is slowly replacing arecanut, cashew and tapioca.

Table 4.2 Cropping pattern of Alakode village

No.	Crops	Area in hectares
1.	Rubber	2605
2.	Coconut	2090
3.	Arecanut	780
4.	Pepper	675
5.	Cashew	620
6.	Tapioca	207
7.	Banana	136
8.	Ginger	60
9.	Turmeric	15
10.	Cocoa	10
11.	Coffee	10
12.	Vegetables	10
13.	Mango	9

Source : AGPVR 1996.

The Kerala Land Reforms Act (1971) conferred ownership rights through 'Pattayams' to many farmers who had leased out lands from the *Jenmies* (the rural oligarchs). The reforms could thus change the agrarian structure and land relations in Alakode. At present about 60 percent of the farmers are marginal while about 33 percent are small farmers. The distribution of land holdings among the farmers are given in the next page in Table (4.3).

Table 4.3 **Distribution of holding in Alakode across size class**

No.	Farmer Categories	Farmers	
		Number	Percentage
1.	Marginal farmers	6320	65.91
2.	Small farmers	3160	32.95
3.	Large farmers	109	1.14
	Total	**9589**	**100**

Source: AGPVR 1996.

4.1.5 Demographic profile of Alakode in 1991

The total population of Alakode in 1991 was 33,456 distributed over 6709 households. The panchayat has a sex ratio in favour of males (981 females per 1000 males). The density of population is 431/km^2. Table (4.4) shows the demographic profile of Alakode.

4.1.6 Development indicators

Some development indicators of Alakode panchayat has been listed and a qualitative assessment of their access and adequacy is presented in Table (4.5).

4.2 An agricultural historiography of Alakode

This section deals with the historiography of agricultural practices across three phases categorised and named (a) pre-migration phase (b) migration phase and (c) post-migration phase.

4.2.1 Pre-migration phase (Period till 1945)

It is well recorded that there was no inflow of migrants to Alakode prior to 1945 during which the region was a thick forest (AGPVR 1996). Thus, the period before 1945 was called pre-migration phase.

Table 4.4 Demographic profile of Alakode (in 1991)

S. No.	Characters		Number
1.	Occupied residential houses		6675
2.	Households		6709
3.	Total population including institutional and houseless population		33456
		Male	- 16888
		Female	- 16568
4.	Scheduled Caste		
		Male	- 1256
		Female	- 1261
5.	Scheduled Tribe		
		Male	- 1
		Female	- -
6.	Literates		
		Male	- 13922
		Female	- 12886
7.	Cultivators		
		Male	- 308
		Female	- 11
8.	Agricultural labourers		
		Male	- 308
		Female	- 11
9.	Livestock, forestry, fishing, hunting, plantation, orchards and allied activities		
		Male	- 5088
		Female	- 667

Source : Census Report 1991

Table 4.5 Some Development Indicators in Alakode

S.No.	Indicators	Access	Adequacy	Constraints
1.	Lower primary schools	✓	–	Lack of infrastructure Library, Laboratories and lavatories
2.	Upper primary schools	✓	–	
3.	High schools	✓	+	
4.	Colleges	X		
5.	Parallel colleges	✓	+	
6.	Anganwadis	✓	–	Lack of proper buildings, toys
7.	Hospital	✓	–	Doctors are irregular and all medicines not available
8.	Ayurveda dispensary	✓	–	No building of its own
9.	Public water supply pipes	✓	–	Do not cover all parts of the Panchayat
10.	Public wells and tanks	✓	–	Water shortage is a severe problem
11.	Rural electrification	✓	–	All areas are not covered, low voltage
12.	Post-office	✓	+	
13.	Telegraph office	✓	+	
14.	Telephone connections	✓	+	
15.	Public markets	✓	+	Wide price fluctuation
16.	Main roads	✓	+	
17.	Sub roads	✓	–	Very narrow, not tarred
18.	Drainage	X		Drainage channels present, not maintained
19.	Banks	✓	+	
20.	Hotels and Teashops	✓	+	
21.	Places for boarding and lodging	X		
22.	Small scale industries	✓	–	
23.	Govt. Veterinary hospitals	✓	–	One hospital can not cater to the needs of a large panchayat
24.	Housing for Dalits	✓	–	Have not covered all families. Lack of lavatories and water
25.	Libraries	✓	+	
26.	Socio-cultural institutions	✓	–	Many have become non functional
27.	Co-operatives	✓	+	
28.	Transportation	✓	–	Buses ply less frequently, jeeps are costly

Legend

✓	:	Access present
X	:	No access
+	:	Satisfactory
–	:	Unsatisfactory

4.2.1.1 Agriculture of the Adivasis

The adivasis of the Alakode forests (*Karimpalar* and *Mavlar*) are known to have practised gathering and shifting cultivation. After selecting and clearing the *Kothukadu**, seeds of nellu (rice), chama (maize - *Zea mays*), tumara (pigeonpea - *Cajanus cajan*), cheera (*Amaranthus* sp.), were mixed together and broadcasted. Since harvesting time of these crops were different, subsistence needs of the adivasis were taken care of temporally. Also, due to their limited ability to process the natural resources, the quantum of resource use was small. In such production systems, therefore, material flows were closed and balanced on a fairly restricted spatial scale. (Gadgil and Guha 1992). For the adivasis the land/forest was more than mere units of production. Their customs and values towards agriculture were in such a way that they attributed sacred qualities to the natural resources. This must have unconsciously prompted them to make minimum use of their natural resources.

4.2.1.2 Agricultural Production System of the natives and early settlers

In the erstwhile British Malabar, Alakode was a part of the Chirakkal taluk. The entire lands were either under the *Dewaswom* or under *Jenmies* . Evidences point to the practice of '*Punam cultivation*' (AGPVR 1996) in these hilly regions in the 19th century. The practice of *punam cultivation*, outlined below, was also replicated for a brief period, by the native farmers and early settlers who had migrated from parts of central Thiruvithamkur. As practised by the Adivasis, seeds of rice, maize, pigeonpea and (or) cucumber (*Cucumis sativus*) were mixed together and broadcasted. Within six months rice would be ready for harvest. By the seventh and eighth month, maize and pigeonpea respectively would be ready

---

* Kothukadu - forest lands prepared for cultivation after slash and burn

for harvest. In the 12th month, seeds of *Erythrina* sp. which are the standards of pepper were sown and pepper were trailed on to them. Crops like tapioca and rubber (discussed in the ensuing pages) introduced by the migrants and coconut, a highly suitable crop for the tract, also were cultivated. Tapioca was grown as intercrop in young coconut and rubber plantations. The productivity of tapioca in the first year was usually high, which declined slightly in the second year. After harvesting, the crop residues of tapioca were incorporated into the pepper basins, which improved the vitality of pepper vines. By the third year pepper would start yielding*. Pepper was cultivated in the fourth, fifth, sixth and seventh year before which coconut and rubber would be ready for harvest. Cultivation of lemongrass (*Cymbopogon flexuous*) was also popular among the native farmers including tiyyas and muslims. However, low profits and strenuous processing curtailed the planting of lemongrass to such an extent that it is no more cultivated today. Although in the above discussion, we have included rubber, it was not cultivated by the native farmers of Alakode in the beginning. But it would be seen that the mode of agriculture transformed from a gathering mode of the adivasis to a settled cultivation mode and later to a commercial form of agriculture with the entry of rubber. Rubber cultivation which is a manifestation of commercial agriculture should be viewed in the context of a larger social process *rural to rural migration* - the socio-economic settings and the dynamics of which we shall analyse.

4.2.2 Phase of migration (1951-1975)

Migration is interpreted as a household survival strategy. The concept of survival emerges as a way of focusing attention on the poverty of many migrants

---

* The third year yield of pepper is eulogized by an axiom in the local language "Munamandil mundudukkan matram mulaku" meaning pepper in the third year pays enough for buying dhotis.

and their movement often result from deteriorating employment and income conditions in rural areas (Simmons 1983). The Alakode Panchayat is composed largely of a population which had migrated from different parts of central Thiruvithamkur. Although rural to urban migration is reported to be the most prevalent type of migration, (Balister *et al* 1984), the Malabar migration in general, and that to Alakode in particular, was essentially the *rural to rural type.* The Demographic Research Centre (1975) has classified internal migration on the basis of (a) origin and destination of movement as short distance and long distance migration (b) duration of stay as daily, temporary and permanent migration and (c) motivation of movement as migration due to 'push factors' and 'pull factors'. A detailed discourse on 'push' and 'pull' factors alone is elaborated, since movement has mostly been from Thiruvithamkur and duration of stay has been by and large permanent.

4.2.2.1 Push Factors

During World War II, acute food shortage due to non-supply of rice from Burma forced an appreciable number of christian (mostly roman catholics) families in central Thiruvithamkur to migrate to Malabar in search of agricultural lands. Migration was their desperate attempt to make both ends meet. Conversely, the prices of agricultural commodities during the war also shot up and some farmers reaped good dividends out of it. The price of even small holdings in Thiruvithamkur soared, which resulted in farmers selling their holdings in order to invest on larger parcels of land in Alakode. However, only a handful of people belonged to the latter.

After the formation of Kerala State on November 1, 1956 there was a frenzied rush to the various parts of south and north Malabar especially Alakode.

Thiruvithamkur and Kochi which became unified early in 1949, removed the barriers between the two princely states. However, the severe restrictions and week long scrutinies at the Malabar border check posts were agonising for the migrants consisting women and children. With the birth of Kerala State, these curbs and traumas were done away with, making the soils of Malabar freely open to them.

4.2.2.2 Pull Factors

Most people earn their living from land and its availability is one of the determining factors in the magnitude of migration from a village (Connell *et al.* 1976). The fertile soils of Alakode was the prime cause which urged many a migrant to move towards this region. By the late fifties the Thiruvithamkur farmers had started reaping the benefits of rubber cultivation. Rubber cultivation in Alakode was thus a natural choice.

The developmental process of the present Alakode was initiated to a large extent by the altruistic endeavours of one of the early migrants - Sri P. R. Rama Varma Raja known widely as the 'Alakode Raja' and referred to as 'Tamburan' (Thomas, 1978; Joseph 1991) (see Plate 4.1). Ramavarma bought around 10,000 acres of land in Alakode during 1936-37, resigned his job as Assistant Dewaswom Commissioner, and settled in Alakode with his family in 1952. A progressive thinker with a remarkable vision, Ramavarma himself invested capital for the construction of the road from Taliparamba to Manacadavu and the three bridges in Karuvanchal, Alakode and Manacadavu. The starting of the N.S.S. High school, post office, telephone exchange, library, rural electrification etc. testify to his commitment to social causes. The Alakode Development Committee that he formed in 1960, was responsible for the emergence of the Alakode Service

Co-operative bank and other institutions. In his own Koliyodu estate, he grew pepper, coconut, coffee, tea, spices and rubber. He was personally responsible for bringing farming families from his native Poonjar and adjoining places and employed them in his estate albeit later, he had his full share of trade union agitation as well as litigation with the Government. Although his development efforts never crossed the Rayarom river, (see Fig. 4.1) his contribution to infrastructure and institution building in Alakode was the most important factor for the Thiruvithamkur farmers' impetuous scramble to the forest lands of Alakode.

It was mentioned earlier that most of the migrants to Malabar were roman catholics. But the spiritual work in Malabar was carried out by Vicars of the Kozhikode Latin Diocese, whose order of adoration was very different from those of the roman catholics. The burgeoning roman catholics, over 70,000 by 1953, made constant appeals to the Pope for constituting a Roman Catholic Diocese, which eventually resulted in the formation of a Roman Catholic Diocese at Talassery on 31st December 1953. Soon after that, a number of churches mushroomed in all new settlement areas and the rate of movement of migrants to these areas accelerated (Mar Sebastin 1991).

4.2.2.3 The Introduction of rubber

The inflow of migrants to Alakode was highest during the period from 1955 to 1965, which almost came to an end by 1975. Farmers in south Malabar after grappling with failures in pepper cultivation moved further north to Alakode, Udayagiri, Chemperi, Naduvil etc. and planted rubber (Chacko 1993). We had already examined how the settlers at first adopted the crop production system of the natives. The settlers brought with them 1-1.5 year old rubber clones from Thiruvithamkur. To save wage labour and more importantly to gain territorial

control over 'their lands*', farmers planted the seedling clones in holes made by plunging iron bars into the soil. Since budded rubber was unavailable at the time, the yield from clones was low. In the subsequent years high yielding varieties like RRII 105 were newly planted as well as replanted. During the phase of migration therefore, rubber gained significant growth in area in Alakode. The spread of rubber *vis-a-vis* the unique homegardens of Kerala is furnished below.

4.2.2.4 Homegardens and associated Value Systems in Alakode

The agricultural practices narrated earlier come under the ambit of the dynamics of homegardens** - a production system in existence for centuries in Kerala. Homegarden as a production system was extant in Alakode, as elsewhere in Kerala across religion, caste and class. Numerous terms have been used by various authors to denote the traditional lands use practices around homesteads *viz.*, mixed garden horticulture, homestead farming system, house compound land, mixed garden, house garden, homegarden, compound farm, kitchen garden, household garden and so on (Jose 1991). Fernandes and Nair (1986) use the term homegarden to refer to land use practices involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and livestock within the compounds of individual houses, the whole crop-tree-animal unit being intensively managed by family labour. The high species diversity coupled with staggered planting provided an year-round-supply of food, fuel wood, plant parts of medicinal value etc.

---

* This was mainly because many times farmers encroached on more than their alloted share of land. Land encroachment issues leading upto the politically contentious tribal bill, though have very serious consequences, need a separate research agenda and hence do not figure in our analysis. Moreover, blatant encroachments as occurred in Wyanad were not conspicuous in Alakode

* * Homegarden is the major agricultural production system in Kerala covering more than 50% of the cultivated area. Perennials like coconut, arecanut, black pepper, cocoa, cashew, jack, mango etc. are grown in close association with seasonal food crops *viz.*, root crops and tubers, pulses, vegetables, spices, medicinal plants and other multipurpose trees. (Jose 1991)

Traditionally homegarden production was mainly for home consumption and production for market exchange was given less emphasis. The indigenous farmers of Alakode predominantly hindus and muslims* promoted and propitiated the homegardens and the values associated with it. The value systems attached with the homegardens are many. The very maintenance of a multicropping system in the homegarden itself has stemmed from viewing nature in a holistic perspective. Homegardens were associated with pride and prestige and considered a symbol of close-knit hard working family. They provided spatial identity and privacy to the household and satisfied the aesthetic needs (Jose 1991). Agriculture produce from the homegardens as token of love were distributed freely among kith and kin of the people of different groups. We thus notice what anthropologists term 'generalised reciprocity' (Ember and Ember 1993) among the people. In this form of reciprocity, people provided goods and services without expecting an equal and/or immediate return. This value-practice attachment can be shown as an evidence of altruism or explained as in-built in their awareness of social interdependence. Either way, they only point to the fact that homegardens had equal, if not greater, roles in their non-market functions as compared to their importance in the household economy. Nevertheless, we shall soon see how a dent created in such value systems is now getting widened.

4.2.3 Post migration phase (Period after 1975)

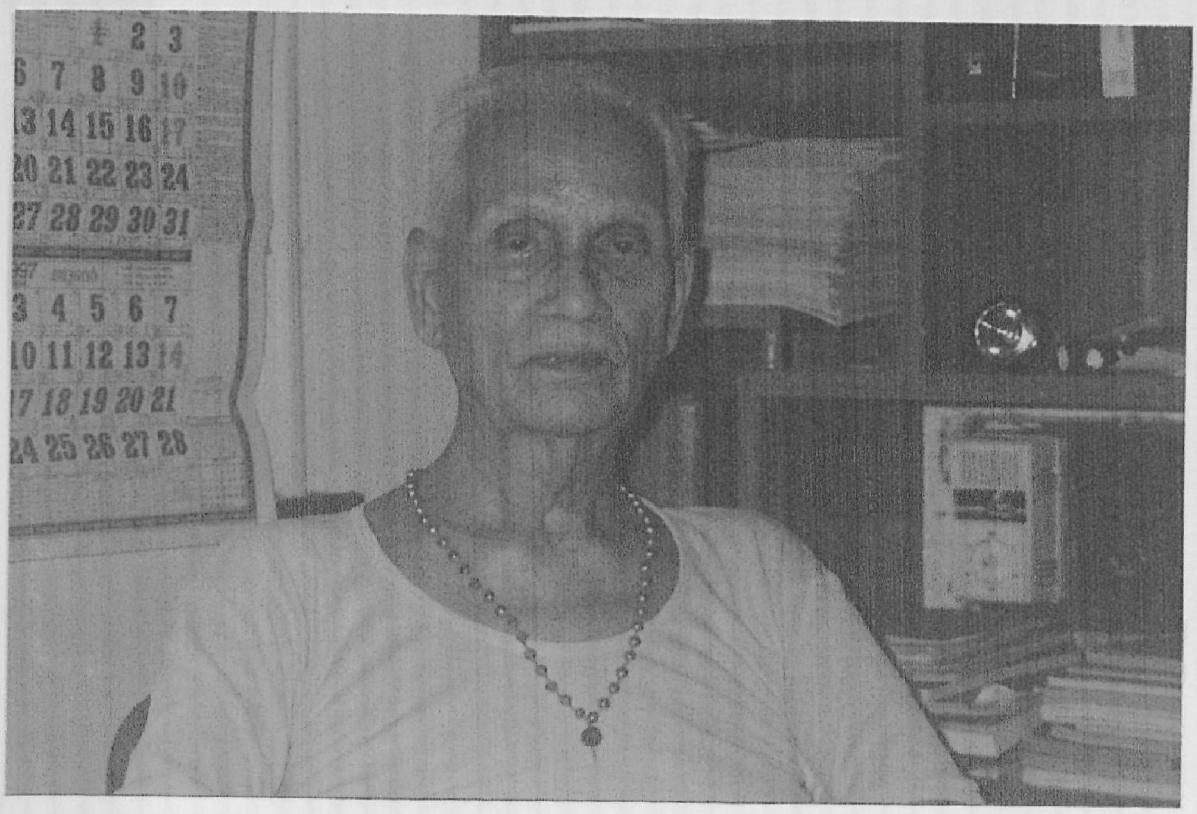
In this section we proceed to analyse three important social changes or impact *viz* (a) psychological acculturation (b) dynamics of the homegardens and associated value systems and (c) evolution of developmental sequences in Alakode.

---

* Muslims are ingeneral supposed to be a trading community. Their participation rates in agricultural activities are low. (Abdussalam 1984, quoted in Abdul Kareem 1988).

