# CONSEQUENCES OF CONVERSION OF MARGINAL HOMESTEADS FOR PLANTING RUBBER IN KOTTAYAM DISTRICT

By

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**THESIS**

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for the degree of

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Kerala Agricultural University

DEPARTMENT OF AGRICULTURAL EXTENSION
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**1997**

## DECLARATION

I hereby declare that this thesis entitled "**Consequences of Conversion of Marginal Homesteads for Planting Rubber in Kottayam District**" is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

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# Introduction

# CHAPTER I

# INTRODUCTION

The evolution of human race from a hunter-gatherer existence to that of agriculture was neither an accident, nor a breakthrough in history. Harrison (1993) observed that cultures which adopted agriculture did so because they were forced to, by a resource crisis of their own making, as increasing populations pressed on shrinking wild food resources. Though the roots of agriculture were established around 10,000 BC, settled agriculture came much later. Many communities used to thrive on shifting cultivation as is still followed in few areas globally. Probably, settled agriculture and the sedentarization it introduced, paved the way for viewing land as a permanent resource base. Agriculture brought along with it domestication of plants from the wild to suit human needs and biological cycles. For centuries agriculture was practised to meet the basic survival needs of the population, and in turn was adapted to the local geographical and topographical peculiarities and availability of species which met the food, fuel, timber, manurial and fodder requirements.

The Industrial Revolution in the eighteenth century increased the need for natural resources like timber and fuel. This in turn led to a severe resource crunch in the Europe. In fact, these developments laid the foundations of colonialism of Third World tropical countries like Latin America, South East Asia, Srilanka and India. Colonisation of these countries was aimed at utilizing their natural resources mainly rainforests-to meet the requirement of raw materials for the expanding industries of the Industrial Europe, chiefly, England, Holland, Spain and France. Plantation agriculture could be considered as a byproduct of colonialism. It was since the Industrial Revolution in Europe that further changes in agriculture and land use came in.

Indian states, especially Kerala has a very long history of trade relations with the Middle East and Europe in spices and forest products. But these trade transactions were based on exchange rather than money. The European traders of the sixteenth and seventeenth century like the Portuguese, Dutch, French and the British in the eighteenth and nineteenth century laid and strengthened the foundations of commercialization of trade in agricultural products. They also introduced the plantation crops like coffee, tea, cardamom and rubber based on the geographical suitability. Most of these early plantations came on the virgin forests cut down by the colonial forces.

Rubber was the last to enter India as a plantation crop introduced by the British. A native of Brazil, rubber was first introduced to the world by Christopher Columbus in 1493 when he saw some native tribal children on the South American land playing with a `ball'. He took a few balls with him and presented them to the King and Queen of Spain. Later, the fame of rubber spread to other European countries. The `vulcanization' process of rubber discovered by Charles Goodyear opened up the commercial possibilities of this plant. The foundation as a plantation crop was laid when Sir Henry Wickham brought seedlings of *Hevea braziliensis* from Brazil to Srilanka. From then on its spread as a plantation crop has never had a looking back.

The first rubber plantation in India on a commercial basis was started in 1902 on the banks of Periyar river in Kerala at a place called Thattekad. By 1910, rubber had spread to 12,000 hectares in Kerala. In the beginning it was essentially cultivated as an estate crop. The need for rubber received a boost with the First World War and the consequent expansion of automobile and tyre industries. The very high international demand for rubber led to rapid expansion of the crop throughout Kerala and North East India. The setting up of the Rubber Board and Rubber Research Institute in 1947 and 1955 respectively, provided further impetus to expansion of area. Slowly, with the saturation of area under the estate sector, the crop spread to small holdings as well. The introduction of Rubber New Planting Subsidy Scheme since 1979 by the Rubber Board was aimed at spreading rubber to small holdings through provision of various growth subsidies. A well planned strategy of research, extension and regulation and planting of natural rubber undertaken by the Rubber Board has contributed a lot towards expansion of this crop in the state. The Government of India has equally contributed towards its expansion. The importance of rubber in the cash economy can be highlighted from the fact that maximum Government expenditure for commercial crop development went to rubber (27.85 crores) followed by tea, coffee, spices and the least for coconut (2.5 crores) as reported by Mani (1992a).

The area under rubber in the state has steadily increased from 78,457 ha in the 1950s to 4,43,300 ha in the 1994-95 period (Anonymous, 1990; Abraham, 1995). Among all the plantation crops rubber commands the largest area increase since 1975 in Kerala. For the decade 1975-85, the area under rubber increased by 64.2%, while for coconut it was only 1.69% (Sundaresan and Gopinath, 1990). Small holdings were mainly responsible for this area increase. Out of the 4,43,300 hectares of rubber area, 3,98,929 ha fell under the small holdings sector and most of them less than one hectare category or marginal farmer category (Abraham, 1995).

All these facts and figures show a distinct trend of change in agricultural land use in Kerala. Started off by the plantation crops, there has been a gradual shift in the farming systems of the state from subsistence oriented farming to farming for cash and foreign exchange. More and more area has been brought under commercial crops. The paddy cultivation area has dropped by 30 per cent from about 8 lakh ha in 1980-81 to 5.41 lakh ha in 1991-92. Tapioca, another important food crop has also lost about 1 lakh hectares (Anonymous, 1993). The area under many other crops like pepper, ginger, turmeric, cashew, jack, mango and the like have registered a similar decrease over the 1975-76 to 1994-95 period. At the same time the net cultivated area under plantation crops has registered an increase from 18% to 24% over the 1980-1990s period and is still increasing (Mani, 1992b).

## 1.1 Need for the study

Kerala is a state characterized by a very undulating topography of hills, valleys, plains and mountains. The state which covers only 1.18% of the total land area of India supports 3.5% (25 million) of the country's population with a high density of 655 persons per sq.km. (Nair and Sreedharan, 1989). Due to the high density of population and very less area actually available for cultivation, the size of individual holdings is very small varying from 0.02 to 1 ha. Homesteads, which involve an intensive and diverse use of the available land, have thus evolved as major farming systems in the state. A wide variety of crops both annuals and perennials, are grown in a mixture to meet the food, fuel, fodder, timber and manure requirements of the family which lives in the homestead. They may also have one or two pairs of cattle and a small unit of poultry. Most of the produce generated is consumed in the home itself and the remaining provides subsidiary income to the family. Over years of experience, these homesteads have evolved into self-sustaining and productive farming systems with optimum utilization of available land, solar energy and technological inputs and efficient recycling of farm and home wastes. More than 50% of the cultivated area is under this system (Nair and Sreedharan, 1989).

The expansion of rubber has entered into the homestead sector since the encouragement of area expansion into the small holding sector by the Rubber Board. Nair and Sreedharan (1989) have observed that rubber has entered even in the homesteads.

Any change from a mixed cropping system like homesteads to a monocrop like rubber or in other words from a traditional subsistence based farming system like the homestead to a cash crop like rubber is bound to have socio-economic, ecological and psychological consequences in the society. Kerala, even after independence has followed the path of a steady increase in the area under non-food crops for subsistence crops. We depend on our neighbouring states like Andhra Pradesh, Tamil Nadu or Karnataka or even far away states like Punjab to meet our increasing shortage of food grains, vegetables, fruits and the like. For instance, during 1991, the state produced hardly 38 per cent of its rice requirement of 28 lakh tonnes. Kerala has now an annual expenditure of Rs.700 crores for buying rice from other states (Anonymous, 1993). The newspaper reports place the production at hardly 10% of requirement. We bring 70% of the vegetables from neighbouring states. Similar is the case of other essentialities like fruits, egg and the like.

Homesteads and homestead based products also support a number of traditional industries and vocations like thatching, fencing, bamboo basket/mat weaving, coconut oil extraction, arecanut processing, coir industry to name a few. Apart from the production functions of food, fuel, timber, fodder and manure, they also have a number of protection functions like providing fencing material, medicine, stake and prop materials and the like. So the study proposes to find out what all crop components and structural intermixes of the homestead have been replaced by rubber, apart from the area under homestead converted. Similarly, the important social and family oriented functions of homesteads replaced by rubber are also proposed to be investigated. So far, no study has been conducted which analysed the transition of homesteads as systems of subsistence to cash crop systems of rubber.

It is envisaged that this study would throw light on the important factors which might have contributed towards the large scale conversion of marginal homesteads for planting rubber. The various consequences of conversion affecting the individual, family and the society due to this land use change is also intended to be analysed. The different dimensions of conversion would throw light on the desirability of such changes for the society at large. The perceived ecological consequences in particular will help to point out whether such land use shifts will contribute to the ecological changes occurring in the study area.

It is also proposed to develop a discriminant function to differentiate between the convertors and non-convertors based on the studied variables of farmers who have converted their marginal homesteads to rubber and those who still retain homestead farming.

The overall implications that emerge from this study will be used to suggest a suitable strategy to rationalize the land use pattern in the study area or put forward alternate strategies for sustainable use of land to meet the increasing food and resource deficit in the state.

The study was thus designed with the following specific objectives:

1. to find out the nature and extent of conversion of marginal homesteads for planting rubber;

2. to develop a discriminant function to differentiate between the convertors and non-convertors of marginal homesteads for planting rubber with respect to the selected factors influencing conversion and non-conversion;
3. to find out the influence of the selected factors on the nature of conversion, extent of conversion and conversion of marginal homesteads for planting rubber by the rubber farmers;
4. to analyse the consequences of conversion of marginal homesteads for planting rubber; and
5. based on the findings, to suggest a suitable strategy for rationalizing the land use pattern of marginal homesteads in the study area.

## 1.2 Limitations of the study

The present study was conducted as a part of the doctoral research programme. Out of the three years allowed, one whole year had to be devoted to completion of course work. Therefore, the study was limited to a single district in the state due to the limitations of time and coverage possible practically, in the stipulated period. However, care has been taken to make the study as objective and systematic as possible. Although the district was selected as a true representation of the subject of study, the study may have some limitations in making generalisation to other areas. Nevertheless, it is expected that the findings of this study would definitely throw light on the different dimensions of change in land use in the society and suggest alternatives for a rational land use for future.

## 1.3 Presentation of the study

The thesis is divided into five chapters. The first chapter has already covered the brief background, need, objectives and limitations of the study. The second chapter deals with the theoretical orientation covering the review of literature pertaining to the study along with a brief historical background of the study and study area. The third one comprises the methodology dealing with the description of the study area, selection of respondents, empirical measurement of the selected variables, tools for data collection and statistical techniques used. The fourth chapter deals with the results of the study and also discussion on the results. The final chapter gives the summary and conclusion of the study. The references and appendix make up the rear end.

# Theoretical Orientation

# CHAPTER II

# THEORETICAL ORIENTATION

A review of previous works, either theoretical or empirical, may assist in throwing light on the various dimensions of the study area, the historical background, philosophies and ideas based on which the problem area originated, new problem or research areas that may evolve in future, which in turn may assist in developing a sound theoretical framework for the study. It may also help in operationalising the important variables enabling data collection on the problem under investigation. Based on the objectives of the study the literature collected has been reviewed under the following broad heads.

1. Changing land use in Travancore - a historical perspective
2. Homesteads as agroforestry systems
3. Plantation systems
4. Factors discriminating convertors and non- convertors of marginal homesteads for planting rubber
5. Nature of conversion of marginal homesteads for planting rubber
6. Extent of conversion of marginal homesteads for planting rubber
7. Relationship between conversion of marginal homesteads for planting rubber and factors influencing conversion
8. Consequences of conversion of marginal homesteads for planting rubber
9. Conceptual framework for the study

## 2.1 Changing land use in Travancore - A historical perspective

In BC 390, when the adventurous Gauls attacked Rome, pepper was one of the materials which they robbed and took back to their country (Joseph, 1972). The famous traveller Al-Baruni has noted down in his travelogue that Kerala was the seat of peace and prosperity way back in 10th century, due to abundance of trade in pepper and cardamom. Historical evidences also indicate that to obtain the monopoly in pepper trade, Roman traders had presented the King of Kodungallur (erstwhile Cranganore) with a golden crown among many other gifts. All these historical facts indicate that Kerala was famous for pepper and cardamom trade even before the birth of Christ throughout the world and thus paved the way for trade and cultural mix with western countries.

Upto the 16th century AD, pepper played a very significant role in the economy of Kerala. During those days pepper was a hill produce and not a plantation product. Like many other hill products pepper was bought locally by traders mostly Arabs, Chinese, Portuguese etc. The increasing demand for this hill produce later led to the widespread cultivation for the purpose of trade. Pepper was allowed to climb almost on any tree in the homesteads unlike in the present. In due course when the Portuguese domination increased they demanded the local rulers to collect the entire produce from the cultivators and sell them at a fixed price. Soon the cultivators were forced to sell their produce at a low price to the local Rajahs at a personal loss, and the Rajahs in turn received handsome gifts from the traders. When this process continued, slowly the price of pepper came down. By 1670 AD, the cultivation of pepper also crashed down to a minimum level indicator of the introduction of market economy into local trade related to agriculture. The Portuguese in turn also introduced plantation crops like cashew, pineapple, cassava, *Atocarpus* and paɪaya into the land of Kerala before they left in the 17th century.

The Dutch closely followed the Portuguese methods of trade and commerce. They introduced the scientific cultivation of coconut on a plantation scale (commercial scale) during their short tenure. This was closely on the heels of the collapse of pepper trade.

### 2.1.1 Changes in land relations

The year 1860 was a crucial turning point in the history of Travancore. It was the year when Ayilyam Thirunal Maharajah Rama Varma (1860-1880) ascended throne. One of the important measures carried out during his administration was enfranchisement of Sirkar Pattom* lands by the Royal Pattom proclamation of June, 1865. Upto that time, the Sirkar was considered as the sole landlord of the whole state. The farmers held land from a Jenmi** and had no right to sell or make any transactions of the land. The Maharajah's proclamation declared all Sirkar Pattom lands to be private property, heritable and saleable. Equally important was the Jenmi-Kudiyans*** Royal Proclamation of 1867. Apart from the land held by the Government issued on tenure (Sirkar lands) considerable area with the state was also held by Jenmis mostly Brahmins. By this Royal Act, it was declared that so long as tenants paid the stipulated rates and other customary dues to the Jenmis, they should not be liable to ejection. By an amendment in 1895 of the

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* Land given on lease by the British Crown

** Land Lord by birth right    *** Land Lord - tenant

Jenmi-Kudiyan Regulation, the tenant's fixity of tenure was finally established and his right was also made heritable or transferable (Aiya, 1906).

Devi (1989) has inferred that, this step of granting ownership rights to tenant cultivators on Sirkar lands coincided with the Sirkar's intention of encouraging settlement of Europeans. The Dewan of Travancore in his Administration Report of 1865 said that "the Sirkar might offer a certain acres of waste lands free of all rent of a generation or for long, but stated period to such ryots as would afford as guarantee of permanent residence in the country by building a homestead of a specified value, towards the creation of which also the Sirkar might permit timber to be felled free of all charges".

The extension of cultivation was one of the most prominent features during the reign of Sri Mulam Thirunal Maharajah. The sense of security fostered by the Revenue settlements and the direct tax collection from Sirkar lands encouraged the cultivating farmers to open up unoccupied tracts which till then remained untouched. This period also saw the opening up of hilly tracts for plantation crops like tea, coffee, cinchona and rubber by the European planters. Lands were assigned at concessional rates. The natives, encouraged by European settlers were also eager to take up fresh land for cultivation. Large numbers began to squat on the hills while others made strehuous efforts to reclaim backwaters for paddy cultivation ( Pillai, 1940b).

Another reform was reducing the assessment on waste lands which formerly was equal to that imposed on best lands in the vicinity. In 1893 an average ground value of Re.1, per acre was fixed on such lands. The virgin lands on the hills of Chengannur, Thiruvalla, Changanassery, Kottayam, Meenachil, Muvattupuzha and Thodupuzha were unregistered dry hilly tracts (*Malancherickal lands*) where the tribals followed a system of shifting cultivation once in twelve or six years. The brushwood was cleared on these lands and a first crop of (*Ozhavu*) paddy was raised. The second crop (*Kerla*) was usually paddy/other cereals/tapioca and the third crop (*Kurumpuppu*) cereals other than paddy, sugarcane, ginger, yams, plantains etc. Cultivation was followed for 3-5 years and the land was left fallow till the next period. In 1911, the Travancore Government prohibited the system of *Malavarum* or *Vilanilamadi* cultivation as it was known and brought these lands under *Puduval* or Sirkar farm rules, for waste lands. The Cherickal lands already planted for tea, coffee, cardamom and rubber were exempted from these new rules ( Pillai, 1940c). Atleast 1,09,129 acres of Cherickal lands were thus opened for cultivation. They formed about 1/10th of the total lands in Travancore in 1913. From the point of view of rubber cultivation, these lands were important since most of these were to be found in the seven taluks which became the major producers of rubber ( Devi, 1989).

By the inspiration of Dewan Madhava Rao and Resident Maltby, King Ayilyam Thirunal took active steps for promotion of planters. Work on the road from Kottayam to the Ghats resulted in two coffee estates being opened as early as 1862. During these years, the value of coffee exports rose and reached a peak of Rs.9.89 lakhs in 1876-77 (Nadar, 1980). Initially the people down below in the plains were unwilling to shift their habitation to mountainous districts to endure separation from friends and relatives, to brave the difficulties of climate and to contend with malaria and wild animals of the jungle. So the Sirkar was inclined to offer special inducements to attract investments. Sri Visakhom Thirunal, the first Prince (1880-85) and Sri. Dewan T. Madhava Rao jointly owned 150 acre coffee estates in the hills as a further inducement. Numerous tax concessions were granted to planters. A large number of European planters took advantage of this opportunity offered and cut down the forests for plantations (Pillai, 1940c).

At the same time natives reclaimed the waste lands in the plains for expanding cultivation. Atleast 85000 acres of land, mostly virgin forests were sold to Europeans and a few Indians. The price/acre which was fixed originally at Rs.6 rose to Rs.80. After a time the Government itself decided to stop further sales. In 1913, The Travancore Government passed the first law limiting the extent of tea and coffee planting. There was to be no new cultivation within 50 yards of any stream bed or within one fourth mile of the crest of any hill nor was livestock grazing to be allowed in natural second growth forests (Tucker, 1988). In spite of that, tea, coffee, cardamom, rubber and cinchona, all found a place in the High Ranges by the turn of this century ( Pillai, 1940c).

Later, changes in land relations were also effected by the Travancore Nayar Regulation Act of 1913 and 1925, and similar Acts like the Travancore Ezhava Regulation of 1925, Nanjinad Vellala Regulation of 1926 and Travancore Malayala Brahmins Regulations of 1931. All these acted against the matrilinear (Marumakkathayam) system of inheritance and resulted in the breaking up of joint family systems (Varghese, 1970). Slowly the Nairs were forced to part with their land and fragmentation of joint properties started taking place on a large scale, during the beginning of this century. In turn, the Christian and Muslim populations, who mostly followed a patrilinear system of inheritance, took advantage of the situation and acquired more and more land from the Hindus. Most of these holdings acquired were used for further extension of area under cash crops and not food crops.

### 2.1.2 Taxation policies of Travancore Government

For the purpose of taxation, the lands in Travancore were classified as wet, garden and dry or waste lands. Wet lands were lands which were levelled and bunded and adapted for cultivation of paddy. Lands under coconut, arecanut, palmyrah, jack, punna, tamarind, mango and the like were garden lands. Dry lands were lands under crops other than those mentioned above (excluding plantation crops). Waste lands were lands left uncultivated and later brought under plantation crops (Porampoke lands or lands left for communal purposes like grazing, collection of green manure etc.) ( Devi, 1989).

For the purpose of encouraging commercial crop cultivation, the taxes on waste lands levied for coffee, tea and rubber cultivation were very light. Lands granted for tea and coffee were to bear an annual assessment of Re.1/acre. If any portion of such land was cultivated with rubber, cardamom or other special crops liable to higher tax, then higher tax was levied from such portions of lands. Lands granted for rubber were assessed with a tax of Rs.6/acre for the first year and thereafter Rs.2/acre from the date of occupation. As for cardamom, the rate was fixed at Re.1/acre for the first four years of occupation with permission from Sirkar and thereafter Rs.2/acre later to Rs.3/acre (Pillai, 1940c).

Apart from this, two famous historic land concessions were made by the Travancore Sirkar for expanding plantations. One was the ten square miles concession in taluks of Shenkotta and Pathanapuram in 1849 to Mr. Huxam which were planted with tea and coffee. Formerly the rent was just 2.5 annas per acre. After 1912, a freehold tax of just Re.1/acre was levied on these lands. The other was the Kannan Devan Hills belonging to the Poonjar Rajah (comprising an area of 215 sq. miles) granted to the Kannan Devan Hill Produce Company, an English concern by the Sirkar. The rate of tax was two annas later raised to 0.5 a British Rupee per annum. These large tracts of land were covered with thick forests (Pillai, 1940c; Devi, 1989).

At the same time, tax on paddy lands worked out to 20 per cent of the gross income, on coconut lands just 15 per cent and for lands under rubber to roughly 0.2 per cent. Till 1906, these land taxes were paid in kind and money. After 1906, the system of tax payment in kind was completely substituted by money payment. The tax was thereafter fixed in money and it did not change with the change in price of paddy.

Since the paddy price was falling during those years, the paddy farmers were forced to sell larger portion of their produce to pay the tax (Devi, 1989).

These changes at the same time did not affect cash crop cultivation since their rates were fixed. These tax reforms might have induced many paddy farmers to switch over to cash crops.

Devi (1989) has further reported that in some of the taluks of midlands, the area under paddy declined when simultaneously area under rubber or tapioca increased. Though paddy lands may not have been brought under rubber, in many cases paddy lands were converted to coconut. Pillai, (1940c) has reported that in days of rubber boom, many people in lower tracts cut down yielding coconut trees to make way for rubber.

### 2.1.3 Provision of waste lands at throw away prices

As mentioned earlier, the Pattom Proclamation of 1865 coincided with the Sirkar's intention of inviting foreign capital in the form of plantations of tea, coffee and rubber.

As early as in 1862, by a Government Memorandum, waste lands were granted for coffee cultivation free of assessment for five years on condition that atleast one-fourth of the land would be planted within the first three years. Tax was fixed as three-fourth of a British Rupee in every acre of land. At the same time the Sirkar retained the right to fell the Royal trees on these lands (teak, blackwood, ebony, sandal wood, cole teak and caroonthelly). In 1862 itself, auction sale of land for coffee cultivation at an upset price of one rupee per acre was notified. By 1865, there were already 45 estates owned by Europeans in the four high ranges of Peerumedu, Shencottah, Agastyamalay and Ashamboo consisting of 9172 acres in all. The average cost per acre worked out to just 14⅛ annas (Devi, 1989).

Meanwhile, the Government also introduced a scheme of assigning cardamom lands to prospective cultivators at tharavila (land value) and the issue of pattas. By 1904-05 the total area thus registered was 13,693 acres which rose to 17,022 acres within four years and to 56,000 acres by the late 1930s. The rate of assignment was just Rs.10/acre though it was raised to Rs.85/- by the 1940s. During these years, there was no ceiling on the extent of a single holding (Sivanandan *et al.*, 1985).

Most plantations of tea, coffee and rubber remained under foreign ownership throughout the 19th century and upto the forties of this century. But many farmers from Meenachil, Thodupuzha and other midland taluks entered into rubber cultivation closely following the Europeans in 1903-1904, (Varghese, 1970). Raman (1988) noted that Travancore had the highest foreign capital investment because 94% of the total area under tea and 72% area under rubber were owned by Europeans in 1931.

A glance into the Table1 would reveal the area increase under plantation crops in Travancore compared to paddy.

Table 1 Area under paddy and plantation crops in Travancore 1920-21 to 1949-50 (1000 ha)

| Year | Paddy | Rubber | Tea | Coffee |
|---|---|---|---|---|
| 1920-21 | 259.20 | 20.40 | 18.80 | NA |
| 1925-26 | 267.20 | 21.40 | 27.08 | NA |
| 1930-31 | 263.40 | 24.16 | 31.20 | NA |
| 1935-36 | 276.08 | 38.68 | 30.80 | 2.48 |
| 1940-41 | 255.60 | 36.28 | 28.68 | 2.32 |
| 1945-46 | 252.88 | 44.64 | 30.92 | 2.80 |
| 1949-50 | NA | 44.60 | 59.36 | 3.48 |

Source: Various issues of Travancore State Manual

### 2.1.4 Early plantations in Travancore

In the centuries of European trade with the Kerala coast especially since 1500s, a number of crops like spices, coconut, pineapple, cashew to name a few had been introduced into the spices rich landscape of Kerala. Even then the pristine forest wealth in the Western Ghats had remained relatively intact. Sudden intensive clearance of the forests began only by the 1830s, with the appearance of plantation crops, first coffee, then tea and much later rubber (Tucker, 1988).

Though the expansion of plantations took place at a more rapid pace in Travancore, the first plantations in Kerala were opened in Mananthawady in Wynad. The British Resident in Travancore encouraged coffee and tea cultivation together in Travancore from 1840 onwards.

The first coffee estate was opened by J.D. Murro in Hope Estate in 1862 at Peerumedu followed immediately by Gen. Stevenson in Woodlands, Baker on Stagbrooks and Richardson on Twyford (Nadar, 1980). The entire Peerumedu hills were taken over by the Travancore Sirkar for coffee cultivation. At that time coffee was the chief crop of Malabar and Travancore. Soon, the devastating leaf disease of coffee in 1875 and a fall in world coffee prices (1878-1888) brought down the boom under coffee planting and many planters started opting tea for coffee (George and Tharakan, 1985).

General Cullen who was the British Resident (1840-1860) is credited with the discovery of cardamom hills in eastern Kerala as the region suited for tea cultivation. The first commercial plantation was opened by F.M. Parker on 25 acres of land. In 1877 in a historic move, the Rajah of Poonjar sold a large tract of thick forest land of 1,00,000 acres in Devikulam taluk to J.D. Munro to start tea cultivation at liberal rate, out of which 39,000 acres went to tea planting. This plantation company under the name "Kannan Devan Hill Produce Company" which is still the largest tea producer in the state owned upto 19 estates under different plantation crops by the turn of the century (George and Tharakan, 1985). Since tea proved to be more successful than coffee at higher elevation upto 7000 ft., soon tea became a viable alternative to coffee at higher altitudes (Tucker, 1988).

Actually a closely knit network of British missionaries, planters and officials interested in immediate profits and retirement homes were the pioneers in plantation crop introduction into Travancore (Tucker, 1988). By the turn of the century, tea was being extensively cultivated in Peerumedu hills, Meenachil and Changanassery taluks in Central Travancore, Shencottah, Ashambu and Ponmudi hills in South Travancore (Aiya, 1906). Most of these plantations were concentrated at elevations over 400 to 4000 ft., from fertile alluvial soils of bottom lands to hill tops with soils so thin and lateritic that they were adequate only for shifting cultivation by tribals (Tucker, 1988).

Rubber as a plantation crop was in its infancy during the days of tea and coffee. The first attempt was made in 1877 when a few rubber plants were taken to the Elayah Rajah of Travancore from Peridiniya estate in Ceylon on experimental basis. Later Anderson in 1891 planted rubber on a small scale at Shalliassery estate in Travancore. The first commercial planting commenced in Thattekad near Alwaye on Periyar river banks in 1902 followed by Mundakayam (Aiya, 1906). By 1910, Mundakayam (now in Kottayam district) was the highest rubber district in South India with 9652 acres of planted rubber. Between 1910-1913, almost 2000 acres of rubber land were owned by Indian planters. Important road transports were constructed connecting Mundakayam with Ranni, Kanjirappally, Erattupettah, Poonjar etc. (Devi, 1989). These facilitated further spread of rubber to lower lying areas. The added advantage of rubber compared to tea and coffee according to Tucker (1988); rubber grows well on low elevation terrains which coffee and tea dislike. On many hill sides virtually from sea level to 3000 ft, rubber trees replaced natural forest. By 1917 at the heights of Europe's war time demand for rubber, Travancore had 12000 ha. (29,640 acres) under rubber alone.

The main rubber growing tracts apart from Mundakayam were, Ranni, Pathanapuram, Kanjirappally, Meenachil, Kollam and Changanassery (Haridasan, 1975).

The earnings from plantation crops and the consequent monetization and commercialization of the economy started off a wave of migration of peasants from Travancore in the early part of this century. The midlands and highlands of Travancore had the favourable topographical conditions for plantations. So the new native commercial farmers moved further eastward to open up forest and waste lands for cash crops like coconut, pepper, ginger etc. and plantation crops. Among the erstwhile 26 taluks of Travancore, maximum immigration was recorded in Devikulam and Peerumedu (37.76% of the total population were immigrants) followed by Pathanapuram (10.66%) in 1901. Most of the immigrations took place from the relatively sparsely populated midland taluks than the thickly populated coastal taluks which points out to the fact that this movement was connected with the rise in price of hill produce and not population pressure as widely believed (Joseph, 1988).

At the same time, Kerala born labour employed in plantations formed only a small proportion of the total labour force. Though a number of agrestic slaves were released from the traditional agricultural sector since the official abolition of slavery from Travancore in 1853, all these labourers were not available for working in plantation. Rigidity of caste system, old ties with landlords and land, fear of malaria, inhospitable condition and cruel treatment in the plantations prevented many from venturing into a new area. So in the early years, the planters had to recruit Tamil labourers from neighbouring famine and drought struck districts of Tirunelvely, Ramnadu, Salem, Coimbatore, all British territories (George and Tharakan, 1985). During 1896, while the local labour in plantations came to just 20%, labour imported from other British territories came to 60% and Mysore, 20% (Griffiths, 1967).

The work of Christian missionaries also cannot be ruled out. Devi (1989) observed that as early as 1810-1819, Col. Munro, the first Dewan-cum-Resident was aware that the spread of Christianity would be indirectly helpful to the British establishment in Travancore. In fact the missionaries played an important role in abolishing slavery. Later, the native Christians were educated by the missionaries and served the European planters as clerks, accountants and estate managers. In the course of time, they also organised little plantations of their own and settled down in midlands and High Ranges (Edwin, 1978). A number of depressed classes were also among those converted.

Consequent to the steep increase of export earnings from cash crops in Travancore, the price of land was on the increase compared to 19th century. The land tenure conditions in Malabar were more favourable due to a number of tenancy reforms and Acts. So gradually during the early part of this century there was a flow of migration mostly from the hilly tracts of Kottayam, Meenachil, Changanassery, Thodupuzha, Moovattupuzha and Vaikom taluks to the sub-mountainous forest tracts of Malabar (Joseph, 1988). A significant clue to this phenomenon is that between 1940 and 1970, there was significant decrease in forest area in the northern districts of Kannur (46% of area in 1940 converted), Kozhikode (32%), Palakkad (32%) and Trichur (16%). Most of it went for agriculture and habitation by assignment, encroachment, settlement of hill tribes, rubber, coffee, pepper and other plantation crops (Panickar *et al.*, 1978).

### 2.1.5 Systems of agriculture followed before advent of plantation culture in Travancore

As per the Manual of Travancore State by Aiya (1906) there were three systems of agriculture prevalent in erstwhile Travancore. The Nanjanad system in the south, the Kuttanad system and Malamkrishi together formed the paddy cultivation areas. The Malamkrishi and forest cultivation formed the areas of shifting cultivation and the garden lands and homesteads formed the third system.

In the Nanjanad system, two crops of paddy were taken using tank irrigation and water courses that irrigated them. Some of the important varieties were Chambavu, Varikarumban, Kunippan, Kattadi, Ithikandappan etc. Kuttanad cultivation was comprised of 22 divisions 12 in Ambalapuzha, 4 in Kottayam, 3 in Changanassery and 3 in Ettumanur. These were mostly low laying lands which were once part of Vembanad lake, lying submerged. Through reclamation efforts which began in 1834, almost 20,000 acres of area from Vembanad lake were reclaimed towards the early half of this century (Panickar *et al.*, 1978). Only one crop Puncha was taken. For most of the year from June to

September, or October these lands lie under the flood waters four rivers which drain into them. Decades back Kuttanad area extended right from Cochin to Kollam.

The cultivated lands scattered among the low hills and slopes occupying the space between the lakes and ghats were termed as "Elas" in the south and `Virippu' in the north. These were the Nilamkrishi areas. They were actually narrow valleys watered by small streams and in every way adapted for rice cultivation. The first crop was grown from April middle to September, immediately after which the field was turned up and prepared for the second crop. The second crop was harvested in January followed again by a sesamum crop. It were these lands which were converted to coconut, tapioca and later to rubber.

Lands on the summits and slopes of hills that were cleared of trees and shrubs for a sort of shifting cultivation were termed `Cherikal'. Malamkrishi was carried out on these lands. The practice involved cutting down the forest immediately after the rains. They were then left for two-three months to dry and set fire in February. From a cycle of once in 29 years followed mostly by tribals, the intervals between two cycles of shifting cultivation had shrunk to 6 years. The fields were sown immediately with the south-west monsoon . Later, these lands were directly converted for planting rubber.

Apart from these abundant rice fields, the garden products were grown on the low slopes of hills. A variety of crops including dry cereals, sesamum, tapioca, dioscorea, amorphophallus were grown on these slopes purely dependent on rains. Sugarcane was also grown on a limited scale on the banks of rivers and streams.