Plate 4.1 Alakode Raja

Plate 4.2 The Arangam Mahadeva temple showing rubber sheets being sun dried



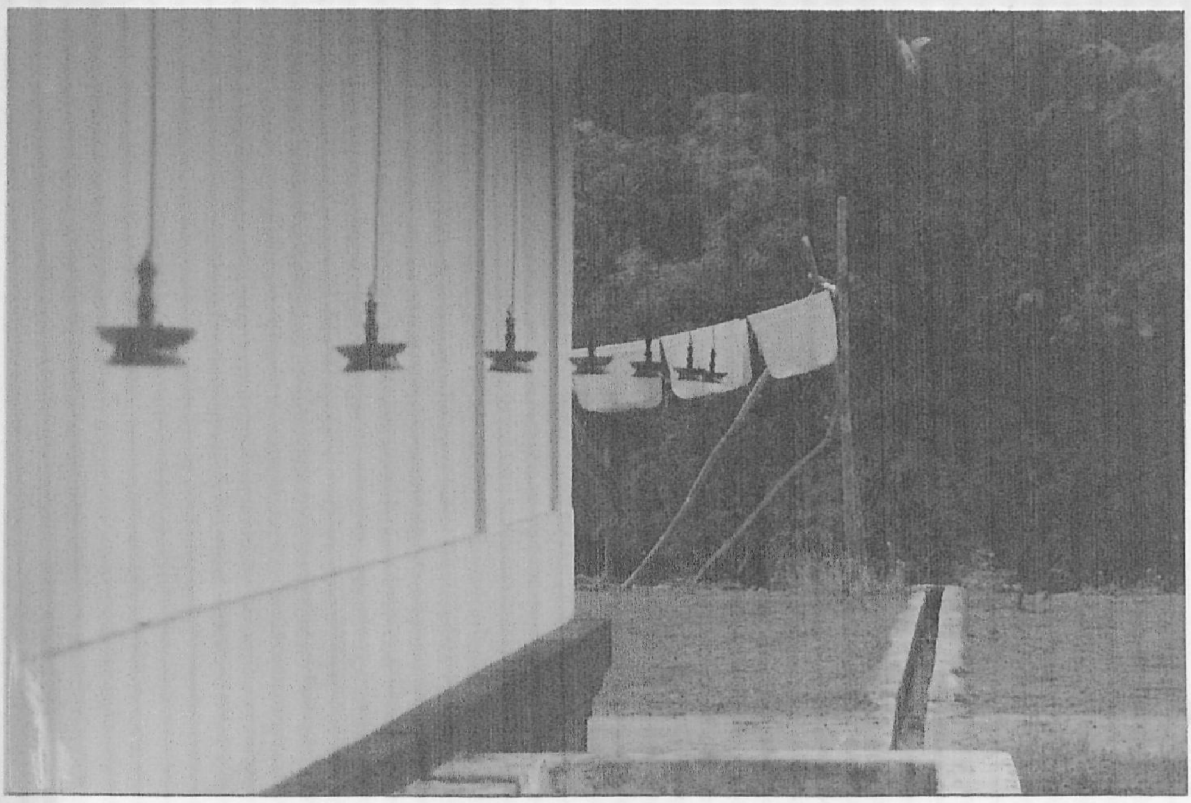
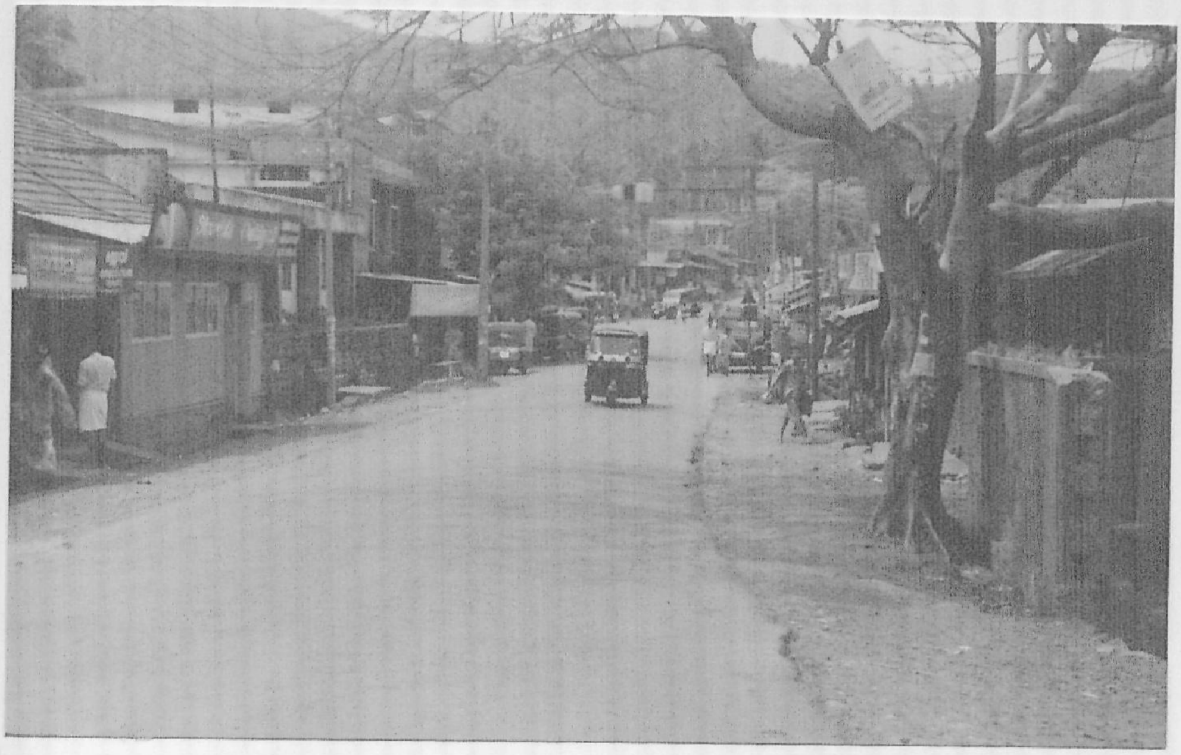


Plate 4.3 Alakode Town



4.2.3.1 Psychological Acculturation

Change in the behaviour of individuals or groups as a result of continued contact with the members of other cultural groups is a well documented phenomenon. Studied under the rubric of 'acculturation' in anthropology, the phenomenon refers to the flow of cultural elements between two or more groups of people (Berry *et al.* 1986). In principle, this flow may take place equally in both directions, but observations reveal that the flow is usually not balanced; it is stronger in one direction than the other. Despite this observed imbalance, the concept of acculturation still refers to a two way flow of cultural elements (Berry 1980). We study acculturation in the context of the migrant catholic farmers with high economic motive and market orientation *vis-a-vis* native hindus and muslims, who had very different value systems especially those associated with homegardens.

Acculturative change may be the consequence of direct cultural transmission or of non-cultural causes such as demographic modification induced by another culture (which is particularly relevant to this study), reactive adaptation to traditional modes of life, urbanisation etc. .... Its dynamics can be seen as the selective adaptation of value systems, the process of integration and differentiation, the generation of developmental consequences and the operation of role determinants and personality factors (Social Science Research Council 1954).

In Alakode as an intraspatial (within the state) conjunction of cultural systems between the natives and migrants had taken place, it is appropriate to study the changes that individuals experience, termed psychological acculturation (Graves 1967), as a result of participation in the acculturative process. Here again such changes are more manifested among the natives than among migrants. The

migrant catholic families were more oriented towards cultivation of crops for meeting the demand created by external market forces rather than the demand arising from within their households. Since rubber was misfit for household consumption and most suitable for economic gains, the catholic families brought more areas in Alakode under rubber. The economic privilege and power enjoyed by the christians gradually attracted the attention of the native hindus and muslims, who had only till then thought of producing food, to meet family needs, to replace what had been consumed, or to balance the demands of their immediate promiscuity in the society. Gradually the farmers of these communities began imitating the catholic farmers by cultivating rubber and subsequently succumbed to the forces of the external market. It is to be emphasised that even though such behavioral shifts would have taken place at some point of time or the other, it was the acculturative process that initiated and propelled the selective adaptation of the native farmers' attitudes and values towards agriculture.

4.2.3.2 Dynamics of the homegarden and associated value systems

The agricultural production system can be viewed as a continuum, production solely for domestic consumption at one end and solely for market exchange at the other end. Traditionally the homegarden production was mainly for home consumption. The gradual integration of peasants into the market has led to the introduction of cashcrops in the homegardens and increased sale of traditional garden produce. Thus, homegardens have gradually moved towards the right side of the continuum (Jose, 1991). We therefore, notice alterations in the age old value systems governing the aesthetic, cultural and other non-market aspects of the home garden among the native farmers which has also affected the ecosystem and health of the homegardens.

Since actions are regarded as the observed indication of values, we further notice alteration in political values (challenges of ideology and power) aesthetic values and religious values*. Macro changes in the religious values are illustrated by the following example. It was common practice for churches to have land under rubber. Nowadays even hindu temples have their own lands under rubber cultivation - a practice unheard of some decades before. The Arangam Mahadeva Temple in Alakode has in its possession two acres of land under rubber. Interestingly it is the only temple in Malabar celebrating its festival in the typical Thiruvithamkur style (see Plate 4.2).

Behavioural shifts from (a) less consumeristic to more consumeristic (b) mutualistic to individualistic and (c) debasing of *Farming based cohesiveness* are also noticed among the farmers of Alakode but it is yet to alter the *interpersonal cohesiveness* in a drastic manner. In short, acculturation and factors like urbanisation has resulted in the homogenisation of the style of life among the people of Alakode, a tendency that is gradually becoming stronger with the development of communication and increased spatial mobility. It must however be pointed out that 'remnants' of the non-market use of the homegarden acts as a deterrent force preventing the complete replacement of the homegarden with rubber (Jose 1991). The multicropping pattern of the homegardens still in existence in Alakode is an affirmation of its continued relevance. Even the christian families of Alakode maintain a multicropping pattern in their homegardens. This could be because of the reverse flow of cultural elements from the natives to these migrants.

---

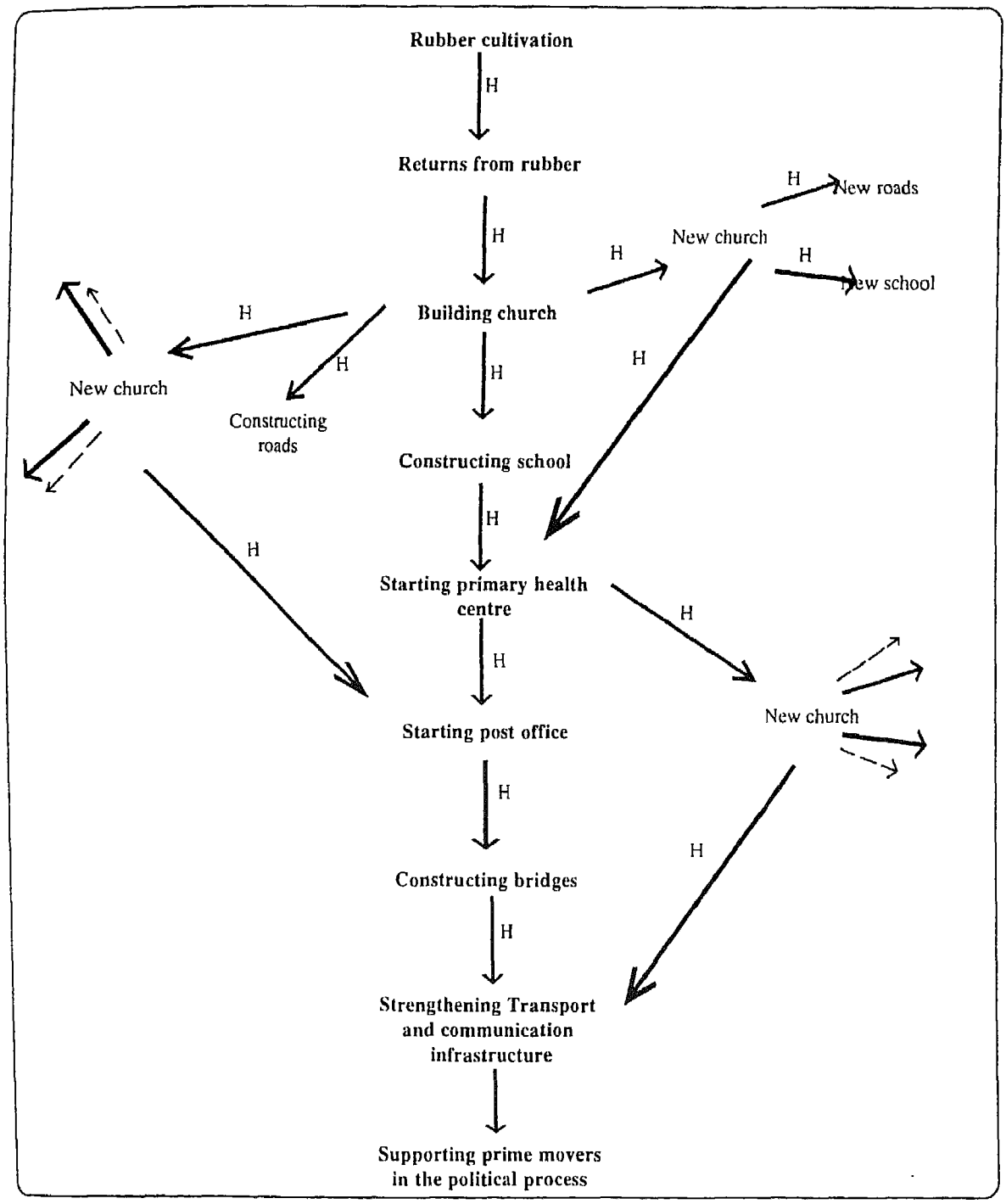
* See Allport, Vernon and Lindizey (1951)'s pioneering study on the relative strength of six values in an individual categorised under (1) theoretical (2) aesthetic (3) political (4) social (5) economic and (6) religious values.

4.2.3.3 Evolution of developmental sequences in Alakode

These eco-cultural implications notwithstanding, few would argue on the aggressive and significant role of the settlers of Alakode in the overall development of the region. The direct and indirect yet powerful influence of the church as a determinant of the development design in Alakode also needs to be acknowledged. We had already mentioned that Ramavarma's developmental initiatives could never cross the Rayarom river. So all the developmental activities across the river were undertaken by the christian settlers with the strong support and cooperation of the natives. It is clearly evident that capital formation accrued primarily through returns from rubber cultivation was the major ingredient and catalyst to the development effects such as (a) elaboration of material possession of the growers and (b) creation and strengthening of public capital (*eg*: roads, schools etc.).

The developmental sequence usually began with the starting of a church in a particular locality and activities revolving around it (see Fig. 4 2). All the Christian growers contributed the human resource at their disposal in building the church. The returns from agricultural produce would form the capital needed for construction. Since rubber was most remunerative and available a plenty, rubber sheets and latex formed a lions share of the agricultural produce donated by the farmers to the church. From the newly built church started a series of development activities under the leadership of the church priest who is (usually) respected by members of even other religious groups. The activities such as constructing roads, building schools and other institutions like post office, primary health centres etc. received the active participation (in kind and physical effort as explained earlier) of the natives across religion, class and caste. Rubber being the crop cultivated by all farmers, it was rubber and the returns from it which helped

Figure 4.2 Temporal and spatial flow of returns from rubber



Legend

- - - - -> : Further sequences follow

H : Contribution of human resource by growers

Note : The illustration is only an example of the manner in which one development sequence succeeds another. It is not necessarily in the same order in all the wards of the panchayat

build the infrastructure and institutions in Alakode (see Plate 4.3). At present, provisions and household items are exchanged for rubber sheets in some shops of Alakode, which gives ample evidence of the privilege enjoyed by the rubber growers.

After attaining the critical base of infrastructure, although inadequate, the attempts of the growers were directed towards improving their social standing manifested through higher education, consumerism etc. Again organised collective bargaining for special services like new bridges, state transport bus links, and further, introducing and (or) supporting prime movers of the political process in the state, and making him/her instrumental in accomplishing their next instalment of social security needs are all but some of the consequences of rubber cultivation.

4.2.3.4 Agricultural modernity of small growers

The agricultural modernity of growers, their use of labour, and futuristic orientation towards rubber cultivation as primary occupation, is studied here to compare with the previous case. The distribution of small growers according to their level of agricultural modernity is presented in Table (4.6).

Table 4.6 Distribution of small growers according to their agricultural modernity in rubber cultivation (n=30)

Composite Agricultural modernity index	Agricultural modernity level	Number of growers	Percentage
< 25	very low	3	10
25 - 50	low	11	36.66
50 - 75	high	8	26.67
> 75	very high	8	26.67

A cursory glance of the above table reveals that more than half of the small growers had greater levels (>50%) of agricultural modernity. However, more than one third of the small growers showed low levels ($25 \leq x \leq 50$) of agricultural modernity and they accounted for the highest number when individual levels of agricultural modernity were considered. Likewise, a small percentage of growers also came under the 'Very low' level ($x \leq 25$) of agricultural modernity. The small growers of Alakode prefer to perceive the worth of multicropping system to a monocultural crop like rubber. Since they have to attend to a variety of crops, their agricultural modernity levels in rubber cultivation are bound to be low. Still the results show that more than fifty percent had high and very high levels of agricultural modernity.

4.2.3.4.1 Source of labour and Holding size

The distribution of small growers classified by source of labour and holding size is depicted in Table (4.7).

Table 4.7 Distribution of small growers classified by source of labour and holding size

Holding size	Growers Utilising	
	Family Labour	Hired Labour
	Frequency	Frequency
< 2	12	0
	(40)	(0)
2 - 4	7	2
	(23.33)	(6.67)
4 - 6	3	4
	(10)	(13.33)
> 6	0	2
	(0)	(6.66)
Total	**22**	**8**
	(73.3)	**(26.7)**

Percentages are given in parentheses

A chi-square value (χ^2 = 8.35 significant at 0.01 level of probability) confirms the association between source of labour and holding size. In this region also, family labour was skewed towards growers having lesser holding size. Wage labour employment was higher towards larger holding sizes.

4.2.3.4.2 Small growers' futuristic orientation towards rubber cultivation as a primary occupation.

Table (4.8) shows the distribution of small growers classified by religion and their futuristic orientation towards rubber cultivation as primary occupation. Small growers classified by religion and their futuristic orientation towards rubber cultivation as primary occupation

Table 4.8 Small growers classified by religion and their futuristic orientation towards rubber cultivation as primary occupation

Religion	Small growers' futuristic orientation towards rubber cultivation	
	Primary Occupation Frequency	Secondary Occupation Frequency
Christians	16	5
	(53.3)	(16.67)
Hindus	4	1
	(13.33)	(3.33)
Muslims	2	2
	(6.67)	(6.67)
Total	**22**	**8**
	(73.3)	**(26.7)**

Percentages are given in parentheses

A chi-square test did not yield an assoication between the growers' religion and their orientation thereby stating that the two attributes were independent. The percentage analysis showed that more than 70% of the growers considered rubber cultivation as a primary occupation a finding which is exactly the opposite of Koottikkal growers. This finding also points to the fact that more traditional crops may be replaced by rubber in future.

4.2.3.5 Education and rubber cultivation

The table presented below shows the distribution of sons of small growers classified by their educational level and orientation towards rubber cultivation as primary occupation.

Table 4.9 Educational level of small growers' sons and their orientation towards rubber cultivation

Educational* level	Boys Frequency	Orientation towards rubber cultivation as primary Occupation Frequency	never as primary occupation Frequency
Illiterate	-	-	-
Primary	7	5	2
	(12.73)	(9.1)	(3.64)
High School	10	8	2
	(18.18)	(14.54)	(3.64)
Higher Secondary	17	10	7
	(30.91)	(18.18)	(12.73)
Collegiate	21	9	12
	(38.18)	(16.36)	(21.81)
Total	**55**	**32**	**23**
	(100)	**(58.16)**	**(41.82)**

Percentages are given in parantheses

* This educational level denotes those currently studying as well as those who have completed that particular level. For those below the High School level, their parents were asked what they wanted their children to be.

An association between the educational level of the boys and their orientation towards rubber cultivation was not obtained by the chi-square test. Interestingly more than half of the boys were in favour of taking up rubber cultivation as primary occupation. A closer look at the table showed that a higher number of educated boys (both higher secondary and collegiate) were willing to cultivate rubber even if it were under compulsion, given the unemployment level in the state. On further probing, it was found that they were interested more towards cultivation of all crops plus rubber rather than a monocrop of rubber alone, contradicting Eapen's finding of the growing preference among young job seekers for non-agricultural and non manual type of occupation (Eapen 1994). Those who showed disinterest in rubber cultivation, as explained in the previous case of Koottikkal, were equally not ambitious to go up the educational ladder or in aiming for higher grades of employment.

However, Table (4.10) amply illustrates the disinterest shown by the girl child towards rubber cultivation. On enquiring about their attitude towards crop and animal husbandry, the girls appeared to be as much detached with rubber cultivation in general as they were with agriculture in general.

Girls were found seldom helping in the crop husbandry activities in the family farm and their involvement was restricted to milking and feeding cattle, poultry etc. The more educated girls distanced themselves even from such activities. These findings clearly distinguish the gender differences prevalent among the youth regarding their attitude towards the importance of agriculture.