According to Aiya (1906), the homesteads of Travancore were one of the richest and most diverse farming systems ever seen in the course of history. In his own word, `the homestead supplies the Travancore with every necessity of life except salt and tobacco. It produces the needful coconut with its manifold uses, forms, the plantain leaves in abundance as eating plates, the useful quantities of eatable roots, the jack fruit and mango which form the solid portion of his daily meal. The open space on which the noon-day sun shines grows the necessary pulses and sesamum. One corner is set apart for vegetables like brinjal, gourds and chillies. Repairs to the mansion itself are undertaken with the timber within the holding. For bathing and drinking he has own well and tanks within the enclosure. The cattle are fed with straw from his own paddy lands. The pepper and betelvines cling to the big trees. Above all, the dried branches and decayed old trees, supply for the household".

Pillai (1940a) observed that though the homesteads were isolated, a large number of them situated in localities having well known though undefined boundaries, formed themselves into Karas or self contained units of rural organisations from very early times with due provisions for the requirements of social economy. This system flourished in Karas until individualistic ideas began to grow in recent times.

Till the early part of the 19th century, Travancore was thus described as a state self sufficient in most of its means of subsistence. Most of the people led a very rustic life bound to the traditional sector of cultivating paddy and other food crops like tapioca, banana, coconut and nurturing of homesteads. Pepper was mostly grown on a limited scale and cardamom was a hill produce.

The situations were to change after the severe famine which hit Travancore in the 1860s. Pillai (1940) reported that Bengal paddy was imported into Travancore for the first time through the Sirkar's commercial agent in 1852 to relieve the famine conditions prevailing then. Soon, the British Government, kindly granted the request of the Sirkar to suspend the export duty on paddy and rice to Travancore from British territories like Indo-China and Siam. Subsequently the Sirkar removed the import duty on paddy which in turn contributed to the influx of large quantities of grain into the state (Aiya, 1906). But the imports continued even after the conditions subsided and year after year the quantity imported increased. From an exporter of paddy in the 1860s, Travancore slowly turned into a net importer by 1895. Though many peasant organisations all over south India and in the Legislative Assembly protested against the indiscriminate dumping, Travancore was not free to protect the interests of its peasants (Devi, 1989). Soon the state faced a fall in the price of paddy which led many farmers to abandon paddy cultivation and turn to cash crops or tapioca. This policy continued till independence.

This period also coincided with the rapid opening up of plantations in the hills by British planters. The money wages of labour also increased which adversely affected the paddy growers due to high land tax and low price of paddy. But the low land tax and high price of plantation crops did not affect the planters. Ultimately, unrestricted import of paddy and increase in demand for plantation crops facilitated expansion of these cash crops at the expense of food crops. In due course it became more convenient to import any amount of food grains through increased export earnings from cash crops and increase the land under commercial crops rather than trying to attain self sufficiency in food (Devi, 1989).

### 2.1.6 State policy after formation of Kerala state

Even after the formation of Kerala state in 1956 the various state Governments actively continued the British policy of giving importance to commercial crops. Immediately after it came to power, the State Government passed the Agrarian Relations Act in 1961. The aim was providing fixity of tenure to all forms of tenants, mode of payment of tax etc. Later the Kerala Land Reforms Act of 1963 and its Amendment in 1969 were also passed. All these Acts exempted all plantations of tea, coffee, rubber and cardamom from land ceiling provisions. There was a 60 per cent increase in area under coffee and 40 per cent under tea for the period 1960-61 to 1968-69. As for tea, due to unavailability of suitable land, it was facing stagnation (Ommen, 1971). The area under cardamom also registered an increase due to the Government policy of providing forest land in High Ranges at a low rate and encroachment by settlers (Sivanandan *et al.*, 1985).

Taking the whole scenario, it could be observed that while the area under cardamom and coffee registered a slow increase, tea area remained almost stagnant. At the same time rubber has registered a steady increase. This expansion was mainly due to increase in area under small and marginal holdings. The paddy area expansion was practically over by 1970s, registering a steady decline thereafter.

## 2.2 Homesteads as agroforestry systems

### 2.2.1 Conceptualisation of agroforestry systems

According to Lundgreen and Raintree (1983) the term agroforestry denotes land use systems consisting of a mixture of perennial and annuals and often also animals. A major concern in agroforestry research is sustainability. It is determined by the structure of the system, its ecological functions and its continued ability to fulfil the socio-economic needs of the people.

A unified definition of agroforestry has been put forward by Tabora (1991) as a sustainable land use system that maintains (sustainability and stability) and increases total yields by combining trees with crops, pasture and animals (productivity) alternately or at the same time (flexibility) using management practices that suit the social and cultural characteristic of the local population (social acceptability) and the ecological conditions of the area (ecological integrity).

### 2.2.2 Conceptualisation of homestead systems

Fernandes and Nair (1986) have conceptualized that homegardens (also known as homestead and mixed gardens and compound farms) are usually located, where they exist at all, close to the household as one of the more intensively cultivated parts of the over all farm. They are characterised by a mixture of several or many annual or perennial species found in association and commonly exhibiting, a layered vertical structure of trees, shrubs and ground cover plants, which recreates some of the properties of nutrient cycling, soil protection and effective use of space above and below the soil surface to be found in forests.

Soemarwoto (1987) has interpreted homegarden as a system for the production of subsistence crops for the gardener and his family. It may or may not have the additional role of production of cash crops. It can be immediately surrounding the home or slightly farther away, but still near the residential area.

Nair (1989) has opined that in different areas with identical agro-climatic conditions, factors such as human population pressure, availability of labour and other production resources, proximity and accessibility to market sources, etc. are the main determinants of the types and forms of agroforestry systems. A typical example is the spread of multi-species, multi-storeyed homegarden systems. Though found mostly in humid lowlands, homegardens are common in pockets of high population density and in other ecological regions also. The compound gardens of Nigeria, the homestead agroforestry in Kerala, multistoreyed garden systems of Java and Sumatra, the Chagga homegardens of Tanzania are some of the typical examples of homestead agroforestry systems.

Nair and Sreedharan (1989) have defined homestead as an operational farm unit in which a number of crops are grown in conjunction with livestock, poultry and/or fish mainly for the purpose of satisfying the farmer's basic needs. The components are so intimately mixed in horizontal and vertical strata, as well as in time, that complex interactions exist between the soil, plants, other components and environmental factors in the farmer's plot.

The farmer chooses his crops and crop combinations based on his own wisdom and perceptions acquired over generations of experience, the criterion being his home requirements of food, fuel, fodder and timber.

Salam *et al.* (1992) defined homestead farming as a special type of agricultural production system practised around the home with a multispecies of annual and perennial crops grown along with or without livestock, poultry and/or fish for the purpose of meeting the fundamental requirements of the home and also to generate additional income through sale of surplus to purchase the non-produceable items of the homesteads.

According to Skutsch (1994), the homegardens in Srilanka represent an enormous wealth not only in terms of biodiversity but also in terms of indigenous technical knowledge.

### 2.2.3 Origins of homestead systems

Hutterer (1984) has opined that homegardens may have originated in prehistoric times when hunters and gatherers deliberately or accidently dispersed seeds of highly valued fruit trees in the vicinity of their camp sites. Soemarwoto (1987) also affirmed the opinion.

Ninez (1984) has pointed out the description of the mythical Garden of Eden in Genesis II in that of a homegarden, containing "every tree that is pleasant to sight and good for food". The area from which this description was drawn, the early Mediterranean, is but one region where agroforestry has long formed an important component of agriculture.

Brownrigg (1985) in his literature review, mentioned that homegardens in the Near Eastern region were documented in paintings, papyrus, illustrations and texts dating to the third millennium BC. They were attached to temples, palaces, elite residences and the houses of the rich.

Arnold (1987) reported that homegardens have long existed as the principal farming systems on dryland accounting for a substantial proportion of land use, with irrigated rice cultivation forming the other main component of the farm system.

### 2.2.4 Structure and diversity of homestead systems

A number of studies and surveys have been conducted all over the world's tropical homegardens revealing the structural diversity of homesteads based on agro-ecological peculiarities and human and social needs. A few studies are reviewed here. Structure has been delineated by Nair (1989) as the composition of the components, including spatial admixture of woody component, vertical stratification of the component mix and temporal arrangement of the different components.

Felger and Nabhan (1978) reported that indigenous Sonoran Desert people utilized about 375 native species of wild food plants or about 15 per cent of the flora.

Karyono (1981) conducted an extensive survey from the lowlands to highlands of West Java. It was found that the average size of 351 homegardens sampled was 2291 $m^2$. The size decreased with altitude. The total number of species found in the survey was 501 in the dry season and 560 in the wet season. The average number of species in the dry season was 19 per homegarden and 24 in wet season. Species density was 8/100 $m^2$ in the wet season.

Homegardens also have animals as their components. Brownrigg (1985) indicated that animals were found in virtually all types of homegardens, eg. poultry, including doves and fish in the Near-East homegardens and poultry and livestock in the Luso-latin and Caribbean homegardens.

Brierley (1985) reported 18 vegetable varieties and 14 distinct types of food trees in a sample garden of less than 2000 sq.m. in Grenada. Thaman (1985) also reported from a land survey of homegardens in Port Moresby, Papua New Guinea; Suva, Fiji; Nuku'alva, Tonga; South Tarwa, Kiribati; Naura Island atleast 85, 114, 79, 61 and 33 different species and distinct varieties of food plants, respectively, in the homegardens in those areas.

Fernandes and Nair (1986) based on their study of different homegardens from various geographical regions reported that the canopies of most homegardens consisted of two or five layers.

Nji and Nkwain (1987) in an economic and sociological analysis of mixed cropping in Menona Division of Cameroon found that a coffee based mixed cropping system was practised around the homesteads in which coffee was mixed with other fruit crops and under cropped with several arable crops. In a food crop based mixed cropping system practised further away from the homesteads, several arable crops were intercropped; coffee, maize, cocoyam were the most important crops grown under mixed culture.

According to Soemarwoto (1987) a prominent structural characteristic of the homegarden is the great diversity of species with many life forms varying from those creeping on the ground, such as sweet potato to tall trees of ten metres and more, eg. the coconut palm and vines climbing on bamboo poles and trees. These create the forest like multi-storey canopy structure of many homegardens.

In a West Javanese village of 41 households Soemarwoto (1987) found that the average number of plant species per homegarden was 56.

The total number of species in the village was 219 in the dry season and 272 in the wet season, an increase of almost 25 per cent in the wet season.

In African Nigeria, according to Dover and Lee Talbot (1988) a typical farm might contain upwards of eight crops, including bananas, beans, cassava, melons and yams, as well as scattering of other species. Farm yield per acre is high as is the overall leaf area per unit area of ground.

Darwiss (1990) reported that the coconut farming systems adopted by Indonesian small holders can be classified into four types: farmyard, polyculture, monoculture and tidal swamp. In the polyculture type system coconuts may be grown with annual, perennial or both types of intercrop. In Java, 78.7% of the coconut small holdings fall within the polyculture pattern and the remaining as monoculture.

### 2.2.5 Functional diversity of homestead systems

Homegardens or homestead systems are raised to perform a variety of roles and fulfill various functions of the farm family and the community therein. The functional basis of homesteads has been defined by Nair (1989) as the major function or role of the system, which may be productive eg. production of food, fodder, firewood and so on or protective, eg. windbreak, shelter belt, soil conservation and so on.

As early as 1937, Ochse and Terra calculated that in Kutowingangum, a village in Central Java, 44 per cent of the total calories and 14 per cent of the protein consumed came from the homegardens, but only 8 per cent of the total costs and 7 per cent of the labour were spent on them.

Homegardens in villages in Lawang, East Java, according to Haryadi (1975), produced a daily average of 398.4 calories, 22.8 gm protein, 16.4 gm fat, 185 gm carbohydrate, 818.4 mg calcium, 555 mg phosphorus, 14 mg iron, 8,362 IU vitamin-A, 1,181.2 mg vitamin-B and 305 mg vitamin-C.

Studies by Ahmed *et al.* (1980) in villages in West Java have shown that homegardens are an important social status symbol. People who do not have a home garden and home, have to build their house on someone else's homegardens. Such people are considered of low status. Fruits and other products are traditionally shared with relatives and neighbours, and products for religious or traditional ceremonies and medicines are given away freely when requested.

Fleuret and Fleuret (1980) reported that the multiplot and multicrop production strategies typical of subsistence agricultural regimes are aimed at reducing the levels of risk to which producer households are exposed.

Gonzales-Jacomes (1981) found that homegardens may also produce higher incomes than other land uses. In Central Mexico the average income per square metre of homegarden was almost 13 times that of irrigated plots.

Hoskins (1987) elaborated that farmers propagate trees for many purposes like seeds, fruits, fibres, gums, saps, leaves and bark. For example, palms are grown in places as far apart as Benin and Thailand to provide palm sap for wine or coconuts for family use or palm fibres to weave baskets for a small family enterprise.

Soemarwoto (1987) reported that homegarden is also an important place for children to play and for adults to congregate in their free time. In West Java, young people who get married may build their homes on their parent's homegardens.

Dover and Lee Talbot (1988) found that multiple cropping spreads the risk of loss among several crops instead of wagering all on a single one. Further, the crop mixtures also served the function of pest control, weed control, increased productivity and improved fertility.

Belsky (1993) in a comparative study of food security in Indonesia and Philippines found that poor farmers are responding to decreasing access to land and declining agricultural productivity by increasing farm tree and agroforestry activities because of multiple benefits of trees.

A typical homestead with a multitude of crops presents a multi-tier canopy configuration. The major portion of the upper canopy goes to coconut. This is followed by other crops like black pepper, cacao and tree spices. The lower storey of the harvesting plane is occupied by banana and cassava and other tuber crops. At floor level, pineapple, vegetables and other herbaceous crops are grown. The intensity of cropping in the homesteads is very high, mostly with rather low levels of biomass productivity of individual components.

### 2.2.6 Homestead systems of Kerala

Nair and Sreedharan (1989) have discussed on the homesteads system in Kerala. Because of the high density of population, the size of landholding is very small, commonly ranging from 0.02 ha to 1.00 ha. The farmers of Kerala usually undertake intensive farming with a variety of crops on the limited area available in order to obtain food, fuel, fodder, timber and cash from the homesteads.

On an average, each household consists of 6-8 people who provide the necessary workforce. In the small holdings, planting, cultural operations and harvesting of different crops occur throughout the year and are attended by farm family. Most crops in the homesteads are labour intensive except coconut. The average requirement of labour on one hectare homegarden with an intensive crop mix and livestock is about 1000 man days per year as compared to 150 man days for coconut monocropping and 400 mandays for rice monocropping.

The multitude of crop species in the homesteads also helps to conserve the fertility by nutrient cycling yielding in spite of high intensity of cropping. The increased microbial activity in the rhizosphere of crops is another positive contribution in the multicropping systems. Mixed farming also leads to substantial improvements in the physical and biological characteristics of the soil. The use of waste materials for feeding cattle, poultry and fish results in efficient recycling of these wastes, whereas increased utilization of family labour in this enterprise reduces expenditure on hired labour. Adoption of mixed farming practices in root-disease affected areas has helped to enhance the productivity of the coconut palms as well as of land. The homestead system also prevents exposure of the bare soil to the beating action of the torrential rains experienced in parts of Kerala and consequentially leads to reduction in soil erosion.

As described by KAU (1989), a typical homestead in Kerala consists of a dwelling house with a small garden in front and a variety of annual and perennial crops grown in mixture in a small piece of land. The crops of homestead may include vegetables, a few coconut and/or arecanut palms, tapioca, banana, drumstick, tree spices, papaya, jack, mango and other fruit trees. In addition to these, the presence of one or two heads of livestock (Cows, goats or buffaloes) with a small unit of poultry is another notable feature. More than 80 per cent of the produce generated is consumed in the home itself and the remaining 20 per cent provide subsidiary income to the household. Over years of experience, these homesteads have evolved into self-sustaining and productive farming systems. Optimum utilization of available land, solar energy and technological inputs and efficient recycling of farm wastes are the important characteristics of this system.

Salam *et al.* (1991) based on the crop-livestock components and interactions in the homesteads have attempted to evolve a homestead model for rainfed farming in the coastal uplands of South Kerala. Another study on pepper associated agroforestry systems in the homesteads of Kerala conducted by Salam *et al.* (1992) listed atleast 31 tree species in homesteads of Kerala which can be successfully used for trailing pepper. Along with the most common coconut based multi-tier cropping system, tree crops like arecanut, jack, mango, cashew, tamarind, teak etc. are also grown in the homesteads for meeting different requirements of the home as well as trailing pepper. Pepper associated agroforestry of the homesteads of Kerala not only meets the food, fodder, fuel and timber requirements of the home but also provides for ornamental and medicinal purposes.

## 2.3 Plantation systems

### 2.3.1 Conceptualization of plantation systems

A definition by International Labour Committee of Work on Plantations (1950) quoted by Graham and Floering (1984) confirms the main features "Plantations are large scale agricultural units developing certain agricultural resources of tropical countries in accordance with the methods of western industry. The institution is essentially a large scale enterprise depending on large capital investment, a large supply of labour, extensive land areas, well developed management and specialization in production for the purpose of export". The above definition places emphasis on the industrial origins of plantation agriculture whose roots lie in the post Industrial Revolution Europe. It becomes clear that plantation agriculture is mainly oriented towards commercial purpose and not subsistence.

Plantation has been defined as a large estate in a tropical or sub-tropical region that is generally cultivated by unskilled or semi-skilled labour under central direction (Anonymous, 1966). This definition implies that plantations are always spread over a large area and are controlled by a central authority, not essentially requiring skilled labour.

Chamala (1984) identified three stages in the rubber industry.

**Stage I** - emerges from an essentially subsistence agriculture practised at the frontiers of cultivation where land is abundant and labour relatively plentiful. The market for capital is both poorly developed and fragmented the credit thus extremely scarce. Under such circumstances the real prices of land and labour are low, whilst that of capital is very high.

**Stage II** - characterised by substantial commercialisation of economy. It has now moved to the second stratum involving mechanised techniques for land clearing and much higher yielding planting materials that positively respond to fertilizers in productive phase. In this stage the move of small holding farmers from Stage I to II requires a more appropriate production technology resources, price change and also external replanting and new planting tracts.

**Stage III** - commercialization of the economy has advanced much further. Agriculture is no longer dominant being increasingly dwarfed by manufacturing services, and other section.

In this case the gradual shift from a subsistence economy to a commercial economy consequent to introduction and establishment of plantations in a country is emphasised. Support for expansion through grant and price supports are considered essential.

According to UK Overseas Development Institute (1989) many developing country Governments now see plantations as positive assets in generating employment and export income despite past misgivings. Structural changes since 1960s in the plantation industry have resulted in various intermediate forms between the estate and the independent small holder; nuclear estates with tenants or independent outgrowers, controlled settlement of specialized small holders with an authority supplying production requirements and processing facilities; and contract growing foreign ownership tended to diminish with increased state and private ownership: but some countries are retreating from nationalization and encouraging foreign investments.

Devi (1989) has proposed that to view the plantation as a system, two of its system dimensions are to be identified. First, the plantation as a social system in the territory in which it is located (the internal dimension) and second, the plantation as an economic system both in the territory of its location and in the wider world community (the external dimension). The external dimension stems from its export orientation and foreign ownerships control over the plantations may take several forms.

The phrasa "Plantation Economy" is applied to those countries of the world where the internal and external dimensions of the plantation system dominate the country's economic, social and political structure and its relation with rest of the world.

Whenever several plantations have come to engross most of the arable farm land in a particular country which is predominantly agricultural, that country can be described as a plantation economy or society.

The plantation as a settlement institution was the means of bringing together enterprise, capital and labour from various parts of the world into a new location where land was available to be combined with these for production of a particular staple.

For any plantation method of production to get established, certain preconditions like geographical and climatic factors, availability of cheap labour, the prices of the crop, demand for the product from the crop were necessary. Tobacco and sugar were the earliest plantation crops. According to Devi (1989), the steady demand for sugar was due to the need for more carbohydrate in colder climates. Coffee, tea and cocoa, the soft drinks were popularised as a substitute for the strong drinks in temperate countries to raise the moral tone of the workers. Rubber is a twentieth century crop which received the impetus from the motor age and in particular by the two world wars.

The discussion by Devi (1989) further elaborates the Industrial Revolution basis of evolution of plantation systems of production. In all these discussions, plantations are considered as large scale enterprises, introduced by the colonial forces by generating a demand for these plantation products in their colonies, and gradually drawing them into a plantation mode of production from their existing agricultural systems.

### 2.3.2 Plantation systems of the world

Nair (1977) has described the natural rubber industry's contribution to the Malaysian economy; rubber contributes about 40% of export earnings as well as contributing to the economy in the form of land tax, export duty, export duty surcharge, replanting cess, income tax, excess profit tax, development tax and other tax levies directly and indirectly.

Salles (1979) reported that Liberia has been based on a plantation economy since the country's creation in 1847. The period 1930-1950 was the most prosperous era for the rubber industry. The large area of land under rubber trees, the output of rubber and the numbers employed give the plantation an essential role in spatial organisation and regional life.

Fleuret and Fleuret (1980) from a study of coffee farming among the Chakaka Poka of Malawi found that coffee begins to bear only after three years have passed. So those who invest in coffee trees either have surplus land and labour to produce the necessary staple foods or have to be prepared to experience food shortages during the interim. When prices were high, established commercial farmers could afford to buy sufficient staples to replace the food they no longer grew.

Winberg's (1981) study of coffee production and exports presents a prime example of dependent agricultural development through the direct integration of agro-exports into the world market in that (i) it competes with food production for local consumption, (ii) it is often a monoculture, subject to the cyclical variation in world market prices, (iii) generates through export taxes, important governmental revenues.

Dillon (1983) made a social and economic assessment of the North Sumatra Smallholder Development Project, an intensive management, high input effort which has provided land, high yielding varieties, credit and extension to help participating households establish individual 2 ha rubber holdings. Analysis of household labour allocation revealed that participating families experienced considerable stress between 3-5 years after rubber planting. Rice and vegetables could be intercropped only during the first 3 years. Thereafter it took additional 18 months before trees could be tapped to generate income. Those with only 2 ha. allotment faced intense family labour demand that interfered with education of children. In these families head of household worked on nearby plantations to earn for household, while spouse and older children worked longer to complete the cultivation required for good growth of young rubber trees and younger children assumed household duties. Households with few children found it impossible to maintain rubber trees properly.

Chamala (1984) reported that in Malaysia, small holding is defined as an area of less than 40 ha. (100 acres). However nearly 52% of small holders own less than 2 ha. and another 35% between 2 and 4 ha. Only 13% own more than 4 ha. About 25% of the total area is in holdings less than 2 ha. Persistent poverty among small holders has been attributed to uneconomic holding size, scattered holdings, and unorganised small holders who have little education, no credit, little equipment. At the same time, in Indonesia, the small holdings, range from 0.5 to 10 ha with an average of 1.5 ha. Small holders are generally living at subsistence level and rubber for some of them is a secondary source of cash income.

Blencowe (1989) pointed out that most of the world's rubber is planted in small holdings. Of almost 7 million ha. planted in the six major producing countries, four fifth or eighty per cent is on small holdings.

A survey was conducted by Panjaitan (1989) to assess rubber small holders capacity in self maintenance of rubber in Losari, a village in the district of Labuhan Batu, North Sumatra. The results indicated that a small holder needs to own 1.5-2 ha. of rubber in order to fulfill needs for family living. Those who owned 0.5 to 1 ha. of rubber only earned 62.7% of the primary living needs. A holding size of 3-4.5 ha. could meet small holders total living cost. The survey concluded that the income of rubber small holders was too low for them to rely on rubber as their only source of income.

### 2.3.3 Plantation systems in India: focus on Kerala

A number of studies have been made on the growth of plantations in India, particularly Kerala. A few relevant reviews are cited below.

Haridasan (1980) has opined that though rubber was started as a plantation crop in India, the plantation element is fast giving place to small scale farming. However small growers are now modernizing their cultivation and processing. The percentage of small holdings in the total rubber area has increased from 32 per cent in 1948-49 to 71 per cent by 1978-79. The share of the estates fell by 68-29%. During the same period, the area under small holdings increased by 677 per cent, increase in estate sector was 47 per cent only. Also the number of small holdings increased by 975 per cent against 30 per cent increase for estates. Small holdings are concentrated in Kerala and within the state, Kottayam and Idukki together account for 61 per cent of <0.4 ha. They have increased their productivity three fold during the last 30 years.

Sivanandan (1985) has given the important requirements for the successful cultivation of rubber in Kerala. Rubber plants require an evenly distributed rainfall of 2000-3000 mm in a year. Sunny forenoons with evening rainfall are conducive for the healthy growth and uninterrupted tapping of rubber. The western side of the Western Ghats which enjoys the benefits of both south west and north east monsoons has a large share of the rubber grown in India.

A humid atmosphere throughout the year without much variation is found to be ideal for rubber. Winds and storms affect older trees through uprooting, trunksnap and branch break. Growth of rubber has been found satisfactory upto 450 m above mean sea level and most rubber plantations in Kerala are found in mid-land regions with elevations varying from few metres in the west to above 450 m in the east.

Accordingly, though the southern part of Trivandrum district is more favourably endowed, the area available is smaller in extent and almost entire area has now been planted. Largest tract available for expansion was the Kottayam belt, though rainfall and soil types were not ideal. Towards the north, dry spells are more and therefore the climate is not very suitable for unirrigated rubber.

Four major rubber regions in the state have been identified by the author:

| Region | Soil type | Rainfall pattern | Suitability |
|---|---|---|---|
| 1. Quilon<br>Trivandrum | Laterite and red soils | 2000-3000 mm. June-July wettest. January-February driest | Relatively high rainfall causes leaf fall disease. soil condition favourable. |
| 2. Kottayam<br>Idukki<br>Alleppey<br>Ernakulam<br>Trichur<br>(Part) | Laterite | 3000-4000 mm south-west monsoon is more intense. Pre-monsoon showers received in March | Soil is poor in available plant nutrient status |

| | | | |
|---|---|---|---|
| 3. Palghat Trichur (Part) | Laterite | Lowest when compared to other regions. Major portion of rain during south-west monsoon. Drought period is long | Most of the areas experience strong dry winds which is a limiting factor for successful rubber cultivation |
| 4. Malappuram Kozhikode Cannanore | Laterite | 3200-3400 mm 80-90% of rainfall in south-west monsoon. Prolonged drought period of 4-5 months | Soil deficiency and prolonged drought are limiting factors |

Mani (1992b) opined that though a number of commercial crops are being grown in Kerala, only four of them merit being termed as plantation crops. They are natural rubber, tea, coffee and cardamom.

In the case of plantation crops, Kerala's share is 92 per cent in rubber, 66 per cent in cardamom, 21 per cent in coffee and about 9 per cent in tea (Anonymous, 1993).

## 2.4 Factors discriminating convertors and non-convertors of marginal homesteads for planting rubber

Not even a single study was available on the factors discriminating convertors and non-convertors of marginal homesteads for planting rubber. Even then, an attempt has been made to include a few studies on factors/ characteristics which discriminated two groups/samples based on adoption-non-adoption, participation-non-participation in development programmes, type of farming practices followed, occupations followed and the like.

Chaukidar and George (1972) in their study on the adoption of package of practices in relation to the HYV programme for paddy in west Godavari district found that adopters and non-adopters differed significantly in relation to six characteristics, namely education, caste, family education, socio-economic status, farm size and the attitude towards consumption of high yielding varieties.

Sharma and Nair (1974) studied the differential characters of adopters and non-adopters of high yielding paddy varieties. It was found that difference with respect to degree of fragmentation, irrigation potential, social participation, knowledge, attitude, economic motivation, risk orientation, level of striving for past and present, market perception, use of mass media, use of inter-personal cosmopolite sources of information, extension contact, perceptions of simplicity, complexity, cost of cultivation, profitability, suitability and labour need were significant.

A study was conducted by Kalamegam and Menon (1977) to find out the differential communication behaviour of small farmers in progressive and less progressive villages in relation to their adoption of improved practices of paddy. It was revealed that utilization of personal localite sources was more in the less progressive village than in the progressive village. At the same time, personal cosmopolite sources were utilized to a greater extent in the progressive village.

Fleuret and Fleuret (1980) observed that resettlement following the filling of a large dam, affected people from different types of communities:Indian maize farmers, plantation workers, participants in collective agricultural schemes and workers on cattle estates. In a comparison of affected and unaffected communities of all four types, it was observed that overall economic well being was higher in the affected than in unaffected communities. The variation in nutritional status between well-off households and relatively poor households was much greater among affected communities than among unaffected communities.

In a comparative analysis of adopters and non-adopters of improved cassava varieties in Ohaji, Local Government area of Nigeria, conducted by Olowu *et al.* (1988) it was found that there was no significant difference between adopters and non-adopters in age, education, family size, distance of farm from home and farming experience. At the same time adopters used more fertilizers, had more contact with extension agents and larger farms than non-adopters of improved cassava varieties.

A comparative analysis of some selected characteristics of settled and shifting cultivators of Manipur was carried out by Singh and Talukdar (1990). It was found that the hill farmers (shifting cultivators) were basically of agricultural occupation, with joint and large families. Their size of operational landholding was also large compared to those of plains. The plain farmers (settled agriculture) had more extension contact, were economically motivated and were willing to take risk compared to hill farmers.

Thyagarajan *et al.* (1990) made a study of the functioning of Cashew Development Scheme in Andimadam block of Tiruchirappalli district of Tamil Nadu. It was found that the participants were better educated, big farmers, highly modern, well-to-do having higher social participation with greater contact with extension agency, having greater exposure to mass-media, possessing scientific orientation and moderate risk orientation with higher economic motivation compared to non-participants.

In a study conducted in Churachandpur district of Manipur to study the differential traits of farmers practising shifting and settled agricultural systems, Pulamate and Babu (1992) found that those farmers practising settled cultivation were having higher socio-economic status, moving closer to formal leadership pattern, higher risk preference, more cosmopoliteness, higher level of aspiration, using credit sources with higher interest rates, higher annual income, higher use of information sources, greater exposure to mass media, more contact with extension agency and had higher knowledge about rice technology as compared to those farmers practising shifting cultivation. However the two groups did not differ significantly in terms of age, education and social participation.

## 2.5 Nature of conversion of marginal homesteads for planting rubber

The researcher could come across only a single study pertaining to the nature of conversion of marginal homesteads for planting rubber in Kerala. All other studies reviewed have been based on nature of changes in the socio-economic scenario and agricultural systems of developing countries, similar to India, towards modernization. The theoretical concepts on modernization are also quoted.

### 2.5.1 Nature of conversion of marginal homesteads in Kerala

Nair and Sreedharan (1989) in their study on Kerala homesteads have discussed on the changing levels in homestead components or in other words trends in the cropping pattern of Kerala over the past few years *vis-a-vis* market prices of commodities, social change and attitudes of the people. Large scale introduction of cocoa in the homesteads occurred in the late 1970s when the price of cocoa in the international market touched an all time high of Rs.45 per kg. of dried beans. A sharp decline in cocoa prices later on resulted in the removal of cocoa from homesteads and replacement by fodder grasses, banana and tuber crops. In the uplands of the low rainfall areas, palmyrah has been the main crop which is nowadays being replaced by coconut due to commissioning of irrigation projects in the area. Rubber is the only commodity for which prices have been steady for the past few years. For this crop labour requirement is comparatively less once the trees attain tapping stage. This has tempted many farmers to undertake cultivation of rubber even in homesteads. Banana and tuber crops are slowly being replaced by rubber in areas where rainfall distribution is uniform.

### 2.5.2 Changing cropping patterns: concepts and studies

Rogers and Svenning (1969) conceptualised modernization as the process by which individuals change from a traditional way of life to a more complex, technologically advanced and rapidly changing style of life. According to this concept, modernization is largely a communicational process. Innovations are communicated to the social system generally from an external source and this in turn temporarily disturbs the equilibrium of the social system, leading to gradual social change.

Murray (1977) in a study on rural modernization in Thai villages has opined that personal modernity begins for a villager when he first seeks to improve his life by voluntarily risking what he already possesses or modernity begins when a villager starts to invest. Investment is formally defined as the voluntary risk of energy, money or other physical resources in the expectation of a future return in excess of the expenditure. It is postulated that the degree of change from a traditional to a modern outlook in a set of villages can be compared by the levels of investment behaviour taking place among their inhabitants.

Dixon (1978) reported that before the establishment of Land Development Scheme in Triboh in Malaysia, the Triboh people followed an agricultural pattern which has become quite typical of the sedentary Iban communities and other Dayak groups in Sarawak. The basis of the system was shifting cultivation of hill or swamp rice supplemented by fruits and vegetables and the rearing of pigs and chickens. These purely subsistence activities were supplemented by growing cash crops like rubber and pepper. The land development schemes were a deliberate attempt to break down the traditional pattern and replace it with a commercial system dominated by rubber.

Stoler (1978) has reported that in homesteads as landholding size continues to decline, income is increasingly sought from off-farm employment. At this stage, cultivation of annuals is reduced in order to release labour and trees and other perennials requiring only low labour inputs come to form the main component again.

Cauvin (1979) discussed the introduction of a new crop in Ivory Coast, a selected variety of oil palm. The ethnic group in Adjukru region of Ivory Coast has traditionally grown tubers and cultivated native oil palms. An earlier agricultural and economic change occurred in the early 1900s when cocoa and coffee trees were introduced. Since 1959, village plantations of selected oil palms have replaced the native trees. These were established by Adjakru on land they have already grabbed with the help of a state company `Sodepalm'.

Zaharah (1980) studied the dual cropping peasantry of Peninsular Malaysia who had entered into modernization of agriculture. Their involvement in *Sawah* agriculture (wet rice cultivation) is an active continuation of traditional peasant activity, while the involvement in the cultivation of non-rice crops, invariably of commercial crops represents a modern agricultural activity. While stead fast and unchanging in their *Sawah* agriculture following traditional water control techniques and minimum dependence on chemical fertilizers, this very same group represents the peasants who were the earliest to cultivate rubber and other cash crops brought into the country like oil palm, tobacco, coffee, sugarcane and cocoa. Rubber was one of the least disruptive of cash crops in relation to the traditional agricultural cycle and it did not compete with paddy in terms of cultivation sites. The fact that rubber was willingly adopted to replace the established non-paddy activities clearly reflects the willingness on the part of the peasantry to change any aspect of the traditional arrangement if the process was practicable and profitable.

Bhowmik (1981) in a study of class formation among tribal workers engaged in tea estates in West Bengal found that most of them were farmers at their place of origin before migrating to the plantations, others were craftsmen or other non-farmers. Once employed, they became wage earners, instead of being self supporting.

In a study conducted on the role of trans-national corporations on Philippines agriculture, Dillon (1983) found that farmers who grew their basic food requirements of paddy and other food crops were persuaded to turn their plots into producing cash crops like banana. Three trans-national corporations (TNCS) namely United Brands, Del Monte and Castle and Cooke controlled most of the banana industry in Philippines covering 25,000 hectares.

Devi's (1989) study on the plantation economies of the Third World revealed that fundamental socio-economic changes were ushered in Srilanka from the 1830s onwards as a result of the estate system of coffee plantations. In the highlands and midlands a large part of the area which were used by the Sinhalese for slash and burn cultivation were declared crown lands and sold to the coffee planters.

Sundaresan and Gopinath (1990) observed that the rice economy of Kerala declined to a considerable extent followed by tapioca. The shift occurred mainly from food crops to cash crops especially from paddy and tapioca to rubber and coconut. Among the plantation crops rubber played the dominant role by commanding the largest area increase since 1975.

Lohmann (1991) has reported that in the pursuit of economic development through integration into the global economy, the biological diversity formerly maintained in Thailand's agriculture has declined. Modern livestock breeds have supplemented many village races, and the growing of crops for exports has often over shadowed traditional rice and mixed agriculture with its numerous local food plant varieties.

Page and Page (1991) illustrated the change in food security faced by Zimbabwe's commercial farmers. They are now less food secure than they were two generations ago. The historic forced replacement of their sustainable indigenous farming system with one whose productivity now relies on the use of large amounts of expensive chemical inputs was the reason cited. Environment friendly, traditional farming practices, such as pyro-culture, minimum tillage, mixed cropping and bush fallowing were completely wiped out and replaced with a highly technical western inorganic farming based on plough cultivation and continuous monoculture of commodity crops, that were supposed to be sustained by liberal amounts of green and animal manure.

Many instances of integration of many developing countries into the global economy though changes in their agricultural, social, political or legal base for modernization invited by colonial forces or the countries themselves have been reported (Anonymous, 1992).

In Egypt, in the 1820s, the rulers initiated a programme to decrease the production of grain for domestic subsistence and to increase production of the one crop that could be exported; long staple cotton. As a part of the programme peasants were also drafted in large numbers to build irrigation works and canals in order to create the hydraulic structure required for cotton cultivation. In 1882, the British took over Egypt and they reinforced the pattern of cotton growing on large estates.

In many African countries the state plays much the same role as trans-national corporation. In India, the setting up of large scale state farms has been favoured route to agricultural modernization, with peasants being dispossessed of their lands to make way for state run plantations. In Senegal and Mali, peasants have been forced to grow specified crops under contract for the government.

According to Hansenn-Kuhn (1993) the government of Costa Rica introduced an agricultural policy known as "Agriculture of Change" which was designed to reorient agricultural production towards exports. Credit and guaranteed prices for domestic grain and bean production for the local market were slashed and restrictions of grain imports, which compete with this production were lifted. Meanwhile the colon (currency of Costa Rica) was devalued in order to make the country's agricultural exports cheaper and more competitive in the world markets. Incentives for exporters under the "Agriculture of Change" have included the removal of export taxes, the dropping of import duties on farm inputs, exemption from income taxes on production for export, preferential interest rates, special access to foreign exchange and export incentive bonds.

Bello and Cunningham (1994) have described the changes brought about in Korean agriculture by Structural Adjustment. Throughout the 1960s and the 1970s, the US had dumped food in Korea through programmes like "Food for Peace". Between 1973 and 1983, grain imports increased by 300 per cent. The lower prices triggered by these imports discouraged domestic production. In the mid-1980s a massive agricultural surplus in the US, led the US to pressure Korea to open up its agricultural market still further to US commodities.

After reducing trade barriers to US cigarettes, the Korean government encouraged farmers to shift production to other crops, such as red pepper. From tobacco, the US pressurised Korea to import beef. The Korean government first allowed the import of 14,500 tons of beef to meet 10 per cent of domestic demand in 1988, then raised the quota to 50,000 tons in 1989 and 58,000 tons in 1990, Korea is now the third largest importer of US agricultural products with imports rising from 1.8 billions in 1986 to 5 billion dollars by the end of 1991.

## 2.6 Extent of conversion of marginal homesteads for planting rubber

Extent of conversion indicated the area converted from one land use to another expressed as percentage or acreage or hectares. Three studies were found which highlighted the shift in land use in Kerala for agricultural or commercial purposes. A few studies pertaining to shift in land use in other states or countries were also reviewed.

### 2.6.1 Extent of conversion in Kerala

Panicker *et al.* (1978) found that of the total increase in net area sown over a period of two decades (1952-53 to 1973-74) food crops, viz., rice, pulses and tapioca, account for only a little over 26 per cent. Nearly three-quarters of the additional area have been brought under commercial crops. Of this crop two crops, viz., coconut and rubber, claim one-half of the total addition to cultivated area.

Mani (1992b) reported that plantation crops account for on an average 22 per cent of the net cultivated area in Kerala State. The share has increased from 18 per cent of the total area in the 1980s to about 24 per cent in 1990s.

The shift in land use in Kerala over the past decade indicated that as early as 1980-81, the state achieved a high degree of land use at 56 per cent, resulting in a steady decline in categories like "barren and uncultivable land", "cultivable wastes" and "land under miscellaneous tree crops". By the end of 1989-90, the proportion of land use touched a peak of 57.44 per cent. Also a substantial increase in net cropped area as well as "area sown more than once" took place.

Taken together with 27.83 per cent forest cover, the state had reached saturation point as far as land use was concerned by the end of the decade (Anonymous, 1993).

### 2.6.2 Extent of conversion in other areas

Bremen (1978) has described the crop shift in Surat, Gujarat state to commercial agriculture. In the alluvial plains of Surat, the main crops have always been millet, corn and groundnut. The highlands and the lowlying lands were planted with rice and after monsoons with lentils. In 1953-54, just 6 acres were under sugarcane in the Bardoli taluk. Within 20 years, the construction of an extensive irrigation system in the flood basins of Tapti river, the construction of Kakrapur dam in 1953 followed by Ukai dam ten years later and a net work of irrigation canals in turn ushered the cultivation of sugarcane, banana, vegetables and summer paddy at the expense of cotton, millet and other crops. Sugarcane acreage spread from 583 acres in 1958-59 to 15645 acres in 1974-75. By 1971, the crops share in the total harvest was almost 2/3rd of the irrigated ground.

A temporal analysis of the cropping pattern changes in Haryana and Punjab was carried out by Singh and Singh (1983) during 1966-67 to 1976-77. It was found that Punjab moved in for rice cultivation apart from wheat. The percentage area under oilseeds and pulses to total cropped area indicated a declining trend whereas maize and cotton maintained almost constant share to total cropped area throughout. The cost shares of remaining cereals, oilseeds and pulses were transferred to more promising crops like rice and wheat.

As for Haryana, bajra, wheat and grain predominated the agricultural scene throughout the period. Rice and wheat registered an increase in their per cent share to total cropped area almost at the same pace (rice from 4.17 to 6.24 per cent and wheat from 16.15 to 25.54 per cent).

World Rainforest Movement (1990) have elaborated on the cash crop economy of some Third World countries which have resulted in the destruction of natural resources. The extent of land use change is described.

In Thailand, many of the most fertile soils have been used to grow cassava, mainly for export to feed Europe's cattle. In the 10 years between 1973 and 1982, exports of cassava from EEC rose from 1.5 million tonnes to 8 million tonnes. Almost all increased production took place in the east and north-east of the country. The bulk of it at the expense of forest.

In Malaysia, the principal export crops, rubber, oil palm and related industries have caused massive forest clearance. The land area cultivated with oil palm in Malaysia increased by 18 per cent or 5,10,000 hectares in 1974 to about 6,00,000 hectares in 1975. By 1985 it had increased to 1,464,900 hectares. In 1985, the total area cultivated under rubber was 1,959,000 hectares. Cocoa also recorded an increase of 6.8 per cent from 1,18,000 hectares in 1981 to 1,26,000 hectares in 1982.

Lohmann (1991) reported that between 1950 and 1978, the cultivation of cassava, maize and sugarcane, increased by 800 per cent in Thailand for export to Japan, Taiwan, the other regions, at the expense of over 50,000 sq.km. of upland forest.

In Philippines thousands were dispossessed of their land during the 1970s and 1980s. Thirty per cent of the total cultivated land is now given over to cash crop production for export, mainly bananas, pineapple and sugarcane. The island of Negroes is now little more than a vast sugar estate, producing 68 per cent of the Philippines sugar crop. The most fertile area of Mindanao, Davao del Norte, is almost entirely under cash crops, with 25,000 hectares of banana plantations alone (Anonymous, 1992).

In Thailand following the logging ban in 1989, forest reserves are being turned over to eucalyptus. As much as 4,000,000 hectares of degraded forest (consisting mainly of farmland, pasture and community woodlands) will be leased to commercial planters to provide pulp and wood chips both for domestic and export markets. Under the recently begun *Khor Chor Kor* programme, villagers will lose almost 1,600,000 hectares of farm land, over 90 per cent of which will be given over to commercial plantations (Anonymous, 1992).

The evolution of the agricultural production system of Sao Paulo, Brazil was analysed for the period 1978-79 to 1988-89, through the process of land use substitution, by Filho and Yoshii (1992). It was found that sugarcane was the main activity substituting for other activities and its area increased by 8,84,700 ha. Other crops which showed significant area increase were oranges (3,42,300 ha); maize (1,09,400 ha) and soyabean (18,300 ha).

Sivakumar (1994) reported that in Karnataka state, there is a state wide shift from food based agriculture to horticulture, sericulture, dryland crops, energy forestry and the like. The area under food crops declined from 75.76 lakh hectares in 1989-90 to 72.91 lakh hectares in 1991-92. While the area under oilseeds increased from 22.65 lakh hectares in 1989-90 to 29.09 lakh hectares in 1991-92, it fell marginally to 27.81 lakh hectares in 1992-93.

## 2.7 Relationship between conversion of marginal homesteads for planting rubber and factors influencing conversion

Conversion of marginal homesteads for planting rubber involved both nature and extent of conversion. Thus it was decided to treat them together as conversion of marginal homesteads for planting rubber (composite index of conversion) in relation to the various factors which influenced conversion. Not a single study could be located which dealt with the conversion of marginal homesteads to rubber and factors influencing the same. Even then, one or two studies which highlighted the factors influencing conversion of land from paddy, tapioca, coconut, cashew to rubber in Kerala could be located. A general overview of factors influencing land use change in cropping systems was included. Due to lack of sufficient studies on the factors influencing land use change, other similar studies concerning relationship between adoption and factors influencing adoption was also included to provide a background of review on similar situations.

Sivanandan (1985) observed that the most significant factor responsible for the advancement of rubber plantation industry in Kerala is the contribution made by tree improvement research. This has been made possible by the combined efforts of Rubber Board and private nurseries. The policy of encouraging private nurseries to take up seedling multiplication under the guidance of Rubber Board has helped in reaching out the planting materials to all needy farmers.

### 2.7.1 Conversion of other crops to rubber and factors influencing conversion in Kerala

Sundaresan and Gopinath (1990) reported that in Thiruvananthapuram district, the main reasons for conversion of paddy and tapioca to rubber and coconut as pointed out by farmers were low profitability, low productivity, high labour cost, high input prices, non-availability of labour, lack of irrigation and influence of others.

In a comparative analysis of rubber holdings of Taliparamba and Kanjirappally Taluks of Kerala, Rajasekharan (1991) revealed that while half of the agricultural land was devoted to rubber in the former, it was 95% in the latter. The reasons attributed to the replacement of cashew by rubber in Taliparamba Taluk were institutional efforts of the Rubber Board, absence of a well developed marketing strategy for cashewnut and advantage of realizing distributed income for rubber throughout the year against 3 months for cashew. The faster spread of rubber in the Southern Taluk was attributed to the ready availability of planting materials and inputs, spread of coconut root (wilt) disease, the spread of a single perennial crop influencing other growers to switch over to that crop and relative profitability of rubber.

### 2.7.2 Factors influencing land use change

Mwalyosi (1992) analysed the factors influencing land use change in parts of Masai Steppe in the Arusha region of Tanzania. Environmental degradation due to land use change in this area was attributed to misuse or breakdown of traditional common property resources management practices caused by two important factors (1) rapid population growth which produced pressure for over exploitation of fixed natural stocks to meet subsistence needs; (2) technological changes which made it easier to exploit natural resources.

### 2.7.3 Conversion of marginal homesteads to rubber and factors influencing conversion

Based on discussions with experts, pilot study and personal observations, eighteen factors were selected and their relationship to conversion was analysed. The factors were age, family size, occupation, farming experience, area under wetland, area under homestead, exposure to technology, availability of family labour, availability of hired labour, outmigration of family labour, outmigration of hired labour, market factors, perception about attributes of rubber cultivation , number of crops, net area under rubber, gross cropped area of the homesteads, cropping intensity of homestead and dispersion of crops in the homestead replaced by rubber.

#### $V_1$ Age

Jha and Shaktawat (1972) observed that adoption behaviour of farmers towards hybrid bajra cultivation was negatively related to adoption of hybrid bajra.

Reddy and Reddy (1972) found that the correlation coefficient between age and adoption of improved agricultural practices of farmers was not significant for paddy and jowar.

Vijayan (1989) observed that adoption of cultivation practices in banana variety Nendran was independent of the differences in age.

Sekar and Alagesan (1994) obtained a negative but significant relation with adoption of sugarcane technologies by cane growers in South Arcot district. Theodore and Singh (1994) and Karthikeyan *et al.* (1995, 1996) reported a positive and significant association with extent of adoption of black gram and adoption of sugarcane technologies by farmers.

Based on pilot study and discussions in this study, it was hypothesised that there would be positive and significant relationship between age and conversion of marginal homesteads for planting rubber.

## $V_2$ Family size

Tyagi and Sohal (1984) could not find any significant relationship between family size and adoption of dairy innovations.

Agarwal and Arora (1989) found that there was no significant relationship between family size and adoption of gobar gas plants.

In a study on knowledge and adoption level of registered cotton seed growers in Chitradurga district of Karnataka, Reddy (1991) could not find any significant relationship between family size and adoption.

At the same time Susamma (1994) observed that a positive and significant relationship existed between extent of adoption of recommended practices of sericulture and family size.

In the present study it was postulated that there would be a significant correlation between family size and conversion of marginal homesteads to rubber.

## $V_3$ Occupation

Rajendran (1978) revealed that adoption of improved rice technologies by farmers was significantly influenced by their main occupation.

Susamma (1994) found that occupation had insignificant relationship with extent of adoption of recommended practices in sericulture.

It was hypothesised for this study that there would be a significant and positive relationship between occupation and conversion of marginal homesteads to rubber.

## $V_4$ Farming experience

Kunchu (1989) inferred that there was significant positive association between farming experience and extent of utilization of developmental schemes by cardamom growers.

Sekar and Alagesan (1994) studied the adoption behaviour of cane growers in South Arcot district and found that more the farming experience, more was the adoption of sugarcane technologies by cane growers.

Theodore and Singh (1994) found that farming experience had a positive and significant relationship with the extent of adoption of black gram among Pudukottai farmers and Thanjavur farmers.

Karthikeyan *et al.* (1995, 1996) also observed a positive and significant relationship between farming experience and extent of adoption of sugarcane technologies by cane growers.

Based on the above trends and relationships a positive and significant relationship between farming experience and conversion of marginal homesteads to rubber was hypothesised.

### $V_5$ Area under wetland

### $V_6$ Area under homestead

Since no studies were available dealing with the two types of landholdings separately it was decided to review the two together under farm size or size of landholding as related to conversion/adoption.

Jha and Shaktawat (1972) established a non-significant association with adoption behaviour of farmers. At the same time Reddy and Reddy (1972) found that farm size was positively and significantly related with the extent of adoption of farm practices in paddy while the correlation was non-significant in the case of jowar.

Sharma and Nair (1974) observed a positive and significant relationship between size of holding and adoption of high yielding varieties of paddy.

In a study conducted in West Bengal by Pathak and Majumdar (1978), it was found that farm size significantly contributed towards adoption behaviour of jute growers. According to Prakash (1980), in the more developed area of tribes, farm size was found to have positive and significant relationship with adoption of improved agricultural practices.

Azadi (1981) found that farm size positively affected adoption of recommended practices among farmers in Pakistan.

Vijayan (1989) observed that adoption of plant protection measures by cultivators of banana variety Nendran was significantly influenced by their farm size. According to Kunchu (1989) there was significant association between farm size and extent of utilization of development schemes by the farmers.

Karthikeyan *et al.* (1995, 1996) found that farm size had a positive and significant association with adoption of sugarcane by cane growers.

Since the studies cited as reference initiated a positive relationship, for the study it was postulated that area under wetland and area under homestead would have a significant relationship with conversion of marginal homesteads for planting rubber.

## $V_7$ Exposure to technology

Pathak and Majumdar (1978) found that mass media contact significantly contributed towards adoption behaviour of jute farmers.

Dudhani *et al.* (1987) assessed the adoption of recommended dry farming practices by farmers in Bijapur district of Karnataka and found that mass media participation had a non-significant association with adoption level. Sekar and Alagesan (1994) also revealed that higher exposure to mass media led to higher adoption of sugarcane technology by farmers.

Theodore and Singh (1994) also found a positive and significant relationship with the extent of adoption of black gram among Pudukottai and Thanjavur farmers.

For the present study also, it was postulated that there would be a positive and significant relationship between exposure to technology and conversion of marginal homesteads for planting rubber.

## $V_8$ Availability of family labour

Not a single study could be located indicating any relationship between availability of family labour and conversion/adoption. However, based on the pilot study and discussion with extension agents, it was hypothesised that there would be a negative and significant relationship between availability of family labour and conversion of marginal homesteads for planting rubber.

### $V_9$ Availability of hired labour

Sundaresan and Gopinath (1990) reported that in Thiruvananthapuram district non-availability of labour was one of the main reasons for conversion of paddy and tapioca to rubber and coconut.

Susamma (1994) could not find any significant relationship between availability of hired labour and extent of adoption of sericultural practices. In the study also it was postulated that availability of hired labour exerted a negative but significant influence on conversion of marginal homesteads for planting rubber.

### $V_{10}$ Outmigration of family labour

No study could be found depicting any relationship between outmigration of family labour and conversion. Based on pilot study and discussion, a positive and significant relationship between outmigration of family labour and conversion of marginal homesteads for planting rubber was hypothesised.

### $V_{11}$ Outmigration of hired labour

In this case also, based on pilot study and related observations and discussions with experts a positive and significant relationship was hypothesised between outmigration of hired labour and conversion of marginal homesteads for planting rubber.

### $V_{12}$ Market factors

In a study on the factors affecting changes in cropping pattern in Nilgiri district, Sridharan and Radhakrishnan (1978) found that the increase of about 1/3rd acreage under tea was attributed to the establishment of processing and marketing facilities for tea.

In this study also, it was hypothesised that there would be a positive and significant relationship between market factors and conversion of marginal homesteads for planting rubber.

### $V_{13}$ Perception about attributes of rubber cultivation

Salvi and Pawar (1966) revealed that adoption of recommended farm practices was positively related to its profitability, compatibility, efficiency and feasibility. At the same time adoption failed to show any relationship with cost and complexity of the practice.

Jaiswal and Roy (1968) found that perception of farmers on all six characteristics ie., profitability, cost, physical compatibility, cultural compatibility, complexity and communicability significantly influenced the adoption of agricultural innovations. Mulay and Roy (1968) also reported the same findings.

Chandrakandan (1973) found that if the farmers perceived a practice to be more efficient in saving time, labour and money in producing more, it increased their adoption.

In a study of adoption of high yielding varieties of paddy, Sharma and Nair (1974) observed that perception of simplicity, complexity, cost of cultivation, profitability of cultivation of high yielding varieties were found to be positively and significantly related with adoption.

Arulraj and Knight (1977) revealed that among the various farm practice attributes studied, except for cost and complexity which had a significant negative relationship with the extent of adoption, physical compatibility and profitability of farm practices had a positive and significant relationship with the extent of adoption.

In the present study, the fourteen attributes of rubber cultivation versus homestead farming selected included slope of land, type of soil, wind direction, local resource utilization, profitability, marketability, economic efficiency, regularity of returns, time availability, immediacy of returns, perceived risk, cultural compatibility, security need and status need. These attributes were all included under a single composite variable, perception of attributes, of rubber cultivation.

It was hypothesised that there would be a positive and significant relationship between perception of attributes of rubber cultivation and conversion of marginal homesteads for planting rubber.

## $V_{14}$ Number of crops

Not a single study could be located which indicated any relationship between number of crops in a homestead and conversion. All the same, it was believed that a homestead with high density and species diversity had lesser chances of conversion to rubber due to the diverse products obtainable from it. Lesser the species number and diversity, more were the chances for conversion. Thus it was postulated that there would be a negative and significant relationship between number of crops in a homestead and the conversion of marginal homesteads for planting rubber.

## $V_{15}$ Net area under rubber

Karthikeyan *et al.* (1995, 1996) found that area under sugarcane had a positive and significant relationship with adoption of sugarcane technologies by cane growers. Susamma (1994) at the same time, did not observe any significant association between area under mulberry cultivation and adoption of recommended practices in sericulture.

Only two reviews indicating similar relationship were available. A positive and significant relation was hypothesised between net area under rubber and conversion of marginal homesteads to rubber.

## $V_{16}$ Gross cropped area

The researcher would not locate any review depicting the relation between gross cropped area and conversion/adoption. Even then, it was postulated that more the gross cropped area of homestead, more would be the density of planting. Nair and Sreedharan (1989) reported that a reduction in the size of holding of homesteads has led to an intensification of cultivation. Though this has reduced the species diversity, the intensity of cultivation of selected species had considerably increased. The present study dealt with marginal homestead (< 1 ha. in area) conversion to rubber. So, it was hypothesised that the gross cropped area of a marginal homestead was negatively and significantly related to the conversion of marginal homestead to rubber.

### $V_{17}$ Cropping intensity

Pathak and Majumdar (1978) reported that cropping intensity significantly contributed towards the adoption behaviour of jute farmers. Cropping intensity of the homestead was inevitably related to the previously cited two variables ie., number of crops in the homestead and gross cropped area of the homestead.

So it was hypothesised that there would be a negative and significant relation between cropping intensity of the marginal homestead and conversion of marginal homesteads to rubber.

### $V_{18}$ Dispersion of crops

Dispersion of crops in the homestead indicated the relative distribution of the crops in the homestead. Evidently, this factor was also related to the number of crops, cropping intensity and gross cropped area of homestead. Thus, it was hypothesised that there would be a negative and significant relation between dispersion of crops in the marginal homestead and conversion to rubber.

## 2.8 Consequences of conversion of marginal homesteads for planting rubber

The researcher could not come across any study on consequences of conversion of marginal homesteads for planting rubber conducted in Kerala or any other states or countries. Hence the review includes studies or observations or findings on consequences of commercialization of agriculture in the form of cash crops or Green Revolution or globalisation of the economy.

In a study conducted among coffee growers Ng'anga (1976) found that coffee growing has contributed to social differentiation and class formation in Gatanga Kandara region in Central Region of Kenya.

Bremen (1978) analysed the consequences of spread of sugarcane cultivation in Surat district of Gujarat state. The increasing acreage under sugarcane has seen the influx of migrant labourers called Khandeshis from neighbouring Maharasthra to Gujarat. This has made the local Halpatis landless, poorer, unemployed for most of the year and uprooted from traditional agricultural labour.

Stavenhagen (1978) opined that the shift to commercial agriculture has several consequences for small farmers: (1) commercial cropping usually involves a much greater risk, which increases the possibility of indebtedness; (2) lessens small farmers' control over production increasing the dependency on outside agencies or institutions.

Cauvin (1979) discussed the problems and consequences of introducing a new crop, a selected variety of oil palm in a forest area of Ivory Coast, the Adjakru region. The new crop has brought changes for individuals, increased income, restricted centres of population and for the region.

Hurtado (1979) described what has happened in Mindanao of Philippines when a multinational company moved in to take control over its banana industry. Thousands of small farmers have lost their land, cultivation of diverse food crops has given way to banana growing, banana workers are poorly paid and the banana plantations have been exempted from the country's albeit timid agrarian reform programme.

Loh (1979) observed that in plantation agriculture, after an average of thirty years, the area was cleared after burning for replanting. This practice led to the loss of N and organic matter and caused soil erosion through the silting of streams and rivers.

Alexander (1980) made a comparative analysis of two areas, Attabira and Rengali blocks in Sambalpur district of Orissa with respect to their differing levels of economic development, due to the commissioning of the Hirakud Irrigation-cum-Electricity project. The project made higher level of agricultural development possible in Attabira compared to Rengali. It was found that economic development leads to a rise in number of new occupations and greater division of labour. There has been a reduction in the size of the work force mainly through withdrawal, first of the children, then the old and the women from the work force. Corresponding to this decrease in size of work force, there was an expansion of domestic workers (looking after the needs of family members) and non-workers (persons not involved in any work). With economic development there has been an expansion of the secondary and tertiary sectors and transfer of workers from primary to secondary and tertiary sector.

Economic development also led to the emergence of a number of new occupations, occupational specialisation and production of marketable surpluses, increasing monetization and increased geographical mobility of villagers.

According to Derr (1979) the processes of agricultural modernization and population growth have interacted in the village of Karimpur in Uttar Pradesh to significantly alter traditional socio-economic relationships within the village. Though the food grain production has increased dramatically over the past 50 years but more villagers are suffering from hunger. This is partly because of the 120% increase in village population but also because the traditional food redistribution system, the jajmani system, no longer function to a minimum level of subsistence to the labourers and artisans. New inputs and infrastructural supports have allowed farmers to reorient their production system from subsistence to profit maximization between the rich and the poor.

Fleuret and Fleuret (1980) reported that commercialization of agriculture causes a decline in crop diversity. As single households place increased amounts of land into production for the market, the range of possibilities for food production is reduced. When supplementary nonstaple foods are deleted from crop inventories in favour of commercial cultigens, the peasant household becomes less self-sufficient and more importantly less able to withstand seasonal variations in the supply of staple foods.

Between 1972 and 1977, Northern Beliz experienced a rapid increase in sugarcane production stimulated by the rising price of sugar on the international market. According to Stavrakis (1980) in the village of Santa Barbara, this led to the formation of a wealthy capitalist class and a poor semi-subsistence class. At the beginning of the sugarcane boom, the few wealthier families were able to take advantage of the new economic opportunity, while the traditional subsistence families who practised slash and burn cultivation of maize on the commercial lands and who did not have the initial capital remained poor and lost their control over their productive resources as sugarcane spread.

Fan (1981) found that plantation system in Malaysia has given rise to sexual division of labour and led to an increasing displacement, relocation and reorganisation of male and female labour.

Nadkarni (1981) reported that commercialization of agriculture could increase instability in output. The requirement of more inputs from the markets and hired labour increased the dependence of farmers on credit and supplies from outside.

Roy and Parmar (1987) studied the impact of Green Revolution among farm families in Punjab on before-after basis and found that, as a result of Green Revolution, farm families aspired for independent living combined with independent farming. The differentiation of family structure also showed change in the size of family. While the percentage of medium sized families increased in 1985, the percentage of small and large size families decreased during this period. Compared to 1966, families consumed more vegetables in their daily diet. The availability of certain selected food items like fats and oils also changed the food pattern in terms of complete use of ghee before 1966.

Soemarwoto (1987) reported that commercialization causes a decline in diversity of species and/or varieties and consequently the pioneers of genetic erosion sets in. For instance in the 1920s, 75 varieties of mango had been reported in the Cirebon area in West Java : but in a recent survey, they could find only 48 varieties. In Depok near Jakarta, only one variety of mango was found in a sample of 15 homegardens. The dominance of a certain crop on the farm increases the risk of losses due to its specific pests and diseases.

Moreover, when market demand and price offered for a certain plant product becomes higher, the cultivation of that species will spread often replacing those species and varieties which are of little or no economic value. This causes a reduction in the complexity of the homegarden and degeneration of its forest like structure. In such processes of commercialization, the highly nutritious, yet commercially less valuable local vegetables are usually the first ones to go.

With the expansion of plantation agriculture, Devi (1989) found that in the secondary sector, the percentage of people employed in most of the traditional occupations like that of blacksmiths, bell metal work, ceramics, rice husking and pounding, toddy tappers and barbers declined. Percentage of boatmen declined, of the labourers employed on roads and bridges etc. increased during 1921-31 by 133.63 per cent. There was also an increase in the tertiary sector employment, an increase in the number of workers engaged in imparting instruction, in medical services and in trade and transport. Simultaneously there was a more rapid increase in the number of agricultural labourers, labourers working on roads and bridges and of those employed in domestic service.

Lohmann (1991) observed that modern large scale irrigation systems installed under government programmes supported by international agencies have increasingly transferred the control of water into the hands of big business, the electricity authority, urban developers, larger landowners and the army and out of the hands of the small farmers who have both the most interest and most experience in preserving watershed ecosystems. For instance, the replacement of wooden dams in traditional "muang faai" irrigation systems in North Thailand with "improved" cement structures has often torn apart the complex forest/stream/rice field labour relationships which villagers have maintained for centuries as an ecological guarantee of subsistence. This has in some cases led to the abandonment of "muang faai" system, together with the system of forest management which forms a part of it, leading to more forest and watershed destruction.

The pursuit of "comparative advantage" by capital poor countries leads to extinction of species and varieties. As the "global exchange economy" extends its network of roads, ports, airports and processing depots, more and more traditional farmers take up specialized export oriented agriculture. The reduction in the number of crop species grown results in an even larger reduction in the number of supporting species. The locally specific nitrogen fixing bacteria, fungi that facilitate nutrient intake though mycorhizzal association, predators of pests, pollinators and seed dispersers, and other species that co-evolved over centuries to provide environmental services to traditional agro ecosystems have become extinct or their genetic base has been dramatically narrowed. Participation in the global economy also forces farmers to stay competitive with other farmers who have been put in the same bind (Anonymous, 1992).

Jose (1992) found that the introduction of rubber into home gardens had resulted in the loss of bio-diversity which could lead to the erosion of genetic resource base and had increased the market dependence of the households affecting their food security and survival capacity.

Mwalyosi (1992) analysed the recent land use changes and its consequences in parts of the Masai Steppe in the Arusha region of Tanzania. It was found that the land use changes have produced severe degradation of the environment and natural resource base, especially depletion of woody cover, reduction of rangelands, loss of soil productivity and accelerated soil erosion.

## 2.9 Conceptual framework for the study

Change is intrinsic to life. Every being born on earth passes through various life processes before it dies out or decays. Human beings passing through the millennia of evolution have consciously and deliberately shaped their surroundings both animate and inanimate. While change is a dynamic process/state of the mind, it may be linear, multi-directional or cyclical or all of these in different permutations and combinations.

Society shaped by man to a large extent is not alien to change. Social change has been simply defined as the change in the structure and function of a society. At the same time, it is not so simple as is depicted. Several theoretical interpretations to the process of social change have been put forward by sociologists, anthropologists and the like over years.

Auguste Comte, Sir Henry Summer Maine and L.H. Morgan were the important interpretors of the classical evolutionary approach. Auguste Comte viewed society as passing through the main phases: (a) the theological and military phase; (b) the scientific and industrial epoch in which positivism displaces war making as the dominant aim of social organization. Maine also viewed social change as passing through a series of stages between social order based on patriarchy to later forms based on freedom and contract. These theories in general emphasised a linear sequence to the process of social change which was questionable.