Table 4.10 Educational level of small growers daughters and their orientation to rubber cultivation

Educational* level	Girls	Orientation towards rubber cultivation	
		Primary Occupation	Disinterested in cultivation
	Frequency	Frequency	Frequency
Illiterate	-	-	-
Primary	3	-	3
	(8.82)	(0)	(8.82)
High School	13	-	13
	(38.24)	(0)	(38.24)
Higher Secondary	13	-	13
	(38.24)	(0)	(38.24)
Collegiate	5	-	5
	(14.70)	(0)	(14.70)
Total	**34**	**0**	**34**
	(100)	**(0)**	**(100)**

Percentages are given in parantheses

* This educational level denotes those currently studying as well as those who have completed that particular level. For those below the High School level, their parents were asked what they wanted their children to be.

4.3 A cross case analysis of Koottikkal and Alakode

A cross case analysis of the two study areas is furnished to compare and contrast the different processes. First, the results of the 't' test computed for distinguishing the factors responsible for the spread of rubber cultivation in the two areas are presented. Then a comparison is presented in a tabular form.

4.3.1 Factors affecting spread of rubber cultivation in Koottikkal and Alakode

The mean difference of variables affecting the spread of rubber cultivation in the two areas are presented in Table (4.11).

Table 4.11 Mean difference of variables affecting spread of rubber cultivation in Koottikkal and Alakode

No.	Variables	Koottikkal	Alakode	t-value
1.	Permanent source of income	4.53	4.63	0.73
2.	Easily manageable crop	3.03	2.93	0.59
3.	Low disease incidence	1.47	1.7	1.55
4.	High long term returns	2.5	2.2	1.56
5.	More employment avenues	1.3	2.83	9.14*
6.	Suitable for self employment	2.8	4.67	12.48*
7.	Investment profit ratio high	2.57	3.47	4.94*
8.	Easy marketability	3.3	3.7	2.38
9.	Attractive price	3.97	4.33	2.44
10.	Additional income from timber	1.5	2.1	3.12*
11.	Additional income from intercrop	1.17	1.47	2.40
12.	Symbol of social status	4.43	3.93	2.42
13.	Knowledge of rubber cultivation	3.6	2.3	9.17*
14.	Absence of ceiling on land	3.93	4.5	3.79*
15.	Adaptability to different edaphic conditions	2.63	3.7	4.31*
16.	Availability of HYV	3.67	4.7	8.46*
17.	High disease incidence of pepper, arecanut and coconut	3.63	2.77	5.41*
18.	Low productivity of cashew	1.17	4.57	29.53*
19.	Low productivity of coconut	3.53	1.47	14.01*
20.	High risk involved in other crops	3.3	1.53	11.17*
21.	Change in Income Tax regulations	3.97	3.87	0.62
22.	Easyness in processing	3.5	3.17	1.69
23.	High utilisation of family labour	4.67	4.53	1.05
24.	Continous demand in market	4.47	4.07	2.25
25.	Catholic communities interest in cultivation	4.53	4.17	2.06
26.	Indirect influences through Church	4.47	3.77	3.50*
27.	Organised R & D activities	4.6	4.27	2.14
28.	Imitating European cultivators	4.27	0.67	21.44*

continued in the next page...

Table 4.11 continued

No.	Variables	Koottikkal	Alakode	t-value
29.	Suitability as secondary income source	4.7	4.23	2.71*
30.	Rubber Boards extension efforts at grass root level	3.77	4.57	4.56*
31.	Extension efforts consistent with the values and beliefs of the people	4.23	4.3	0.422
32.	Labour input is less	1.33	1	2.57
33.	Credit support	2.73	3.77	5.29*
34.	Presence of marketing societies	2.87	4.2	7.98*
35.	Subdivision and fragmentation of land	4.1	2.66	7.32*
36.	Effective functioning of RPS	2.8	2.53	1.48
37.	Intense political lobbying	2.67	2	3.96*
38.	Aiming for better standard of living	4.33	4	1.62
39.	Real estate business potential	1.67	4.2	15.43*
40.	Inheritance through traditional cultivation	4.2	1.47	17.91*
41.	Land encroachment by settlers	2.03	4.33	12.91*
42.	Special schemes for Sc and ST	3.43	3.9	2.81*
43.	Increased interest shown by all religions, class and castes	3.17	4.1	5.76*

* Significant at 0.01 level of probability

Of the 43 variables studied 25 variables were significant at 0.01 level of probability. The ten variables more relevant to Koottikkal were : knowledge of rubber cultivation, high disease incidence of pepper, arecanut and coconut, low productivity of coconut, imitating European cultivators, high risk involved in other crops, indirect influences through church, suitability as secondary income source, sub-division and fragmentation of land, intense political lobbying and inheritance through traditional cultivation of rubber.

The variables relevant to Alakode (15 in number) were : more employment avenues, suitability for self-employment, high investment to profit ratio, additional income from timber, absence of ceiling on land, adaptability to different edaphic

Plate 4.4 Monocrop of rubber in Koottikkal

Plate 4.5 Multicropping pattern showing rubber, cashew, coconut and arecanut

conditions, availability of HYV, low productivity of cashew, extension efforts at grassroot level, credit support, presence of marketing societies, real estate business potential, land encroachment by settlers, special schemes for SC/ST and increased interest shown by all farmers across religion, class and caste.

4.3.2 Comparison of select domains of Koottikkal and Alakode cases

Table (4.12) presents a brief overview of Koottikkal and Alakode cases for select domains.

Table 4.12 A Cross case analysis of Koottikkal and Alakode

No.	Domains	Koottikkal	Alakode
1.	Land ownership		
	Marginal farmers	75.76 %	65.91 %
	Small farmers	19.83 %	32.95 %
2.	Dominant cropping pattern	Monocrop of rubber (see Plate 4.4)	Multicropping system, but single largest area under rubber (see Plate 4.5)
3.	Rubber area to total agri-cultural area in the panchayat	78.22 %	31.19 %
4.	Migration	Less evident	migration was a response to & impetus for social change.
5.	Psychological Acculturation	Less evident	Pronounced patterns are discernible
6.	Consumerism	Change in patterns	Change in patterns
7.	Farming based - cohesiveness	weak	weak, but better than Koottikkal
8.	Interpersonal cohesiveness	weak	fairly strong
9.	Agricultural modernity index	> 80% had higher level of agricultural modernity	only slightly above50% had higher levels of agricultural modernity

Table 4.12 continued

10.	Small growers' futuristic orientation towards rubber cultivation	> 70% recommended rubber cultivation only as a subsidiary activity	> 70% recommended rubber cultivation for primary occupation.
11.	Educated youth in rubber cultivation		
	Boys	> 60% showed disinterest	Nearly 60% showed interest in taking up rubber cultivation
	Girsl	> 80% showed disinterest	100% showed disinterest
12.	Association between religion and small growers' orientation to rubber cultivation	Association established	No association
13.	Association between source of labour and holding size	Association established	Association established
14.	Source of labour	dominant family labour	dominant family labour
15.	Factors affecting spread of rubber cultivation	Knowledge of rubber cultivation, high disease incidence of pepper, coconut and arecanut, low productivity of coconut, imitating European cultivators, high risk involved in other crops, indirect influence through Church, suitability as secondary income source, subdivision and fragmentation of land, intense political lobbying and inheritance through traditional cultivation of rubber.	more employment avenues, suitability for self employment, high investment to profit ratio, additional income from rubber, absence of land ceiling, adaptability to different edaphic conditions, availability of HYV, low productivity of cashew, extension efforts at grassroot level, credit support, presence of marketing societies, real estate business potential, land encroachment by settlers, special schemes for SC/ST and increased interest shown by all farmers across religion, class and caste.

From the above two cases it is obvious that rubber cultivation has made its imprint on the society by playing a role in mediating human relationship and activities in the socio-psychological and cultural mileu. But it is also important to know whether rubber cultivation has affected the eco-system components like soil, water, biodiversity etc. In short the ecological impact of rubber needs to be understood and studied. This is taken up in the next chapter.

CHAPTER 5

ECOLOGICAL IMPACT OF RUBBER CULTIVATION

5. Ecological impact of rubber cultivation

Introduction

The plantation system undoubtedly was the most obvious intrusion of the market forces of the colonial system into the subsistence-based indigenous system of the developing countries. The historical antecedents*, that have led to the changes in the cropping pattern notwithstanding, our focus here will be to analyse the ecological impact created by rubber (i.e. crop) *per se*. It was observed during literature scrutiny, that a good number of studies probing the environmental consequences caused due to rubber were compared and weighed against the tropical forest ecosystem. Comparisons were made only on select characteristics using a few indicators, but every attempt was made to aggrandise the analogy between the two systems. Again, there were only a handful of studies which compared the impacts between any two plantation systems. Thus, tropical forests have been the dominant standard for the ecological impact studies of rubber which, by every stand point, cannot be faulted with. The *faux pas* lay in the overlooking of the fact that a forest ecosystem was a 'whole' more than the sum of its parts. This will be the platform on which we shall base our analysis.

The discussion below intends to provide broad impact points identified as affected by rubber cultivation. The scheme of analysis will be under the following heads.

---

* For a critical discourse on the history of environmental management in the tropics, see Baker (1993).

1. Soil
2. Water
3. Grazing lands
4. Biomass potential
5. Biodiversity
6. Genetic base of the crop
7. Food
8. Other observations

5.1 Soil

The impact of rubber cultivation on the soil properties have been extensively studied. Therefore our discussion will be spread over the sub heads *viz.* (a) soil fertility (b) physico-chemical properties (c) physical properties (d) biological properties and (e) physical processes.

5.1.1 Soil fertility

Growers in both the regions opined that fertility of soils cultivated with rubber has been progressively decreasing. They pointed out that chemical fertilisation has become inevitable for higher production, whereas during the early years of cultivation, the inherent fertility of the soil was adequate enough to sustain growth and yield. Some studies on soil fertility-related problems in rubber cultivation are scanned.

5.1.1.1 Total and available nitrogen, potassium and phosphorus

Studies have shown that total nitrogen and potassium content in rubber grown soils were always lower than that of virgin forests (Karthikakutty Amma 1995). Significant reduction in nitrogen and potassium levels were also recorded

after forests were cleared for planting rubber and other tree crops (Sanchez *et al.* 1985; Mongia and Bandopadhyay 1994).

Although available phosphorus was recorded low in both sites, a build up in total phosphorus could be observed in rubber plantation when compared to the adjacent forests (Karthikakutty Amma 1995). The low requirement of phosphorus by rubber explains the high phosphorus status in the soil.

5.1.1.2 Organic carbon

Organic carbon was significantly lower in rubber plantations as compared to natural forests (Karthikakutty Amma 1995). Reduction in organic carbon content when forests were converted to plantations have been reported by scientists. (Prasad *et al.* 1985; Sivanadyan and Norhayati 1992). However, there are reports suggesting that fertility index, which includes organic carbon, in rubber plantations in Kerala was medium to high in all rubber growing districts (Karthikakutty Amma *et al.* 1991).

Again the organic carbon content showed increasing trends from the second and third plantation cycle, which points to the possibility of reaching equilibrium with the forest soils (Karthikakutty Amma 1995).

5.1.1.3 Total and exchangeable magnesium and calcium

The quantities of exchangeable magnesium and calcium were low in rubber cultivated areas as compared to natural forests. A high amount of magnesium was removed from each plantation cycle higher than that of nitrogen and potassium, pointing to the necessity of a revision in the present fertiliser schedule. But rubber trees appear to have a fair degree of adaptability to low calcium environment (Karthikakutty Amma 1995).

Further, a decrease in C/N ratio with depth was observed in the upper horizon of rubber cultivated soils (Krishnakumar 1989). Norhayati and Lau (1990) found that even though organic carbon, total nitrogen, potassium and exchangeable nutrients were lowered following forest clearing, from the 50th month of rubber planting, higher values comparable with the forest situation were observed . However Aweto (1987) reported that inspite of application of N, P and K, soil mineral nutrient status was found to be lowered even after 18 years of rubber cultivation. The Rubber Board's recommendation of the use of cover crops (*Mucuna bracteata, Peuraria phaseoloides* etc.) is said to improve soil organic matter, soil structure, root proliferation and nitrogen fixation.

5.1.2 Soil Physico-chemical properties

Cultivation of rubber can reduce the soil pH rendering the soil acidic. This was due to the partial canopy, continuous application of nitrogenous fertilisers and increased leaching of cations with a concomittant increase in H^+ and Al^{3+} concentration. A drop in pH was also noticed in forests cleared for rubber cultivation. Significant decrease in pH was noticed in the third planting cycle and since the same area would be utilised for subsequent cycles, reduction in pH should be viewed seriously (Norhayati and Lau 1990; Asawalam *et al* 1991 ; Karthikakutty Amma 1995).

The cation exchange capacity (CEC) was also lower in rubber cultivated soils as compared to forest soils (Karthikakutty Amma 1995). In an earlier work also, low values of exchangeable cations was reported for rubber growing soils of Kerala (Krishnakumar 1989).

5.1.3 Soil Physical Properties

A higher content of clay in rubber cultivated soils than in natural forests indicates a higher degree of clay formation under the influence of rubber. (Premakumari 1987; Aweto 1987; Asawalam *et al.* 1991; Krishnakumar and Potty 1992). KrishnaKumar and Potty contested that the increase in clay content was moderated by the presence of sesquioxides. In another study, clay content in rubber soils were found to be lower than that in the Kerala forests. (Balagopalan and Jose 1993).

Conflicting reports on bulk density of the soil can be seen with Krishnakumar *et al* (1990) observing improvement in soil physical properties such as bulk density, soil porosity, moisture retention and infiltration when rubber was cultivated in soils degraded by shifting cultivation. But Norhayati and Lau (1990) stated breakdown of physical properties after land clearing. In the top soil, bulk density increased after burning, reduced when legumes were cultivated, but never reached the original level noticed in the forest. Soils of rubber plantations rarely showed structural degradation due to the high sesquioxide content and soil texture was seldom altered by management (Karthikakutty Amma 1995).

5.1.4 Soil biological properties

Significant loss of soil organism, biodiversity or species richness was found to accompany agricultural systems based on intensive cultivation, high fertilizer inputs and crop monoculture (Paoletti *et al.* 1992). The growers of Koottikkal pointed out that there has been a sharp decline in earthworm population in their rubber plantations. Earthworms which were in plenty earlier declined because of the use of chemical fertilizers. The growers of Alakode

were not conscious of any change in earthworm population perhaps due to the fact that rubber in these regions were only in the second plantation cycle. Dr. Rajendran# opined that earthworm population in rubber plantation was fairly high but admitted not having studied the temporal variation in their population. Earthworms are sensitive indicators of soil condition and their presence in large numbers is usually regarded as an indicator group to monitor and measure soil health and productivity (Lee 1991; Pankhurst 1994). Scientists of the Rubber Research Institute of India, seeking anonymity, confirmed that the total population of soil micro organisms (microflora and micro fauna) in rubber cultivated soils was less than that of other agricultural production systems.

5.1.5 Soil physical processes

Fast switching over of land use towards monocropping of plantation crops is a major cause of land degradation in the sloppy terrain (Land Use Board 1997) and generally rubber plantations are more prone to erosion than coffee gardens (Donner 1987). In Alakode for instance, with the spread of rubber cultivation, other trees were cut down thereby reducing the water holding capacity of the soil and accentuating soil erosion (AGPVR 1996). Farmers agreed that erosion of soil was very high during the initial years of forest clearing, and crop-establishment. The construction of bunds and digging of pits which they later adopted and which is being popularised by the Rubber Board, have been considerably effective in serving as checks to minimize soil erosion. The Kerala State Planning Board (1996) acknowledges the above fact "among the crops only in the case of plantation segment, particularly rubber and tea, soil conservation has been recognised as a basic infrastructural support for establishing the plantations".

Summing up her findings, Karthikakutty Amma (1995) concluded that for ensuring sustainable yield from rubber plantations and for making the rubber ecosystem as close to the forest ecosystem, intense cover crop management and application of higher doses of nitrogenous and potassic fertilizers should be adopted. Liming in lower dosages to ward off lowering in pH and to compensate for the loss of calcium and magnesium should also be done. The Land Use Board (1997) observed '... so what would be needed for sustainable cultivation is not a reduction of the inputs per se, but only a reduction in the use of market purchased inputs. Thus, an integrated nutrient supply system assumes importance which includes crop rotation, use of bio fertilizers, rural compost, vermi compost, farm yard manure etc. The production and use of biofertilizers is an absolute essentiality(KGPVR 1996; Land Use Board, 1997).

However, the Rubber Boards' input subsidy schemes, the high cost of organic manure, increased wage labour, lack of interest in animal husbandry, and easiness in availability and use of chemical fertilisers offset the sustainable production or rubber. Growers were fully conscious and aware* of the deleterious effects of chemical inputs on the environment. But they were still resorting to use of chemicals in their plantations. This then could be the biggest paradox of education and pose a serious challenge to the development departments of various agencies including the Rubber Board.

5.2 Water

According to Dr. Pushpangadan#, in a typical tropical forest ecosystems, more than 60% of rain water is imbibed by the high organic matter containing soils which then is gradually released. Since the canopy formation in the forest

* Organic farming has been popularised first by a malayalam daily 'Deepika' and later by other leading dailies. Surprisingly almost all farmers knew about the Japanese method of farming and considered organic farming better than chemical fertilisation.

is rather multi-storeyed, the beating action of the rain is almost nullified. However, the rubber canopy being single layered gives only a partial block to the rain water. Thus, most of the water goes as runoff with percolation rate into the soil being only to the extent of about 10-15%. This aggravates the erosion of soil and associated depletion in the level of beneficial micro organisms. In his opinion, after 5-6 plantation cycles, soil would loose its vitality, groundwater recharge would be less and aquifer would go further down.

A three-year-old rubber plant consumes 46 litres of water per day. When the tree attains tappable age, the water intake will be still higher. Considering that 14% of agricultural area in Kerala is under rubber, its importance in the ecosystem can not be undermined (Jose 1991). Again by converting* paddy lands which are natural drainage systems into rubber, coconut and other crops, water drains off with very little infiltration into the cultivated areas. In consequence this will affect the soil moisture regime and destroy nearby water sources inflicting permanent injuries on the ecology of the region (Jose 1991; Raviraman 1996).

Comparing forest soils and rubber cultivated soils Karthikakutty Amma (1995) concluded that available moisture percent obtained by subtracting the moisture percentage at wilting point (-1.5 MPa) from that at field capacity (-0.033 MPa), always showed higher values in forest profiles. In an earlier work, high water holding capacity for soils under natural forests as compared to rubber was reported (Balagopalan and Jose 1993). Growers in both the regions said that water sources were depleting year after year due to rubber cultivation, rendering wells, ponds and rivers dry. The Koottikkal Grama Panchayat has

* A Ph.D. thesis entirely on conversion of paddy lands to rubber has been submitted to the KAU this year by Smt. Latha Unnikrishnan.

given water conservation top priority by targeting planting of bamboo and other water conserving plants near slopes and river beds. Some growers pointed out that the dry leaves of Jack absorbed water and increased the water holding capacity of the soil, a property less exhibited by rubber leaves. Since most of these trees (Jack, Artocarpus etc) were cut and removed compulsorily due to Rubber Boards' specifications, there has been an imbalance in the soil moisture regime.

5.3 Grazing lands

The colonial state restricted the grazing areas of the indigenous people, encouraging the planters to build up their private estates. In the early years, the colonial state had recognised the ownership rights of the natives over grazing lands; subsequently it changed its position arguing that they could have only grazing rights, thus encroaching on their lands without compensation (Raviraman 1996). In Thiruvithamkur, (Umadevi 1989) decline in livestock population was attributed to non-availability of grazing lands apart from demographic, climatic, techno-economic and institutional factors. In both Koottikkal and Alakode, grazing lands have had sharp decline in terms of area. Rubber has virtually incapacitated the chemistry of mixed farming system characterised by crop and animal husbandry. In both regions livestock population as well as grazing land areas continue to decline.

5.4 Biomass potential and nutrient cycling

Some scientists have reported that the biomass potential of a mature Hevea ecosystem can attain levels similar to that of the more luxuriant tropical evergreen forests. They argue that rubber plantations present almost a closed ecosystem and nutrient cycling, in a near steady state during their life span and

have concluded that if agricultural development was to take place to supplant natural forests, rubber plantations would be the most efficient of any other agroforestry system, akin to the Rubber Board's campaign of rubber as an environment friendly crop (Joseph 1991; Sivanadyan and Norhayati 1992; Krishnakumar and Potti 1992; Goldthorpe 1993).

Myers *et al* (1994) studying the nutrient cycling both in rainforests and a five year old rubber plant in Srilanka concluded that even though the total annual litterfall in both systems were similar, there were differences in litter quantity and decomposition rate, and therefore rubber cultivation system was only in a partially synchronous state. Jose (1991) rejects the 'closed nutrient cycle - arguments' of rubber plantations stating that since rubber utilised fossil fuel energy which are 'external' inputs siphoned into the system, it conferred better to an open nutrient cycle and never to a self sustaining ecosystem.

5.5 Biodiversity

A major issue facing biodiversity conservation is the rate of spread of rubber in Kerala causing displacement of habitat of flora and fauna. Dr. Vandana Shiva[#] pointed out that since rubber can be cultivated only as a monocrop, and wipes out other plant species, it has marginalised traditional trees, tubercrops, vegetables and medicinal plants into isolated refugia. Dr. Pushpangadan was equally concerned about the cultivation of rubber having compounded the endangerment of agrobiodiversity* and medicinal plant population. Due to shift in cropping pattern in favour of rubber, diversity of crops has come down. In a deliberate effort to exploit the land resources, the farmers of Kerala adopted a polycrop combination of annuals and perennials in a

* Agrobiodiversity is a subset of biodiversity, and refers primarily to genetic variability in cultivated plants and domesticated animals together with their progenitors and closely related wild species, growing and evolving under natural conditions (Swaminathan 1997).

haphazard manner with no strict discipline as to the temporal and spatial arrangements of the crops. When coconut allows a wide variety of intercrops, the number and variety of intercrops grown under rubber are considerably less (Regeena 1992).

Dr. Babu Ambat# also agreed with the view that rubber cultivation did not permit undergrowth and was equally critical about the scientists' passivity in addressing the ecological issues pertaining to its cultivation. Farmers in both the regions confirmed that it was better to grow rubber separately in another area and apportion some area for the homegarden. They opined that even in places where rubber was replaced by other crops, the plants failed to survive. Though many growers followed the Rubber Boards' recommendation of growing tapioca as intercrop in the initial years of establishment of rubber, severe rodent pest attack (rats and hedgehog) on tapioca tubers and roots of rubber seedlings, have forced them to discontinue the practice. However, growing of pineapple was popular in all rubber growing areas on bunds and alongside borders. Non-beneficiaries of Rubber Board schemes were found to retain a larger number of intercrops per hectare compared to the beneficiaries because they were unrestrained in their farming activity with regard to following Rubber Board's specification*.

5.6 Genetic base of the crop

The commercial cultivars are generally purelines, clones, or hybrid varieties and consequently are more or less genetically uniform (Singh 1983). Today 90 per cent of the rubber cultivated areas are under a single clone namely RR11-105 (Krishnakumar 1997). Large acreages under a single clone coupled

---

* The beneficiaries of loans and(or) subsidy schemes are allowed to retain a maximum of 40 coconut palms, 80 arecanut palms or 20 'other' trees per hectare of rubber. When all are retained together as intercrop, 2 arecanut palms are considered equal to one coconut tree and 2 coconut trees equal to one 'other' tree.

with a narrow genetic base are prime factors that promote disease epidemics leading to massive devastation of crops. Genetic homogeneity aggravates genetic vulnerability to atleast some biotic and abiotic stresses, necessitating the increased use of pesticides. Therefore, to convert the green revolution into an evergreen revolution, we need a wide range of genetic material in a crop which can help in the breeding of location-specific varieties (Swaminathan 1997). Though growers experimented with newer and different varieties of rubber like RRII-118, none of the varieties matched the quality of RRII-105 with respect to productivity or disease resistance.

5.7 Food

Kerala has been a food deficit state all along her history and the per-capita production of foodgrains has been falling. It fell from 62 kg in 1971 to 38 kg in 1991 (Directorate of Economics and Statistics 1992). The present trend of rapid shift in land use in an extensive scale from mixed cropping to mono cropping of rubber to all locations of Kerala, irrespective of suitability factor in respect of land resources, should be done with caution.

Farmers no more find cultivation of rice fascinating and they choose to either leave paddy lands fallow or convert it for cultivation of other remunerative crops. It is a moot question whether this lopsided growth of a few cash crops is desirable and sustainable (Pillai 1994; Land Use Board 1997). Along with this the spread of rubber cultivation has accentuated the division of labour between men and women in paddy cultivation (Kato 1994). Dr. Umadevi# also agreed with the view that there has been a greater displacement of female labour from paddy, with the introduction of rubber. All these point to the fact that 'a system approach which gives due regard for the multiple opportunity available within the

limited land resource available at the command of the farmer has to be nurtured' (Kerala State Planning Board 1996). In a similar vein Dr. Rajasekharan# forcefully expressed that a farmer who went in for a multicrop combination in his homestead was more rational than the one who took to rubber cultivation.

5.8 Other observations

In this section observations of both farmers and scientists are listed.

(a) Dr. P. J. Joseph# advanced a hypothesis that the rate of *Phytophthora* disease incidence in other crops was more pronounced after the introduction of rubber, which has a severe problem of abnormal leaf fall caused by *Phytophthora palmivora* and other *Phytophthora* sps.

(b) Dr. R. S. Iyer# was of the opinion that rubber was best suited for partially denuded lands but cautioned against its cultivation in the homesteads of Kerala.

(c) Growers complained about high mosquito breeding in rubber plantations.

(d) Growers in Alakode felt that when rubber wood was used as firewood, it produced more smoke and soot.

5.9 Generalisations

An overview of the above discussion provides the following conclusions which warrents greater attention from the part of the research subsystem.

(a) Like any other agricultural production systems, nitrogen and potassium content in rubber soils are low and phosphorus content is fairly high. This necessitates use of nitrogenous and potassic fertilizers in very high doses.

(b) Organic carbon content in rubber soils is high.

(c) Magnesium depletion in rubber soils is high, requiring revision in the fertilizer schedule.

(d) Though calcium content in soils are low, rubber trees at present show adaptability to low calcium environment.

(e) Rubber cultivation lowers the soil pH rendering it acidic. Therefore liming should be practiced.

(f) Reduction in cation exchange capacity of rubber soils is also noticed.

(g) Conflicting reports on clay content in rubber soils exists.

(h) In partially or fully degraded soils, rubber cultivation improves bulk density while in forest soils cleared for rubber, bulk density decreases.

(i) Microbial population in rubber soils are low compared to other agricultural production systems.

(j) Soil erosion in mature plantations have been restricted by pits and Kayyalas.

(k) Rubber cultivation has adversely affected the moisture content of the soil.

(l) There exists a relationship between rubber cultivation and depletion of water sources in nearby areas.

(m) Rubber cultivation has reduced the area under grazing lands.

(n) Rubber plantations have an open nutrient cycle due to addition of external inputs into the system and siphoning out produce from it.

(o) Rubber cultivation has marginalised other tree crops, vegetables and medicinal plants.

(p) Large acreage under a single clone (RR11 105) and a narrow genetic base threaten disease epidemic outbreak.

(q) Rubber cultivation in Kerala has compounded the problem of food dependence on other states.

Table 5.1 Comparison of rubber and forest ecosystems

No.	Domains	Rubber ecosystem	Forest ecosystem
1.	Available nitrogen	Low	High
2.	Available potassium	Low	High
3.	Available phosphorus	High	Low
4.	Organic carbon content	Medium to high	Very high
5.	Magnesium content	Low	High
6.	Calcium content	Low	High
7.	Soil pH	Progressive reduction	Balanced
8.	Microbial population	Low	Very high
9.	Soil erosion	Medium to high	Nill to very low
10.	Water content	Reduction in moisture content	Propitiates and improves water holding capacity
11.	Water sources in nearby areas	Is depleted	Is conserved
12.	Nutrient cycling	Open	Closed
13.	Biodiversity	Is wiped off	is conserved
14.	Genetic base	Narrow	High
15.	Use of external inputs	Very high	Absent
16.	System sustainability	Poor	Self sustaining

The potency of the impact of rubber cultivation needs greater deliberation in formulating conscientious plans and strategies for ensuring livelihood options and essential ecological security of natural resources. The Rubber Board before popularising rubber as an eco-friendly crop should consider the above factors and

its research should be sensitised to the systems approach rather than emphasising the commodity approach.

In the next chapter the effectiveness of the Rubber Board's extension services has been presented. It can be seen how the advisory and extension services of the Board have gained the credibility and trust of the small growers.

Personal communication with the above scientists during the course of the study is acknowledged. (Refer *Appendix VII* for addresses).

CHAPTER 6

EFFECTIVENESS OF RUBBER BOARD'S EXTENSION SERVICES

6. Effectiveness of Rubber Board's extension services.

In this chapter, an attempt has been made to study the effectiveness of Rubber Board's extension and advisory services. The perceptions of extension officers as well as small growers regarding the Board's extension services are presented. A brief analysis on the functioning of Rubber Producers Societies (RPSs) is also furnished.

The Advisory and Extension Services of the Rubber Board

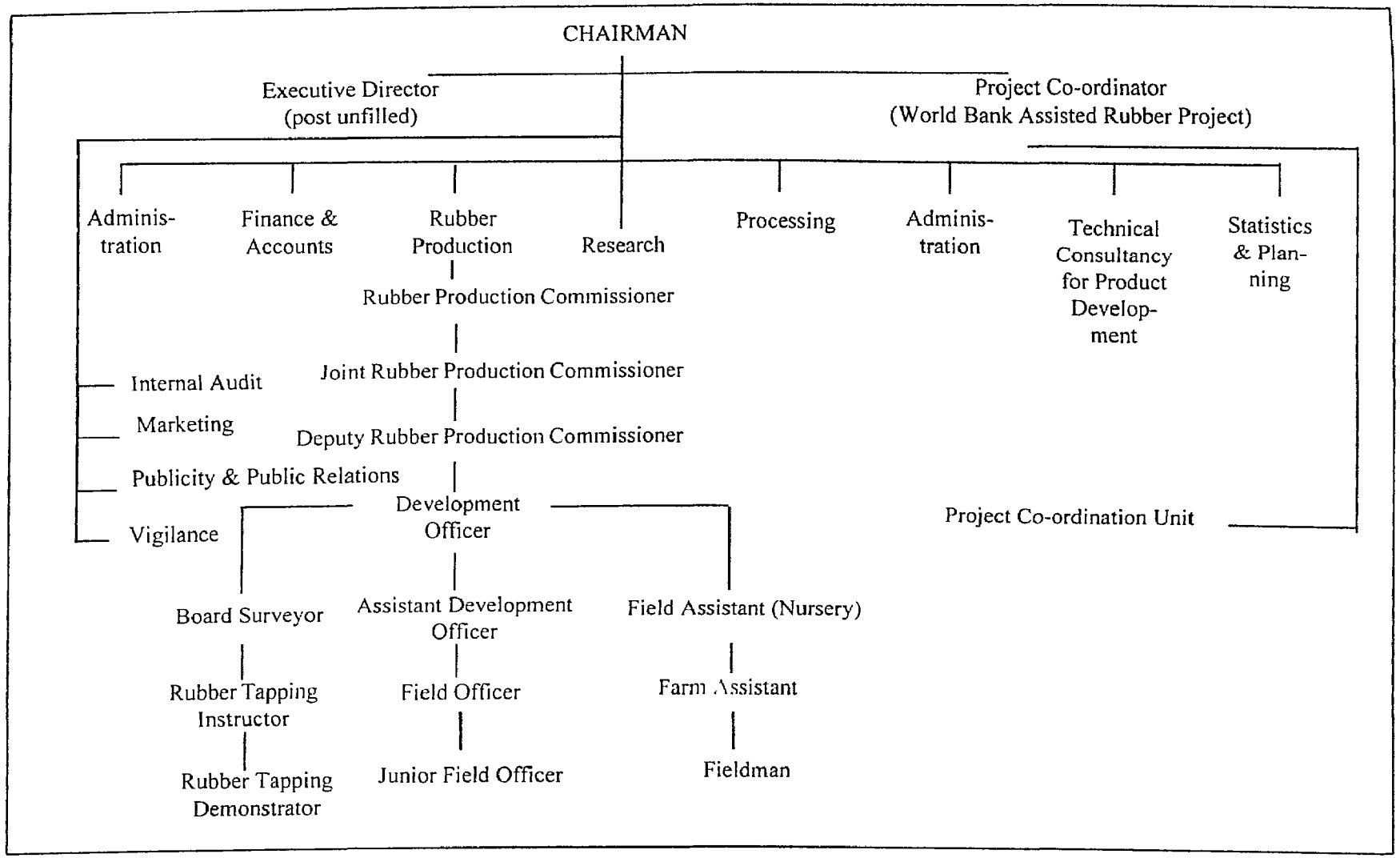
The origin of the Rubber Board can be traced back to a conference of rubber producing interests convened by the Government of India in December 1945. The conference considered it necessary to provide suitable organisational support for the development of the rubber plantation industry. A Committee appointed to examine in detail all aspects recommended creation of a Board having preponderant representation of producers. The Rubber (Production and Marketing) Act, 1947 passed subsequently by the Central Government led to the constitution of the Indian Rubber Board. By an amendment approved in 1954, the act became Rubber Act, 1947 and the Board's name changed to the Rubber Board (refer Fig. 6.1 for organisational setup).

The advisory and extension services* of the Rubber Board rendered (Rubber Board 1996) by the board include.

- A well structured field establishment set up under Rubber Production Department offers free advisory and extension services to rubber growers on all aspects of rubber cultivation and production.

* For details on constitution, funding and development shemes, refer publications of the Rubber Board or see Rubber Board (1996).

Figure 6.1 Organisational Chart of Rubber Board



- About 450 technical officers of various cadres available under three zonal offices, six supervisory offices, 41 regional offices and 162 field offices are spread over all important rubber growing regions.

- Scientists of Rubber Research Institute of India and senior technical officers of central office of Rubber Production Department extend specialised assistance whenever needed through visits and correspondence.

- Service through self help groups promoted for quick and extensive coverage.

- Selected extension messages of topical importance are carried across to target clientele, through well planned and executed short annual campaigns.

- Mass media, periodicals and advisory pamphlets and folders are extensively used for educating growers.

The results of the survey involving extension officers and small growers on effectiveness of the Board's extension services are presented below under 'findings'.

6.1 Perceptions of Extension Officers*

The perceptions of extension officers are presented first.

6.1.1 Classification of small growers' entrepreneurship

The classification is made based on religion and across age, gender and class.

---

* Here 'extension officers' refer to the 'field officers' and assistant development officers of the Rubber Board.

Table 6.1 Religion wise classification of small growers' entrepreneurship as perceived by extension officers. (n=30)

Religion	Age		Gender		Class		
	Young	Others	Male	Female	Lower Class	Middle Class	Upper Class
	Frequency		Frequency		Frequency		
Hindus	27	3	30	0	0	27	3
	(90)	(10)	(100)	(0)	(0)	(90)	(10)
Christians	0	30	27	3	0	24	6
	(0)	(100)	(90)	(10)	(0)	(80)	(20)
Muslims	24	6	30	0	3	9	18
	(80)	(20)	(100)	(0)	(10)	(30)	(60)

Percentages are given in parentheses

The above table (6.1) reveals that 90% of the extension officers perceived that among hindus, the young showed more entrepreneurship in rubber cultivation. All felt that males were more enterprising and 90% perceived that middle class category had more entrepreneurship than other class categories.

Regarding christians, all the extension officers felt the old were more enterprising. While 90% perceived males as having entrepreneurship in rubber cultivation, 80% voted for the middle class category.

The extension officers (80%) perceived that the young muslims had more entrepreneurship than the old. All pronounced males as having more entrepreneurship and a lesser number (60%) felt the upper class income group among muslims showed greater entrepreneurship.

It is concluded that most of extension officers perceived young hindu and muslim growers as having more entrepreneurship, while all agreed upon the enterprising nature of the more elder christians. All officers agreed that males, irrespective of their religion exhibited better entrepreneurship. Most of them recognised middle class hindus and christians as well as upper class muslims as having more entrepreneurship with respect to rubber cultivation.

Christians were pioneers in establishing rubber cultivation which is precisely why the aged are regarded as having more entrepreneurship. As discussed in an earlier chapter, the hindus and muslims were new entrants to rubber cultivation and the young were the earliest of adopters. In rubber cultivation usually the males are more active right from cultivation to marketing, which explains the above finding. In Kerala, the upper class muslims are consolidating land, planting rubber and making real estate business out of it. These are perhaps the reasons for the Extension officers' perception.

6.1.2 Extension officer's perception on factors affecting spread of rubber cultivation

The extension officers rated four broad factors in the following manner.

Table 6.2 Principal factors affecting the spread of rubber cultivation in Kerala as perceived by extension officers (n=30)

S.No.	Factors	Score
1.	Extension contribution	38
2.	Growers initiative	43
3.	Socio-political factors	11
4.	Economic factors	8
	Total	**100**

It is interesting to note from Table (6.2) that the extension officers do acknowledge growers' initiative (scored 43) as the principal factor affecting spread of rubber cultivation. Extension efforts of the Rubber Board have been ranked second (a score of 38) followed by socio-political (11) and economic factors (8). Thus, the extension officers conclude that growers' initiative matched with planned extension interventions of the Board, contribute more than 80% to the diffusion of rubber cultivation in Kerala.

6.1.3 Extension officers' perception on growers response to extension initiatives in traditional and non-traditional areas.

The perception of extension officers on growers response were different for the two areas as shown below.

Table 6.3 Response of growers towards extension initiatives in traditional and non-traditional areas as perceived by extension officers

S.No.	Responses	Traditional Area	Non-traditional Area
1.	Good in the past - presently bad	17	0
		(56.67)	(0)
2.	Good both in the past and present	11	12
		(36.67)	(40)
3.	Bad in the past - presently good	2	18
		(6.66)	(60)
4.	Bad both in the past and present	0	0
		(0)	(0)

Percentages are in parentheses

A comparative analysis of growers' response to extension initiatives in traditional and non-traditional area is brought out in Table (6.3). In traditional areas, more than half of the extension officers perceived a change from good response in the past to poor response at present, while in non-traditional areas the perceptions were almost exactly the opposite. One third of the officers perceived that the growers showed as good a response to extension initiatives now as they had earlier in both the areas. None perceived it to be consistantly bad either in the traditional or non-traditional area.

The Board is currently concentrating its efforts on the non-traditional areas as farmers in these areas show greater interest in rubber cultivation. The extension efforts in traditional areas already at its peak is gradually approaching a plateau with only few new technology choices to offer. This realisation could have elicited the officers response in the above manner.

6.1.4 Frequency of contact

The table below shows the numbe of times extension officers contacted small growers in a week.

Table 6.4 Frequency of contact with small growers as perceived by extension officers (n=30)

No.	Frequency	Number	Percent
1.	Once in a week	3	10
2.	Thrice in a week	6	20
3.	Five days in a week	21	70

Table (6.4) clearly shows that frequency of contact of extension officers with the small growers as perceived by the former is very high. A high percentage (70%) of extension officers contacted growers five times in a week.

6.1.5 Mode of contact

The extension officers used different modes of contact which are ranked in the following order.

Table 6.5 Mode of contact with small growers as perceived by extension officers (n=30)

No.	Mode	Preferential ranks I	II	III	IV
		Frequencies			
1.	Personal contact	27	3	0	0
		(90)	(10)	(0)	(0)
2.	Group meetings	3	24	3	0
		(10)	(80)	(10)	(0)
3.	Circular letters	0	0	17	13
		(0)	(0)	(56.67)	(43.33)
4.	Office call	0	3	13	17
		(0)	(10)	(43.33)	(56.67)

Percentages are given in parentheses

Table (6.5) depicts the mode of contact of extension officers with small growers, in the preferential rank order of personal contact, group meeting, circular letter and office call respectively from rank I to rank IV. Personal contact with the growers will help him clarify his feelings, aid him to choose between conflicting decisions and increase the trust towards the organisation. This is perhaps why the Board has devoted a good proportion of their staff for individual extension.