Later, the alternatives to evolutionism were put forward by Ogbon in his cultural lag theory of social change. It disproved the Evolutionary Approach and concluded that in the process of social change, material culture accumulates while other parts of culture like customs, beliefs, laws, philosophies, religion take a longer time to adapt to this change, thus resulting in continuous maladjustment between the two types of culture. A major criticism of this approach was the over simplification of the materialistic view of society and the generalisations to all societies like the evolutionary approach.

The classical diffusion theorists, who challenged the evolutionists, single line, immanent approach, built their research of social change mainly on the movement of things from society to society inquiring little about the social system contexts of either the originating or the borrowing cultures. At the same time, the multilineal evolution theory propounded by Steward, went one step further from the classical evolution theory. He rejected the same single view of causality of change, and that the changes in subsistence or technology are the prime movers in cultural evolution. He delineated parallel patterns of development/ change in different societies with their basis being the same.

Actually social change is all of these but none of these alone. For social change itself is so diverse and interrelated that a single functionalist/evolutionist/ diffusionist approach may not sufficiently explain the intricacies and intrinsic nature of change. For instance, according to Smelser (1970) social cycles, the breakdown and reconstitution of social order, the creation of new value systems, the integration of smaller social units into larger ones etc., represent different types of social change. According to the author, if we consider economic development as a type of social change, at least four distinct inter-related processes arise:

(1) in the realm of technology, a developing society is changing from simple and traditional techniques toward the application of scientific knowledge;

(2) in agriculture, the developing society evolves from subsistence farming toward the commercial production of agricultural goods. This means specialization in cash crops, purchase of non-agricultural products in the market and often agricultural wage-labour;

(3) in industry, the developing society undergoes a transition from the use of human and animal power toward industrialization proper, which produce commodities marketed outside the community of production;

(4) in ecological arrangements, the developing society moves from the farm and village towards concent- ration.

These developments may take place simultaneously, sequentially or an overlapping of the two. The causes, courses and consequences of economic development or social change of any type invariably follows a pattern and frame work. But it varies from society to society or community to community.

Consequence has been defined by Rogers and Shoemaker (1971) as the changes that occur within a social system as a result of adoption or rejection of an innovation. In other words, consequence is a subprocess of social change. Innovation may be an idea, a feeling, a product or invention or discovery which has diffused into the society. In the study, it is a crop: rubber, which was diffused into our society by external agents - the colonial forces.

Analysis of diffusion research has revealed that consequence as a sub process of social change has not received the attention it deserves. Many possible reasons have been put forward; overemphasis on the positivity of consequences, the inadequacy or inappropriateness of the usual survey methods of research, lack of long range research approach, the difficulty of empirically studying consequences or quantifying consequences are some. The concept of `cultural relativism' as coined by Rogers and Shoemaker (1971) is another viewpoint that each culture and the change within it should be judged in light of its own specific circumstances and needs. The researcher's cultural bias should not enter into the analysis of consequences.

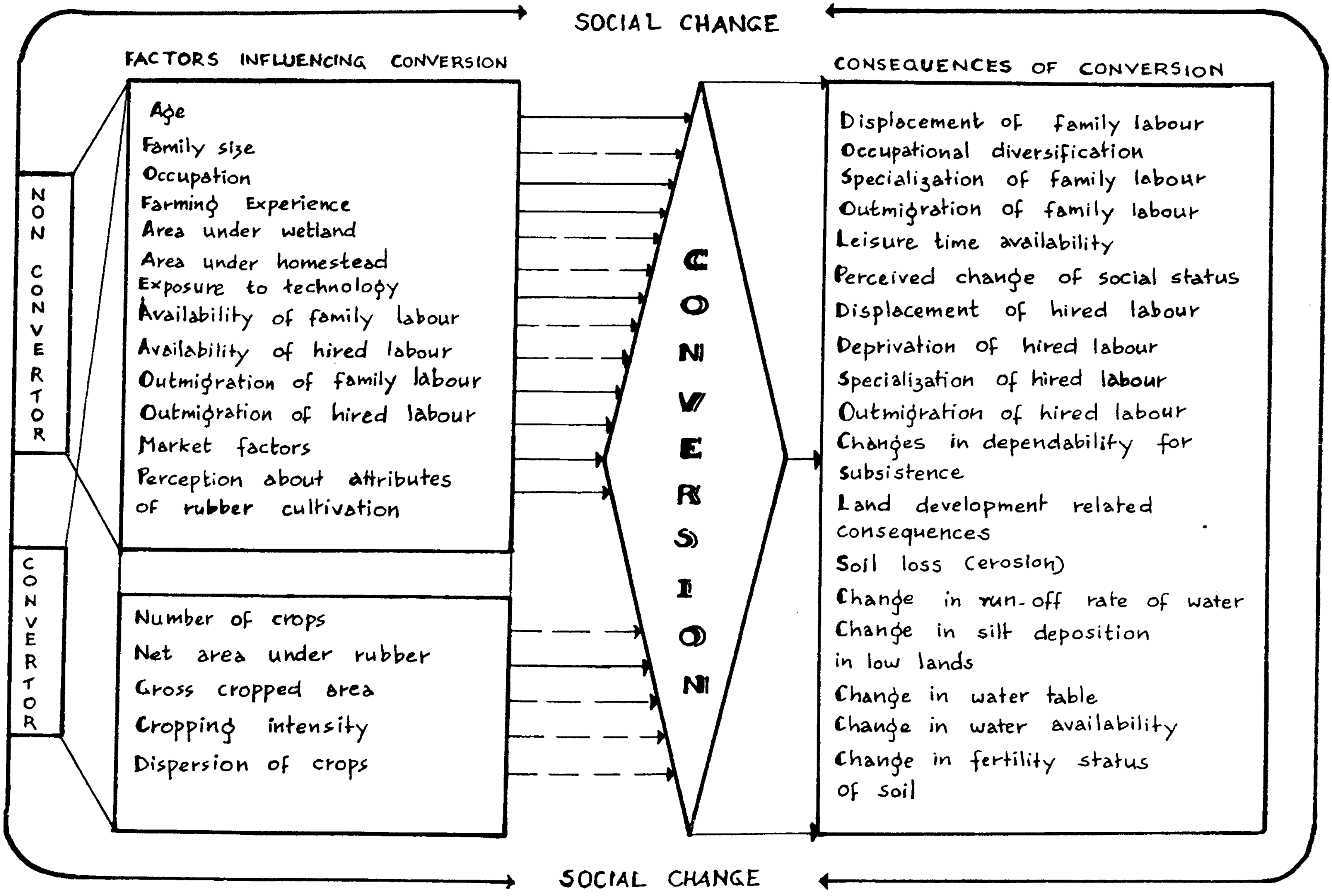
Consequences may also be studied from different dimensions relieved of the myth of positive consequences always being the end result of diffusion of innovations. Functional consequences are the desirable effects of an innovation while dysfunctional consequences are the undesirable effects. The contents of functionality/ dysfunctionality in turn may vary from society to society. But consequences should not be at the cost of destroyal of the qualities of a healthy society. Similarly functionality also depends on time and the individuals/participants who adopt the innovation.

Very often, consequences may be direct or indirect. Direct consequences are those changes in a social system which occur in immediate response to an innovation. Indirect consequences occur as a result of direct consequences. Similarly, manifest consequences are those that are recognized and intended by the members of a social system. Latent consequences are neither intended nor recognized by the members. Indirect consequences may also be first generation, second generation or even third generation or more. Thus, when an innovation is introduced/diffused into the social system the types or forms of consequences it may bring about are often unpredictable and multilinear.

In this study, rubber is a crop which was introduced into our agricultural scenario by the colonial forces. Its gradual penetration into our socio-economic and ecological fabric has brought about changes direct or indirect, manifest or latent, functional or dysfunctional, or a combination of all these or more. As described earlier, though rubber as a cash crop made its entry much earlier, its spread to marginal homesteads is relatively recent. This study was thus an attempt to delineate the causes of conversion of marginal homesteads for planting rubber and the consequences which followed.

It was conceptualised that, there would be significant relationship between the factors influencing conversion and the process of conversion. The consequences of conversion of marginal homesteads for planting rubber were also analysed to study the process of social change in this aspect. The conceptual framework developed for the study is depicted in Fig.1.

FIG. 1 CONCEPTUAL DIAGRAM DEPICTING THE HYPOTHESISED RELATIONSHIP BETWEEN INDEPENDENT VARIABLES, DEPENDENT VARIABLE AND CONSEQUENCES



# Methodology

CHAPTER III

# METHODOLOGY

In this chapter the methods employed in the study are presented preceded by a brief description of the study area, ie., Kottayam district. It was found necessary to include a description of the study area to develop the background and highlight the back drop against which rubber cultivation advanced in the study area and the significance of the study.

The entire chapter is divided into the following sections.

1. Description of study area,
2. Operationalisation and development of index for measuring nature and extent of conversion of marginal homesteads for planting rubber,
3. Selection, operationalisation and measurement of the factors influencing conversion of marginal homesteads for planting rubber,
4. Selection, operationlisation and measurement of the possible consequences of conversion of marginal homesteads for planting rubber,
5. Location of study area and sampling procedure adopted,
6. Techniques employed in data collection,
7. Statistical tools used in the study,

## 3.1 Description of study area

### 3.1.1 Kottayam district

The word "Kottayam" has its origin in the Malayalam word "Kottayakam" which means interior of a fort Thazhathangadi in Kottayam Municipality was in the past the seat of Munjunad Rajas of 8th Century AD and later of the Thekkumkara Rajas of the 11th century AD. Relics and ruins of certain fortifications and palaces of that era are still found in this area indicating that the present day town of Kottayam was once inside the fort.

### 3.1.2 Location and geographic distribution

Kottayam district situated in South Kerala is characterised by the absence of a coast line. It is cushioned between Alappuzha district to the west, Idukki district to the east, Ernakulam district to the north and Pathanamthitta district to the south.

The district extends from 9°24' to 9°52' North Latitude and 76°22' to 76°52' East Longitude. The total area is 2204 sq.km. and Kottayam district falls tenth among the fourteen districts of Kerala in area. Apart from Kottayam taluk in which the district headquarters is situated, there are four other taluks namely Vaikom, Changanassery, Meenachil and Kanjirappally

### 3.1.3 Land type and soil

The lower most and western most areas of Kottayam district consists of the Vembanad lake which is the drainage basin of the rivers flowing through the district. The land bordering the Vembanad lake is the lowland comprising of swampy areas and deltas upto an elevation of 7 m above MSL. The midland (7 m to 75 m elevation) consists of low hills and valleys followed by the highlands to the east (elevation, 75 to 750 m). The majority of the district falls under highland category with the High Ranges of Western Ghats forming the eastern border.

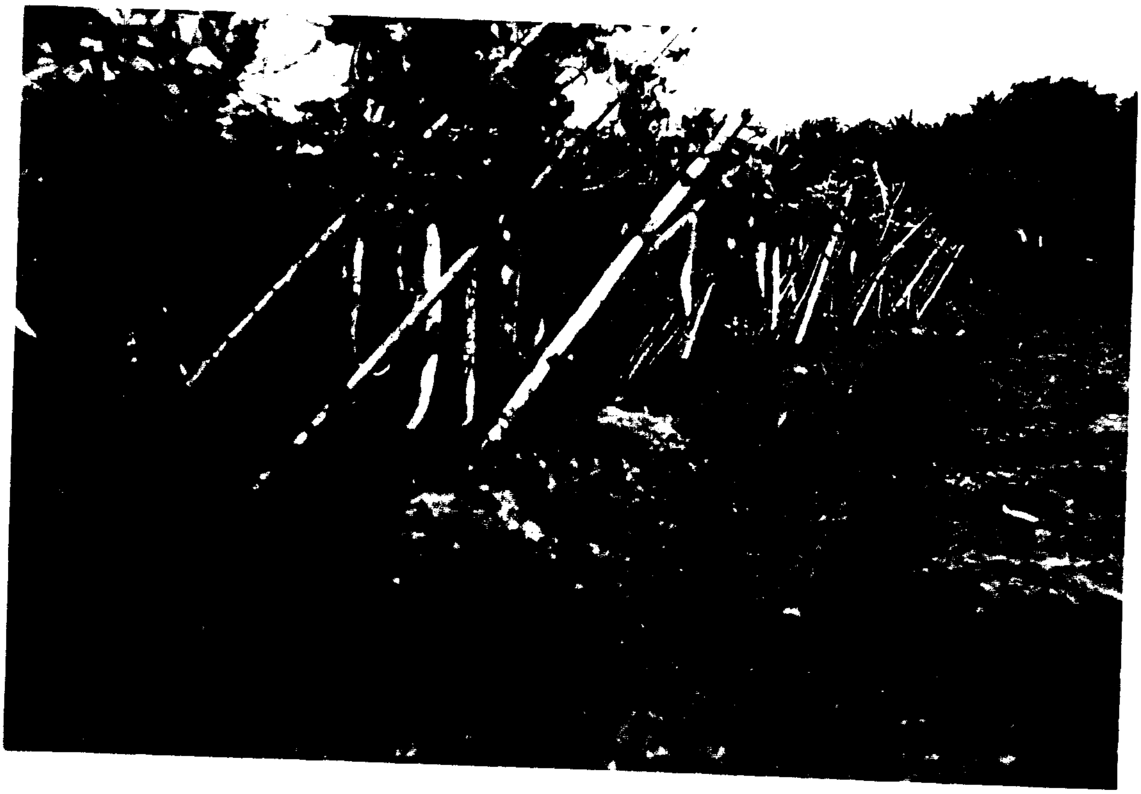
Vaikom taluk and parts of Changanassery and Kottayam taluk are mostly made up of alluvial soils especially in areas lying near the backwaters. In the midlands of Changanassery and Kottayam taluks and the entire Kanjirappally and Meenachil taluks, the soil is laterite in origin ranging from gravelly laterite loams to lateritic loams (red loams). The soil in the valleys is mostly sandy clay loam.

### 3.1.4 Vegetation and cropping pattern

The most important crops cultivated in Kottayam district are rubber, coconut, tapioca and pepper. Over the last decade, large tracts of tropical forests of the highland region have been cutdown and replaced by crops like rubber, tapioca, pepper, cocoa, ginger, turmeric, coconut and coffee. Paddy cultivation in Kottayam district is mostly confined to the lowlands, valleys and the flood plains of rivers with just one crop taken in most areas. Large scale vegetable cultivation is prevalent in pockets of Vaikom (Kuruppanthara, Peruva, Thalayolaparambu) taluk, Kottayam taluk and Changanassery taluk (Paipad) both for local and commercial purposes (Plate 1 & 2).

Plate 1. Amaranthus and tapioca cultivation on paddy lands in Kuruppanthara (Manjoor Panchayat)

Plate 2. Snake gourd pandals on paddy lands (Kuruppanthara)



The total cropped area in Kottayam district comes to 1,81,279 ha (1991-92). Out of this, rubber alone occupies an area of 1,08,851 ha. The details of comparison of change in area under different crops over a period of just three years is depicted in Table 2. There has been a shift in cropping pattern definitely in favour of rubber compared to paddy, coconut or pepper.

Homesteads of Kottayam district are spread throughout the district from low lands to highlands with slight variations, in the types of crops and trees grown. A large number of annuals and perennials are grown in a mixture, suited to the sustenance needs of the farm family. Without any spacing or definite cropping pattern, the homesteads used to resemble tropical forests due to their high crop diversity and canopy and ground coverage. Over years, the crops and cropping patterns in the homesteads have faced loss of diversity. Even then a large number of fruit and forest trees, vegetables, tubers and ornamentals, spices and condiment crops and beverage crops are being grown in these coconut based homesteads.

A few tree species which are reported to be facing extinction due to changes in land use as quoted in Sarva Vigyana Kosham, (Anonymous, 1990) in the district are bamboo *sp.*, teak, rosewood, wildjack, karimthali (*Diospyros* sp.), kadambu (*Akthocephalus* sp.), Ben Teak (*Lagestroemia* sp.), Karimaruthu (*Terminalia* sp.), Venga (*Pterocarpus marsupium*), Agil (*Dioxylum* sp.), Neer Maruthu (*Terminalia arjuna*), Mullilavu (*Bombax* sp.), Irul (*Xylia* sp.), Jack, Mango, Vaka (*Albizzia* sp.), Punna (*Calophyllum* sp.), Banyan sp., Turmeric, Njara (*Syzygium sp.)*, Karimthakara, Neem, Marotti (*Hydrocarpus* sp.) etc.

Table 2 Change in area under important crops in Kottayam district

| Sl. No. | Crops | Year 1989-90 (ha) | 1991-92 (ha) | 1992-93 |
|---|---|---|---|---|
| 1 | Paddy | 30063 | 23885 | - |
| 2 | Sugarcane | 191 | 134 | 187 |
| 3 | Pepper | 10210 | 10546 | 9704 |
| 4 | Ginger | 1416 | 600 | 404 |
| 5 | Turmeric | 435 | 297 | 239 |
| 6 | Cardomom | 23 | 205 | 205 |
| 7 | Betelnut (Arecanut) | 1665 | 1307 | 1272 |
| 8 | Tamarind | 368 | 325 | 314 |
| 9 | Cloves | 296 | 231 | 210 |
| 10 | Nutmeg | 355 | 434 | 444 |
| 11 | Cinnamon | 38 | 37 | 33 |
| 12 | Jack | 3700 | 3640 | 3387 |
| 13 | Mango | 3126 | 2442 | 2257 |
| 14 | Banana | 5060 | 2370 | 2469 |
| 15 | Pineapple | 628 | 717 | 670 |
| 16 | Pappaya | 796 | 785 | 747 |
| 17 | Cashewnut | 1178 | 1011 | 950 |
| 18 | Tubers | 1930 | 1849 | 1678 |
| 19 | Tapioca | 12228 | 11620 | 10827 |
| 20 | Vegetables | 1656 | 2151 | 2233 |
| 21 | Sesamum | 49 | 100 | 85 |
| 22 | Coconut | 48360 | 46012 | 44992 |
| 23 | Betel leaves | 47 | 28 | 21 |
| 24 | Lemongrass | 24 | 15 | 7 |
| 25 | Tea | 2007 | 2025 | 2036 |
| 26 | Coffee | 1385 | NA | NA |
| 27 | Rubber | 104105 | 108851 | 110997 |
| 28 | Cocoa | 4489 | 3108 | 2426 |
| 29 | Fodder grass | 256 | 226 | 257 |
| 30 | Green manure crops | 281 | 339 | 339 |

Source: Government of Kerala, Department of Statistics, Statistics for Planning 1989-90

### 3.1.5 River systems

Meenachil, Manimala and Muvattupuzha are the three rivers which flow through Kottayam district. Among these, Meenachil is the river which flows through the entire length and breadth of the district. It has a length of 78 kms with a vast drainage basin of 1081.04 sq.km. comprising parts of Peerumedu, Meenachil, Vaikom and Kottayam taluks. In its long course, it passes through the townships of Palai, Poonjar, Erattupettah, Ettumannoor and Kottayam. This fact itself indicates the importance of the river in deciding both limitations and potentials of land use and water use in the district.

Major part of the Muvattupuzha river flows through Ernakulam district. It passes through the Vaikom taluk only towards the end of its long course finally joining the Vembanad lake in Vaikom. The maximum length of the river is 120.75 kms.

The Manimala river flows through the Peerumedu, Kanjirappally and Changanassery taluks. This river has its origin in the Peerumedu taluk of Idukki district at an attitude of 1280 m. Only a part of the river flows through Kottayam district, in its course towards Vembanad lake. The total drainage area of the river is 802.9 sq.km. and has a length of 91.77 kms.

These three rivers have contributed a lot to the development of once frequently used inland waterways in the district.

### 3.1.6 Irrigation

There are no major irrigation projects in Kottayam district. This may be due to the insignificant area under paddy cultivation. Most of the cultivation in turn is in the fertile valleys or flood plains of rivers. So the crops are mostly rainfed. There are a number of minor lift irrigation projects. Apart from the use of Government and private canals, tanks and wells are also seen in use.

The classification followed by Roy and Verma (1988) divides Kottayam district into four sub-micro regions viz., Kumarakom low lying plains, Kottayam rolling plains, Meenachil Kanjirappally upland and Ranni forested hills. Parts of Vaikom, Kottayam and Changanassery taluks fall under the first region. Major portion of this area is flood prone. This is a low lying area intersected by rivers and canals with alluvium as the main soil type (Cartographic Division, Government of India).

The second region lies in the central part of the district comprising of parts of Vaikom, Meenachil, Kottayam, Changanassery and Kanjirappally taluks. The region is drained by Muvattupuzha and Meenachil rivers. Geological bed is charnocite and alluvium and soils are laterite of recent formation (shallow black, brown and alluvial soil) of southern region.

The third region lies in the eastern portion of the district comprising parts of Meenachil, Kottayam, Changanassery and Kanjirappally taluks. Some hillocks and isolated hills are found in the region. Geological bed is charanockite with intrusions of basic dykes. Soils are laterite and alluvial.

The fourth region is a very small area to the south eastern tip of the district in Kanjirappally taluk. Geological bed is charnockite and soil type same as alluvial as that for third region.

The Kumarakom low-lying plains which borders the Vembanad lake has an average height of just 6 M above mean sea level. Seasonal cultivation of paddy is carried out during winter after pumping out water into the kayal. The entire region remains submerged during rainy season. Paddy and coconut are important crops.

The Kottayam Rolling plains gently slopes towards the west with average height ranging from 70 M to 80 M. Rice is the important crop of this region.

The upland region forms the catchment area of Meenachil and Manimala river. Hillocks and isolated hills are seen towards the western part. The region slopes towards the west. The height ranges from 80 m to even more than 1000 m in Poonjar village (1,195 m). Rubber plantations thrive in the region.

The Ranni forested hills is the continuation of Thekkadi Reserve forest. The maximum height in this region (549 m) lies in Erumeli village. The forest is semi- decidous type with teak, rubber, cashew and the like. Erumeli and Mundakkayam are the important settlements.

### 3.1.7 Climate

Kottayam district has a tropical humid climate with very high temperature during summer months and heavy rains. Throughout the district, March-May are the hottest months, June to September, and October-November are the rainy seasons. Winter is experienced during December to February.

Average annual rainfall in the district is 289 cm with variations between 240-340 cms. The highest temperature shoots upto 31°C during hottest periods and daily minimum comes to 25°C. The district experiences strong Westerly or North-Westerly winds during the monsoons. During other periods, winds are mostly easterly or north-easterly during mornings.

### 3.1.8 Demographic and socio-economic profile

Kottayam district stands tenth among the 14 districts of Kerala state with respect to population 1,697,442 (1981 census). Out of this, the rural population comes to 1,538,335. Compared to the state's rate of growth of population of +19.14%, this district has a very low growth rate for the last twenty year period. During 1961-71 period the rate of growth was +17.13% which plunged down to +10.29% during 1971-81. The density of population comes to 830 persons/sq.km.

There are 72 panchayats in this district. Kottayam, Palai, Changanassery and Vaikom are the four important Municipalities, each famous for different reasons. Kottayam Municipality is the Headquarters of the district, Palai Municipality is famous for being the heart land of rubber planters and Vaikom for its once cultural and historic value.

The average family size in Kottayam district for a household is 5.05. The number of viable holdings come to 3,44,646. The details of distribution of working population in the district are given below (1991-92).

| | | |
|---|---|---|
| Total main workers | - | 5,37,087 |
| Cultivators | - | 84,327 |
| Agricultural labourers | - | 1,25,424 |
| Household industrial workers | - | 12,071 |
| Other workers | - | 3,15,265 |

### 3.1.9 Rubber cultivation and its growth in Kottayam district

The history of rubber expansion in Kottayam district can be traced back to the period when the present Kottayam district was under the erstwhile Travancore State ruled by the British. Though Kottayam district was not the pioneer in rubber cultivation, rapid expansion took place in this district compared to other districts due to many socio-economic and political factors.

A number of reforms introduced by the British paved the way for commencement of rubber planting. By the historic Pattom proclamation of 1865, full ownership rights were granted to tenants who until then could not sell or transfer their property without the British Sirkar's permission. Land thus became a saleable property. This historic event also coincided with the British Government's declaration of intention of encouraging European settlements (Devi, 1989) in the high range areas of Travancore. Large scale capital investment in the form of European plantations was started by clearing the forests.

Another classical reform was pertaining to the Cherickal lands. These were unregistered dry lands on hilly areas cleared once in 12 years for paddy/shifting cultivation by tribals. These lands formed about 1/10th of total lands in Travancore. By creating title, these lands were converted into private property in the place of public property. In these Cherickal lands, 2448 ha came under Changanassery taluk, 7915 ha under Kottayam taluk and 915 ha under Meenachil taluk. The rest of the area came under the present Alappuzha and Idukki districts. These lands in turn were to become the rubber belts of Kottayam district (Devi, 1989).

Taxation policies of the British Government favouring plantation crops like rubber, tea, coffee and cardamom in place of paddy also acted as an incentive for conversion of land to plantations, mainly rubber in the midlands.

The first rubber plantations were opened by the British planters and investors in the late 19th century from Ceylon. The first large scale commercial rubber plantation was established at Mundakayam from 1904 onwards. Lands were acquired from the British Government and the Vanjipuzha Chief in Mundakayam and a number of Rubber companies were started by 1906. Some of the companies were Teekoy Rubber Company, Oskadan River Rubber Co. and the Malayalam Rubber and Produce Company. By 1910, Mundakayam was the biggest rubber district in South India with 9652 acres of planted rubber rising to 11,173 acres by 1913. Connections with Kanjirappally, Erattupettah, Poonjar and the like were established through road for further expansion (Devi, 1989).

By 1916 the area under rubber in erstwhile Travancore went upto 30,000 hectares spread over Mundakayam, Changanassery, Meenachil of present Kottayam district and Ranni and Pathanapuram of present Pathanamthitta district. Soon, native Travancoreans especially converted Christians and orthodox Christians followed suit in starting rubber cultivation. In a way, Travancore had entered the foreign investment scenario way back in the beginning of this century.

The expansion of area under rubber plantations also led to the growth of many banking companies in Travancore which provided credit for investment in cash crops (Lieten, 1975). To quote with example, the number of banking companies in the erstwhile state rose from just five in 1917-18 to 258 in 1927-28 concentrated in the rubber belt of Travancore (Changanassery, Meenachil and Kottayam taluks of present Kottayam District).

Kottayam district is also famous for its migrations in connection with plantation culture. With the boom through rubber and other plantations, capital acquired from the cash crops was used for searching more land suitable for cash crop cultivation. This triggered off a wave of migration from the hilly tracts of Kottayam, Meenachil, Changanassery and Vaikom taluks to sub-mountainous regions of Malabar between 1940-1970 period (Joseph, 1988) in search of cultivable lands.

Later, the Land Reforms Act of 1963 and its Amendment in 1969 were passed by the Governments of Independent Kerala State. These Acts exempted plantation crops from land ceiling provisions. There was 40 per cent increase in the area under rubber during this period (1960-61 to 1968-69) (Ommen, 1971). By 1970s, the expansion of rubber area in the estate sector had stagnated. Area increase was mainly concentrated in small and marginal holdings.

## 3.2 Operationalisation and development of the index for measuring the nature and extent of conversion of marginal homesteads for planting rubber

Kottayam district is characterised by the absence of a coastal area. It mostly consists of midlands and lowlands where homestead cultivation was the most common type of cropping system followed. Over years especially since the 1970s there has been large scale conversion of these homesteads to rubber or for other non-agricultural purposes. These homesteads are mostly less than two hectares in area. Conversion of such homesteads, which are multi-cropped systems based on the subsistence requirements of the farmers to a monocrop like rubber are believed to bring about changes in both the physical, socio-economic and psychological aspects of the farmer's life. With respect to the physical aspects, both the extent of area under homestead displaced by rubber and the crops in the homesteads, which were raised for fulfilling various functions of the farm family in turn replaced by rubber were to be considered.

Thus, it was envisaged that development of an index which would highlight both the nature and extent of conversion of the marginal homesteads to rubber would be very interesting. It would in turn throw light on the type of conversion in all the taluks of the district and the dispersion or distribution of the various crops within the homesteads replaced by rubber.

In the present study the term "conversion" has been used to denote both the area under a homestead not exceeding one hectare replaced completely or partially by rubber and the type of crops and their functions which used to meet the subsistence requirements of the farm family replaced by rubber since the year 1980 so that at the time of study, the rubber trees have attained tapping stage (a rubber tree takes minimum 7 years to attain tapping stage) and are a source of income to the farm family. Thus, a 'convertor' is a farmer who has converted his homestead of 1 ha. or less to rubber since 1980.

The term 'non-conversion' denotes the retaining of a homestead, (area not exceeding one hectare), by a farmer adjacent to the holding of a farmer who has replaced his homestead completely or partially to rubber since 1980.

In this context, it would also be necessary to clarify what is a homestead under Kerala conditions. As described by KAU (1989), a typical homestead consists of a dwelling house with a small garden in front and a variety of annual and perennial crops grown in a mixture in a small piece of land usually ranging from 0.2 ha to 1 ha. The crops of a homestead may include vegetables, coconut or arecanut palms, tapioca, banana, drumstick, jack, mango, a few fruit species and the like. In addition to these, the presence of one or two heads of livestock with a small unit of poultry is another notable feature. More than 80 per cent of the produce generated is consumed in the home itself and the remaining 20 per cent provide subsidiary income to the household. Over years of trial and error experience these homesteads have developed into self sustaining and productive farming systems. Optimum utilization of the available land, solar energy and technological inputs and efficient recycling of farm wastes are the important characteristics of this system.

In Kerala, out of 4,43,300 ha. area under rubber cultivation, 3,98,929 ha. falls under small holding category, the majority of holdings not more than 1 ha. (Abraham, 1995). Most of the farmers under this category have left all their other means of subsistence from the land and turned to rubber. This in turn highlights the reason for selection of holdings of less than one hectare. Thus the change due to the transformation from a multi-cropped system to monocrop system is believed to be more discernable in the case of marginal rubber farmers.

The development of the index was carried out in three stages.

### 3.2.1 Development of index to measure nature of conversion of marginal homesteads for planting rubber

As a first step elaborate discussions were carried out with scientists and experts in the field of agroforestry on the different types of crop components, their configuration and arrangements in a typical homestead in Kerala focusing on Kottayam district. A list of all possible functions of these crop components, both annuals and perennials that would be replaced by rubber were prepared. Thorough literature collection on the subject was also carried out. The non-crop components like livestock and infrastructure related to homestead cultivation were not taken into consideration since it would be difficult to bring crop and non-crop displacement under the same scaling system or unit.

The prepared list containing twentytwo possible functions was sent to thirty judges, consisting of experts in the field of agriculture, agroforestry, economics and rubber cultivation, Land Use Board Officials, a few farmers and intellectuals to indicate their judgement on the rationality of conversion of marginal homesteads for planting rubber with respect to the function of homesteads replaced by rubber. The judgement was obtained on a five point continuum ranging from most to least rational. The judges were asked to indicate their rationality from three points of view viz., (a) agricultural, (b) socio-economic and (3) ecological points of view. Thus three scores of rationality were obtained for each judge. Though the judges rating sheets were sent to 30 judges responses were obtained only from 22 judges. The weightage for each function based on the rationality scores of the judges was obtained.

As a first step, the rationality scores for each function of the twentytwo judges were added for each point of view. Thus for each function three sets of cumulated rationality scores were obtained. The three cumulated rationality scores of each function were added and divided by the maximum potential score for each function ie., 110. Thus a composite rationality weightage was obtained. The average of the composite weightage gave the functional rationality weightage for each function. Thus 22 functional rationality weightages were obtained for the twenty two functions selected. The formula was,

$$CRW = \sum_{i=1}^{22} \frac{xia + xib + xic}{110} \qquad \ldots\ldots\ldots(1)$$

$$FRW = \frac{CRW}{3} \qquad \ldots\ldots\ldots(2)$$

where,

CRW = Cumulated Rationality Weightage

xia = The rationality score for the ith judge from agricultural point of view

xib = The rationality score for the ith judge from socio-economic point of view

xic = The rationality score for the ith judge from ecological point of view

FRW = Functional Rationality Weightage

The Functional Rationality Weightages for the twenty two functions is given as Appendix I.

The next step involved computation of Actual Functional Weightage Index for a crop based on the type of crops replaced by rubber in the marginal homestead. Each respondent was asked to list out the type of crops, both annuals and perennials replaced by rubber in his homestead. The total of all the 22 Functional Rationality Weightages (FRW) was thus obtained denoted as M.

$$M = \sum_{i=1}^{k} xi$$

k = Maximum possible functions of all crops taken together in a homestead = 22.

xi = FRW of the ith function of a crop

In the present study 22 functions of a homestead were taken into consideration.

As a next step, the various functions of each crop in the respondents' homestead from among the twenty two functions were listed.