6.1.6 Extent of assistance of local influential leaders to extension services

Local influential leaders have played an active role in assisting the extension officers. They are ranked based on the perception of the officers.

Table 6.6 Influence pattern of local leaders as perceived by extension officers

No.	Local leaders	Ranks			
		I	II	III	IV
		Frequencies			
1.	Local political leader	0	3	6	6
		(0)	(10)	(20)	(20)
2.	Church Priest	3	21	3	3
		(10)	(70)	(10)	(10)
3.	Panchayat official	0	3	9	0
		(0)	(10)	(30)	(0)
4.	RPS President	27	0	3	0
		(90)	(0)	(10)	(0)

Percentages are given in parentheses

The influence pattern of local leaders in assisting the extension officers is displayed in Table (6.6). Analysing the pattern, the first and second ranks were given to the RPS president (90%) and the church priest (70%) respectively. The RPS president by virtue of his post is frequently contacted by the officers and as stated elsewhere, the church priest is an accepted personality in many rubber growing areas and plays a major role in information dissemination about rubber cultivation.

6.1.7 Extension effectiveness

Effectiveness indices were worked out for various extension activities and their levels are presented. Effectiveness level is classified as follows ($\geq$70 is high, 51-69 is moderate and $\leq$ 50 is low).

Table 6.7 Effectiveness of various extension activities of the Rubber Board as perceived by extension officers

S.No.	Extension activities	Effectiveness Index	Effectiveness Level
1.	Replanting operations	86	High
2.	New planting	96	High
3.	Popularising HYV	90	High
4.	Discriminating fertilizer application	54	Moderate
5.	Plant protection	84	High
6.	Scientific tapping	90	High
7.	Cover crop establishment and maintenance	70	High
8.	Rain guarding	72	High
9.	Chemical stimulation of yield on old trees	56	Moderate
10.	Improving processing facilities	74	High
11.	Development of women	61	Moderate
12.	Assistance to tribals	72	High
13.	Educating farmers regarding input subsidy	80	High
14.	Educating farmers regarding plantation insurance	66	Moderate
15.	Educating farmers regarding credit facilities.	80	High

The extension effectiveness as perceived by the extension officers of the Board was, in general, high for all activities excepting 'discriminating fertilizer application', 'chemical stimulation of yield on older trees', 'development of women' and 'educating farmers regarding plantation insurance', which were but rated as moderate in effectiveness. None of the activities were rated as low.

The overall analysis project, prove that the Rubber Board has been highly effective in providing extension and advisory services to the small growers.

6.2 Growers' perceptions on Rubber Boards' extension services

The small growers feel that the Rubber Board has built an image of its own as a clean, customer-friendly and trustworthy organisation among the farming community of Kerala. That the Rubber Board has succeeded in gaining the confidence of the rubber growers, is in itself a measure of the achievements of the extension services provided by its dedicated workers. The growers in both Koottikkal and Alakode were satisfied with the frequency and extent of contact with the extension officers. The Board utilises the services of the church in a very effective manner. The extension officers apprise the church priests regarding information on training programmes, meetings and special campaigns, which then are passed on to the growers after the mass. Non-christians also come to know of the communication by word of mouth. It must be pointed out that the success of the Rubber Board has been largely due to, its working with the people at grass-roots and more importantly due to its realisation of the need to work in harmony with the cultural pattern of the local people. The growers also hailed the extension officers' services for educating them regarding the different aspects of rubber cultivation. It was observed that a good number of growers had a fair knowledge of rubber cultivation and its marketing. However, the growers of Koottikkal complained about

lack of newer varieties suitable to Kerala and redundancy of information related to cultivation passed on in meetings and training programmes. These minor complaints apart, the extension and advisory services of the Board and through this, it has gained the good will and trust of the rubber growers.

6.2.1 Extension Effectiveness

The extension effectiveness indices computed here were based on growers rating and the same range was utilised as is shown in Table 6.8.

In Koottikkal, growers rated the effectiveness of most extension activities as high except 'discriminating fertilizer application', 'chemical stimulation of yield on older trees' and 'development of women' which were rated low. The performance on the activities such as 'assistance to tribals' and 'educating farmers regarding credit facilities' were perceived as moderately effective.

Viewing the situation in Alakode, the extension performance on activities like 'discriminating fertilizer application' and 'chemical stimulation of yield on older trees', were rated low. The performance on the activities such as 'development of women' and 'assistance to tribals' were perceived as moderately effective. All the other activities were rated as highly effective.

Analysing the overall effectiveness of the extension machinery it is clearly seen that activities directly related to production were rated highly effective. This may be because growers were unaware of the educational activities of the Rubber Board. In general the neglected activities were 'discriminating fertilizer application', 'chemical stimulation of yield on older trees', 'development of women', 'assistance to tribals' and 'educating farmers regarding credit facilities'.

Table 6.8 **Effectiveness of various extension activities of the Rubber Board as perceived by the growers of Koottikkal and Alakode (n=30 each)**

S.No.	Extension activities	Koottikkal		Alakode	
		Effectiveness			
		Index	level	Index	level
1.	Replanting operations	92.67	High	92.0	High
2.	New planting	96.0	High	94.67	High
3.	Popularising HYV	77.33	High	88.67	High
4.	Discriminating fertilizer application	40.67	Low	28.0	Low
5.	Plant protection	86.0	High	88.0	High
6.	Scientific tapping	88.0	High	93.33	High
7.	Cover crop establishment and maintenance	76.67	High	72.0	High
8.	Rain guarding	77.33	High	82.0	High
9.	Chemical stimulation of yield on older trees	35.33	Low	26.0	Low
10.	Improving processing facilities	70.67	High	89.33	High
11.	Development of women	29.33	Low	54.0	Moderate
12.	Assistance to tribals	58.67	Moderate	58.0	Moderate
13.	Educating farmers regarding input subsidy	74.67	High	93.0	High
14.	Educating farmers regarding plantation insurance	70.67	High	80.0	High
15.	Educating farmers regarding credit facilities.	66.0	Moderate	70.0	High

6.3 Rubber marketing Co-operative Societies

From the 1960s, Rubber Board has rendered assistance for establishment of 37 member societies located in all important rubber growing districts and taluks. The Board has joined these co-operatives to establish and manage an apex institution at Kochi under the name of Kerala State Co-operative Rubber Marketing Federation Ltd., undertaking rubber procurement and marketing on an all India basis. The Federation is the biggest rubber dealing organisation in the country. The other activities include fertilizer mixing and marketing, processing of crumb rubber, dealing in fungicides and rubber processing chemicals, aerial spraying, production of technically specified rubber and rubber compound in own factories. The federation has a network of seven sales branches in the country and 13 purchase depots in Kerala. The federation handled 7.38% of the total rubber procured in the State during 1995-96 (State Planning Board 1996; Rubber Board 1996). The evaluation of Co-operatives did not however, from part of the study. Instead, we chose to focus on the functioning of small growers' self-help groups otherwise called Rubber Producers Societies (RPSs).

6.4 The Rubber Producers' Societies

Rubber producers' societies* (RPSs) are small, grassroot level self-help groups of rubber growers registered as charitable societies. They assist in transfer of technology to members, undertake or assist group processing and marketing of members' rubber produce, organize and assist group approach for new planting, replanting and productivity improvement, raise nurseries and distribute high yielding rubber planting materials. Organised on regional basis with equity support from Rubber Board, the RPSs have set up a number of private limited companies which are successfully processing and marketing rubber. As per rules a grower who desires to become a member should have at least 0.20 hectare of land under rubber (Rubber Board 1989).

* The architect of this concept was Mr. P. C. Cyriac, former Chairman, Rubber Board

The Koottikkal RPS charges a membership fee of Rs. Fifty and an annual fee of Rs. Ten. The administrative unit is the Director Board which has a president and six other office bearers. Usually field officers of the Board are nominated members. Thus, the RPSs established at the village level provided the institutional frame work at the micro level and is assumed to be self contained with least government interference. The results on the functioning of RPS are presented hereunder.

6.4.1 Perceptions of extension officers

The perceptions of extension officers regarding the functioning of RPSs are presented hereunder.

6.4.1.1 Performance of RPS

The overall performance of RPS is rated by extension officers in the following manner.

Table 6.9 Performance of RPS as rated by extension officers in their respective localities (n=30)

Performance	Number	Percent
Very poor	0	0
Poor	12	40
Good	18	60
Very Good	0	0
Total	**30**	**100**

The perception of extension officers regarding the performance of RPSs, projects that 60% rated them as good while the rest rated them as poor. The reasons supporting this finding are discussed below

6.4.1.2 Major reasons attributed to the success of RPS

The success factors are as follows.

1. Bulk distribution of procured agro-inputs at marginally subsidised prices to members
2. Organising seminars and group meetings on different aspects of crop cultivation and marketing
3. Rubber Board supporting RPS by lending technical services of field officers
4. Organising short term training programmes for members
5. Rubber Board supporting RPS for setting up crop collection centres and group processing facilities.

6.4.1.3 Major reasons attributed to the failure of RPS

The reasons are as follows.

1. Lack of remuneration to office bearers as work is purely voluntary
2. Lack of team work among office bearers
3. Inefficient management of RPS by office bearers
4. Inability to conduct timely general body meetings
5. Lack of timely auditing of accounts
6. Non compliance to Rubber Boards' guidelines
7. Lack of working capital for procurement, and storage of latex and sheets
8. Group rivalries and political factionalism
9. Lack of group cohesiveness among the growers
10. Growers have not felt it indispensable to become members of RPS

The opinions of extension officers regarding the reasons for success of RPS are catalogued as subsidised* input distribution, organising training programmes and group meetings, and Rubber Boards' support in lending technical and financial help to the societies.

The major constraints to the functioning of RPS are classified under three categories *viz.*, (a) due to office bearers (b) institutional (c) due to members

(a) Due to office bearers

Inefficient management and lack of teamwork and emoluments hamper the proper functioning of RPS.

(b) Institutional

Lacking working capital and auditing of accounts coupled with non-compliance to the Board's guidelines are the major constraints under this.

(c) Due to members

Group rivalries and poor cohesiveness among growers as well as the fact that membership still not made statutory have acted against the growth and proper functioning of RPS.

6.4.1.4 Participation of growers in RPS

Participation indices were worked out for the different types of participation among RPS members. The participation levels are classified as follows (>70 is high, 51-69 is moderate and < 50 is low).

---

* Refer *Appendix (II)* for subsidised rates of inputs

Table 6.10 Extent of participation among member growers in RPS as perceived by extension officers (n=30)

S.No.	Typology of participation among growers	Participation Index	Participation Level
1.	Participation for solving immediate problems	62.5	Moderate
2.	Participation for material incentives	83.3	High
3.	Functional participation	57.5	Moderate
4.	Interactive participation	72.5	High
5.	Self mobilisation	30	Low

From Table (6.10) it is clear that the extension officers accorded high levels of participation only for two items *viz.*, participation for material incentives (83.3) in which the level was remarkably high as most member growers came together only for getting subsidised inputs distributed through the RPS. Interactive participation also fared well (72.5) as growers being literate interacted well with the Rubber Board officers in training programmes and seminars etc. Moderate indices were obtained for 'solving immediate problems' (62.5) and functional participation (57.5) which included group meetings and planning exercises by the growers themselves. 'Self mobilisation' as expected, scored lowest (30) because growers seldom took initiatives independent of the institution to change systems. This is evident from the fact that the RPS as an institution has been unable to organise growers to face their own problems of either the economy or the ecology.

6.4.2 Growers' perception on RPS

In Koottikkal three RPSs are functioning *viz.*, Koottikkal, Elangadu and Yendayar RPSs. Though Koottikkal RPS has the largest membership (206 members),

the Yendayar RPS is the nodal RPS of the region. The RPSs of different localities in and around Koottikkal have floated a company called the Kanjirappally Rubber (P) Ltd. in 1996. The President of the Koottikkal RPS remarked that out of its 206 members only 15-20 turned up for seminars and meetings. He felt that the poor attendance of the members was mainly because, being traditional cultivators of rubber, they felt they had very little to gain out of the training programmes and seminars. The president was critical equally of the scientists of the Rubber Board who in seminars indulged in theoretical intricacies rather than giving pragmatic suggestions needed for on - farm operations. Many a time he said, the scientists found themselves in embarassing situations after being questioned on some techniques and skills. Again, under the pretext of reinforcement, old techniques and information were delivered to them. The growers thus gradually began to keep away from such meetings. Most of the member-growers interviewed spoke of lack of initiative among the growers to plan and discuss cultivation aspects in RPS meetings. But in other public places (*e.g.* church) the growers freely discussed the production problems. The President agreed that most of the growers came only for getting subsidised agro-inputs but also claimed that it was a great service to the rubber growers.

In Alakode although there are RPSs in Kuttippuzha, Tertalli, Molothunkunnu most of them are reduced to mere 'input distribution centres'. The growers complained of lack of service minded people to manage the societies. The societies seldom arranged classes and seminars. Similarly group approaches for productivity improvement or raising nurseries were not undertaken by any of the societies. However, the field officers' frequent contact with the growers have helped them to keep abreast with uptodate information on development schemes and training programmes.

The important tasks of an extension agency involved in the spread of a productive activity, are to impart knowledge to the stake- holders as well as to establish and sustain its credibility among them. There is ample evidence to infer that the Rubber Board has been very effective in accomplishing these arduous tasks and is regarded generally by growers as a clean and customer-friendly organisation. It is clear that the image of the Board is a direct measure of the achievement of the extension services provided by its dedicated workers. The Rubber Producers Societies have not become a popular mass movement as envisaged by the Board. Their role in solving the problems of the small growers are beset with a number of hurdles which, if overcome, will not only aid and abet technology transfer but also ensure user control over research.

In the next chapter, an analysis of the factors affecting the spread of rubber cultivation is discussed. The growth rates for area, production and yield of rubber have also been computed.

CHAPTER 7

FACTORS AFFECTING SPREAD OF RUBBER CULTIVATION

7. Factors affecting spread of rubber cultivation

The results of quantitative data analysis are presented in this chapter. First the growth rates for area, production and yield of rubber computed using time series data are presented, after which the results of factor analysis are given.

7.1 Computation of compound growth rate (CGR)

The annual compound growth rates of area, production and yield of rubber is furnished in Table (7.1).

Table 7.1 Compound growth rate in area, production and yield of rubber in Kerala (1955-1994)

Particulars	Area	Production	Yield
Constant	5.175 (0.0355)	5.001 (0.08095)	2.826 (0.0566)
X-coefficient	0.0184 (0.005)	0.0334 (0.0008)	0.0419 (0.00081)
X^2- coefficient	- 0.00017 (0.00005)	- 0.00037 (0.00008)	- 0.0002 (0.00008)
R^2	0.974	0.959	0.906
Annual CGR in %	4.327	7.994	3.490

Note:- 1. Figures in parentheses refer to the standard errors
2. All co-efficients are significant at 0.01 level of probability

High R^2 values as seen from Table (7.1) indicates good fit of the three selected variables. It is seen that the growth rate of production was highest (7.994%) followed by area (4.327%) and yield (3.490%). But it is inferred from the co-efficient of X^2 that all the three growth rates were decelerating *i.e.*

increasing at a decreasing rate, and nearing an optimum. It is also evident that the decelerating rate was highest for production (- 0.00037) followed by yield (- 0.0002) and area (- 0.00017).

The decelerating trend shows that the growth rate was not constant but varying. So decade wise movement of growth rates was analysed and is presented in the table below.

Table 7.2 Compound growth rates of area, production and yield of rubber over decades in Kerala

Period	Phase	Growth rate in percentage		
		Area	Production	Yield
1955-1964	I	4.616	6.660	1.953
1964-1973	II	5.041	12.540	7.127
1973-1982	III	1.671	2.214	0.531
1982-1991	IV	5.999	9.119	2.963
1991-1994*	V	1.943	9.061	6.979

* Last four years only

Table (7.2) clearly brings out the fact that Phase III recorded the minimum growth rates for all three variables *viz.* area (1.671%), production (2.214%) and yield (0.531%). Maximum growth rates for production (12.540%) and yield (7.127%) and a relatively high growth rate for area (5.041%) were obtained in Phase II - although the maximum growth rate for area was in Phase IV (5.999%). Excepting that in the IIIrd phase, growth rates in area remained more or less constant. however, the growth rate in area has shown a sharp decline in Phase V which reveals the fact that area expansion under rubber was drastically declining. There were wide fluctuations in growth rates of production and yield; but in

production, almost constant rates were noticed from the IVth phase onwards. In yield however, there was a sharp decline in the phase V from that of the previous phase.

The change in total production of rubber may be either due to change in area or change in yield. Hence it was found necessary to analyse the change in area's contribution towards change in total production over years. From the previous results it was seen that the growth rates in production exhibited instability upto the IIIrd phase and stability in the next two phases. Since growth rates cannot alone explain the contribution of change in area towards change in total production, a decomposition analysis was carried out to study the contribution of area and yield towards production across the five phases.

Table (7.3) **Decomposition of total rubber production in terms of area and yield over decades**

Period	Phase	Contribution of area (in percentage)	Contribution of yield (in percentage)	Interaction (in percentage)
1955-1964	I	69.94	18.36	11.70
1964-1973	II	28.94	46.40	24.66
1973-1982	III	59.32	34.51	6.17
1982-1991	IV	50.83	30.08	19.09
1991-1994*	V	20.11	75.55	4.34

* Last four years only

The results of the decomposition analysis of total rubber production is presented in table (7.3). In phase I, phase III and phase IV, maximum contribution towards production was made by area (69.94%, 59.32% and 50.83% respectively). In phase II and phase V, yield gave maximum contribution to production (46.4% and 75.55% respectively). It is also seen that

the interaction effect between area and yield has also contributed towards production in phase II and phase IV. It is interesting to note the minimum values for area and interaction and the maximum value for yield were recorded in the last phase.

From the above discussion it is quite obvious that the change in share of area to change in total production was decreasing drastically. On the other hand, it is also seen that the growth rate for area over the years ws higher than that of yield and had the least deceleration rate among the three variables. Thus, high growth rate in area with least decelerating rate coupled with a reduction in the share of area towards total production presents a paradoxical situation. This means that there are several factors which could possibly affect the area. The factor analysis presented below isolated such relevant factors affecting the spread of rubber cultivation.

7.2 Factors affecting spread of rubber cultivation

7.2.1 Identification and labelling of factors

The factor analysis extracted 12 factors (refer *Appendix VI*). Under each factor, the variables were grouped based on their factor loadings *i.e.* the larger the absolute size of the factor loading, the more important the loading was in interpretting the factor. The factors were accorded names based on the characteristics of the variables under each. Of the 12 factors, only 11 were retained for reasons* of parsimony and interpretability. Thus 11 factors groups with 42 variables were altogether retained. The table below gives the labelled names of the factors and the number of variables under each.

* In the original roated matrix, the second factor had only one variable under it. A closer scrutiny also revealed that this variable had been well taken care of in the first factor.

Table 7.4 **Factors and number of variables under each**

No.	Factor	Labelled as	Number of variables under each factor
1.	Factor-I	Production-development factor	18
2.	Factor-II	Religious-market factor	2
3.	Factor-III	Social status factor	2
4.	Factor-IV	Economic factor	2
5.	Factor-V	Situational-organisational factor	2
6.	Factor-VI	Income generation factor	3
7.	Factor-VII	Institutional factor	3
8.	Factor-VIII	Income saving factor	3
9.	Factor-IX	Technological factor	3
10.	Factor-X	Socio-political factor	2
11.	Factor-XI	Cultural factor	2
		Total	**42**

Factor-I : Production-development factor

The variables which had the highest loading on factor I were the following. The variable number and the factor loading against each item (in brackets) are provided.

1. X_5 - Provide employment avenues (0.778)
2. X_6 - Suitable for self employment (0.867)
3. X_7 - High investment-profit ratio (0.520)
4. X_{13} - Increase in knowledge of rubber cultivation (0.768)
5. X_{14} - Absence of land ceiling (0.401)
6. X_{16} - Availability of high yielding varieties (0.752)

7. X_{17} - High disease incidence in pepper, arecanut and coconut (0.623)
8. X_{18} - Low productivity of cashew (0.942)
9. X_{19} - Low productivity of coconut (0.875)
10. X_{20} - High risk involved in other crops (0.781)
11. X_{28} - Imitating European cultivators (0.912)
12. X_{33} - Sufficient credit support (0.552)
13. X_{34} - Presence of marketing societies and dealers (0.755)
14. X_{35} - Sub-division and fragmentation of land (0.715)
15. X_{39} - Real estate business potential (0.903)
16. X_{40} - Inheritance through traditional cultivation (0.893)
17. X_{41} - Land encroachment by settlers (0.834)
18. X_{43} - Increased interest shown later by people across class, caste and religion (0.685).

Factor II : Religious-market factor

The items which loaded highly on the second factor are given below

1. X_{24} - Continuous demand in the market (0.582)
2. X_{25} - Catholic community's interest in cultivation (0.849)

Factor III : Social status factor

The items with high loadings in this factor are given below

1. X_{4} - High long term returns (0.673)
2. X_{12} - Symbol of social status (0.794)

Factor IV : Economic factor

The items which loaded highly on this factor are

1. X_{32} - Less labour input (0.437)
2. X_{38} - Growers aiming for better standard of living (0.793)

Factor V : Situational-organisational factor

The items with high loadings are

1. X_{15} - Adaptability to different edaphic condition (0.522)
2. X_{36} - Effective functioning of RPSs (0.786)

Factor VI : Income generation factor

High loadings were found in

1. X_{1} - Permanent source of income (0.512)
2. X_{3} - Low disease incidence in the crop (0.839)
3. X_{11} - Provides additional income from intercrops to the growers (0.403)

Factor VII :Institutional factor

Loadings were high in the factors *viz.*

1. X_{8} - Easy marketability (0.791)
2. X_{23} - High utilisation of family labour (0.456)
3. X_{30} - Rubber Board's extension services at grassroot level (0.426)

Factor VIII : Income saving factor

The items with high loadings are

1. X_{10} - Provides additional income from timber (0.441)
2. X_{21} - Change in income tax regulation (0.809)
3. X_{22} - Easiness in processing (0.519)

Factor IX : Technological factor

Items which loaded high on this factor are

1. X_9 - Attractive price for produce (0.480)
2. X_{27} - Organised research and development activities (0.646)
3. X_{29} - Suitability as secondary income source (0.659)

Factor X : Socio-political factor

High loadings are obtained in

1. X_{37} - Intense political lobbying (0.571)
2. X_{42} - Special schemes supporting cultivation for tribals and the under privileged sections of the society (0.589)

Factor XI : Cultural factor

The items with high loadings are

1. X_{26} - Indirect influence through church in promoting cultivation (0.376)
2. X_{31} - Extension efforts consistent with the culture and values of the growers (0.799)

From the above discussion, it is clearly seen that atleast 11 factors were responsible for the rapid spread of rubber cultivation in Kerala. It is observed that several social, political, cultural, economic and production variables have played significant roles in its spread.

The following chapter gives the major conclusions of the study.

CHAPTER 8

SUMMARY

8. SUMMARY

Kerala accounts for 86 per cent of area under rubber cultivation and 94 per cent of rubber production in India. Rubber cultivation which was introduced in the beginning of the century presently occupies 20 per cent of the net sown area in the state. The growth of rubber plantations has resulted in replacement of food crops, expansion of rubber based industries, development of transport and communication infrastructure, increase in the standard of living of the people and upsurges in organised movement for collective bargaining. The present study essentially a qualitative inquiry has been designed with the following objectives.

1. To study the social impact of rubber cultivation.
2. To analyse the the ecological impact of rubber cultivation.
3. To study the effectiveness of Rubber Board's extension services.
4. To delineate the factors affecting spread of rubber cultivation in Kerala.

The study was undertaken in two rubber growing panchayats of Kerala *viz.* Koottikkal panchayat in Kottayam district and Alakode panchayat in Kannur district. The holding sector comprising small growers that contribute 84.86 per cent of total rubber area in Kerala forms the basis of this analysis. A number of people from different walks of life formed the respondents of the study. A sample of thirty small growers each from Koottikkal and Alakode and thirty extension officers of Rubber Board was selected following simple random sampling procedure. Apart from these two categories of respondents, large growers, scientists of Rubber Board and Kerala Agricultural University, social scientists, environmentalists, church priests, local politicians, students and children of small growers were interviewed to enrich the body of information of the study.

A methodological mix was adopted for this study by synthesising qualitative and quantitative methods of inquiry and analysis. A variety of methods like direct observation, personal interviews, mailed questionnaire, interview schedule and literature review were employed to collect data. Lest the study is handicapped by being ahistorical, historical research was employed to place it in proper context.

Growth rates of area, production and yield of rubber were computed using both semi-log quadratic trend equation and exponential trend equation. Further, a decomposition analysis was also done to study the percentage contribution of change in area towards change in production of rubber. Other statistical tests like factor analysis, students 't' test, percentage analysis, chi-square test and frequency distribution were utilised for the study.

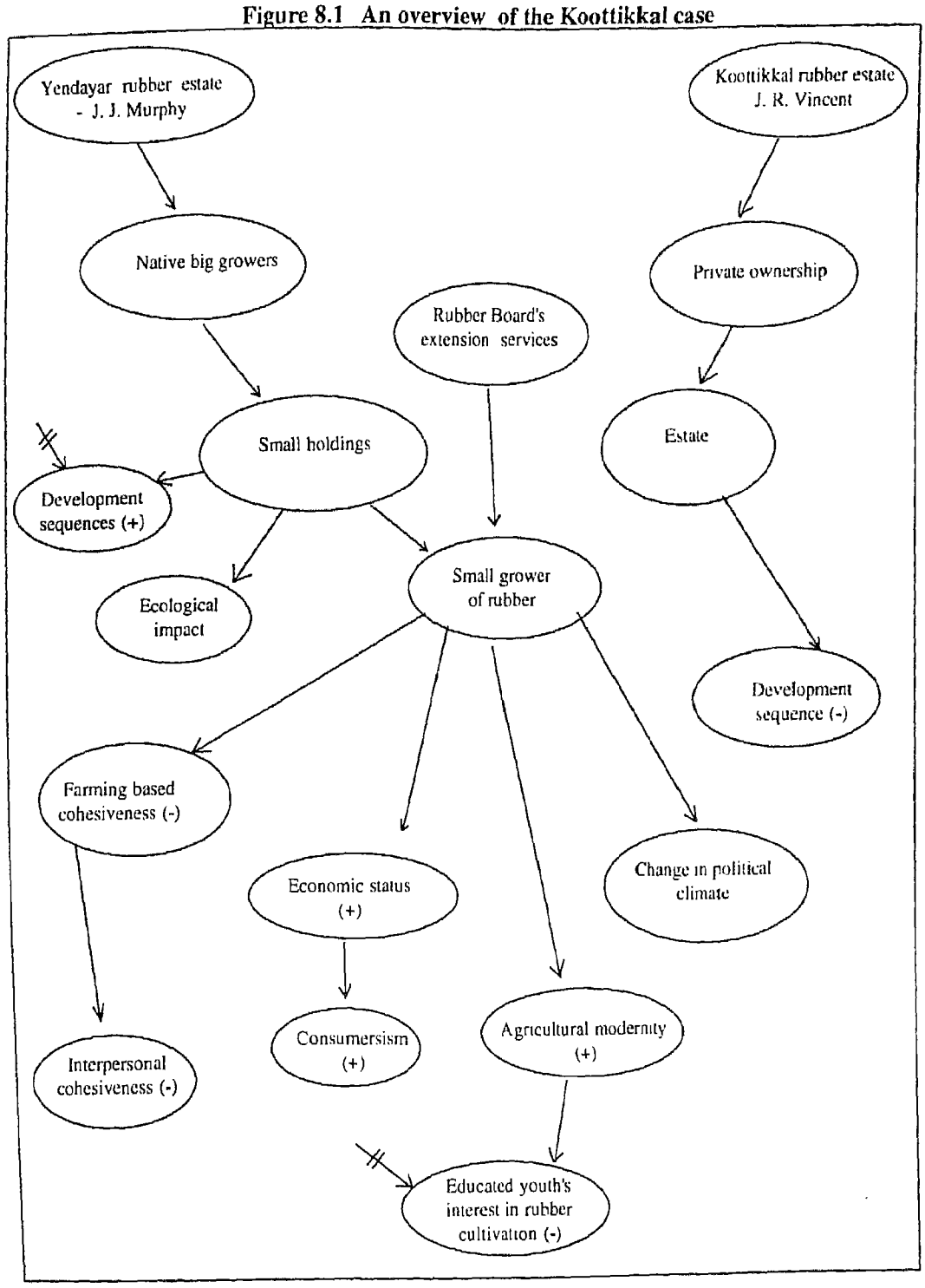
Major findings

Social impact of rubber cultivation

The Koottikkal case

The analysis of the historiography of rubber cultivation in Koottikkal broughtforth the importance and contribution of John Joseph Murphy in pioneering the cultivation of rubber in the area (see Fig. 8.1 for the overview). His contributions to the scientific management practices in rubber cultivation and his social development efforts were studied. The transfer of land ownership of the Yendayar estate which Murphy had developed, from the rural oligarchs to the native small farmers were also studied. The increased adoption of rubber cultivation by the small growers was explained using the imitation theory of learning. A comparison between the estate and holding sectors in Koottikkal brought out differences in the development of rural infrastructure in the immediate surroundings.

Figure 8.1 An overview of the Koottikkal case



Legend

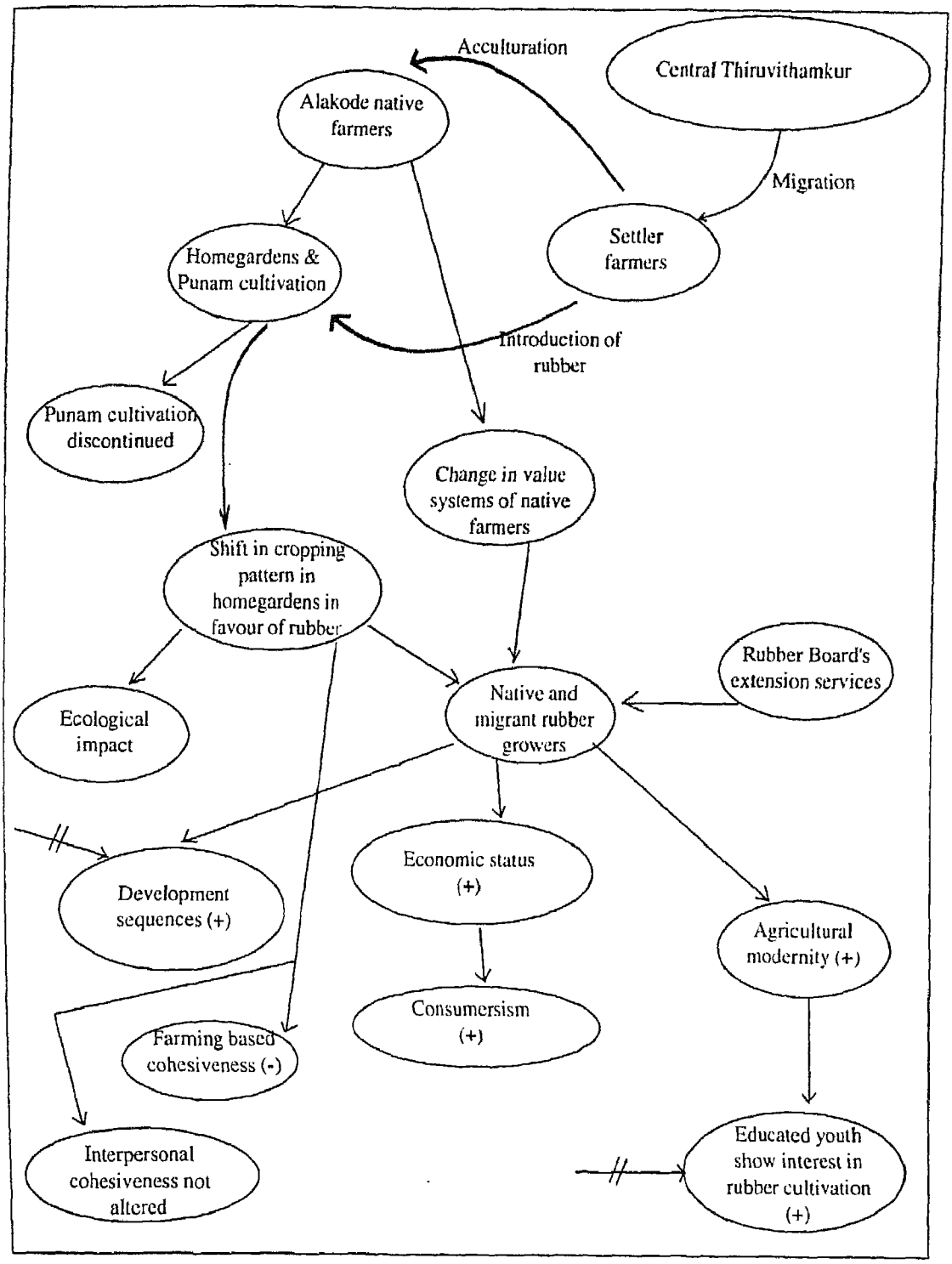
+ : Positive influence — : Negative influence ⇢: Other factors

Regarding agricultural modernity of small growers, more than eighty per cent of them had higher levels of agricultural modernity. But more than seventy per cent preferred rubber cultivation only as a secondary income source. Among the educated youth more than sixty per cent of the boys and more than eighty per cent of the girls showed lack of interest in rubber cultivation. Changes in consumer behaviour patterns were discernible among small growers and they showed poor cohesiveness and integration amongst themselves. Association between religion and small growers' futuristic orientation towards rubber cultivation and association between source of labour and holding size were established. The level of political participation of the growers were observed to be high but much of the political activism revolved around the price fluctuations of rubber in the market.

The Alakode case

The agricultural history of Alakode was categorised into three phases based on migration of farmers to Alakode after 1945. In the pre-migration phase (period till 1945), the agricultural production systems of the adivasis and natives were explored. The phase of migration (1945 to 1975) witnessed the play of 'push' and 'pull' factors which caused the migrants to get settled at Alakode. It was observed that the mode of agriculture transformed from a gathering mode of the adivasis to a settled cultivation mode and later to a commercial form of agriculture with the entry of rubber. Some characteristic features of the homegardens of Alakode in the pre-migration and migration phases was outlined. In the post migration phase (period after 1975) social change in terms of psychological acculturation, shift in agricultural production system from traditional homegardens to commercial cultivation of rubber were described. Changes in value systems of the different sections of growers and the evolution of developmental sequences in Alakode were also analysed.

Figure 8.2 An overview of the Alakode case



Legend (+) : Positive influence
(-) : Negative influence
// : Influence of other factors

Slightly above fifty per cent of small growers had higher levels of agricultural modernity but more than seventy per cent preferred rubber cultivation as a primary source of income. Among the educated youth nearly sixty per cent of the boys showed interest in taking up rubber cultivation while all girls showed disinterest. Patterns in change in consumer behaviour were also noticed in the small growers. Though the farming based cohesiveness was poor, the inter-personal cohesiveness among the small growers was fairly strong. There was no association between religion of the grower and their futuristic orientation towards rubber cultivation. An association was established between source of labour and holding size and growers tended to employ wage labour as their holding size increased (see Fig. 8.2 for the overview).

A cross case analysis of Koottikkal and Alakode was done to compare and contrast the two regions which is depicted in the table below.

A Cross case analysis of Koottikkal and Alakode

No.	Domains	Koottikkal	Alakode
1.	Land ownership		
	Marginal farmers	75.76 %	65.91 %
	Small farmers	19.83 %	32.95 %
2.	Dominant cropping pattern	Monocrop of rubber	Multicropping system, but single largest area under rubber
3.	Rubber area to total agri-cultural area in the panchayat	78.22 %	31.19 %
4.	Migration	Less evident	migration was a response to and impetus for social change.
5.	Psychological Acculturation	Less evident	Pronounced patterns are discernible
6.	Consumerism	Change in patterns	Change in patterns

7.	Farming based cohesiveness	weak	weak, but better than Koottikkal
8.	Interpersonal cohesiveness	weak	fairly strong
9.	Agricultural modernity index	> 80% had higher level of agricultural modernity	only slightly above 50% had higher levels of agricultural modernity
10.	Small growers' futuristic orientation towards rubber cultivation	> 70% recommended rubber cultivation only as a subsidiary activity	> 70% recommended rubber cultivation for primary occupation.
11.	Educated youth in rubber cultivation		
	Boys	> 60% showed disinterest	Nearly 60% showed interest in taking up rubber cultivation
	Girls	> 80% showed disinterest	100% showed disinterest
12.	Association between religion and small growers' orientation to rubber cultivation	Association established	No association
13.	Association between source of labour and holding size	Association established	Association established
14.	Source of labour	dominant family labour	dominant family labour
15.	Factors affecting spread of rubber cultivation	Knowledge of rubber cultivation, high disease incidence of pepper, coconut and arecanut, low productivity of coconut, imitating European cultivators, high risk involved in other crops, indirect influence through Church, suitability as secondary income source, subdivision and fragmentation of land, intense political lobbying and inheritance through traditional cultivation of rubber.	more employment avenues, suitability for self employment, high investment to profit ratio, additional income from rubber, absence of land ceiling, adaptability to different edaphic conditions, availability of HYV, low productivity of cashew, extension efforts at grassroot level, credit support, presence of marketing societies, real estate business potential, land encroachment by settlers, special schemes for SC/ST and increased interest shown by all farmers across religion, class and caste.

Ecological impact

(a) Like any other agricultural production systems, nitrogen and potassium content in rubber soils are low and phosphorus content is fairly high. This necessitates use of nitrogenous and potassic fertilizers in very high doses.

(b) Organic carbon content in rubber soils is high.

(c) Magnesium depletion in rubber soils is high, requiring revision in the fertilizer schedule.

(d) Though calcium content in soils are low, rubber trees at present show adaptability to low calcium environment.

(e) Rubber cultivation lowers the soil pH rendering it acidic. Therefore liming should be practiced.

(f) Reduction in cation exchange capacity of rubber soils is also noticed.

(g) Conflicting reports on clay content in rubber soils exists.

(h) In partially or fully degraded soils, rubber cultivation improves bulk density while in forest soils cleared for rubber, bulk density decreases.

(i) Microbial population in rubber soils are low compared to other agricultural production systems.

(j) Soil erosion in mature plantations have been restricted by pits and Kayyalas.

(k) Rubber cultivation has adversely affected the moisture content of the soil.

(l) There exists a relationship between rubber cultivation and depletion of water sources in nearby areas.

(m) Rubber cultivation has reduced the area under grazing lands.

(n) Rubber plantations have an open nutrient cycle due to addition of external inputs into the system and siphoning out produce from it.

(o) Rubber cultivation has marginalised other tree crops, vegetables and medicinal plants.

(p) Large acreage under a single clone (RR11 105) and a narrow genetic base threaten disease epidemic outbreak.

(q) Rubber cultivation in Kerala has compounded the problem of food dependence on other states.

(r) A grower who goes in for a multicrop combination in his homestead is a more rational farmer than the one who takes up rubber cultivation alone.

(s) Rubber cultivation is ideal for partially denuded lands.

(t) In some regions high mosquito breeding is seen in rubber plantations.

(u) Rubber wood used as fire wood produce more smoke and soot.

(v) A concerted effort on the part of the research system of either the Rubber Board or State Agricultural Universities to study the ecological impact of rubber cultivation has been found lacking.

(w) Rubber eco-system is not in any way similar to the forest eco-system.

(x) The ecological impact of rubber cultivation using a comprehensive set of indicators has been found lacking.