The Actual Functional Weightage (AFWI) for each crop was found out.

$$AFWI = \frac{\sum_{i=1}^{n} xi}{M} \times 100$$

where

xi = Functional Rationality Weightage (FRW) of the ith function of a crop

n = Number of functions of the crop replaced by rubber

M = The total of 22 Functional Rationality weightages (FRW)

The Actual Functional Weightage Index for each crop in the homestead was thus computed (Appendix II). All the AFWI values for the crops in a homestead were added and this composite value divided by the number of crops gave the Functionality Index, of a homestead.

$$FI = \frac{\sum_{i=1}^{l} AFWI}{N}$$

where,

FI = Functionality Index for a homestead

l = Number of AFWI values

N = Number of types of crops in the homestead

Thus FI was considered as the Functional Index of a homestead.

### 3.2.2 Development of an index to measure the extent of conversion of marginal homesteads for planting rubber

Extent of conversion is related to the Gross Cropped Area under homesteads. Hence it was necessary to find out the gross cropped area of the homestead to know the actual area converted in each homestead. In this case the Gross Cropped Area should include both the present area under rubber which was previously utilized for homestead farming and the area retained under homesteads at present in the case of those farmers who have not completely converted their homesteads to rubber.

As cited earlier, each farmer was asked to list out the type and number of crops of each species both annuals and perennials which had been replaced by rubber. To find out the Gross Cropped Area, the acreage/area covered by each crop in the homestead was to be computed.

The acreage/area under a perennial

= Average area occupied by a single plant/tree of that species (in hectare) x number of that species

The area under the annuals like vegetables, tubers and the like was considered as such in hectares. The purpose was to bring both the area under perennials (tree species) and annuals (vegetables, tubers etc.) under a single unit of measurement.

Adding up the area thus obtained under all the crops in the homestead gave the Gross Cropped Area (GCA) of the homestead which has been converted to rubber. For those homesteads where complete conversion of the homestead to rubber had not taken place, it was necessary to find out the GCA of the area still retained under the homestead also. Since the data collection was restricted to only rubber holdings it was necessary to compute the GCA of the homestead area retained from existing information.

The total of the acreage under each homestead for all those homesteads where complete conversion to rubber had taken place was computed. This gave the total Gross Area of those homesteads alone.

The summation of the net area under each rubber holding for all those rubber holdings where complete conversion of homestead to rubber had taken place was also carried out. The summation of Gross Area divided by the summation of Net Area gave a constant. This constant was multiplied with the area under the homesteads retained and the GCA thus obtained was added to the GCA obtained previously for the area under rubber holding to obtain the actual Gross Cropped Area of these homesteads where complete conversion to rubber holdings had not taken place.

The extent of conversion was found out by applying the formula.

$$E\,C = \frac{PCA}{GCA} \times 100$$

where,

EC = Extent of conversion

PCA = Pure Cropped Area under rubber

GCA = Gross Cropped Area (Gross cropped area under rubber alone for those homesteads when complete conversion had taken place and GCA under rubber + GCA under homestead retained for those homesteads where complete conversion had not taken place)

### 3.2.3 Operationalisation and development of dependant variable, the composite index to measure the conversion of marginal homesteads for planting rubber

Once the index for measuring nature of conversion and extent of conversion was developed, it was necessary to develop a composite index to find out the conversion of marginal homesteads for planting rubber. The nature of conversion, extent of conversion and conversion were the three dependent variables in this study.

The Functional Weightage Index and Extent of Conversion Index for each rubber holding measured were applied into a third formula to obtain the Conversion Index (Narain *et al.*, 1991).

Development of the Conversion Index (CI) involved transformation of the index values of nature and extent of conversion for standardization. For this procedure, Let the Functional Weightage Index value for a holding be Y1

Let the Extent of Conversion Index value for a holding be Y2

Y1 and Y2 for each rubber holding were to be transformed into Z1 and Z2.

$$Z_1 = \frac{Y_1 - \text{Mean of } Y_1}{\text{SD of } Y_1} \qquad \text{..........(1)}$$

$$Z_2 = \frac{Y_2 - \text{Mean of } Y_2}{\text{SD of } Y_2} \qquad \text{..........(2)}$$

$Z_1$ = Transformed value of nature of conversion

$Z_2$ = Transformed value of extent of conversion

$Y_1$ = Functional Weightage Index value for the ith rubber holding

$Y_2$ = Extent of Conversion Index Value for the ith rubber holding

N = Number of respondents = Number of rubber holdings = Number of marginal homesteads replaced by rubber

From the 'N' $Z_1$ and $Z_2$ values the maximum of $Z_1$ and $Z_2$ values were found out. The deviation of each $Z_1$ and $Z_2$ from the maximum value of $Z_1$ and $Z_2$ were also computed and squared. After squaring the deviations, the deviations were added. The square root of the added deviation gave the Composite Index or the CI for the 'N' respondents.

ie. $$CI = \sqrt{(Z_1 - \text{Max of } Z_1)^2 + (Z_2 - \text{Max of } Z_2)^2}$$

The Composite Index (CI) value thus obtained was to be expressed as a Conversion Index. This in turn also involved slight transformation. The reciprocal of the Composite Index was to be found out. For this at first C was found out.

$$C = \overline{CI} + 2SD$$

where,

$\overline{CI}$ = Mean of the `N' CI values of conversion

SD = Standard deviation of `N' CI values

$$\text{The final Index } I = Di = \frac{CI}{C} \times 100$$

Thus `I' was the final index of conversion for the $i^{th}$ respondent.

## 3.3 Selection, operationalisation and measurement of the factors influencing conversion/non-conversion of marginal homesteads for planting rubber

Rubber is a crop which has gained immense popularity in the State especially since the last fourty years. The area under rubber has been increasing rapidly at the expense of other traditional crops like paddy, coconut, banana, tapioca etc. Hence, it was necessary to find out what were the probable factors that would have triggered off this sudden increase in area under this single crop. As for Kottayam district, more than half the cropped area comes under this mono crop. In the recent past, small and marginal homesteads on a large scale have been replaced with rubber by farmers of this area. Since the marginal farmers are directly dependent on their homesteads for sustenance, it would be very interesting to find out what all factors prompted the farm family to convert their homestead to rubber.

At the same time, it was believed there would be farmers in the areas adjacent to the homesteads which were replaced by rubber who still retained their homesteads without conversion. These farmers obviously retained their homesteads under the pressure of conversion taking place around them. So it would be interesting to find out the factors which influenced non-conversion of their homesteads for planting rubber inspite of social pressure for conversion. The same factors which were believed to influence conversion would be naturally acting upon non-convertors also. So it would be interesting to compare the convertors and non-convertors with respect to the same set of factors. It was also believed that the comparison would throw light on what all factors discriminated convertors from non-convertors.

A list of all possible factors that were believed to influence the conversion/non-conversion of marginal homesteads to rubber were selected, based on discussion with experts in the Kerala Agricultural University, Land Use Board, Kerala Forest Research Institute and the like. A comprehensive list of factors was sent to sixty judges and were asked to indicate their judgement on the degree of relevancy of each factor in contributing towards conversion/non-conversion of marginal homesteads to rubber on a five point continuum. Along with that, five variables which were believed to influence conversion alone were also included for relevancy rating. Responses were obtained from just 32 judges. Relevancy rating was carried out for the fifty five variables. The selected list of variables based on their high relevancy rating (Appendix III) were then subjected to pilot study. Four variables were removed based on the results of pilot study. Finally thirty one variables were selected. The final list of variables selected is presented below.

$V_1$ - Age

$V_2$ - Family size

$V_3$ - Occupation

$V_4$ - Farming experience

$V_5$ - Area under wet land

$V_6$ - Area under homestead (non-rubber area)

$V_7$ - Exposure to technology

$V_8$ - Availability of family labour

$V_9$ - Availability of hired labour

$V_{10}$ - Outmigration of family labour

$V_{11}$ - Outmigration of hired labour

$V_{12}$ - Market factor

$V_{13}$ - Perception about rubber cultivation

a - Ecological Attributes

$a_1$ - Slope of land

$a_2$ - Type of the soil

$a_3$ - Wind direction

$a_4$ - Local resources utilization

b - Economic attributes

$b_1$ - Profitability

$b_2$ - Marketability

$b_3$ - Economic efficiency

c - Temporal attributes

$c_1$ - Time availability

$c_2$ - Immediacy of returns

d - Socio-economic attributes

$d_1$ - Perceived risk

$d_2$ - Cultural compatibility

$d_3$ - Security need

$d_4$ - Status need

$V_{14}$ - Number of crops

$V_{15}$ - Net area under rubber

$V_{16}$ - Gross cropped area

$V_{17}$ - Cropping intensity

$V_{18}$ - Dispersion of crops

### 3.3.1 Operationalization and measurement of selected independent variables influencing conversion/ non-conversion of marginal homesteads for planting rubber

#### 3.3.1.1 Age

Operationalised as the number of chronological years completed by the respondent at the time of interview. Each respondent both convertor and non-convertor was asked to indicate the number of years he/she had completed at the time of study.

#### 3.3.1.2 Family size

Defined as the number of members in the family of the respondent at the time of study. For every member a score of one was given so that the number of the score would be equal to the size of the family.

#### 3.3.1.3 Occupation

Susamma (1994) has operationally defined occupation as an activity in which the respondent is continually engaged for his livelihood or an additional income.

The same definition held good in this study also. The occupation of both convertor and non-convertor (homestead farmers) was measured using an arbitrary scale developed for the purpose similar to that of Susamma (1994). In this scale scoring was based on both main and sub-occupations followed by the farmer. The occupation of rubber farming alone or homestead farming alone was given the highest score of ten. A 10 point classification of occupation was followed in both cases with an occupation of rubber and foreign job + paddy/other crops and homestead and foreign job and paddy obtaining lowest score of one. The categories with corresponding scores were:

| | Rubber farming | Homestead farming | score |
|---|---|---|---|
| 1. | Rubber farming alone | Homestead farming alone | 10 |
| 2. | Rubber + paddy+/other crops | Homestead + paddy | 9 |
| 3. | Rubber + agricultural labour | Homestead + agricultural labour | 8 |
| 4. | Rubber + agricultural labour + paddy +/other crops | Homestead + agricultural labour + paddy | 7 |
| 5. | Rubber + part time business | Homestead + part time business | 6 |
| 6. | Rubber + part time business + paddy +/other crops | Homestead + part time business + paddy | 5 |
| 7. | Rubber + full time business | Homestead + full time business | 4 |
| 8. | Rubber + full time business + paddy +/other crops | Homestead + full time business + paddy | 3 |
| 9. | Rubber + job abroad | Homestead + job abroad | 2 |
| 10. | Rubber + job abroad + paddy +/other crops | Homestead + job abroad + paddy | 1 |

### 3.3.1.4 Farming experience

This variable was operationalised as the number of physical years the farmer has been engaged in farming. For every year of farming experience a score of one was given.

### 3.3.1.5 Area under wetland

Operationalised as the area owned/leased in by the farmer in hectares, put to paddy/vegetable/other annuals cultivation. The actual area in hectares was found out. Since only single crop was taken in most cases, only net area was taken into consideration.

### 3.3.1.6 Area under homestead

Operationally defined as the area retained as homestead by a farmer in hectares even after the conversion of a part of his/her homestead into rubber. The area was measured in hectares.

### 3.3.1.7 Exposure to technology

Exposure to technology by the farmers was measured in terms of the extent of utilization of various sources of information : personal, socio-political and mass media in rubber technology which in turn had influenced his conversion/non-conversion of marginal homesteads for planting rubber.

The scoring procedure developed by Nair (1969) was used in this study with slight modifications. Each respondent was asked to indicate what all sources of information he/she had utilized and the frequency of their utilization. The scoring procedure developed was:

| Frequency | Score |
|---|---|
| Always | 2 |
| Sometimes | 1 |
| Never | 0 |

The information sources utilized were listed as:

### A. Personal

a) Relatives

b) Friends

c) Rubber Board Officials

d) Agricultural Officer

e) Agricultural Assistant

f) Neighbours

g) Others

### B. Socio-political

a) Panchayat

b) Credit Co-operatives

c) Service Co-operatives

d) Market Co-operatives

e) Political organisations

f) Religious institutions/organisations

g) Trade Unions

h) Any other

### C. Mass Media

a) `Rubber' magazine

b) News Papers

c) Radio

d) Television

e) Farm magazines of KAU/SDA

f) Any other

The scores were added across each item to give the index of exposure to technology.

### 3.3.1.8 Availability of family labour

This variable was defined as the relative easiness in availability of family labour for carrying out different farm operations in the homestead for the farmer which in turn may have influenced his/her conversion/non-conversion of marginal homesteads for planting rubber. An arbitrary scale was developed for the purpose. Each respondent was asked to indicate the easiness of availability of family labour for six important farm operations on a four point continuum provided for the purpose. The scoring procedure followed was:

| Availability | Score |
|---|---|
| Easily available | 3 |
| Available | 2 |
| Difficult | 1 |
| Not available | 0 |

A score of one was given for the labour utilized in each of the six operations selected. The easiness in availability was measured for each operation. The scores were then added across all the six items to give a composite score of availability of family labour. Thus the maximum score obtainable by a person was 18 (6x3) and the minimum 0 (6x0).

#### 3.3.1.9 Availability of hired labour

This variable was defined as the relative easiness in availability of hired labour for carrying out different farm operations in the homestead for the farmer which in turn may have influenced his/her conversion/non-conversion of marginal homesteads for planting rubber. The scaling and scoring procedure to measure the availability of hired labour was the same as that for availability of family labour.

#### 3.3.1.10 Outmigration of family labour

Operationalised as the outward movement of family labour (male/female) involved in homestead farming on occupational/ geographical basis, which had influenced the conversion/non-conversion of marginal homesteads for planting rubber. This may include movement in search of occupations other than agricultural labour outside/within the locality or movement in search of agricultural labour itself outside/within the locality.

Each respondent was asked whether any member from his/her family who was assisting in farm operations had shifted his/her occupation to other occupations outside/same locality or moved out in search of agricultural labour itself outside/same locality.

An arbitrary scale was developed to measure the outmigration of family labour in this study for every family member who had shifted. The scoring pattern followed was:

| | | | Score |
|---|---|---|---|
| 1. | a) Every occupation other than agricultural labour | : | 6 |
| | b) Agricultural labour | : | 3 |
| 2. | a) Migration outside locality | : | 4 |
| | b) Migration within locality | : | 2 |

The final score obtainable for a member who had shifted his/her occupation was:

| | | |
|---|---|---|
| a) Every occupation other than agricultural labour and outside locality | : | 10 (6+4) |
| b) Every occupation other than agricultural labour and same locality | : | 8 (6+2) |
| c) Agricultural labour + outside locality | : | 7 (3+4) |
| d) Agricultural labour + same locality | : | 5 (3+2) |

### 3.3.1.11 Outmigration of hired labour

Operationalised as the outward movement of hired labour (male/female) engaged, on occupational/geographical basis which had influenced the conversion/non-conversion of marginal homesteads for planting rubber by the farmer. This many include movement in search of occupations other than agricultural labour outside/within the locality or movement in search of agricultural labour itself, outside/within the locality by the hired labour engaged by the farmer.

Each respondent was enquired whether any hired labourer engaged by him/her who was assisting in farm operations had shifted from his present occupation as agricultural labour to other occupations outside/within the same locality or moved out in search of agricultural labour itself outside/same locality.

As in the case of measurement of outmigration of family labour, an arbitrary scale was developed for measuring this factor also. For every hired labourer who had shifted, the scoring pattern followed was:

| | | | Score |
|---|---|---|---|
| 1. | a) Every occupation other than agricultural labour | : | 4 |
| | b) Agricultural labour | : | 2 |
| 2. | a) Migration outside locality | : | 2 |
| | b) Migration within locality | : | 1 |

The final score obtainable for a hired labourer who had shifted his/her occupation was:

| | | Score |
|---|---|---|
| a) Every occupation other than agricultural labour + outside locality | : | 6 (4+2) |
| b) Every occupation other than agricultural labour + same locality | : | 5 (4+1) |
| c) Agricultural labour + outside locality | : | 4 (2+2) |
| d) Agricultural labour + same locality | : | 3 (2+1) |

### 3.3.1.12 Market factors

Operationally defined as the facilities available to the farmer for all processes involved in marketing of rubber, which in turn may have influenced his/her conversion of marginal homesteads for planting rubber.

The respondent was asked what all marketing facilities were availed by him/her among the list of four. For every facility availed, the scoring pattern followed was:

| Facility | | Score |
|---|---|---|
| Marketing facility | : | 4 |
| Processing facility | : | 3 |
| Transportation/storage facility | : | 2 |
| Service co-operatives | : | 1 |

Based on the number of such facilities under each category, a composite score was obtained for every facility by multiplying the number of each facility available with score for that facility. Summation of all the composite scores under each category gave the total score indicating the market factor influencing conversion/non-conversion.

### 3.3.1.13 Perception about attributes of rubber cultivation influencing conversion/non-conversion of marginal homesteads for planting rubber

Theodorson and Theodorson (1970) defined perception as the selection, organisation and interpretation by an individual of specific stimuli in situations according to prior learning, activities, interests and experiences.

In the present study perception about attributes of rubber cultivation versus homestead farming was operationalised as the meaningful sensation of convertors/non-convertors about the relative worth, value or efficiency of cultivating rubber by replacing homestead farming in comparison with retaining homestead farming without conversion.

In order to study the influence of farm practice attributes on innovation - decision process, Arulraj and Knight (1977) selected 15 variables for judgement. They included cost, physical compatibility, immediacy of returns, complexity, profitability, feasibility, inputs availability, cultural compatibility, rate of cost recovery, efficiency, observability, perceived risk, feasibility, marketability and novelty.

Sudha (1987) developed a scale to analyse perception about Lab-to-Land Programme. A set of fourteen statements related to the perceptual field of the programme were prepared on four point continuum, with the scoring pattern being, very effective-4, effective-3, less effective-2 and least effective-1.

In this study also perception about attributes of rubber cultivation versus homestead farming was measured using arbitrary scale developed for the purpose. Based on discussion with experts and rubber farmers, fourteen attributes of rubber cultivation influencing conversion/non-conversion in comparison with homestead farming were identified and the farmer was asked to indicate his/her degree of perception on a five point continuum with scoring pattern as follows:

## a. Ecological attributes

a1) Slope of land

Degree to which lay of the land is considered to be suitable (ranging from plain land to steep incline facing east, west, north or south) for cultivating rubber in comparison with homestead farming.

Scoring pattern:

| Highly suitable | Moderately suitable | No change | Less suitable | Least suitable |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

a2) Type of soil

The degree of suitability of the soil (alluvial or clay loam or laterite) for successful cultivation of rubber in comparison with homestead farming.

Scoring pattern:

| Highly suitable | Moderately suitable | No change | Less suitable | Least suitable |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

a3) Wind direction

The degree to which the direction of wind is perceived to influence the cultivation of rubber in comparison with homestead farming.

Scoring pattern:

| High influence | Moderate influence | No change | Less influence | Least influence |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

a4) Local resource utilization

Comparing homesteads and rubber, the degree to which effective utilization of local resources like water, labour, manures, land etc. can be carried out without external dependence.

Scoring pattern:

| High in effective utilization | Moderate in effective utilization | No change | Low in effective utilization | Least effective utilization |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

## B. Economic attributes

b1) Profitability

The degree to which maximum financial returns can be obtained from the cultivation of rubber in comparison with homestead farming as perceived by the farmer.

Scoring pattern:

| Highly profitable | Moderately profitable | No change | Less profitable | Least profitable |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

b2) Marketability

The perception of the farmer about the degree to which products from rubber can be marketed easily without any delay compared to products from homesteads.

Scoring pattern:

| Easily marketable | Marketable | No change | Difficult | Very difficult |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

b3) Economic efficiency

Perception about the degree to which maximum output/returns can be obtained for every rupee invested in a rubber holding compared to a homestead.

Scoring pattern:

| Highly efficient | Moderately efficient | No change | Less efficient | Least efficient |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

b4) Regularity of returns

Perception about the degree to which rubber cultivation can provide returns on a regular basis compared to homestead farming.

Scoring pattern:

| Highly regular | Moderately regular | No change | Less regular | Least regular |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

## c. Temporal attributes

c1) Time availability

Comparing homestead farming with rubber cultivation, perception of convertor/non-convertors about the extent of free time (in hours) available to the farmer and his family that can be utilized for any subsidiary activity other than farming.

Scoring pattern:

| Substantial increase | Increase | No change | Decrease | Substantial decrease |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

c2) Immediacy of returns

The degree to which rubber cultivation can provide immediate returns in comparison with homestead farming.

Scoring pattern:

| Immediate | Speedy | No change | Slow | Very slow |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

## d. Socio-psychological attributes

d1) Perceived risk

Perception about the degree of risk involved by engaging in rubber cultivation in comparison with homestead farming.

Scoring pattern:

| High risk | Moderate risk | No change | Less risk | Least risk |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

d2) Cultural compatibiltiy

The degree to which cultivation of rubber is consistent with the values, beliefs and philosophy behind farming as part of evolution and development of human culture compared with homestead farming as perceived by convertor/non-convertor

Scoring pattern:

| Highly compatible | Some what compatible | No change | Less compatible | Least compatible |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

d3) Security need

The perception of convertors/non-convertors about the degree to which rubber cultivation satisfies the farmer's need for a secure life both physical and psychological.

Scoring pattern:

| Highly satisfying | Moderately satisfying | No change | Less satisfying | Least satisfying |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

d4) Status need

Perception about the degree to which rubber cultivation can bring status to the farmer in the society in comparison with homestead farming.

Scoring pattern:

| Highly satisfying | Moderately satisfying | No change | Less satisfying | Least satisfying |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 5 | 4 | 3 | 2 | 1 |

To obtain an aggregate score of perception for a respondent, at first all the scores obtained for the 14 attributes were added up. The sum total was divided by the maximum potential score obtainable ie., 70(14x5). This value expressed in percentage gave the aggregate score of perception for a respondent, convertor/non-convertor.

The formula for aggregate score of perception:

$$AP = \frac{T}{M} \times 100$$

AP = Aggregate perception score on rubber cultivation versus homestead cultivation

T = Total observed score of the respondent as observed in the 14th attribute

$$= \sum_{i=1}^{14} ai \quad \text{where ai is the score on the } i^{th} \text{ attribute}$$

M = Maximum potential score = 14 x 5 = 70

## 3.3.2 Operationalization and measurement of situational variables influencing conversion of homesteads for planting rubber

### 3.3.2.1 Number of crops

Operationally defined as the number of different species of crops, both annuals and perennials of a marginal homestead replaced for cultivating rubber by a convertor. The convertor was asked to list out the number of the different species of crops he/she had replaced for planting rubber.

### 3.3.2.2 Net area under rubber

Operationalised as the area in the homestead which has been replaced by rubber by the convertor and at present under rubber cultivation. The convertor was asked to indicate the area in hectares which has been brought under rubber cultivation since 1984.

### 3.3.2.3 Gross cropped area

The gross cropped area of the homestead is operationally defined as the sum total of the area occupied by each species both annuals and perennials in a homestead which was replaced by rubber.

The method for finding out the gross cropped area of a homestead is as described in the section 2.2.

### 3.3.2.4 Cropping intensity

Cropping intensity is operationally defined as the intensity of agricultural activity in a homestead which was replaced by rubber. For the present study it was measured as,

$$CI = \frac{\text{Gross Cropped Area of the homestead}}{\text{Net area under homestead converted to rubber}}$$

It could also be written as

$$CI = \frac{\text{Gross Cropped Area of the homestead}}{\text{Net area under rubber}}$$

In this case, cropping intensity was estimated with respect to the area under rubber alone which was previously under homestead cultivation. Thus, net area under homestead converted into rubber was taken into consideration rather than net area under homestead. This is because the respondents might have homesteads which were only partially converted to rubber holdings.

#### 3.3.2.5 Dispersion of crops in the homestead

Operationalised as the inequality of distribution/ concentration of the crops in a homestead which was replaced by rubber. This is actually a farmer's decision. This variable was expressed as an Index named Her Findal Index. This is an index of dispersion/concentration of the crops in a homestead.

The formula is:

$$HFI = \frac{\sum_{i=1}^{r} xi^2}{\left(\sum_{i=1}^{r} xi\right)^2} \times 100$$

where, r = Number of crops in the homestead

xi = The acreage under the $i^{th}$ crop in a homestead

### 3.4. Selection, operationalisation and measurement of the consequences of conversion of marginal homesteads for planting rubber

Unlike other introduced crops, the advance of rubber in our society has been so rapid that the changes brought about by it were likely to be highly significant. In the study area, ie., Kottayam district, more than half the cropped area has already been brought under rubber. So it was expected to bring about some change in the social, psychological, agricultural and ecological fabric of the study area. In this study it was intended to look closely into some of the important consequences believed to be brought about by the conversion of marginal homesteads for planting rubber atleast ten years back.

As a first step, a list of all possible consequences was prepared in consultation with experts in the field of social change, land use studies, agriculture, ecology etc. The comprehensive list of all possible consequences was sent to sixty judges and were asked to indicate their judgement on the degree of relevancy of each consequence on a five point continuum. Replies were obtained from just thirty two judges. Relevancy rating was carried out for the 58 consequences (Appendix IV). The selected list of consequences with high ratings were then subjected to pilot study. The pilot study did elicit the need for any change in the number of consequences selected. The final list of consequences selected is presented below:

C1 - Displacement of family labour

C2 - Occupational diversification

C3 - Specialisation of family labour

C4 - Outmigration of family labour

C5 - Leisure time availability

C6 - Perceived change of social status

C7 - Displacement of hired labour

C8 - Deprivation of hired labour

C9 - Specialisation of hired labour

C10 - Outmigration of hired labour

C11 - Changes in dependability for subsistence

C12 - Land development related consequences

C13 - Soil loss (erosion)

C14 - Change in run-off rate of water

C15 - Change in silt deposition in low lands

C16 - Change in water table

C17 - Change in water availability

C18 - Change in fertility status of soil

The operationalisation and measurement of the consequences is presented below:

### 3.4.1 Displacement of family labour

Displacement has been defined in Encyclopedia Britannica as the removal from the usual or proper place/to expel or to shift or redirect from a previous position (Anonymous, 1973).

In the study, displacement of family labour was operationalised as the redirecting or shifting of the occupation as family labour of a homestead farmer consequent to conversion of his/her marginal homestead for planting rubber.

Displacement of family labour was measured in terms of the quantity of family labour displaced after conversion of his/her marginal homestead for planting rubber in man days.

One man day = 6 hours

$$\text{The number of man days/year} = \frac{360}{6} = 60 \text{ Man days}$$

The number of man days of family labour before conversion and after conversion were considered. The difference between the two was taken as a measure of displacement of family labour. The value ranged from 0 to 60, zero indicating no displacement and 60 indicating complete displacement.

### 3.4.2 Occupational diversification

The Encyclopedic meaning of the term diversification is the practice of spreading investments among a variety of securities or in a class of securities.

Sadanji and Singh (1992) have defined occupational diversification as adopting non-crop occupation(s) which is(are) new to him for self-employment along with or deviating from the parental occupation(s) like crop cultivation, traditional occupation and caste occupation or doing the same caste or non-crop parental occupation in a new way in terms of products, services, etc. to accomplish high economic ends.

In this context, occupational diversification was operationalised as the spreading of investments from rubber among a variety of off-farm occupations/investments which were new to him/her along with the present occupation as rubber farmer, consequent to conversion of his/her marginal homestead to rubber.

A simple method of measurement was adopted to find out the occupational diversification of a rubber farmer. Based on discussions and field observations, five possible off-farm occupations/investments were selected. Each convertor was asked to indicate which all off-farm ventures had been started by him/her consequent to conversion of his/her homestead to rubber among the listed five. For every off-farm investment/occupation, a score of one was given. Based on the response, the maximum score obtainable for a convertor was 5 and minimum 0. The score obtained by a convertor was then expressed in percentage to obtain an index of occupational diversification.

$$\text{Occupational diversification (OD) of a convertor} = \frac{\text{Score obtained}}{\text{Maximum score obtainable (5)}} \times 100$$

### 3.4.3 Specialisation of family labour

Dictionary meaning of specialisation is differenti-ation that tends towards greatly increased efficiency in one function at the expense of the other.

In this study specialization of family labour was operationally conceptualised as the differentiation of the time spent by a rubber farmer (convertor) that tends towards greater efficiency/concentration of investments/ time in rubber farming and related activities at the expense of other income generating activity(ies)consequent to conversion of his/her marginal homestead for planting rubber. The number of members in a family who were engaged in income generation were taken into consideration. For every member the time spent for rubber cultivation and related aspects and time spent for other income generating activities was considered. Out of the total time spent for income generating activities by the family (time spent for rubber + time spent for other income generating activities) the total time spent for rubber alone by the family was utilized for finding out the specialisation of family labour. The value was expressed as an index.

$$\text{Specialisation Index (SI)} = \frac{\text{Time devoted to rubber by the family}}{\text{Total time spent for income generating activities by the family}} \times 100$$

### 3.4.4 Outmigration of family labour

Operationalised as the outward movement of family labour (male/female) who was involved in homestead farming on occupational/ geographical basis, consequent to conversion of his/her marginal homestead for planting rubber. This may include movement in search of occupation other than agricultural labour outside/within the locality or movement in search of agricultural labour itself outside/within the locality.

Each convertor was asked whether any member from his/her family who was assisting in homestead farming had shifted his/her occupation to other occupations outside/same locality or moved out in search of agricultural labour itself outside/same locality consequent to conversion.

An arbitrary scale was developed to measure the outmigration of family labour The scoring pattern and the scale were the same as given in section 3.3.1.10.

### 3.4.5 Leisure time availability

Susamma (1994) operationally conceptualized leisure time availability as the total time (hours) available to for the members of the family which can be utilized for any subsidiary activity including the time now used for sericulture activities.

In the study, leisure time availability was operationally conceived as the total time in hours available to the rubber farmer since the conversion of his/her marginal homestead for planting rubber, which can be utilized for some meaningful activity. It is measured as the difference between the leisure time available before conversion and after conversion in hours.

### 3.4.6 Perceived change of social status

Operationalised as the perception about the degree of change in the social standing of the convertor brought about, consequent to conversion of his/her marginal homestead for planting rubber.

The perceived change of social status was measured using an arbitrary scale developed for the purpose. Each convertor was asked to indicate his/her perception about the change in social status consequent to conversion on a five point continuum with scoring pattern as follows:

| Items | Score |
|---|---|
| Substantially increased | +2 |
| Increased | +1 |
| No change | 0 |
| Decreased | -1 |
| Substantially decreased | -2 |

### 3.4.7 Displacement of hired labour

This variable was operationalised as the redirecting or shifting of the occupation as hired agricultural labour engaged by a homestead farmer consequent to the conversion of the farmer's marginal homestead for planting rubber.

Displacement of hired labour was measured in terms of the quantity of hired labour engaged by a homestead farmer displaced after conversion of marginal homestead for planting rubber by the farmer. This was quantified in man days.

The method of measurement was the same as that followed for displacement of family labour.

### 3.4.8 Deprivation of hired labour

Encyclopedia Britannica has defined the word deprive as to take away what one has, owns, or has a right to (Anonymous, 1973).

Deprivation of hired labour was conceptualised as the degree of perception of the hired labourer engaged by the homestead farmer that he/she has lost/has been forced to lose/dispossessed of his occupation as hired labour in the farmer's homestead consequent to conversion of marginal homestead for planting rubber by the farmer.

The deprivation of hired labour was measured by using an arbitrary scale developed for the purpose. The hired labourer was asked to indicate the degree of deprivation perceived by him on a three point continuum with scoring pattern as follows:

| High deprivation | Moderate deprivation | Low deprivation |
|---|---|---|
| 3 | 2 | 1 |

### 3.4.9 Specialisation of hired labour

For the study, specialisation of hired labour was operationalised as the differentiation of the time spent by a hired labour that tends towards greater efficiency/ concentration of his/her investments/time in rubber cultivation related agricultural labour at the expense of other income generating activity(ies) since conversion of marginal homestead to rubber.

Out of the total time spent for income generating activities by the hired labourer (time spent for rubber cultivation related agricultural labour + time spent for other income generating activities) the time spent for rubber cultivation related labour alone was used for computing specialisation. It was expressed as an index.

$$\text{Specialisation Index} = \frac{\text{Time devoted to rubber by hired labour}}{\text{Total time spent for income generating activities by the hired labour}} \times 100$$

### 3.4.10 Outmigration of hired labour

Operationally conceived as the outward movement of hired labour (male/female) who was engaged by the farmer assisting homestead farming on occupational/geographical basis consequent to conversion of the marginal homestead to rubber holding. This may include movement in search of occupations other than agricultural labour outside/within the locality or movement in search of agricultural labour itself outside/within the locality.

The response for measuring the consequence was obtained from the convertor. The rubber farmer was asked whether the hired labour engaged by him/her who was assisting in farming operations had shifted his/her occupation as agricultural labour to other occupations outside/same locality or moved out in search of agricultural labour itself outside/within the locality.

An arbitrary scale was developed for this purpose. The scale and the scoring pattern are same as given as 3.3.1.11.

### 3.4.11 Changes in dependability for subsistence

Operationally conceived as the difference in the degree of dependability for basic resources like food, fodder, fuelwood, manure and timber from the homestead by the respondent farmer in terms of before and after conversion of his/her homestead for planting rubber.

The degree of dependability for the five resources by the respondent before conversion and after conversion was to be measured along a four point continuum. Each farmer was asked to indicate his/her degree of dependability for food, fodder, fuelwood, manure and timber before conversion and after conversion. The scoring pattern was:

| Before conversion | After conversion | Score |
|---|---|---|
| Surplus | Surplus | 6 |
| Sufficient | Sufficient | 4 |
| Deficient | Deficient | 2 |
| Not at all available | Not at all available | 0 |

The difference in dependability was to be found out for each resource. Maximum score of change in dependability being `6' and the minimum score being `0' for each resource.

The total score for change in dependability for a farmer's family was computed by summing up the individual scores for changes in dependability for each resource. Thus, the highest total score possible was 30(6x5) and lowest score 0(5x0). This total score indicated the change in dependability for subsistence.

### 3.4.12 Land development related consequences

Operationally conceptualised as the development brought about on the land which was under homestead by the respondent in relation to conversion of his/her homestead to rubber in the form of levelling/bunding/trenches/pits/ terracing for successful cultivation of rubber.

Based on discussions with field level functionaries of the Rubber Board and personal observations, four types of land related consequences were identified. Each convertor was asked to indicate which all land development works had been undertaken by him/her in relation to conversion. For every land development work undertaken a score of one was given so that a respondent could obtain a maximum score of 4 and a minimum of zero.

The score obtained by a respondent was then expressed in percentage to obtain an index of land development related consequences.

$$\text{Land development related consequence (LD)} = \frac{\text{Score obtained}}{\text{Maximum score obtainable}} \times 100$$

### 3.4.13 Change in run-off rate of water

This possible consequence due to conversion of marginal homesteads to rubber was operationalised as the increase or decrease in the rate of flow of water down the slope of the marginal homestead, consequent to planting rubber as perceived by the respondent.

Each convertor was asked whether he/she had perceived any change in the run-off rate of water down the slopes/down the area in which rubber was cultivated since the conversion of his/her marginal homestead to rubber. If so, the change perceived was to be indicated along a five point continuum with scoring pattern as follows:

| Item | Score |
|---|---|
| Substantially increased | 2 |
| Increased | 1 |
| No change | 0 |
| Decreased | -1 |
| Substantially decreased | -2 |

### 3.4.14 Change in silt deposition in low lands

Operationalised as the increase or decrease in the silt (top soil) brought from the hills and uplands along with the rains or flowing water and deposited in the lowlands/paddy lands consequent to conversion of homesteads to rubber along the slopes as perceived by the respondent.

The convertor respondent was asked whether he/she had perceived any change in the silt deposition brought by rains or water flowing down the slopes every monsoon since conversion of homesteads to rubber on the slopes. If so, the change was to be indicated along a five point continuum with scoring pattern as follows:

| Item | Score |
|---|---|
| Substantially increased | +2 |
| Increased | +1 |
| No change | 0 |
| Decreased | -1 |
| Substantially decreased | -2 |

### 3.4.15 Change in water table

This consequence was operationalised as the increase or decrease in the level of water in wells/ponds/waterbodies owned by the convertor or in the nearby areas consequent to conversion of marginal homesteads to rubber as perceived by the farmer.

The convertor was asked whether there had been any change in the water table in the wells/ponds/water bodies in the rubber holding consequent to conversion of his/her marginal homestead to rubber. The change was to be indicated on a five point continuum with scoring pattern:

| Items | Scoring pattern |
|---|---|
| Substantially increased | +2 |
| Increased | +1 |
| No change | 0 |
| Decreased | -1 |
| Substantially decreased | -2 |

### 3.4.16 Change in water availability

Operationally defined as the increase or decrease in the quantity of water available to the convertor for the fulfilment of various home and farm related needs consequent to conversion of his/her marginal homestead for planting rubber from the wells/ponds/water bodies on his/her land or nearby areas.

The change in water availability consequent to conversion was to be measured along a five point continuum with scoring pattern as follows:

| Item | Score |
|---|---|
| Substantially increased | +2 |
| Increased | +1 |
| No change | 0 |
| Decreased | -1 |
| Substantially decreased | -2 |

### 3.4.17 Soil loss (erosion)

Operationally conceptualised as the loss of soil cover over the rubber holdings along with rains/surface flow of water/winds/drought consequent to conversion of homesteads for planting rubber as perceived by the farmer.

The reduction in soil cover was measured along a three point continuum with scoring pattern as follows:

| High loss | Moderate loss | Low loss |
|---|---|---|
| ↓ | ↓ | ↓ |
| 3 | 2 | 1 |

### 3.4.18 Change in fertility status of the soil

Change in fertility status of the soil was operationally defined as the improvement or decrease in the fertility status of the soil consequent to conversion of marginal homesteads to rubber as perceived by the convertor.

The convertor was asked whether there had been any change in the fertility status of the soil in his/her holding consequent to conversion. If so the change was to be indicated along a three point continuum.

| Improved | No change | Decreased |
|---|---|---|
| ↓ | ↓ | ↓ |
| +2 | 0 | -2 |

## 3.5 Location of the study area and sampling procedure adopted

Kottayam district in Kerala state is also known as the land of `lakes', `latex' and `letters'. The word `latex' signifies the importance of rubber in this district. True to the name, Kottayam district has the maximum area under rubber in the State. The district-wise trend in area increase for rubber in both estate and small holdings sector is given in Table 3. The maximum number of small holdings under rubber are also found in this district. Almost two third cropped area in Kottayam district has already been brought under rubber displacing other crops. Every year more and more land under other crops is being brought under rubber (Table 2). Also, the Rubber Board National Head Quarters and the Rubber Research Institute of India are both situated in this district highlighting the importance of selecting this district. The expansion of rubber area in Kottayam district due to congenial socio-political conditions paved the way for establishment of these two institutions. And the presence of these premier institutions in turn triggered further expansion. The efficient extension work for rapid expansion through timely subsidies

Table 3 District-wise area of rubber under holdings and estates (Area in hectares)

| Sl. No. | District | 1960-61 | | 1970-71 | | 1980-81 | | 1990-91 | |
|---|---|---|---|---|---|---|---|---|---|
| | | H | E | H | E | H | E | H | E |
| 1 | Thiruvananthapuram | 3657 | 1097 | 6223 | 1414 | 9208 | 971 | 21213 | 943 |
| 2 | Kollam | 13335 | 9888 | 21116 | 12338 | 28533 | 12548 | 22957 | 9481 |
| 3 | Pathanamthitta | - | - | - | - | - | - | 36611 | - |
| 4 | Alappuzha | 2195 | 115 | 3802 | 60 | 4222 | 51 | 3350 | - |
| 5 | Kottayam | 35676 | 9818 | 49313 | 9874 | 61880 | 5046 | 99205 | 4683 |
| 6 | Idukki | - | - | - | - | 15084 | 4813 | 31166 | 4379 |
| 7 | Ernakulam | 13495 | 4568 | 21807 | 6260 | 23543 | 3312 | 47991 | 3172 |
| 8 | Thrissur | 1537 | 5389 | 3236 | 5847 | 4392 | 5390 | 6478 | 4792 |
| 9 | Palakkad | 2471 | 3640 | 3237 | 1906 | 9949 | 2038 | 19420 | 1384 |
| 10 | Malappuram | - | - | 9930 | 7573 | 14491 | 4833 | 18745 | 3875 |
| 11 | Kozhikode | 8417 | 10325 | 9283 | 7113 | 13508 | 5663 | 12255 | 4395 |
| 12 | Wynad | - | - | - | - | - | - | 4987 | 48 |
| 13 | Kannur | 7583 | 2603 | 14664 | 3428 | 21254 | 3063 | 21371 | 1509 |
| 14 | Kasargod | - | - | - | - | - | - | 16164 | 986 |

H - Holdings
E - Estate

Source: Rubber Board Statistics (1994)

and field work is also due to the presence of the Rubber Board. Against such a solid background, Kottayam district was purposing selected as the study area.

Kottayam district has 5 taluks and 5 Rubber Board Divisional Office Regions. The sample farmers to be selected were to include both convertors of marginal homesteads to rubber and non-convertors of marginal homesteads to rubber (those farmers who still retained their homesteads). The area of jurisdiction of the five Regional Offices covered, taluks falling outside the district also. These divisions were purely based on the area of rubber holdings. Since the presence of homesteads was also to be taken into consideration, the sample farmers were selected based on division of the district into five taluks namely Changanassery, Kanjirappally, Kottayam, Meenachil and Vaikom.

Purposive sampling procedure was adopted in the study. The area of study being Kottayam district, it was not at all difficult to obtain respondents from convertor category. At the same time due to saturation of cropped area in Kottayam district with rubber holdings, it was relatively difficult to obtain marginal homesteads retained without conversion in sufficient numbers, if equal sample size was to be adopted for both categories of respondent in each taluk. Hence slight modifications were adopted in the sampling procedure so that sufficient homesteads were available for a thorough unbiased selection of respondents of both category. Also, the area of the homesteads converted/retained was not to exceed beyond 1 hectare. Those respondents who had converted the homesteads to rubber during 1980-1985 period (new planting) alone were to be selected. This is because a rubber tree takes atleast seven years to attain tapping stage and economic returns from tapping can be obtained only after that. Hence, the sample was selected taking all these factors into consideration.

According to Rubber Board norms, the rubber planters registered under the Rubber Board are categorised into two categories based on their area under rubber. Those owning estates (area ranging from 40 hectares to 800 hectares and above) and those owning holdings (area upto 40 hectares). Kottayam district has 72 panchayats (Fig. 2) and 31 field offices of Rubber Board. No data were available on the Taluks or Panchayats where maximum marginal homesteads were converted to rubber during the above cited period or on homesteads in the area. Therefore the required sample was obtained based on field level observation and information collection from Krishi Bhavan and Rubber Board Field Officers at the Panchayat level. The sample of 200 convertors was selected purposively from 20 Panchayats of Kottayam district (Fig. 3). The taluk-wise number of convertors is presented in Table 4. Most of the area in Kanjirappally taluk is under traditional estates and large holdings and homesteads were a rarity. In Kottayam taluk also homesteads where conversion to rubber was yet to take place were rare due to urbanisation. In Vaikom taluk conversion was a more recent phenomenon. Though the highlands of Meenachil and Changanassery were traditional rubber areas, these two taluks had more of marginal homesteads converted to rubber. Even then, only 100 marginal homesteads where conversion was yet to take place were observed from

Table 4 List of panchayats in Kottayam district selected for study

| Sl. No. | Taluk | Panchayat | Number of convertors (n = 200) | Respondents non-convertors (n = 100) |
|---|---|---|---|---|
| 1 | Changanassery | Karukachal | 8 | 4 |
| | | Kangazha | 14 | 7 |
| | | Madappally | 8 | 4 |
| | | Nedumkunnam | 11 | 5 |
| 2 | Kanjirappally | Elikulam | 11 | 6 |
| | | Erumeli | 10 | 5 |
| 3 | Kottayam | Ayarkunnam | 6 | 2 |
| | | Ettumanoor | 4 | 2 |
| | | Pampady | 8 | 3 |
| 4 | Meenachil | Bharananganam | 10 | 3 |
| | | Erattupettah | 14 | 7 |
| | | Kidangur | 14 | 7 |
| | | Kuravilangad | 10 | 5 |
| | | Palai Muncipality | 6 | 1 |
| | | Poonjar | 10 | 5 |
| | | Ramapuram | 12 | 6 |
| | | Uzhavoor | 12 | 6 |
| 5 | Vaikom | Kadathuruthy | 11 | 6 |
| | | Manjoor | 11 | 8 |
| | | Mulakulam | 10 | 8 |

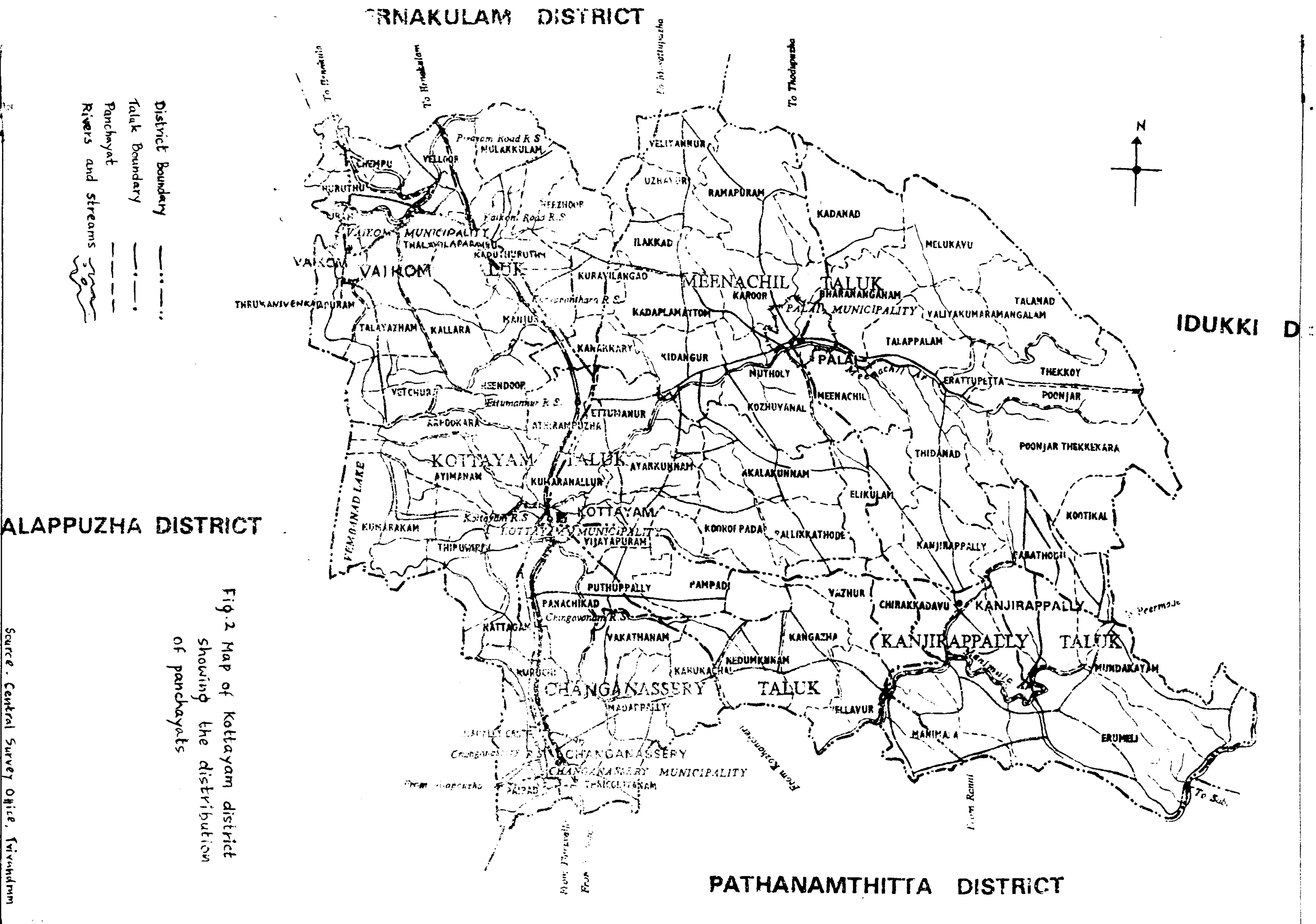



Fig.2 Map of Kottayam district showing the distribution of panchayats

Source. Central Survey Office, Trivandrum

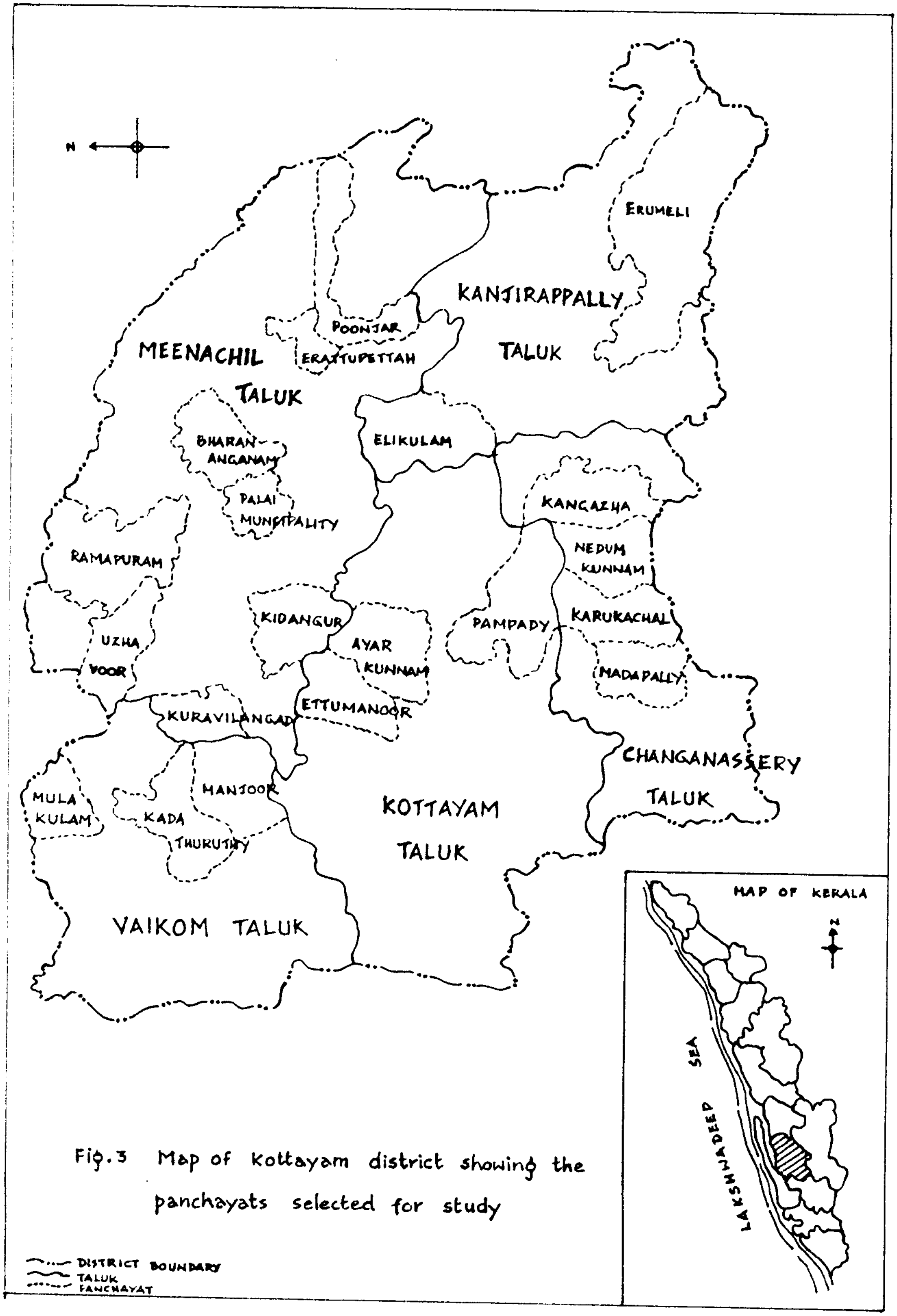



Fig. 3 Map of kottayam district showing the panchayats selected for study

the selected panchayats in spite of thorough search. This factor also indicates the near saturation of cropped land under rubber in the district.

Thus, 200 convertors and 100 non-convertors from adjacent area to that of convertors from 20 selected panchayats of Kottayam district formed the final sample size for the study.

## 3.6 Techniques employed in data collection

The data were collected from the respondents using both personal field level observations and a well structured interview schedule prepared for the purpose (Appendix V). As a first step a draft interview schedule was prepared which was used during the pilot study. The pilot study was carried out in Kodakara block of Thrissur district, a non-sample area. As cited earlier in the text, a few modifications were brought about in the interview schedule based on response of the farmers in the pilot study area. The pilot study was carried out during the month of January 1995. Based on the modifications incorporated, the final interview schedule was divided into three parts viz. the 1st part containing general information on the convertor/non-convertor, 2nd containing factors influencing conversion/non-conversion of marginal homesteads for planting rubber and the 3rd, consequences of conversion of marginal homesteads for planting rubber. The responses for the first and second part were obtained both from convertors and non-convertors. The third part was aimed at obtaining response from convertors alone. The respondents were directly interviewed at their home. The final survey lasted for three months viz., March to May 1995.

## 3.7 Statistical tools used in the study

A number of statistical procedures were used in this study.

### 3.7.1 Discriminant analysis

Discriminant analysis using Fisher's Discriminant function was carried out to differentiate between the convertors and non convertors with respect to the factors influencing conversion/non-conversion of marginal homesteads for planting rubber.

### 3.7.2 Simple Correlation Analysis

Simple correlation analysis was carried out to find out the linear relationship between factors influencing conversion of marginal homesteads for planting rubber and the nature of conversion, extent of conversion and conversion (composite index) of marginal homesteads for planting rubber.

### 3.7.3 Multiple Linear Regression Analysis

Multiple Linear Regression Analysis was carried out to find out the relative contribution of the selected significant factors to the extent of conversion, nature of conversion and conversion of marginal homesteads for planting rubber.

### 3.7.4 Step-down regression analysis

Step-down regression analysis involved step-by-step elimination process of independent variables influencing the dependent variable. Based on the elimination process the best sub set of independent variables (factors influencing conversion of marginal homesteads for planting rubber) which would predict or explain the maximum variability in the dependent variable (nature of conversion, extent of conversion and conversion of marginal homesteads for planting rubber) were selected.

### 3.7.5 Path analysis

Through step-wise regression it will be possible to know only the best sub-set of predictor variables which exert maximum influence on the dependent variable. When the selected independent variables enter into path analysis, the magnitude and direction of the direct influence (effect) as well as the indirect effect of each variables on the dependent variable can be discerned. Also the total of the indirect effects of each independent variable obtained by adding of the indirect effects of each variable acting through other variables on the dependent variable can be found out. Path analysis also helps to identify the most important independent variable which influences each dependent variable. Therefore path analysis was carried out in the study to find out the relative effect of the factors influencing conversion on the nature, extent and conversion of marginal homesteads to rubber.

### 3.7.7 Percentage analysis

Percentage analysis was one of the main statistical tool used in the study of consequences of conversion. All the consequences measured on different scales and units were made scale free for ranking the consequences. For this the maximum potential score for each consequence for a respondent was found out. The formula used for each response of the convertor for each scale was:

$$\frac{\text{Score obtained}}{\text{Maximum potential score}} \times 100$$

These scale free percentage values of 200 respondents were added up for each consequence and then divided by the number of responses to obtain the average value. Ranking of the average values of each consequence was carried out.

# Results and Discussion

CHAPTER IV

# RESULTS AND DISCUSSION

The findings in this study are presented under the broad sub-headings:

1. Distribution of convertors based on nature and extent of conversion of marginal homesteads for planting rubber
2. Discriminant analysis of convertors and non-convertors of marginal homesteads for planting rubber with respect to factors influencing conversion/non-conversion of marginal homesteads to rubber.
3. Relationship between extent of conversion of marginal homesteads for planting rubber and factors influencing extent of conversion of marginal homesteads for planting rubber.
4. Relationship between nature of conversion of marginal homesteads for planting rubber and factors influencing nature of conversion.
5. Relationship between conversion (composite index derived from extent and nature of conversion) of marginal homesteads for planting rubber and factors influencing conversion.
6. Comparison of perception of convertors/non-convertors about attributes of rubber cultivation influencing conversion/non-conversion.
7. Consequences of conversion of marginal homesteads for planting rubber.
8. Based on the findings suggest a suitable strategy for rationalizing the land use pattern of marginal homesteads in the study area.

## 4.1 Distribution of convertors based on nature and extent of conversion of marginal homesteads for planting rubber

The convertors were divided into four categories (quadrants) based on the nature and extent of conversion of marginal homesteads for planting rubber as depicted in Table 5 and 6.

In the case of nature of conversion, the categorisation into four quadrants was carried out based on the Functionality Index (FI) values of the marginal homesteads, converted to rubber. It is evident from the Table 5 that 119 convertors tended towards higher nature of conversion within the medium category (59.5%). Low nature of conversion was indicated by just three respondents while 24 per cent of the convertors belonged to the medium low category of conversion. It is noteworthy that 15 per cent of the convertors had undergone a high loss of diversity of their homesteads through conversion to rubber.

Table 5 Distribution of convertors based on nature of conversion (Functionality Index values)

(n = 200)

| Category | Class interval | Frequency | Percentage (%) |
|---|---|---|---|
| Low | 20.05-24.62 | 3 | 1.5% |
| Medium Low | 24.63-29.19 | 48 | 24% |
| Medium High | 29.2-33.76 | 119 | 59.5% |
| High | 33.77-38.33 | 30 | 15% |

Homesteads are actually simulations of the natural ecosystems. When co-existence with the natural ecosystems was practised by the people, they also maintained the diversity of the homesteads. The erosion of diversity started with the onset of commercialization of agriculture. This trend was evident in the district of Kottayam also. A long history of rubber plantation culture in the district accentuated the process. Hence nature of conversion was studied with respect to just 47 species of crops most commonly found in the study area (Appendix ). The maximum level in nature of conversion was limited to only 16 types of crops replaced by rubber. Though most of the respondents belonged to the medium high category of nature of conversion, the conversion in terms of diversity was not so high.

The results clearly pointed out the peculiarity of the area selected for study. Already nearing saturation with rubber at the cost of any other crops, the conversion of marginal homesteads to rubber was at the cost of already eroded diversity of the homesteads. The respondents in the study area were probably psychologically preparing for conversion consciously or sub-consciously over years, against the backdrop of expanding rubber area around them.

The results of extent of conversion of marginal homesteads for planting rubber or in other words the extent of area under homesteads converted to pure crop of rubber are given as Table 6. The categorisation was carried out based on the extent of conversion values of the marginal homesteads converted to rubber. As indicated in the table, 56.5 per cent of the respondents belonged to less than 50 per cent category of conversion of area under marginal homesteads to rubber. While 55 respondents had undergone upto 75 per cent conversion, only 13 convertors had converted more than 75 per cent of the area under marginal homesteads to rubber.

Table 6 Distribution of convertors based on extent of conversion of marginal homesteads for planting rubber

(n = 200)

| Category | Class interval | Frequency | Percentage (%) |
|---|---|---|---|
| Low | 0-25% | 19 | 9.5% |
| Medium Low | 26-50% | 113 | 56.5% |
| Medium High | 51-75% | 55 | 27.5% |
| High | 76-100% | 13 | 6.5% |

The extent of conversion was measured in terms of the gross cropped area of the marginal homesteads converted to pure crop of rubber. Gross cropped area in turn indicated the land space utilized in a homestead by the crop mix. More the gross cropped area lesser would be the extent of conversion to rubber. In the study area, though the diversity of the crops maintained or cultivated in a homestead was very low, the land space utilized was higher when compared to pure crop of rubber. In other words, the number of different species of crops in the marginal homesteads converted to rubber afforded a more efficient utilization of the land resources compared to pure crop of rubber. Hence the extent of conversion was comparatively low.

A profile of the convertors in terms of nature and extent of conversion would shed light on the present scenario of changing use of agricultural landscape of the study area.

Traditional homesteads were characterised by rich diversity and efficient utilization of available space and sunlight and other resources, deriving models from natural ecosystems. Though loss of diversity has made conversion to a pure crop like rubber easier, the extent of conversion has not been so high. This finding points to the vital fact that in spite of so much loss of diversity of homesteads over years, the crop mixture presently followed made more efficient utilization of land in comparison to rubber. This finding in turn reveals by itself the rich use of land during the past across the land scape of Kerala. Thus, a qualitative shift in the land use in favour of cash crops like rubber with a very low land utilization capability and efficiency could be inferred.

## 4.2 Discriminant analysis of convertors and non-convertors of marginal homesteads for planting rubber with respect to factors influencing conversion/non-conversion of marginal homesteads to rubber

The results of comparison of convertors and non-convertors with respect to the selected thirteen factors using Fishers' Discriminant Analysis function are presented in Table 7.

It is evident from the Table and Fig. 4 that out of the thirteen factors compared, four factors namely farming experience, availability of hired labour, outmigration of hired labour and perception of attributes of rubber cultivation by the respondent could explain the maximum discrimination between convertors and non-convertors of conversion of marginal homesteads for planting rubber. Among these four factors, outmigration of hired labour was the factor which discriminated or differentiated the convertor from non-convertor most significantly (`t' value, 6.34**). At the sample level, the outmigration of hired labour of convertor was higher than that of the non-convertor as evident from the means of the two categories of respondents. Perception about the attributes of rubber cultivation which included fourteen attributes namely slope of the land, type of the soil, local resource utilization, profitability, marketability, economic efficiency, regularity of returns, time availability, immediacy of returns, perceived risk, cultural compatibility, security need and status need gave the lowest discrimination index value of 2.52** (`t' value), amongst the four. Farming experience and availability of hired labour offered a discrimination of 4.24** and 4.53** (`t' values) respectively between the convertor and non-convertor.

Table 7 Results of Fisher's Discriminant Analysis between convertors and non-convertors of marginal homesteads to rubber with respect to selected socio-economic and personal variables

| Items | Variables | | Occupation | Farming experience | Wet land | Area under homestead | Exposure to technology | Availability of family labour | Availability of hired labour | Outmigration of family labour | Outmigration of hired labour | Market factors | Perception about rubber |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Age | Family size | | | | | | | | | | | |
| Mean Group I (n=200) | 55.92 | 5.07 | 6.45 | 30.65 | 0.08 | 0.16 | 11.84 | 10.60 | 7.62 | 5.78 | 4.26 | 26.17 | 72.04 |
| Mean (Group II (n=100) | 53.71 | 5.18 | 6.46 | 24.90 | 0.06 | 0.21 | 12.76 | 9.34 | 4.71 | 6.99 | 1.76 | 22.95 | 69.77 |
| T values for D(I)S | 1.64 | -0.7 | -0.05 | 4.24** | 0.71 | -2.1 | -1.89 | 1.42 | 4.53** | -1.49 | 6.34** | 1.62 | 2.52** |
| Percentage contribution of variables | -4.3554 | 1.1056 | 0.0394 | 26.4196 | -0.4859 | 9.6277 | 2.9434 | 4.3876 | 28.9264 | 3.5434 | 19.2178 | 2.7075 | 5.9227 |

'F' value for testing TEQ = 11.204** with 13 and 286 DF
Centoid Discriminant socores for Group I and II = 5.054 and 2.774

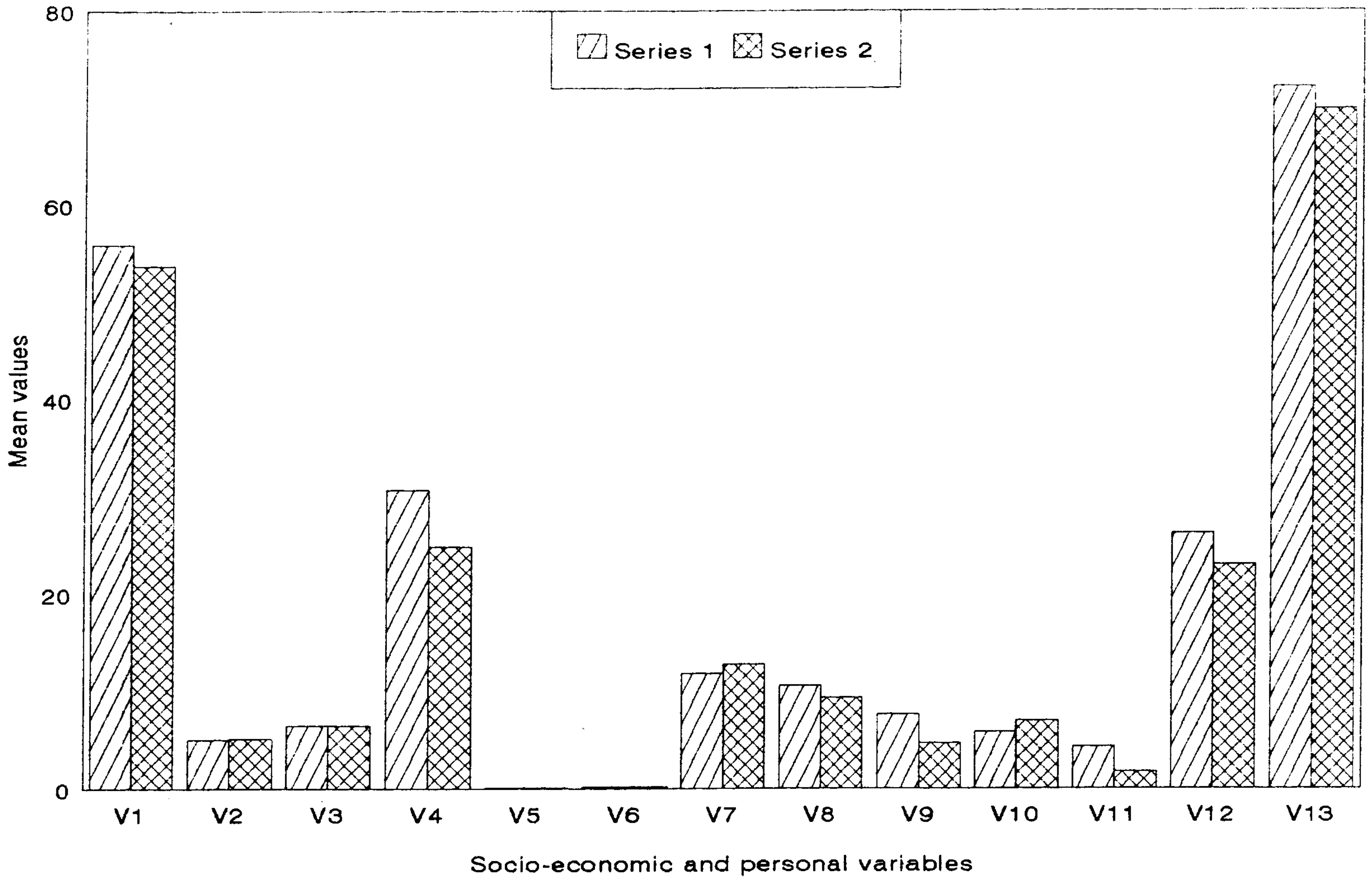



**Fig.4 Factors discriminating convertors and non convertors of marginal homesteads to rubber based on Fisher's discriminant function**

At the sample level, farming experience, availability of hired labour and perception about the attributes of rubber cultivation of the convertors was significantly higher than that of the non-convertors as indicated by the means.