The analysis brought to light the fact that rubber ecosystem is not even a near substitute for a tropical forest ecosystem and that the two systems are incomparable.

Effectiveness of Rubber Board's extension services

a. Most of the extension officers perceived young hindu and muslim growers as having more entrepreneurship, while all agreed upon the enterprising nature of the more elder christians. All officers agreed that males, irrespective of their religion exhibited better entrepreneurship and most of them recognised middle class hindus and christians as well as upper class muslims as having more entrepreneurship with respect to rubber cultivation.

b. Extension officers opined that growers' initiative matched with planned extension interventions of the Board, contributed more than 80% to the diffusion of rubber cultivation in Kerala.

c. A comparative analysis of growers' response to extension initiatives in traditional and non-traditional area is brought to light the fact that in traditional areas, more than half of the extension officers perceived a change from good response in the past to poor response at present, while in non-traditional areas the perceptions were almost exactly the opposite.

d. The frequency of contact of extension officers with the small growers as perceived by the former is very high. Majority of extension officers contacted growers five times in a week.

e. The modes of contact of extension officers with small growers were in the preferential rank order of personal contact, group meeting, circular letter and office call respectively from rank I to rank IV.

f. The extent of assistance by local leaders to the extension officers were perceived in such a way that the first and second ranks were given to the RPS president and the church priest respectively.

g. The extension effectiveness as perceived by the extension officers of the Board was, in general, high for all activities excepting 'discriminating fertilizer application', 'chemical stimulation of yield on older trees', 'development of women' and 'educating farmers regarding plantation insurance', which were rated as only moderate in effectiveness. None of the activities were rated as low.

h. The small growers perceived that the Rubber Board's extension activities were highly effective except for 'discriminating fertilizer application', 'chemical stimulation of yield on older trees', 'development of women', 'assistance to tribals' and 'educating farmers regarding credit facilities'. The extension services of the Board have gained the goodwill and credibility of the growers.

i. The perception of extension officers regarding the performance of RPSs, projected that 60% rated them as good while the rest rated them as poor.

j. The major reasons attributed to the success of RPS were as follows:

i. Bulk distribution of procured agro-inputs at marginally subsidised prices to members
ii. Organising seminars and group meetings on different aspects of crop cultivation and marketing
iii. Rubber Board supporting RPS by lending technical services of field officers
iv. Organising short term training programmes for members
v. Rubber Board supporting RPS for setting up crop collection centres and group processing facilities.

k. The major reasons attributed to the failure of RPS were as follows.

i. Lack of remuneration to office bearers as work is purely voluntary
ii. Lack of team work among office bearers
iii. Inefficient management of RPS by office bearers
iv. Inability to conduct timely general body meetings
v. Lack of timely auditing of accounts
vi. Non compliance to Rubber Boards' guidelines
vii. Lack of working capital for procurement, and storage of latex and sheets
vii. Group rivalries and political factionalism
ix. Lack of group cohesiveness among the growers
x. Growers have not felt it indispensable to become members of RPS

l. Extension officers ranked different types of participation of growers in RPS in the following order : participation for material incentives. interactive participation, participation for solving immediate problems, functional participation and Self mobilisation.

m. Small growers perceived that RPSs have not become a popular mass movement as envisaged by the Board.

Factors affecting spread of rubber cultivation

The compound growth rates in area, production and yield of rubber in Kerala computed for the years 1955 to 1994 were respectively 4.327%, 7.994% and 3.490%. Decadel-wise compound growth rates were also estimated by dividing the fourty year period in to five phases. A decomposition analysis of total production in terms of area and yield over decades brought out the fact that the change in share of area to change in total production of rubber is decreasing drastically. It was observed that growth rate for area over the years was higher than that of yield and had the least deceleration rate among area, production and yield.

The eleven factors affecting spread of rubber cultivation extracted after the factor analysis were production-development factor, religious-market factor, social status factor, economic factor, situational-organisational factor, income generation factor, institutional factor, income saving factor, technological factor, socio-political factor and cultural factor.

Policy implications

1. Agricultural technological interventions bring about changes not only in the on-farm production system but also have far reaching consequences in the socio-cultural mileu These alterations need to be critically monitored and studied so as to draw lessons for planning social and technological interventions in the future.

2. The rapid expansion of area under rubber has adversely affected the eco-system. The negative effects have been mostly noticed in the areas *viz.* soil, water, grazing lands, biodiversity and food security. Till now, these changes have not been scientifically researched upon using a comprehensive set of indicators. Research systems should take notice of these and initiate research on these lines.

3. The extension efforts of the Rubber Board were largely effective in promoting improved management practices in rubber cultivation and earning the credibility of the growers. However, the Board has failed to take a holistic view of the agricultural production systems thereby perpetuating rubber monoculture. This has resulted in social and ecological changes. Since extension research has been virtually absent in the Board it could neither foresee nor study these happenings. Therefore, there is a pressing need to initiate and strengthen extension research in Commodity Boards such as Rubber Board, Spices Board etc.

4. Diffusion of rubber cultivation depends on several factors which are specific to a locality. An analysis of these factors identified are extremely useful for planning appropriate strategies for agricultural and rural development. Studies on factors affecting and impact arising out of the technology-society interface should be a priority area in social science research in agriculture.

BIBLIOGRAPHY

Bibliography

Abdul Kareem P. 1988. Education and Socio economic development : Case of Muslim Communities in Kerala. *M.Phil thesis,* University of Kerala, Kariavattom.

Adnan, S, Barrett, A, Nurul Alam, S.M and Brustinow A. 1992. *Peoples' Participation. NGOs and the Flood Action Plan,* Research and Advisory Services, Dhaka

Alakode Grama Panchayat Vikasana Report (AGPVR) 1996. BAB Printers and Publishers, Kannur.

Allport G.W, Vernon P.E, and Lindzey, G. 1951. *Study of Values - Manual for directors* , The Riverside Press, USA.

Asawalam, D.O.K , Osodeka V.E, Kamal , O.J. and Eligitator, E.E. 1991. Effects of rubber cultivation on soil physical and chemical properties. Paper presented at RRII Seminar session on August 29, 1991.

Aweto A.O. 1987. Physical and nutrient status of soils under rubber. (*Hevea brasiliensis*) of different ages in south western Nigeria. *Agricultural Systems*, **28** : 63- 72.

Baker, R. 1993. *Enviormental Management in the Tropics.* CRC press, Boca Raton.

Balagopalan, M and Jose, A.I. 1993. A comparative study on the properties of soils in relation to vegetational types. *Journal of tropical Agriculture*, **31** : 167 - 173.

Balister, Ram N and Chauhan T. R. 1984. A study of migration of agricultural labourers in Bichpuri Block of Agra district. *J. Agric. and Scientific Res.* **26 1/2** : 42 - 46.

Bandura, A and Walters, R.H. 1963. *Social learning and personality development.* Rinehart and Winston, New york.

Berry, J.W. 1980. Ecological analysis for cross cultural psychology. In Warnen, N (ed) *Studies in cross cultural psychology*, **1**, Academic, London.

Berry, J.W., Van De Koppel, J.H.H, Senechal C, Annis, R.C. , Bauchet,S ; Cavalli - sforza, L.L. ; and Witkin H.A. 1986 *On the edge of the forest: A comparative study of the development of cognitive style in central Africa*, Swets Zeitlinger, Lisse.

Blomkvist Hans . 1997. Caste and Democracy , *Seminar* 456 : 21 - 25.

Blumer, H. 1969. *Symbolic Interactionism* Prentice-Hall, New Jersey.

Census of India 1991 *Census Report*, Government of India.

Chacko, A.C. 1993. *Alakodinte Katha.* (Mal) Rose Printers, Taliparamba : 33 - 35.

Chandy, K.M. 1974. Rubber Plantation Industry. A critical review. *Rubber planters conference (India) Souvenier,* Kottayam : 2.

Cicilyamma, T. 1984. An economic analysis of rubber in Kerala, *M.Phil Thesis,* University of Kerala, Kariavattam.

Connell J, Dasgupta B, Laishley. R and Lipton M 1976. *Migration from rural areas. The evidence from village studies.* An ILO study. Oxford University Press, New Delhi.

Demographic Research Centre 1975. *Salient Features of migration in Kerala.* Bureau of Economics and Statistics GOK, Trivandrum.

Denzin, N.K. 1978. The logic of naturalistic inquiry in Denzin, N.K. (ed) *Sociological methods : A source Book,* McGraw Hill, New York.

Directorate of Economics and Statistics 1992. *Kerala at a glance.* GOK, Vikas Bhavan Trivandrrum.

Donner 1987. *Land use and environment in Indonesia,* University of Hawai, Honolulu : 132.

Eapen, Mridul. 1994. Employment and unemployment in Kerala - An analysis of recent trends. *International Congress on Kerala studies Abstracts* **2** : 65.

Ember C.R. and Ember M. 1993. *Anthropology.* Prentice Hall India : 259.

Fernandes, E.C.M. amd Nair, P.K.R. 1986. An evaluation of the structure and function of tropical homegardens, *Agriculture Systems* **21 (4)** : 279 - 310.

Gadgil, M and Guha, R 1992. *This Fissured Land,* Oxford University Press, Calcutta.

George, M.K. 1994. Crisis in the Kerala Model of development - : Educational paradoxes. *International Congress on Kerala studies Abstracts* **2** : 8 - 9.

Giddens, Anthony 1971. *Capitalism and modern social theory.* Cambridge University Press New York. : 39.

Goldthorpe, C.C. 1963. Natural rubber and the Environment, *International Rubber Digest* : 9 -15.

Graves, T.D. 1967. Psychological acculturation in a tri-ethnic community. *South Western journal of Anthropology,* **23.** : 337 - 350.

Guba, E.G. 1978. Towards a methodology of naturalistic inquiry in educational evaluation. *CSE Monograph series in Evaluation* **8**, Centre for the study of Evaluation, Los Angeles.

Jeffrey Robin. 1976. *The Decline of Nayar Dominion, Society and Politics in Travancore 1847 - 1908,* Vikas Publishing House, New Delhi : 118.

John, A.V. 1966. *Mundakkayam Planters Association,* All India Rubber Planters Association, Mundakayam : 5.

Jose, Darley. 1991. Homegardens of Kerala : Small and Marginal Farmers Response To changes in Agrarian structure and Environmental Constaints. *MS Thesis,* Agricultural University of Norway.

Jose, Darley 1993. *Kerala Patanangal* (Mal)**1** April - June. Chithira Printers & Publishers Cochin : 87 - 93.

Joseph K.T. 1991. Soil conservation in *The state of Nature Conservation in Malasiya* (ed) Kiew, R., Malaysian Nature Society, Kuala Lampur : 209 - 21

Joseph Kuravilangad. 1991. *Konippadikal* (Mal) Bobby Books, Kozhikode.

Karthikakutty Amma M, Nair A.N.S, Mathew M and Chacko C.K. 1991. Fertility status of the rubber growing soils of Kerala. *Rubber Board Bulletin* **26** (4) 28 - 32.

Karthikakutty Amma M. 1995. Effect of continuous cultivation of rubber (*Hevea brasiliensis*) on soil properties. *Ph.D Thesis,* University of Kerala, Kariavattom.

Kato, T. 1994. The emergence of abandoned paddy fields in Negeri Sembilan, Malaysia. *South - Asian studies* 32 : 2, 145 - 172.

Kerala State Planning Board 1996. *Economic Review.* GOK, Trivandrum.

Kershaw K.L. 1957. *J.J Murphy 1872 - 1957.*

Koottikkal Grama Panchayat Vikasana Report (KGPVR) 1996. Cejo offset printers, Changanassery.

Kotler, Philip. 1995. *Marketing Management.* Prentice Hall India Ltd., New Delhi. : 182.

Krishnakumar A.K. 1989. Soil under *Hevea* in India - A physical, chemical, and minerological study with reference to soil moisture, cation influence on yield of *Hevea brasiliensis. Ph.D Thesis,* IIT, Kharagpur.

Krishankumar, A. K., Thomas E, Rao N, Potty S.N, and Sethuraj. M.R. (1990). Ecological impact of rubber (*Hevea brasiliensis*) plantations in North East India : Influence on soil physical properties with special reference to moisture retention, *Indian Journal of Natural Rubber Research,* 3 (1): 53 -63.

Krishankumar A.K. and Potty S.N. 1992. Nutrition of *Hevea* , *Natural ruhber : Biology cultvation and Technology*, (eds) Sethuraj M.R. and Mathew N.M., Elsevier, Amsterdam.

Krishankumar A.K. 1997. Rubber plantation industry in the next century. (Mal) *Mathrubhoomi Kurshika Varshika Pathippu* : 101 - 107.

Land Use Board 1997. *Kerala State Land Resource Based Perspective Plan for 2020 A.D.* GOK, Trivandrum : 235

Lee, K.E. 1991. The diversity of soil organisms in Hawksworth D.L (ed) *The biodiversity of microorganisms and invertebrates : Its Role in Sustainable Agriculture.* CAB International, Wallingford : 73 - 87.

Mahesh, R. 1994. Changing pattern of household consumption in Kerala : Consequences and Oppurtunites . *International Congress on Kerala Studies Abstracts,* 5 : 52.

Mani, S. 1982. In Analysis of Indian Natural Rubber Market, *M.Phil Disseration* . JNU, New Delhi.

MarSebastin. Valloppalli 1991. Konippadikal (Au) Kuravilangad Joseph, 1991. Bobby Books, Kozhikode :

Mathew, J. 1991. Dimensions of Demand For Rubber, *M.Phil Thesis*, University of Kerala, Kariavattom.

Menon Mukunda P. 1990. Rubber Cultivation in India An overview, *Vithu muthal vipani vare* (Mal) Rubber Board. Kottayam : 4 - 11.

Menon, Sreevalsan J. 1995. Taxonomical Analysis of Agricultural Modernity of Farmers. *MSc (Ag) Thesis*, KAU, Vellayani.

Miles, B.M. and Huberman, A.M 1994. *Qualitative Data Analysis*, Sage Publications, Thousand Oaks, London.

Mongia A.D and Bandopadhyay A.K. 1994. Soil nutrients under natural and planted forest in island ecosystem, *Journal of the Indian Society of Soil Science,* 42 : 43 - 46.

Mukherjee, C and Vaidyanathan A. 1980. Growth and Fluctuation in food grain yields per hectare, *Indian Journal of Agricultural Economics* 35 (2) : 60 - 70.

Myers, R.J.K, Palum C.A, Cueras E., Gunatilleke and Brossard M. 1994. The Synchronisation of nutrient mineralisation and plant nutrient demand, *The Biological Management of soil Fertility* (eds) Woomer P.L. and Swift M.I, John Wiley and Sons : 81 - 116.

Nair, P.R. 1979. Role of primary education in socio-economic change : The Kerala case in Oommen M.A. (ed) *Kerala Economy Since Independence*, Oxford Publication, New Delhi.

Namboothiri, Madhavan M. 1993. Factors influencing Agricultural Productivity : A case study with special reference to Kerala. *M.Phil Thesis,* University of Kerala, Kariavattom.

Norhayati, M and Lau C.H. 1990. Soil fertility changes following land clearing and rubber cultivation. Paper presented at the International Soil Science Congress Kyoto, Japan.

Oommen, M.A. 1979. Development of capitalism in Kerala agriculture : some preliminary observations, *Mainstream* **15** (20) : 22 - 29.

Pankhurst, C.E. 1994. Biological indicators of soil health and sustainable productivity, *Soil Resilience and Sustainable Land Use* (eds) GreenLand, D.J. and Szaboles I., CAB International, : 331 - 348.

Paoletti, M.G, Pimentel D, Stinner B.R, and Stinner D. 1992. Agroecosystem biodiversity : Matching production and conservation biology, *Agriculture, Ecosystems and Enviorment* **40** : 3 -23.

Patton, Q..M. 1987. *How to use Qualitative methods in evaluation.* Sage Publications, Newbury Park, London.

Patton, Q.M. 1990. *Qualitative Evaluation and Research Methods,* Sage Publications, Newbury Park London.

Pillai, P.P. 1994. *Kerala Economy : Four decades of Development,* Institute of Planning and Applied Economic Research, John Mathai Foundation, Trissur.

Prasad K.G, Singh S.B, Gupta G.N and George M. 1985. Studies on changes in soil properties under different vegetation, *Indian Forester* 3 : 794 - 801.

Premakumari, S. 1987. Nutrient recycling under monoculture conditions in the tropical forest ecosystem. *MSc (Ag) Thesis,* KAU Vellanikkara.

Raviraman, K. 1996. Intervention in the Western Ghats : An enquiry into the historical processes of loss of biodiversity and community sources of livelihood. Paper presented to the Indo - British workshop on " Biodiversity : conservation and evaluation ' at TBGRI Palode Feb 15-17, 1996.

Regeena, S. 1992. Financing of small-scale rubber growers in Kerala - an economic analysis. *Ph.D Thesis,* TNAU, Coimbatore.

Rosamma Thomas. 1989. Catholic service societies and Socio-economic Development in Kerala, A case study of Malanadu Development Society. *M.Phil Thesis,* University of Kerala, Kariavattom.

Roselind George. 1996. The consumption, saving and investment pattern in the rubber plantation sector of Kerala economy, *M.Phil Thesis,* University of Kerala, Kariavattom.

Rubber Board. 1989. *Rubber Producers Society, Karadu Niyamavali* (Mal) Kottayam.

Rubber Board. 1996 *The Rubber Board and its Functions*, Kottayam.

Rubber Board. 1996a. *Indian Rubber Statistics.* **21**, Kottayam.

Sanchez, P.A , Palm C.A, Davey C.B, Szothl. T and Russel C.E 1985. Tree crops as improvers in humid tropics (in) Cannel M.G.R. and Jackson J.N (eds) *Trees as crops plants*, U.K. Institute of Terrestrial Ecology. Hantingden.

Simmons, A.B. 1983. Migration and Rural Development conceptual Approaches, Research Findings, and Policy Issues - Proceedings of the Expert Group on population distribution, migration and development. Tunisia : 156 - 192.

Singh, B.D. 1983. *Plant Breeding*, Kalyani Publishers New Delhi : 392 - 393.

Sivanadyan, K and Norhayati, M. 1992. Consequences of transforming tropical rain forests to *Hevea* plantation. *The planter* 68 (800) : 547 - 567.

Social Science Research Council 1954. Acculturation : An exploratory formulation, *American Anthropologist*, 56 : 973 - 1002.

Sooryamoorthy, R. 1991. The Emergence of consumerism in Kerala. *Ph.D Thesis*, Loyola college of social sciences, Trivandrum.

Sooryamoorthy, R. 1994. Emergence of consumerism in Kerala, *International Congress on Kerala studies Abstracts*, 2 :15 - 17.

Srinivas, M.N. 1966. *Social Change In Modern India*. Orient Longman, New Delhi : 59.

Sunny, K.P. 1988. Consumption Behaviour in Kerala - A study on NSS data. *M.Phil Dissertation*, JNU New Delhi.

Sunny, K.P. 1994. Changes in consumption behaviour in Kerala, *International Congress on Kerala Studies Abstracts*, 2 : 63

Swaminathan, M.S. 1997. Agrobiodiversity and its potential, *Biodiversity and tropical forests - The Kerala Scenario* (eds) Pushpangadan P and Nair K.S.S., STEC, GOK. Trivandrum : 1 - 6.

Thomas K.V. Pottamkulam. 1968. *Mundakkayam Oru Avalokanam, Souvenier* (ed) M.K. George Paikad.

Thomas. P. 1978. *Swapna Bhoomiyil* (Mal)

Toffler, A. 1970. *Future Shock*, Pan Books, London.

Umadevi, S. 1989. *Plantation economy of the Third World*. Himalaya Publishing House, New Delhi.

Varghese T.C. 1975. *Agrarian change and economic consequences*, Allied Publishers : 116.

Verghese. K.E. 1982. *Slow Flows the Pampa*, Concept Publishing Company, New Delhi.

Zaccaro, S.J. and McCoy M.C. 1988. The effects of task and interpersonal cohesiveness on performance of a disjunctive group task. *Journal of Applied Social Psychology* 18 : 837 - 851.