The relative importance of the variables based on their power to discriminate between the convertors and non-convertors was indicated by the percentage contribution of each variable to the total distance measured. From the Table it was clear that the most important variables which discriminated or contributed towards maximum discrimination between the two groups were availability of hired labour (28.9264), farming experience (26.4196) outmigration of hired labour (19.2178), area under homestead (9.6277) and perception about attributes of rubber cultivation (5.922). These five variables together contributed more than 90 per cent of the total distance measured.

The centroid discriminant scores, based on the scores of all the factors taken together for each group also differed significantly for convertor and non-convertor (5.054 and 2.774).

Outmigration of hired labour was the most important factor which discriminated the convertors from non-convertors among the four significant factors. The district of Kottayam has a very long history of rubber cultivation spanning about 150 years. It is almost saturated with rubber in both estates and holdings. With the advent of plantation agriculture in Travancore during the 1860s, a large number of cultivators and agricultural labourers attached to the traditional agricultural sector of paddy and homestead system were forced to migrate in search of other occupations to other localities or same locality. This was because the requirement of labour on plantations was less intense compared to paddy/homestead cultivation. In the estates, the planters in turn recruited cheap labour from the neighbouring districts of Madras Presidency. Even then a considerable population of agricultural labour took up work on the different plantations of tea, coffee and rubber. According to the Report of the South Indian Planters Enquiry Committee of 1896 only 20 per cent of labour employed in estates of Travancore was local. Small scale migration of labourers was also taking place to plantations of Srilanka and Malaya both assisted and unassisted by agents of recruitment.

A number of taxation policies of the Travancore Government and land reforms acted as an incentive for opening up of new lands for cultivation. Both forest lands and common lands or `waste lands' were opened up for investment in plantations by the British planters and native farmers. Devi (1989) has also pointed out that creation of titles to land, system of taxation favourable to cash crop cultivation, change in payment of tax from kind to cash, and provision of waste lands at throw away prices for cultivation of coffee, tea and rubber, had the effect of releasing land from the traditional sector in favour of cash crop cultivation.

Later, the Land Assignment Regulation of 1907 also helped in releasing atleast 87000 acres of land for cultivation between 1925-1932 (Joseph, 1988). All these factors enhanced the demand for hired labour in Travancore. At the same time, the agricultural labour class in Travancore was not so high (only 12 per cent of the population as early as 1911, as observed by Joseph, 1988).

The opening up of plantations by the British and foreign investments also paved the way for commercialization and monetization of the economy. The export earnings from cash crops resulted in flow of capital into the state. This in turn created a new set of avenues or occupational opportunities for the population. Building of transport systems of rail and road, opening of rubber based industries, trade and commerce related activities were some of the new avenues to name a few. So the phenomenon of migration was not new. Only the pace and mode of migration has changed from an agricultural oriented one to a commercial oriented one.

The convertor marginal farmers had more land under ownership than non-convertors. Naturally their availability and requirement of hired labour was more than that of the non-convertors as evident from the table. The scarcity of labour was bound to affect the larger landowners than the smaller, which induced them to convert their marginal homesteads to rubber earlier than the farmers who retained their homesteads. Moreover convertors were farmers with more farming experience than non-convertors as indicated by the results. Most of the convertors belonged to families with a long tradition of farming. Their deep rooted agricultural background itself enabled them to take risks by introducing a new crop in place of homesteads. They also took advantage of the expanding market for rubber and the social trend of large scale conversion of land under food crops to non-food crops due to their strong agricultural base. This factor, in turn, increased their perception about rubber in comparison to homestead cultivation. At the same time, the size of homesteads of non-convertors was too uneconomic for conversion. The monetization of the economy made it difficult for the homestead farmers to sustain their family from the products of homesteads alone. In the sample, most homestead farmers had other occupations as additional source of income compared to convertors. Stoler (1978) has affirmed that as land holding size continues to decrease, income is increasingly sought from off-farm employment. This phenomenon cannot be viewed as one happening over a ten year period. Rather, the process of conversion now concentrated in small and marginal holdings was a result of accumulated effect of all these factors which discriminated the convertors from the non-convertors. The hypothesis that there would be significant difference between the convertors and non-convertors of marginal homesteads for planting rubber with respect to selected factors was thus accepted.

## 4.3 Relationship between extent of conversion of marginal homesteads for planting rubber and factors influencing extent of conversion of marginal homesteads for planting rubber.

Relationship between extent of conversion and factors influencing conversion of marginal homesteads to rubber is presented in four ways viz., simple correlation analysis, multiple linear regression analysis, step-down regression analysis and path analysis.

### 4.3.1 Simple correlation analysis

The results of simple correlation analysis are presented in Table 8. From the data presented it is clear that out of the eighteen factors studied, seven factors were found to have significant relationship with the extent of conversion.

Area under homesteads retained by a convertor was found to have a negative but significant relationship with the extent of conversion. Out of the total area owned under the homestead by a convertor the area converted for planting rubber depicted the extent of conversion. Naturally more the area retained under homesteads by a respondent, lesser was his extent of conversion.

A positive and significant relationship was established between exposure to technology of the convertors and their extent of conversion. It was clear that more the exposure to different sources of information, personal, socio-political or mass media more was the extent of area converted.

A highly significant and negative correlation was observed between availability of family labour and extent of conversion of marginal homesteads for planting rubber. This finding indicated that more the availability of family labour lesser was the tendency to convert the homestead by a respondent.

Market factor was found to have a positive and significant relationship with extent of conversion of marginal homesteads for

Table 8 Relationship between extent of conversion of marginal homesteads for planting rubber and selected independent variables

(n = 200)

| Variable No. | Name of variable | Coefficient of correlation (r) |
|---|---|---|
| $V_1$ | Age | -0.0705 |
| $V_2$ | Family size | -0.0519 |
| $V_3$ | Occupation | -0.1180 |
| $V_4$ | Farming experience | -0.1022 |
| $V_5$ | Area under wetland | -0.1319 |
| $V_6$ | Area under homestead | -0.5280** |
| $V_7$ | Exposure to technology | 0.1432* |
| $V_8$ | Availability of family labour | -0.2429** |
| $V_9$ | Availability of hired labour | 0.0705 |
| $V_{10}$ | Outmigration of family labour | 0.0537 |
| $V_{11}$ | Outmigration of hired labour | -0.0280 |
| $V_{12}$ | Market factors | 0.2183** |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.1048 |
| $V_{14}$ | Number of crops | -0.1356 |
| $V_{15}$ | Net area under rubber | 0.2948** |
| $V_{16}$ | Gross cropped area | -0.3017** |
| $V_{17}$ | Cropping intensity | -0.8154** |
| $V_{18}$ | Dispersion of crops | 0.0689 |

** Significant at 1 per cent level
* Significant at 5 per cent level

planting rubber. Higher the availability of marketing, processing, transportation and storage and co-operatives facilities for rubber, higher was the extent of conversion.

Among the situational factors influencing conversion, while net area under rubber had a highly positive and significant correlation with extent of conversion, gross cropped area and cropping intensity of the homesteads displaced had a highly negative but significant relationship with extent of conversion of homestead for planting rubber. Larger the gross cropped area and cropped intensity of the homesteads converted, lesser were the chances for increasing area under rubber.

It is a known fact that a farmer who had larger area under his/her marginal homestead could convert a part of his homestead for planting rubber and retain the rest of the land for growing crops required to meet his family's sustenance needs. At the same time a farmer owning a small homestead had to convert his entire homestead to rubber if it had to be economic. So naturally more the area under homestead owned by the convertor lesser was his rate of conversion to rubber proving the hypothesis.

Exposure to technology and market factors which go together showed a significant positive relationship with conversion. The Rubber Board is the chief agency working for the promotion of rubber cultivation through increase in area, production and productivity all over India. The Rubber Board has been implementing various schemes right from 1957 onwards for this purpose. Some of these important schemes include Replanting Subsidy Scheme (1957-1979), New Planting Loan Scheme (1962-1979), New Planting Subsidy Scheme (1979) and Rubber Plantation Development Scheme Phase I to IV (1980 onwards). All these schemes involved granting of loans or subsidies or supply of planting materials at different rates for different categories of growers; small holding and estate sector. Assistance is also provided for purchase of various inputs and accessories required for rubber cultivation, tapping and processing. The Board also has a well developed network of extension officers spread throughout the district of Kottayam. Moreover, the Head Quarters of Rubber Board and Research and Development Wing (Rubber Research Institute of India) are situated in Kottayam district. The district also had the maximum number of rubber dealers. There were atleast 700 small scale and large scale industries manufacturing more than 20 different types of rubber based products spread all over the district (Anonymous, 1994). Moreover more than 50% of such industries in Kerala State were concentrated in this single district. The Board also published several informative literature like the Rubber Board Bulletin, the farm magazine `Rubber' to keep its planters well informed of the latest developments in the field of rubber cultivation and industries. The district could also boast of a huge automobile tyre mixing unit of the MRF, the giant in natural rubber based automobile tyre manufacture and its buying point of processed high quality RMA (RSS) graded rubber sheets. All these factors provided enough evidence to the fact that Kottayam district had a good market for rubber and the exposure to all information on rubber was equally good. Hence the positive correlation. The hypothesis that there would be a positive and significant correlation between exposure to technology and market factors and conversion was accepted.

Homestead systems are farming systems based on the involvement of family labour. Since they are situated around the home, the family members depend on the products of the homesteads to meet their various requirements of fuel wood, timber, vegetable, fibre, manure and the like. So constant care and interdependence was the pre-requisite for maintenance of a homestead. As long as family labour was available even if partial, it acted as an incentive for the family to retain their homestead. Even if the members were employed in other occupation, as long as it did not involve physical outmigration the members was/were available as labour atleast in the evenings. So the availability of family labour was negatively correlated with extent of conversion of homesteads to rubber and the hypothesis was accepted.

A typical homestead is characterized by a wide variety of crops both annuals and perennials grown to meet the different sustenance requirements of the family living in it viz., food, fuelwood, timber, fruit, manure and fodder. It often includes animals and poultry also. They are characterized by a high species diversity with no particular spacing simulating forest canopy with efficient recycling capacity. Over years, with the spread of commercialization of agriculture, compared to the overall intangible social and cultural value of the homesteads more and more attention has been paid to the tangible economic gains of the home gardens. Crops in a homsteads thus got slowly replaced by cash crops or crops with market demand reducing the species diversity and structural complexity. So a farmer owning a homestead with a low species diversity of just 3-4 economically important species comes closer to a plantation mode of cultivation making it easier for him to convert his marginal homestead to rubber later on. For a farmer who still retained the high species diversity, conversion was not so easy. Therefore higher the gross cropped area and cropping intensity of a homestead lesser were the chances for conversion.

Soemarwoto (1987) has also opined that, commercialization causes a decline in the diversity of species and/or varieties and consequently the process of genetic erosion sets in. In such homegarden, control of species composition and harvest has changed from being internal, ie., by the gardeners themselves to external, ie., by the market factor.

Thus, the hypothesis that there would be significant and negative relationship between gross cropped area and cropping intensity of the homestead converted to rubber was accepted. Similarly, as hypothesised, the net area under rubber increased with increase in conversion to rubber.

### 4.3.2 Multiple Linear Regression Analysis

The relative contribution of each factor influencing the extent of conversion was found out using Multiple Linear Regression Analysis. The results are presented in Table 9.

Table 9 Results of multiple linear regression analysis involving extent of conversion of marginal homesteads to rubber and selected independent variables

(n = 200)

| Variable No. | Name of variable | Regression coefficient `B' | `t' value of `B' |
|---|---|---|---|
| $V_1$ | Age | -0.047 | 0.395 |
| $V_2$ | Family size | 0.838 | 1.383 |
| $V_3$ | Occupation | -0.104 | 0.350 |
| $V_4$ | Farming experience | 0.039 | 0.366 |
| $V_5$ | Area under wetland | 3.250 | 0.807 |
| $V_6$ | Area under homestead | 9.676 | 11.435 |
| $V_7$ | Exposure to technology | -0.005 | 0.028 |
| $V_8$ | Availability of family labour | -0.101 | 0.723 |
| $V_9$ | Availability of hired labour | 0.045 | 0.251 |
| $V_{10}$ | Outmigration of family labour | 0.089 | 0.817 |
| $V_{11}$ | Outmigration of hired labour | -0.036 | 0.206 |
| $V_{12}$ | Market factors | 0.001 | 0.025 |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.120 | 1.492 |
| $V_{14}$ | Number of crops | -1.358 | 3.659** |
| $V_{15}$ | Net area under rubber | 44.956 | 5.816** |
| $V_{16}$ | Gross cropped area | -18.693 | 5.268** |
| $V_{17}$ | Cropping intensity | -9.317 | 6.959** |
| $V_{18}$ | Dispersion of crops | -17.140 | 2.765** |

F value for R = 32.77** 18 and 181 DFS $R^2$ = 0.7652 R = 0.8748

Out of the eighteen factors taken into consideration it was found that the factors namely number of crops, net area under rubber, gross cropped area under homestead converted to rubber, cropping intensity of the homestead and dispersion of crops made significant contributions towards extent of conversion. Out of these five factors, cropping intensity exerted the maximum influence on extent of conversion as is evident from the high `t' value of 6.959**. Dispersion of crops exerted the least influence among the significant factors (`t' value of 2.765**). A `F' value of 32.77 and a high $R^2$ value of 0.7652 (76.52% contribution) indicated that the relative contribution of these five variables was the most significant towards extent of conversion of homesteads. In a state like Kerala with its highly undulating topography and acute scarcity of land really suited for cultivation, farmers have had to make careful choices while selecting cropping patterns in the homesteads to make maximum fruitful use of their available land. A multi-tier, multi-species system of cultivation has hence been followed in the marginal homesteads for maximum utilization of land, space, soil, water, nutrients and light synchronous with the seasonal and climatic requirements of the crop and the family's requirements. Over years because of continuous fragmentation of land due to diverse social and economic reasons the number of marginal holdings have been on the increase. For instance, as an indicator, from 2,71,246 operational holdings in Kottayam district during 1980-81, the number has risen to 3,44,646 by 1990-91 and the average holding size has come down from 0.52 to 0.41 ha. (Government of Kerala, 1993).

Under these circumstances of reducing land size the area converted to rubber (extent of conversion) would depend on the utilization of and dependency on the available land resources by the marginal homestead farmer. Thus number of crops, cropping intensity, gross cropped area and the dispersion of crops in the homesteads would be the most deciding factors of conversion rather than socio-economic or socio-psychological factors.

### 4.3.3 Step-down regression analysis

This analysis was employed to find the best set of variables for predicting the dependent variable ie., extent of conversion of marginal homesteads for planting rubber. The results of step-down regression analysis of extent of conversion with selected factors influencing conversion is presented in Table 10.

It could be seen that out of the total variation explained by the selected eighteen factors, 75.76 per cent ($R^2 = 0.7576$) variability of the dependent variable ie., extent of conversion was explained by six variables namely family size ($v_2$), number of crops ($V_{14}$), net area under rubber ($V_{15}$), gross cropped area ($V_{16}$), cropping intensity ($V_{17}$) and dispersion of crops ($V_{18}$) in the homestead.

Step-down regression analysis involved a continuous step by step elimination of each variable from the analysis to arrive at the best sub-set of variables or factors which could explain the highest per cent variation in the extent of conversion of marginal homesteads to rubber. That step in which all the variables included became

Table 10 Results of step-down regression analysis of extent of conversion of marginal homesteads for planting rubber with selected independent variables

(n = 200)

| Variable No. | Name of variable | Regression coefficient `B' | `t' value of `B' |
|---|---|---|---|
| Step-down 12 | | | |
| $V_2$ | Family size | 0.778 | 1.691* |
| $V_{14}$ | Number of crops | -1.448 | 4.307** |
| $V_{15}$ | Net area under rubber | 42.123 | 5.852** |
| $V_{16}$ | Gross cropped area | -15.879 | 5.171** |
| $V_{17}$ | Cropping intensity | -9.117 | 7.226** |
| $V_{18}$ | Dispersion of crops | -13.569 | 2.439** |

F value for R = 85.72** 7 and 192 DFS

Multiple $R^2$ = 0.7576 (percentage variation explained = 75.76%)

Multiple R = 0.8722

significant was taken as the final step. Normally two rules are followed for selection of the final step in the case of large samples. Rule number one is to select that step where the `t' value is more than `one' for all the variables. The second rule is to select that subset of variables whose `t' values are at 1% or 5% level significant. In this case due to the large sample size of the respondents the first rule was applied. A high `F' value of 85.72 indicated that the twelfth step-down equation with 12 variables dropped contained the best subset of variables or factors which could explain the maximum variability of the dependent variable.

### 4.3.4 Path analysis

The results of path analysis are presented in Table 33. In simple correlation analysis, only the linear relationship between the dependent and independent variables were explained. Multiple regression analysis indicated the relative contribution of each independent variable while the step-down regression analysis advanced a step further by separating the best set of independent variables or factors which explained the maximum variability in the dependent variable. At the same time the relative effect (both direct and indirect) of even the insignificant variables on the dependent variables could be clearly brought out only through path analysis.

It was clear from the Table that out of the eighteen factors selected, the highest direct effect on extent of conversion was exerted by the five variables namely net area under rubber (0.6204), gross cropped area (-0.5886), cropping intensity (-0.5206), number of crops (-0.1776) and dispersion of crops in the homestead (-0.1216). Out of these only net area under rubber had a positive direct effect (Fig. 5).

Table 11 Results of Path Analysis of extent of conversion of marginal homesteads to rubber with selected independent variables

(n = 200)

| Variable No. | Name of variable | Direct effect | Rank | Total indirect effect | Rank | Largest indirect effect | Through variable number |
|---|---|---|---|---|---|---|---|
| $V_1$ | Age | -0.0350 | 10 | 0.4091 | 8 | -0.0907 | $V_{16}$ |
| $V_2$ | Family size | 0.0678 | 7 | 0.3545 | 12 | -0.0909 | $V_{17}$ |
| $V_3$ | Occupation | -0.0162 | 14 | 0.1918 | 17 | -0.0443 | $V_{17}$ |
| $V_4$ | Farming experience | 0.0308 | 13 | 0.3931 | 9 | -0.0963 | $V_{17}$ |
| $V_5$ | Area under wetland | 0.0331 | 12 | 0.220 | 16 | -0.0679 | $V_{17}$ |
| $V_6$ | Area under homestead | 0.0908 | 6 | 0.7752 | 3 | -0.3308 | $V_{17}$ |
| $V_7$ | Exposure to technology | -0.0014 | 17 | 0.3427 | 13 | 0.0904 | $V_{15}$ |
| $V_8$ | Availability of family labour | -0.0393 | 9 | 0.3721 | 11 | -0.1325 | $V_{17}$ |
| $V_9$ | Availability of hired labour | 0.0117 | 15 | 0.5502 | 5 | 0.2069 | $V_{15}$ |
| $V_{10}$ | Outmigration of family labour | 0.0348 | 11 | 0.1837 | 18 | 0.0621 | $V_{15}$ |
| $V_{11}$ | Outmigration of hired labour | -0.0081 | 16 | 0.3726 | 10 | -0.1493 | $V_{16}$ |

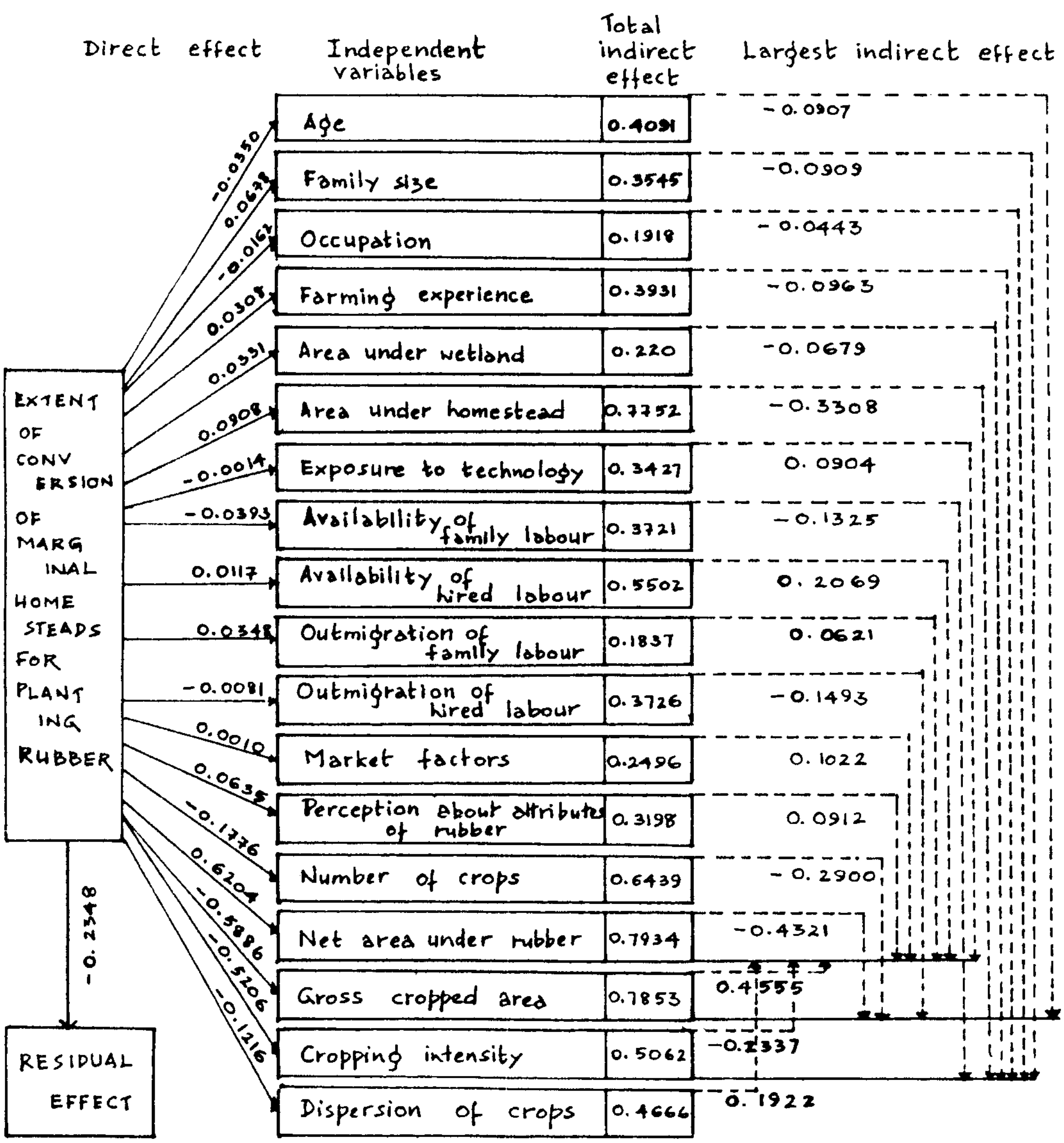
Contd.....

Table 11 contd.....

| Variable No. | Name of variable | Direct effect | Rank | Total indirect effect | Rank | Largest indirect effect | Through variable number |
|---|---|---|---|---|---|---|---|
| $V_{12}$ | Market factors | 0.0010 | 18 | 0.2496 | 15 | 0.1022 | $V_{15}$ |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.0635 | 8 | 0.3198 | 14 | 0.0912 | $V_{15}$ |
| $V_{14}$ | Number of crops | -0.1776 | 14 | 0.6439 | 4 | -0.2900 | $V_{16}$ |
| $V_{15}$ | Net area under rubber | 0.6204 | 1 | 0.7934 | 1 | -0.4321 | $V_{16}$ |
| $V_{16}$ | Gross cropped area | -0.5886 | 2 | 0.7853 | 2 | 0.4555 | $V_{15}$ |
| $V_{17}$ | Cropping intensity | -0.5206 | 3 | 0.5068 | 6 | -0.2337 | $V_{15}$ |
| $V_{18}$ | Dispersion of crops | -0.1216 | 5 | 0.4666 | 7 | 0.1922 | $V_{15}$ |

Residual effect = 0.2348

Fig. 5 Path diagram showing the direct and indirect effects of the independent variables on extent of conversion of marginal homesteads to rubber



The total indirect effect of independent variables on the dependent variable was obtained by adding up all the indirect effects of that variable through the other selected independent variables. Among the eighteen selected variables, the highest total indirect effect on extent of conversion was exerted through net area under rubber (0.7934). Out of this, the largest indirect effect was through the factor gross cropped area ($V_{16}$). The other important variables exerting high total indirect effect were, gross cropped area (0.7853), area under homestead (0.7752) number of crops (0.6439) and availability of hired labour (0.5502) and the largest indirect effect was exerted by these variables through net area under rubber ($V_{15}$), cropping intensity($V_{17}$), gross cropped area ($V_{16}$) and net area under rubber ($V_{15}$) respectively.

## 4.4 Relationship between nature of conversion of marginal homesteads for planting rubber and factors influencing nature of conversion

The results of analysis of relationship between nature of conversion of marginal homesteads for planting rubber and factors influencing conversion of homesteads to rubber are presented in Table 12. Four methods of analysis viz, simple correlation analysis, multiple linear regression analysis, step-down regression and path analysis were followed.

### 4.4.1 Simple correlation analysis

A glance through the Table revealed that out of the eighteen factors studied just two factors, availability of family labour and number of crops replaced in the homestead held a significant relationship with nature of conversion.

Table 12 Relationship between nature of conversion of marginal homesteads to rubber and selected independent variables

(n = 200)

| Variable No. | Name of variable | Coefficient of correlation (r) |
|---|---|---|
| $V_1$ | Age | -0.0111 |
| $V_2$ | Family size | 0.0357 |
| $V_3$ | Occupation | 0.0055 |
| $V_4$ | Farming experience | -0.0360 |
| $V_5$ | Area under wetland | -0.0191 |
| $V_6$ | Area under homestead | 0.0333 |
| $V_7$ | Exposure to technology | 0.0494 |
| $V_8$ | Availability of family labour | -0.1506** |
| $V_9$ | Availability of hired labour | 0.0745 |
| $V_{10}$ | Outmigration of family labour | -0.0374 |
| $V_{11}$ | Outmigration of hired labour | -0.0081 |
| $V_{12}$ | Market factors | 0.0745 |
| $V_{13}$ | Perception about attributes of rubber cultivation | -0.0070 |
| $V_{14}$ | Number of crops | -0.3704** |
| $V_{15}$ | Net area under rubber | 0.0313 |
| $V_{16}$ | Gross cropped area | -0.0211 |
| $V_{17}$ | Cropping intensity | -0.0770 |
| $V_{18}$ | Dispersion of crops | 0.0897 |

** Significant at 1 per cent level
* Significant at 5 per cent level

Availability of family labour established a negative and significant relationship with nature of conversion of marginal homesteads for planting rubber. This indicated that higher the availability of family labour in the homesteads lesser was the nature of conversion or the quality of conversion.

Similarly number of crops replaced by rubber in the homesteads were found to have a highly significant but negative correlation with nature of conversion. The results clearly indicated that homesteads having higher number and/or diversity of crops faced lesser chances of conversion in comparison to homesteads having lesser number of crops.

Just two factors among the 18 selected factors were found to have any significant relationship with nature of conversion. This result obtained may be due to two reasons; one, some of the factors other than those included in the study were found to influence nature of conversion which was a qualitative dependent variable, two, nature of conversion was a rather insignificant effect in comparison to extent, due to the saturation of the study area with rubber holdings which in turn might have diluted/nullified the diversity existing in the remaining homesteads.

Availability of family labour and number of crops in the homesteads were two highly interrelated factors which held a negative and significant relationship with the nature of conversion of marginal homesteads to rubber.

Homestead farming is predominantly a family oriented farming system. In the recent past hired labour has been increasingly utilized in the homesteads due to changing human-land relations. Even then, it is traditionally a family labour centred agriculture. Through years of trial and error experiments, experiences combined with an inborn understanding of the land and its lay, the potential of the land, the availability of water resources and climatic conditions, the farm families have been growing a variety of crops both tree and annual crops to meet their various sustenance requirements.

Homesteads require constant care and attention with a personal involvement for their healthy maintenance and long term survival. The constant availability of family labour has a direct and catalytic effect on increasing the diversity of crops in the homestead both structural and functional. This in turn increases the responsibility of the farm family towards the upkeep of the homestead and to sharing of resources and products of the homestead within the members of the community. Penny and Singarimbum (1973) also observed that when there are not many off-farm jobs, people spent more time on their homegardens and crop diversity increased. Hence more the availability of family labour and more the crop diversity of the homestead lesser are the chances of conversion of marginal homesteads to rubber which also proved the hypothesis that availability of family labour and crop diversity would have a negative and significant relationship with conversion.

### 4.4.2 Multiple linear regression analysis

The relative contribution of each factor towards the dependent variable, nature of conversion was explained by Table 13. It was found that just one single factor, ie., number of crops made significant contribution towards nature of conversion of marginal homesteads for planting rubber. The contribution by a few other variables namely occupation, availability of family labour and availability of hired labour was just approaching significance. A significant `F' value of 2.98** and a moderately high $R^2$ value of 0.2284 (22.84% contribution) indicated that the percentage contribution of the selected factors on the nature of conversion of marginal homesteads for planting rubber was significant.

### 4.4.3 Step-down regression analysis

Step-down regression analysis was carried out to find out the best sub-set of factors which explained the maximum variability of the dependent variable. In this case the results indicated that the factors, occupation ($V_3$), availability of hired labour ($V_9$), number of crops in the homestead ($V_{14}$) gross cropped area (before conversion) ($V_{16}$) and cropping intensity ($V_{17}$) of the homestead (Table 14) contributed to 21.44% variation in the dependent variable, nature of conversion. A high `F' value of 10.59** indicated that the contribution was significant. Even then, the low percentage of contribution of the variables indicated that there might be variables other than those selected for the study which exerted significant influence on the nature of conversion.

Table 13 Results of multiple linear regression analysis involving nature of conversion of marginal homesteads to rubber and selected independent variables

(n = 200)

| Variable No. | Name of variable | Regression coefficient `B' | `t' value of `B' |
|---|---|---|---|
| $V_1$ | Age | -0.006 | 0.162 |
| $V_2$ | Family size | 0.115 | 0.666 |
| $V_3$ | Occupation | 0.129 | 1.518 |
| $V_4$ | Farming experience | -0.007 | 0.248 |
| $V_5$ | Area under wetland | 0.238 | 0.207 |
| $V_6$ | Area under homestead | 0.921 | 0.477 |
| $V_7$ | Exposure to technology | -0.025 | 0.451 |
| $V_8$ | Availability of family labour | -0.045 | 1.113 |
| $V_9$ | Availability of hired labour | 0.056 | 1.082 |
| $V_{10}$ | Outmigration of family labour | -0.013 | 0.414 |
| $V_{11}$ | Outmigration of hired labour | 0.012 | 0.250 |
| $V_{12}$ | Market factors | -0.004 | 0.371 |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.005 | 0.214 |
| $V_{14}$ | Number of crops | -0.648 | 6.103** |
| $V_{15}$ | Net area under rubber | 1.161 | 0.525 |
| $V_{16}$ | Gross cropped area | 0.802 | 0.789 |
| $V_{17}$ | Cropping intensity | -0.378 | 0.987 |
| $V_{18}$ | Dispersion of crops | -1.721 | 0.970 |

F value for $R^2$ = 2.98** with 18 and 181 DFS
Multiple $R^2$ = 0.2284 (22.84%) R = 0.4479

Table 14 Results of step-down regression analysis of nature of conversion of marginal homesteads to rubber with selected independent variables

(n = 200)

| Variable No. | Name of variable | Regression coefficient `B' | `t' value of `B' |
|---|---|---|---|
| $V_3$ | Occupation | 0.098 | 1.466* |
| $V_9$ | Availability of hired labour | 0.072 | 1.710* |
| $V_{14}$ | Number of crops | -0.645 | 7.072** |
| $V_{16}$ | Gross cropped area | 1.221 | 3.047** |
| $V_{17}$ | Cropping intensity | -0.447 | 2.322* |

F value for R = 10.59** with 5 and 104 DFS
Multiple $R^2$ = 0.2144 (21.44%)

### 4.4.4 Path analysis

Path analysis was carried out to find out the direct and indirect effect of each independent variable on the dependent variable, nature of conversion. The results presented in Table 15 indicated that highest direct effect was exercised by the factors, number of crops in the homestead (-0.5372) followed by gross cropped area under homestead (-0.1598), cropping intensity (-0.1338), occupation (0.1272) and availability of family labour (-0.1098).