APPENDICES

Appendix I

QUESTIONNAIRE FOR RUBBER BOARD OFFICERS

(1) Age ..... Area of working ..... in ..... district

(2) Sex ..... Qualification .....

(3) How often do you (or field officers under you) meet rubber growers ?

(a) Weekly ..... (Once, Twice, Thrice, Four times, Five times)

(4) What are the modes of contacts with the growers ?

Rank them according to the use (1,2,3 etc.)

Personal contact -

Group meeting -

Circular letters -

Office call by growers -

(5) Have the following persons helped you to organise rubber grower's meeting, seminar etc. ?

Assign ranks

Local political leader -

Church priests -

Panchayat officials -

Others (Specify) -

(6) How has been the response of growers towards your extension efforts in the traditional and non-traditional areas ?

(Give tick mark for both categories)

Traditional area	Non-traditional area
Past good, Present bad	Past good, Present bad
Past bad, Present good	Past bad, Present good
Past good, Present good	Past good, Present good
Past bad, Present bad	Past bad, Present bad

(7) If you feel extension efforts have helped in accelerating the spread of rubber in Kerala, then to what extent has been extension's contribution.
(Kindly ensure that the total adds up to 100%)

Extension contribution	.....	%
Growers initiative	.....	%
Socio-political factors	.....	%
Economic factors	.....	%
Total	....100.....	

(8) Some of the extension contribution in terms of improving productivity and decision support are enlisted. Kindly rate their effectiveness.

		Effectiveness				
		Least/	Less/	Questionable/	More/	Most
1.	Replanting operations					
2.	New planting					
3.	Popularising HYV					
4.	Discriminating fertilizer application					
5.	Plant protection					
6.	Scientific tapping					
7.	Cover crop establishment and maintenance					
8.	Rainguarding					
9.	Chemical stimulation of yield on older trees					
10.	Improving processing facilities					
11.	Development of women					
12.	Assistance to tribals					
13.	Educating farmers regarding input subsidy					
14.	Educating farmers regarding plantation insurance					
15.	Educating farmers regarding credit facilities					

(9) How are the rubber producers societies functioning in your locality ?
(Tick mark)

Very poor Poor Good Very good

(10) Did you play a key role in initiating the formation of RPS in your locality ?
Yes / No

(11) How is the participation of growers in RPS ? (Tick mark)

	Very poor	Poor	Good	Very Good
1. Participation for solving immediate problems				
2. Enjoying benefit of inputs, subsidy				
3. Group meetings and planning exercises by the growers				
4. Joint learning with the Rubber Board officials and Field officers				
5. Self-mobilisation				

(12) What are the major reasons for the failure of RPS if any ? (kindly enslist)

(13) What are the reasons for the success of RPS ? (kindly enlist)

(14) Which category of growers listed under are more enterprising (Assign rank)

Hindus Christians Muslims

(15) Of the different religious which category of growers are more enterprising? (Tick)

Hindus				Christians				Muslims			
Young Male	Old Female	Young Male	Old Female	Young Male	Old Female	Young Male	Old Female	Young Female	Old		
Lower class	Middle class	Lower class	Middle class	Lower class	Middle class	Lower class	Middle class	Lower class	Middle class		
Upper class		Upper class		Upper class		Upper class		Upper class			

Appendix II

Interview Schedule for small growers

1. Name of the small grower -
2. Age in completed years -
3. Religion -
4. Educational status -
5. Holding size (in acres) -
6. Source of labour - Family labour/ hired labour/ both
7. Educational status of family members
   - Wife -
   - Son -
   - Daughter -
   - Others -
8. Factors affecting spread of rubber cultivation
   (Most important/ More important/ Questionable/ Less important/ Least important)

   1. Permanent source of income
   2. Easily manageable crop
   3. Low disease incidence
   4. High long term returns
   5. More employment avenues
   6. Suitable for self employment
   7. Investment profit ratio high
   8. Easy marketability
   9. Attractive price
   10. Additional income from timber
   11. Additional income from intercrop
   12. Symbol of social status
   13. Knowledge of rubber cultivation
   14. Absence of ceiling on land
   15. Adaptability to different edaphic conditions
   16. Availability of HYV
   17. High disease incidence of pepper, arecanut and coconut
   18. Low productivity of cashew
   19. Low productivity of coconut
   20. High risk involved in other crops
   21. Change in Income Tax regulations
   22. Easyness in processing
   23. High utilisation of family labour
   24. Continous demand in market
   25. Catholic communities interest in cultivation
   26. Indirect influences through Church
   27. Organised R & D activities
   28. Imitating European cultivators
   29. Suitability as secondary income source

30. Rubber Boards extension efforts at grass root level
31. Extension efforts consistent with the values and beliefs of the people
32. Labour input is less
33. Credit support
34. Presence of marketing societies
35. Subdivision and fragmentation of land
36. Effective functioning of RPS
37. Intense political lobbying
38. Aiming for better standard of living
39. Real estate business potential
40. Inheritance through traditional cultivation
41. Land encroachment by settlers
42. Special schemes for Sc and ST
43. Increased interest shown by all religions, class and castes

9. Some of the extension contribution in terms of improving productivity and decision support are enlisted. Kindly rate their effectiveness.

	Effectiveness				
	Least/	Less/	Questionable/	More/	Most
1. Replanting operations					
2. New planting					
3. Popularising HYV					
4. Discriminating fertilizer application					
5. Plant protection					
6. Scientific tapping					
7. Cover crop establishment and maintenance					
8. Rainguarding					
9. Chemical stimulation of yield on older trees					
10. Improving processing facilities					
11. Development of women					
12. Assistance to tribals					
13. Educating farmers regarding input subsidy					
14. Educating farmers regarding plantation insurance					
15. Educating farmers regarding credit facilities					

10. How is the participation of growers in RPS ? (Tick mark)

	Very poor	Poor	Good	Very Good
1. Participation for solving immediate problems				
2. Enjoying benefit of inputs, subsidy				
3. Group meetings and planning exercises by the growers				
4. Joint learning with the Rubber Board officials and Field officers				
5. Self-mobilisation				

11. **Agricultural modernity**

1. Adoption behaviour

A. Adoption of improved management practices in rubber

1. Area under HYV
2. Quantity of organic matter
3. Quantity of lime
4. Fertilizer Dose
   - N
   - P
   - K
   - Mg
5. Name of pests and diseases
6. Period of occurrence
7. How is it identified
8. Name and quantity of chemical

B. Innovativeness

	Yes / UD / NO
1. A good farmer experiments with new ideas in farming	
2. Though it takes time for a farmer to learn new methods it is worth taking the efforts	
3. As soon as you get information regarding a new agricultural practice, will you take immediate decisionto put it into practice.	
4. If the Government would help you to establish a farm elsewhere would you move?	
5. Do you think a farmer, experimenting with his own new ideas, but maintaining his farm/enterprise without loss could be called innovative?	

2. Communication behaviour

A. Information source utilisation

	Regularly / Sometimes / Never
1. Impersonal source	
a) Radio	
b) Newspaper	

c) T.V.
d) Farm magazine
e) Farm articles in popular magazines

2. Formal personal source:
a) Agricultural Assistants
b) Agricultural Officer
c) Field officers of Rubber Board

3. Informal personal souce
a) Friends & Relatives
b) Neighbours and fellow farmers
c) Family members
d) Progressive farmers
e) Local leaders

4. Commercial source
a) Fertilizer dealers
b) Pesticide dealers
c) Co-operative officials
d) Bank personnels

5. Other source
a) Exhibitions / Melas / Festivals
b) Group meetings
c) Training
d) Demonstrations
e) Seminars

B. Information Dissemination Behaviour

Regularly/ Sometimes / Never

How many times a week will you convey improved agricultual information to the following persons
a) Family members
b) Friends/relatives
c) Neighbours
d) Fellow cultivators
e) Farmers outside the village

3. Entrepreneurial behaviour

A. Economic Motivation

(Strongly agree/ agree/ Questionable/ disagree/ strongly disagree)

- Community respects rich farmers more than poor farmers
- Prestige is more important than profit in judging success of farm
- Money alone does not give satisfaction in a farmer's life
- A farmer should always aim at social recognition than recognition on monetary ground
- Farmers should adopt an innovation which helps him to get more money

- A farmer requires only money to achieve most of the goals in life

B. Calculated Risk taking
(Strongly agree/ agree/ questionable/ disagree/ strongly disagree)

I don't fear investing my money on a venture whose dividends I have calculated

I will consider a risk worthtaking if the possibility for success is 40 - 60%

I don't mind working under conditions of uncertainity as long as there is a reasonable probability of gains from it for me

I will consider a risk worthtaking only if the probability for success is 60%

I don't care if the profit is small so long as it is assured and constant

4. Socio-psychological behaviour

A. Attitude towards Scientific cultivation

Scientific cultivation spoils structure and fertility status of soil

Only scientific agriculture can bring prosperity to our nation

It will be possible to solve our food problem through HYV cultivation

It is very difficult to cultivate HYV by an ordinary farmer

Chemical fertilizers and plant protection chemicals are important methods to increase production

The way a farmer's forefathers farmed is still be best way to farm

B. Knowledge about improved farm practices

Name 2 HYV
Quantity of organic matter
Fertilizer dose
Name 2 Weedicides
Name 2 Pests
Name 2 diseases
Name 2 insecticides
Name 2 fungicides

Appendix III

Subsidised rates of inputs through RPS as against that of Private dealers

No.	Input		RPS rates	Private rates
1.	Formic Acid	35 kg	46.75	50.00
2.	Formic Acid	1 kg	52.50	60.00
3.	Tapping Knife 5.5"	1 each	60.00	85.00
4.	Tapping Knife 6.5"	1 each	76.00	100.00
5.	Tapping Knife 9"	1 each	120.00	140.00
6.	Copper sulphate (loose)	1 kg	47.50	52.22
7.	Plastic twine (Ancore)	1 kg	60.00	70.00
8.	Golden Touch	100 gm	22.00	25.00
9.	Golden Touch	200 gm	43.00	48.00
10.	Plastic Cup	1 each	1.60	2.10
11.	Cup Hanger 1 grade	1 kg	30.00	33.00
12.	Cup Hanger 2 grade	1 kg	29.00	35.00
13.	Sieve	1 each	110.00	120 - 165
14.	Aluminium Dish 500 gm	1	63.00	75.00
15.	Aluminium Mug	1 each	24.00	44.00
16.	Urea	1 kg	3.34*	3.74
17.	Mussorie Phos	1 kg	1.40*	2.10
18.	Muriate of Potash	1 kg	3.22*	4.22

* - Extra 6% of expense is also added

Appendix IV

Rubber : Area, Yield and Production in India

Year	Area	Yield	Production	Annual Growth
1950 - 51	75	284	15830	-
1960 - 61	144	365	25697	4.96
1970 - 71	217	653	92171	13.62
1980 - 81	284	788	153100	5.21
1990 - 91	475	1076	329615	7.97
1991 - 92	489	1130	366745	11.26
1992 - 93	499	1191	393490	7.29
1993 - 94	508	1285	435160	10.59
1994 - 95	516	1362	471815	8.42
1995 - 96	523	1422	506910	7.44
1996 - 97 (Estimate)	530	1500	549000	8.30

Production, Consumption and Import of Natural Rubber (NR) in India

Year	Production	Consumption	Import
	in metric tonnes		
1950 - 51	15830	19854	4170
1960 - 61	25697	48148	23125
1970 - 71	92171	87237	2469
1980 - 81	153100	173630	9250
1990 - 91	329615	364310	49013
1991 - 92	366745	380150	15030
1992 - 93	393490	414105	17884
1993 - 94	435160	450480	19940
1994 - 95	471815	485850	8093
1995 - 96	506910	525465	51635
1996 - 97 (Estimate)	549000	570000	15000

Appendix V

Tappable area, production and average yield of rubber per hectare in Kerala

Year	Tapped area (hectares)	Production (tonnes)	Averaged Yield (kg/hectare)
1955-56	62399	21680	347
1956-57	67394	21853	324
1957-58	66198	22196	335
1958-59	65415	22062	337
1959-60	65007	21890	336
1960-61	65355	23175	354
1961-62	69269	24954	360
1962-63	78516	29057	370
1963-64	89529	33792	377
1964-65	102125	41391	405
1965-66	106623	46953	440
1966-67	107298	50495	471
1967-68	111400	59978	538
1968-69	116935	66473	568
1969-70	126358	76897	609
1970-71	134103	86773	647
1971-72	142000	95499	673
1972-73	146957	105934	721
1973-74	156384	117221	750
1974-75	160956	121558	755
1975-76	167742	128769	768
1976-77	173737	139349	802
1977-78	177085	123677	698
1979-80	178890	136609	764
1980-81	179980	140320	780
1981-82	181180	139435	770
1982-83	184340	152662	828
1983-84	187720	162212	864
1984-85	193290	172092	890
1985-86	205780	184563	897
1986-87	218750	202129	924
1987-88	229940	216562	942
1988-89	246660	238414	967
1989-90	268714	275397	1025
1990-91	284960	307521	1079
1991-92	301360	343109	1139
1992-93	306539	368648	1203
1993-94	313416	408311	1304
1994-95	318965	442830	1389

Appendix VI

Rotated matrix of variable loadings

	VX 1	VX 2	VX 3	VX 4	VX 5	VX 6	VX 7	VX 8	VX 9	VX 10	VX 11	VX12	CO
X1	0634	0693	2831	- 0070	1584	- 3660	5121	- 0699	1326	4808	1427	- 0417	7861
X2	- 0541	8748	0409	- 0207	- 0434	0453	- 1199	- 0081	1097	0904	0253	0141	8095
X3	1601	- 1204	- 0603	- 0396	- 0875	0166	8391	0974	0302	- 0544	- 0912	0429	7809
X4	- 1745	0280	0692	6734	1128	0294	2659	- 0572	- 1170	- 0733	2757	0382	6737
X5	7779	0172	0559	- 2469	1996	1557	- 0600	- 0962	0663	- 0782	1011	1717	7966
X6	8670	0221	0116	- 0387	0440	0285	1952	0880	0463	- 1212	0813	- 0954	8349
X7	5203	1818	- 1876	3063	- 2422	- 1051	1971	1291	- 2431	0328	1241	- 1264	6496
X8	2505	- 0216	0165	0590	- 0527	0356	0233	7912	0528	- 0461	- 0345	0381	7051
X9	2742	1425	3237	0483	1660	- 2355	- 0762	2066	- 0698	- 4080	- 2892	1809	6724
X10	3183	1245	- 1479	1709	2144	- 0856	- 0993	0836	- 4408	- 0936	0485	3718	5816
X11	3625	0597	- 0701	1328	- 2049	- 0674	4027	- 2697	1437	- 2488	1198	- 0462	5380
X12	- 2280	- 0909	0097	7943	0444	0755	- 2264	0684	1232	0247	- 0238	- 1045	7821
X13	- 7676	0190	0047	1389	2150	2037	0465	- 0849	- 0270	- 1182	0731	0661	7265
X14	4013	2189	- 0571	- 1245	3605	- 3249	- 2375	- 0017	- 2779	- 1187	- 1520	- 1752	6647
X15	4726	0754	- 0152	0797	1929	- 5215	0780	0641	- 0573	1685	1238	- 0736	6075
X16	7524	1548	0123	0827	0101	- 0893	1498	0594	- 0943	- 0504	- 0485	0263	6456
X17	- 6228	2678	1316	- 1390	3494	2743	1562	1921	- 0779	1061	- 0330	- 1174	7870
X18	0423	0482	- 0465	- 0749	0591	- 0474	0567	0650	- 1267	0122	- 0301	0850	9355
X19	- 8746	- 0304	0954	- 0894	- 1285	1297	- 1011	- 0544	0431	0603	- 0056	- 0766	8408
X20	- 7805	0654	1177	0822	- 0775	2221	- 0700	- 1214	- 0853	0820	0974	- 1840	7665
X21	- 0498	1005	0166	- 0130	1038	- 2197	0858	0874	8098	0254	0245	- 0041	7441
X22	- 1148	2919	- 1152	1092	- 4400	4123	0074	- 0945	5186	0527	- 0755	- 0414	7734
X23	- 0766	4442	- 0461	3998	0648	1269	0697	- 4562	0008	2423	- 2933	3083	8381
X24	- 2419	- 3556	5820	0916	- 2805	- 3386	- 1160	- 0588	1112	- 0241	0128	1417	7764
X25	- 2250	0982	8485	0270	0278	0430	0056	0648	- 0316	- 0535	- 0264	1044	7991
X26	- 3605	- 2552	- 0831	1614	- 1230	0831	- 0379	- 1685	2546	1694	- 3754	- 3755	6269
X27	- 2636	1522	- 0077	- 0163	- 1661	2510	- 2576	1691	- 0109	6455	- 0331	- 1025	6963
X28	- 9118	0546	0839	1209	0102	0937	0201	- 1601	1204	- 0631	0123	0177	9098
X29	- 3513	- 0511	1092	0252	- 0162	0537	- 0364	1299	- 0709	- 0580	1289	0752	6209
X30	4214	0923	- 0462	- 0476	2990	- 0669	1070	4258	- 2398	- 0226	- 0649	3195	6409
X31	0400	- 0158	1527	- 0415	- 1218	- 0934	0230	0641	- 0011	- 0766	1008	7980	7054
X32	- 3122	- 3807	- 0590	1213	4366	3811	- 0422	1101	2333	0552	- 2442	1108	7411
X33	5516	1928	- 1807	1720	- 1995	- 1896	- 0518	3383	- 0533	- 0482	0868	- 1039	6201
X34	7545	1563	0356	- 0393	1626	- 1076	0511	- 1351	- 1044	0469	1350	- 0719	6913
X35	- 7154	1775	- 0010	- 0405	- 1506	- 1618	- 0308	- 021	0 2295	0620	3252	0944	7665
X36	- 1473	0874	- 0350	0720	0461	7861	- 0159	0033	- 1954	1492	0742	- 1765	7531
X37	- 4468	- 1456	- 0929	1202	1306	0666	- 0853	- 0952	2324	- 1525	5707	1401	7009
X38	- 2193	0090	0178	- 1548	- 7934	0570	0778	0804	- 0142	0888	- 0643	0840	7321
X39	9026	- 0734	- 1084	- 0016	0287	- 1377	0971	- 0606	- 0273	1256	- 0653	0421	8836
X40	- 8932	- 0198	1205	1658	- 1005	0362	- 0754	- 1247	- 0436	- 0069	0294	0971	8757
X41	8342	0315	- 1791	- 0196	0074	- 0246	- 0155	1702	- 1737	0538	0769	1110	8104
X42	3737	1222	0115	2597	- 0788	0319	- 0369	0570	- 1643	0463	5887	1177	6236
X43	6847	- 0791	3254	- 0039	- 0282	1654	- 2743	0260	- 0579	- 0306	2618	- 1168	7719
% VAR	28 9201	4 3040	3 8237	4 1725	4 6732	5 0076	3 9816	3 7158	4 2455	3 9171	3 4611	3 4762	73 6983

Appendix VII

Addresses of experts consulted during the study

Dr. P. Pushpangadan	Director Institute, Palode,	Tropical Botanical Garden Research Trivandrum.
Dr. Vandana Shiva	Director	Research Foundation for Science, Technology and Ecology, A-60, Hauzkhas, New Delhi - 16.
Dr. R. S. Iyer	Former head and Professor Department of Chemistry, KAU	College of Agriculture, Vellayani Thiruvananthapuram - 695 522.
Dr. C. Rajendran	Associate Professor Department of Chemistry, KAU	- do -
Dr. P. J. Joseph	Assistant Professor Department of Plant Pathology, KAU	- do -
Dr. S. Umadevi	Head and Professor	Department of Economics, Kerala University, Kariavattom, Thiruvanathapuram
Dr. P. Rajasekharan	Senior Scientist (Economics)	Rubber Research Institute of India Kottayam.
Dr. Babu Ambat	Director	Centre for Environment and Development, Near Employment Exchange, Thiruvanathapuram