The highest total indirect effect were exerted by the variables, net area under rubber (0.5235), gross cropped area under homesteads (0.4824), availability of hired labour (0.3339), availability of family labour (0.3218) and area under homestead (0.2870) and the largest indirect effect was exerted by these variables through the single factor number of crops in the homestead ($V_{14}$), in all cases, indicating the significance of this factor in deciding nature of conversion (Fig. 6).

Nature of conversion implied, the structure and function of marginal homesteads that were converted to rubber. The number of crops in a homestead indicated the type of structure and the functions served by the homesteads to the farm family. Soemarwoto (1987) observed that a prominent structural characteristic of the homegarden is the great diversity of species with many life forms varying from those creeping on the ground like sweet potato, to tall trees of ten metres or more, ie. the coconut palm and vines climbing on bamboo poles and trees. Species diversity and plant density vary from place to place

Table 15 Results of path analysis of nature of conversion of marginal homesteads for planting rubber with selected independent variables

| Variable No. | Name of variable | Direct effect | Rank | Total indirect effect | Rank | Largest indirect effect | Through variable number |
|---|---|---|---|---|---|---|---|
| $V_1$ | Age | -0.0268 | 15 | 0.2733 | 6 | 0.0399 | $V_3$ |
| $V_2$ | Family size | 0.0592 | 9 | 0.2099 | 14 | -0.0343 | $V_8$ |
| $V_3$ | Occupation | 0.1272 | 4 | 0.2149 | 13 | -0.0599 | $V_{14}$ |
| $V_4$ | Farming experience | -0.0371 | 12 | 0.2632 | 8 | -0.0389 | $V_8$ |
| $V_5$ | Area under wetland | 0.0154 | 18 | 0.1852 | 16 | -0.0545 | $V_{14}$ |
| $V_6$ | Area under homestead | 0.0547 | 10 | 0.2870 | 5 | 0.0897 | $V_{16}$ |
| $V_7$ | Exposure to technology | -0.0411 | 11 | 0.2668 | 7 | -0.0596 | $V_3$ |
| $V_8$ | Availability of family labour | -0.1098 | 5 | 0.3218 | 4 | -0.0715 | $V_{14}$ |
| $V_9$ | Availability of hired labour | 0.0917 | 7 | 0.3339 | 3 | -0.1177 | $V_{14}$ |
| $V_{10}$ | Outmigration of family labour | -0.0320 | 13 | 0.1583 | 17 | -0.0431 | $V_{14}$ |
| $V_{11}$ | Outmigration of hired labour | 0.0177 | 16 | 0.2550 | 9 | -0.1362 | $V_{16}$ |

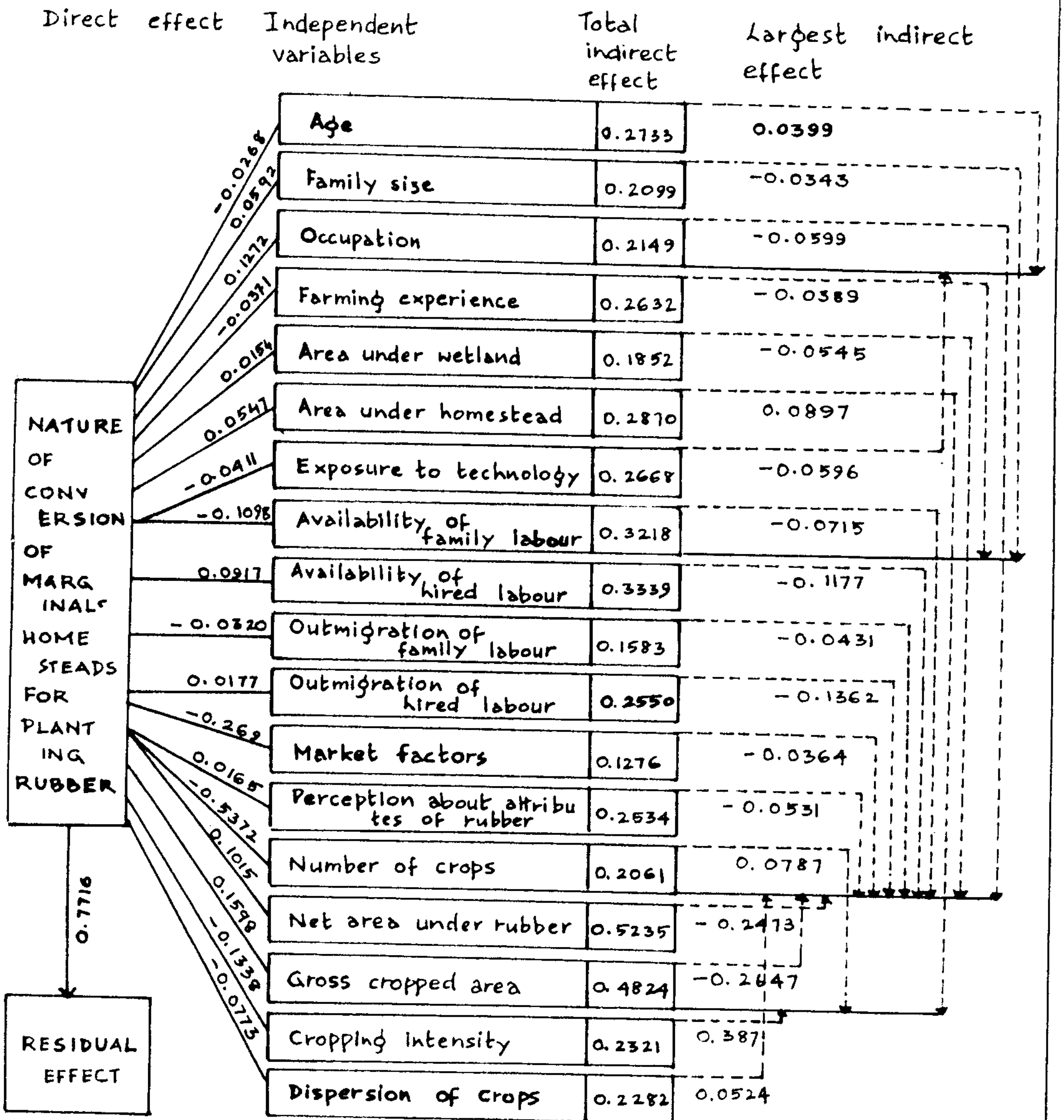
Contd.....

Table 15 contd.....

| Variable No. | Name of variable | Direct effect | Rank | Total indirect effect | Rank | Largest indirect effect | Through variable number |
|---|---|---|---|---|---|---|---|
| $V_{12}$ | Market factors | -0.269 | 14 | 0.1276 | 18 | 0.0364 | $V_{14}$ |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.0165 | 17 | 0.2534 | 10 | -0.0531 | $V_{14}$ |
| $V_{14}$ | Number of crops | -0.5372 | 1 | 0.2061 | 15 | 0.0787 | $V_{16}$ |
| $V_{15}$ | Net area under rubber | 0.1015 | 6 | 0.5235 | 1 | -0.2473 | $V_{14}$ |
| $V_{16}$ | Gross cropped area | 0.1598 | 2 | 0.4824 | 2 | -0.2647 | $V_{14}$ |
| $V_{17}$ | Cropping intensity | -0.1338 | 3 | 0.2321 | 11 | 0.387 | $V_{16}$ |
| $V_{18}$ | Dispersion of crops | -0.0773 | 8 | 0.2282 | 12 | 0.0524 | $V_{14}$ |

Residual effect = 0.7716

Fig. 6 Path diagram showing the direct and indirect effects of the independent variables on nature of conversion of marginal homesteads to rubber



influenced by ecological and socio-economic factors. For instance, in Grenada there were 18 vegetable varieties and 13 distinct types of food trees in a sample garden of less than 2000 sq.m. (Brierley, 1985). In a west Javanese village of 41 households, the average number of plant species per homegarden was 56. The total number of species in the village was 219 in the dry season and 272 in the wet season, ie., an increase of almost 25 per cent in the wet season (Soemarwoto, 1987). Salam *et al.* (1992) have identified atleast 31 tree species meeting the food, fuel, timber and trailing of vines requirement of the households in a survey of homesteads of Kerala. In another survey, Nair and Sreedharan (1989) have identified atleast 65 species of crop plants, both trees and annuals serving the function of cereals, pulses, fruits, oils and fats, beverages, spices and condiments, vegetables, fodder and many others in the homesteads of Kerala. Apart from this, the surplus products from the homestead after meeting the requirements of the farm family are also used for cash generation.

Ahmed *et al.* (1980) reported that the percentage of total produce of homestead consumed by the household were, fruit 46, coconut 83.7, vegetable 94.7, medicinal plants 95.5 and tubers and roots 97.3. Other important products for home consumption were fuelwood, construction materials and materials for handicraft and home industry.

All these supportive evidences point out towards the indispensable role homsteads have in the day to day living of a family dependant on it.

The crops in a homestead also signify the culture and tradition of a community/society which depends on it. For instance studies in West Java have shown that homesteads are an important social status symbol (Ahmed *et al.*, 1980). Fruits and products are traditionally shared with relatives and neighbours, and products for religious or traditional ceremonies and medicine are given away freely when requested.

Thus the diversity and cultural richness of our society has been inextricably linked with the existence and continuance of the homesteads in our social system from the ancient times. So number of crops rather denotes the qualitative value of the homesteads which were replaced by rubber; the productive and protective functions of a homestead which were replaced by rubber. Thus number of crops emerged as the most significant and decisive factor in Multiple Linear Regression Analysis, step down analysis and path analysis influencing and contributing towards nature of conversion.

As correctly cited earlier availability of hired labour and availability of family labour were linked with the nature of conversion through the factor number of crops ($V_{14}$). The largest indirect effect on the nature of conversion was also through the factor number of crops ($V_{14}$) in the homesteads replaced by rubber.

## 4.5 Relationship between conversion of marginal homesteads for planting rubber and factors influencing conversion

Relationship between conversion (composite index of conversion) of marginal homesteads for planting rubber and factors influencing conversion was analysed under four headings, viz., simple correlation, multiple linear regression analysis, step-down regression and path analysis.

### 4.5.1 Simple correlation analysis

This analysis was carried out to find out the magnitude and direction of relationship between the dependent and independent variables. The results are presented in Table 16. The index of conversion was actually a combination of the index of extent of conversion and nature of conversion of marginal homesteads to rubber. It was found that out of the eighteen variables analysed five variables established a significant relationship with conversion.

Area under homestead was found to have a negative but highly significant relationship with conversion of homesteads. As the area under the homestead decreased more was the quantity and quality of conversion. In other words lesser the area, more the conversion was the effect.

A negative but significant relationship was established between availability of family labour and conversions. This indicated that more the availability lesser were the chances for conversion.

Table 16 Relationship between conversion of marginal homesteads to rubber and selected independent variables

(n = 200)

| Variable No. | Name of variable | Coefficient of correlation (r) |
|---|---|---|
| $V_1$ | Age | -0.0038 |
| $V_2$ | Family size | 0.0115 |
| $V_3$ | Occupation | -0.0067 |
| $V_4$ | Farming experience | -0.0453 |
| $V_5$ | Area under wetland | -0.0840 |
| $V_6$ | Area under homestead | -0.2421** |
| $V_7$ | Exposure to technology | 0.0841 |
| $V_8$ | Availability of family labour | -0.1977** |
| $V_9$ | Availability of hired labour | 0.0080 |
| $V_{10}$ | Outmigration of family labour | 0.0343 |
| $V_{11}$ | Outmigration of hired labour | -0.0188 |
| $V_{12}$ | Market factor | 0.1266 |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.0156 |
| $V_{14}$ | Number of crops | -0.2688** |
| $V_{15}$ | Net area under rubber | 0.1244 |
| $V_{16}$ | Gross cropped area | -0.1952** |
| $V_{17}$ | Cropping intensity | -0.3507** |
| $V_{18}$ | Dispersion of crops | 0.0156 |

** Significant at 1 per cent level
* Significant at 5 per cent level

Among the situational factors, number of crops in the homestead was found to have a negative and highly significant relationship with conversion of the homestead. The results evidently showed that more the trees or crops in a homestead or rather more dense the crop cover, lesser were the chances of conversion.

Gross cropped area also indicated a significantly negative relationship with conversion of marginal homesteads to rubber. That is, more the area put to cultivation or tree cover or crop cover, lesser were the chances of conversion.

A negative and significant relationship was also established between cropping intensity of the homesteads and conversion of marginal homesteads to rubber.

### 4.5.2 Multiple linear regression analysis

In this case multiple regression analysis was carried out to find out the relative contribution of the selected eighteen factors towards conversion of marginal homesteads to rubber (a composite index of nature and extent of conversion).

Out of the eighteen factors included in MLR, only four variables namely number of crops in the marginal homestead replaced by rubber, net area under rubber, gross cropped area of the homestead and dispersion of crops in the homesteads made significant contribution towards conversion of marginal homesteads to rubber. A high `F' value of 4.46** and a multiple $R^2$ value of 0.3073 (30.73% contribution) indicated that the contribution was significant (Table 17).

Table 17 Results of multiple linear regression analysis of conversion of marginal homesteads to rubber with selected independent variables

(n = 200)

| Variable No. | Name of variable | Regression coefficient `B' | `t' value of `B' |
|---|---|---|---|
| $V_1$ | Age | 0.000 | 0.308 |
| $V_2$ | Family size | 0.001 | 0.659 |
| $V_3$ | Occupation | 0.001 | 1.548 |
| $V_4$ | Farming experience | 0.000 | 0.358 |
| $V_5$ | Area under wetland | 0.001 | 0.293 |
| $V_6$ | Area under homestead | 0.806 | 0.766 |
| $V_7$ | Exposure to technology | 0.000 | 0.293 |
| $V_8$ | Availability of family labour | 0.000 | 1.965 |
| $V_9$ | Availability of hired labour | 0.000 | 0.513 |
| $V_{10}$ | Outmigration of family labour | 0.000 | 0.167 |
| $V_{11}$ | Outmigration of hired labour | 0.000 | 0.401 |
| $V_{12}$ | Market factor | 0.000 | 0.557 |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.000 | 0.259 |
| $V_{14}$ | Number of crops | 0.000 | 4.024** |
| $V_{15}$ | Net area under rubber | -0.002 | 4.007** |
| $V_{16}$ | Gross cropped area | 0.039 | 3.024** |
| $V_{17}$ | Cropping intensity | -0.014 | 0.034 |
| $V_{18}$ | Dispersion of crops | -0.018 | 2.267** |

F value for R = 4.46** with 18 and 181 DFS
Multiple $R^2$ = 0.3073 R = 0.5543

### 4.5.3 Step-down regression analysis

Step-down regression analysis was carried out to find out the best sub-set of factors or variables which contributed to maximum variability in the dependent variable, conversion.

All the selected eighteen factors were subjected to step-down regression analysis. The method involved continuous step by step elimination of variables which did not make significant contributions towards variability of the dependent variable. The elimination process was stopped only when the best sub-set of variables was selected with `t' values significant. In this case the best sub-set was arrived in the twelfth step-down (Table 18). The variables which contributed maximum were occupation ($V_3$), availability of family labour ($V_8$), number of crops ($V_{14}$), net area under rubber ($V_{15}$), gross cropped area ($V_{16}$) and dispersion of crops ($V_{18}$).

### 4.5.4 Path Analysis

Path analysis was carried out to find out the relative direct and indirect effect of the selected variables/factors on the dependent variable.

When the eighteen factors were together entered into path analysis, net area under rubber ($V_{15}$) was found to exert the maximum direct effect on conversion of marginal homesteads to rubber followed by gross cropped area under homestead ($V_{16}$), number of crops in the homestead ($V_{14}$) availability of family labour ($V_8$) and dispersion of crops ($V_{18}$) (Table 19).

Table 18 Results of step-down regression analysis of conversion of marginal homesteads to rubber with selected independent variables

(n = 200)

| Variable No. | Name of variable | Regression coefficient \`B' | \`t' value of \`B' |
|---|---|---|---|
| $V_3$ | Occupation | 0.001 | 1.764* |
| $V_8$ | Availability of family labour | 0.001 | 2.213* |
| $V_{14}$ | Number of crops | -0.002 | 4.688** |
| $V_{15}$ | Net area under rubber | 0.036 | 7.027** |
| $V_{16}$ | Gross cropped area | -0.011 | 5.134** |
| $V_{18}$ | Dispersion of crops | -0.015 | 2.190* |

F value for R = 13.66** with 6 and 193 DFS
Multiple $R^2$ = 0.3014 R = 0.5490

Table 19 Results of path analysis of conversion of marginal homesteads to rubber with selected independent variables

(n = 200)

| Variable No. | Name of variable | Direct effect | Rank | Total indirect effect | Rank | Largest indirect effect | Through variable number |
|---|---|---|---|---|---|---|---|
| $V_1$ | Age | 0.0469 | 10 | 0.4368 | 9 | -0.0970 | $V_{15}$ |
| $V_2$ | Family size | 0.0555 | 8 | 0.3558 | 13 | -0.0875 | $V_{16}$ |
| $V_3$ | Occupation | 0.1228 | 6 | 0.2483 | 15 | -0.867 | $V_8$ |
| $V_4$ | Farming experience | -0.0518 | 9 | 0.386 | 12 | -0.0812 | $V_{16}$ |
| $V_5$ | Area under wetland | 0.0207 | 15 | 0.2191 | 17 | -0.0394 | $V_{16}$ |
| $V_6$ | Area under homestead | 0.0832 | 7 | 0.4975 | 6 | -0.3259 | $V_{16}$ |
| $V_7$ | Exposure to technology | 0.0252 | 14 | 0.4154 | 10 | 0.1070 | $V_{15}$ |
| $V_8$ | Availability of family labour | -0.1837 | 4 | 0.3556 | 14 | -0.0835 | $V_{15}$ |
| $V_9$ | Availability of hired labour | -0.0412 | 11 | 0.6642 | 4 | 0.2448 | $V_{15}$ |
| $V_{10}$ | Outmigration of family labour | -0.0123 | 17 | 0.2447 | 16 | 0.0735 | $V_{15}$ |
| $V_{11}$ | Outmigration of hired labour | 0.0270 | 13 | 0.4421 | 8 | 0.1585 | $V_{15}$ |

Contd.....

Table 19 contd....

| Variable No. | Name of variable | Direct effect | Rank | Total indirect effect | Rank | Largest indirect effect | Through variable number |
|---|---|---|---|---|---|---|---|
| $V_{12}$ | Market factor | -0.0383 | 12 | 0.2123 | 18 | 0.1210 | $V_{15}$ |
| $V_{13}$ | Perception about attributes of rubber cultivation | 0.0189 | 16 | 0.3991 | 11 | 0.1080 | $V_{15}$ |
| $V_{14}$ | Number of crops | -0.3356 | 3 | 0.7105 | 3 | 0.3380 | $V_{15}$ |
| $V_{15}$ | Net area under rubber | 0.7342 | 1 | 0.7171 | 2 | -0.4261 | $V_{16}$ |
| $V_{16}$ | Gross cropped area | -0.5804 | 2 | 0.8452 | 1 | 0.5390 | $V_{15}$ |
| $V_{17}$ | Cropping intensity | -0.0043 | 18 | 0.6133 | 5 | -0.2765 | $V_{15}$ |
| $V_{18}$ | Dispersion of crops | -0.1713 | 5 | 0.4937 | 7 | 0.2274 | $V_{15}$ |

Residual effect = 0.6927

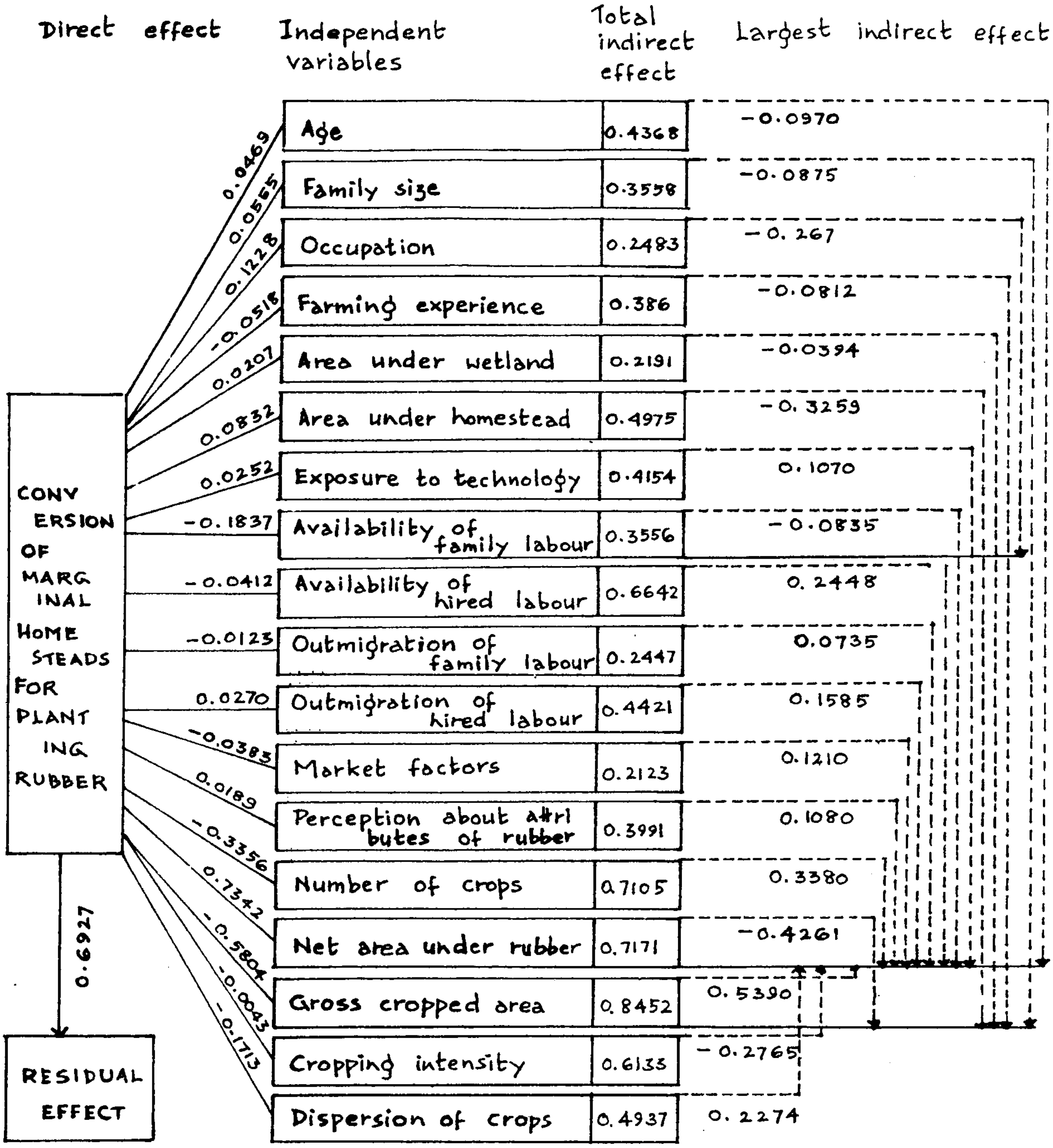
When the total indirect effect of each factor was analysed, the largest total indirect effect was exerted by the factor gross cropped area of the homestead ($V_{16}$, 0.8452) through variable net area under rubber ($V_{15}$) followed by net area under rubber ($V_{15}$, 0.7171) through gross cropped area ($V_{16}$) followed by number of crops ($V_{14}$, 0.7105) availability of hired labour ($V_9$, 0.6642) and cropping intensity ($V_{17}$, 0.6133), all through the factor net area under rubber ($V_{15}$) (Fig. 7).

The dependent variable, conversion of marginal homesteads for planting rubber was actually a composite variable derived from the dependent variables, nature and extent of conversion. In simple correlation analysis, family labour availability ($V_8$) which had held significant relationship with the nature and extent of conversion was also found to have a significant relationship with conversion of marginal homesteads to rubber. The factor number of crops ($V_{14}$) was found to influence both nature of conversion and conversion (composite index).

At the same time area under homestead ($V_6$) gross cropped area ($V_{16}$) and cropping intensity ($V_{17}$) which showed significant negative relationship with extent of conversion were found to hold the same relationship with conversion of marginal homesteads to rubber only.

Availability of family labour and number of crops were two factors which could influence both the quantitative and qualitative replacement of marginal homesteads by rubber as explained earlier in this chapter. In the case of area under homestead, gross cropped area

Fig. 7 Path diagram showing the direct and indirect effects of the independent variables on conversion of marginal homesteads to rubber



and cropping intensity, all three factors were only related to the area under the marginal homesteads converted to rubber. Hence these factors could influence the quantitative conversion of homesteads.

In the case of Multiple Linear Regression Analysis (MLR), number of crops ($V_{14}$) was the only factor which contributed significantly towards nature of conversion, extent of conversion and conversion of marginal homesteads to rubber simultaneously. At the same time net area under rubber ($V_{15}$) gross cropped area ($V_{16}$) and dispersion of crops ($V_{18}$) in the homestead were found to contribute significantly towards variability in extent of conversion and conversion of homesteads to rubber only.

In the case of step-down regression analysis conducted, it was found that, out of the best sub-set of variables of the dependent variables viz., nature of conversion, extent of conversion and conversion of marginal homesteads to rubber only the variables, number of crops in the homestead ($V_{14}$) and gross cropped area ($V_{16}$) were common in explaining the variability of the three dependent variables.

The history of evolution of homesteads can be probably traced back to the period when man gradually shifted from a hunter gatherer existence to settled agriculture. In the tropics or the sub-tropics, the cropping systems and the species diversity of the homesteads may have evolved by the people based on the principles of forest ecosystems on which they depended. They were raised to serve the dual functions of maintaining the ecological stability of the area and at the same time meet the sustenance needs of the people depending on it.

Soemarwoto and Soemarwoto (1984) have observed that homegarden as an agroforestry system should ideally combine the ecological function of forests with those of providing the socio-economic needs of the people. This aspect implies that availability of plenty of family labour had a major role to play in deciding the crops to be grown or plants to be domesticated for meeting the diverse requirements of the farm family. Similar results were observed by Shaxson and Taver (1992), that is, increase in labour availability over the production period is associated with a more diverse cropping pattern. The homesteads in the tropical region were especially high in their species diversity due to the Tropical rain forest nearby.

Over years commercialization of agriculture had its effect on the agricultural front also. The family and community involvement in maintaining homesteads started getting slowly alienated when people started searching for other avenues far removed from farming. Slowly the monetization of the economy from a social economy based on sharing of surplus strengthened this alienation. Consequently products from homesteads started being viewed as commodities for profit making. The crops in the homesteads were also slowly losing their diversity both in quantity and quality. The multitude of species with both direct immediate needs and indirect long term needs started getting replaced by species with direct economic returns to the farmer. The scarcity of labour at home hastened this process. Soon, it became rather easy to switch over from a 3-5 species economic returns based homestead to a monocrop like rubber. Soemarwoto (1987) has quoted similar observations. Commercialization causes a decline in the diversity of species or varieties (mentioned earlier in this chapter). For quoting another instance, in the 1920's, 75 varieties of mango were reported in Cirebol area of West Jawa. On the contrary in Depok near Jakarta where homegardens have specialised in commercial fruit growing, only one variety of mango is found in a sample of 15 homegardens.

Thus it emerges from the analysis that family labour scarcity and loss of diversity of homesteads have been going on in parallel, influencing conversion of marginal homesteads to rubber.

The findings from this study revealed that survival of farming systems like homesteads was very much dependent on the existence and continuous growth of diversity of the cultural and social fabric of a community which depended on it. Thus a shift in the mind of the society towards dis-integration of its traditional social and economic values was the main factor behind such shifts in land use of which family labour availability or lack of it was only an indicator.

As observed in the previous two sections, area under homestead, availability of family labour, number of crops, gross cropped area and cropping intensity of the homestead, held a negative and significant relationship with the conversion of marginal homesteads to rubber proving that the hypothesis was correct.

## 4.6 Comparison of perception of convertors/non-convertors about attributes of rubber cultivation versus homestead farming influencing conversion/non-conversion

Analysis and comparison of perception of attributes of convertors and non-convertors was carried out by ranking the attributes of both the categories of respondents based on mean score obtained under each attribute. The convertors and non-convertor were then compared based on the ranks obtained. The results are presented in the Table 10.

The attributes were studied under four major categories namely, ecological attributes, economic attributes, temporal attributes and socio-psychological attributes.

'Wind direction' was pointed out as the most important attribute of rubber cultivation compared to homestead farming which probably prevented the conversion of homesteads to rubber (Mean score 4.67). In other words, the direction of the wind affecting successful rubber cultivation was the most important drawback in cultivating this crop which was not experienced in homestead farming.

As for convertor, marketability of rubber latex (sheets) and its other products was the most important attribute influencing conversion in comparison with products from a homestead which were not so easily or efficiently marketable. The mean score was 4.315.

Table 10 Comparison of perception of attributes of rubber cultivation among convertors and non-convertors of marginal homesteads to rubber

| Sl. No. | Attribute | Non-convertors | | Convertors | |
|---|---|---|---|---|---|
| | | Mean score | Rank | Mean score | Rank |
| A | **Ecological attributes** | | | | |
| 1 | slope of land | 2.99 | 12 | 3.305 | 11 |
| 2 | Type of soil | 3.35 | 9 | 3.57 | 7 |
| 3 | Wind direction | 4.67 | 1 | 4.115 | 3 |
| 4 | Local resource utilization | 2.81 | 13 | 2.805 | 14 |
| B | **Economic attributes** | | | | |
| 1 | Profitability | 3.75 | 4 | 4.12 | 2 |
| 2 | Marketability | 4.01 | 2 | 4.315 | 1 |
| 3 | Economic efficiency | 3.25 | 10 | 3.19 | 12 |
| 4 | Regularity of returns | 3.66 | 5 | 3.645 | 4 |
| C | **Temporal attributes** | | | | |
| 1 | Time availability | 3.23 | 11 | 3.49 | 10 |
| 2 | Immediacy of returns | 3.64 | 6 | 3.565 | 8 |
| D | **Socio-psychological attributes** | | | | |
| 1 | Perceived risk | 3.99 | 3 | 3.155 | 13 |
| 2 | Cultural compatibility | 2.65 | 14 | 3.495 | 9 |
| 3 | Security need | 3.42 | 8 | 3.615 | 5 |
| 4 | Status need | 3.57 | 7 | 3.6 | 6 |

Marketability was placed second by non-convertors as an important attribute of rubber cultivation compared to homestead products as indicated from mean score of 4.01. In other words non-convertors were also of the opinion that rubber products were more easily and efficiently marketable in comparison to homestead products. Convertors found rubber cultivation to be more profitable compared to homestead farming and placed it second among the fourteen attributes compared (Mean score = 4.12).

The third important attribute pointed out by non-convertor was the perceived risk involved in rubber cultivation compared to homestead farming with a mean score of 3.99. The convertors on the other hand gave wind direction (mean score 4.115) as the third important attribute influencing rubber cultivation compared to homestead farming. It meant that convertors also perceived rubber crop was highly prone to wind inflicted damage while homesteads were not so prone.

The convertorsplaced profitability of rubber cultivation as the second important attribute . The non-convertors gave fourth place to profitability (mean score = 3.75) acknowledging that rubber cultivation was more profitable than homestead farming. Regularity of returns from rubber cultivation in comparison to homestead was given the fourth rank by convertor (mean score 3.645). In other words products or returns were obtained at regular intervals from a rubber crop compared to a homestead, as perceived by convertors.

Regularity of returns from rubber in comparison to homesteads was perceived as the fifth important attribute of rubber cultivation compared to homesteads by non-convertors. On the other hand, security need fulfilment by rubber in comparison to homestead farming was given the fifth rank by convertors.

The other attributes ranked by the non-convertors in descending order were immediacy of returns, status need, security need, type of soil suited for rubber, economic efficiency of rubber compared to homesteads, time availability, slope of the land, local resource utilization and cultural compatibility. As for convertor rubber farmers other important attributes in descending order were status need, type of soil suited for rubber versus homesteads, immediacy of returns, cultural compatibility, time availability, slope of the land, economic efficiency, perceived risk in rubber cultivation versus homestead farming and lastly local resource utilization.

## 4.7 Consequences of conversion of marginal homesteads for planting rubber

Eighteen important consequences of conversion of marginal homesteads to rubber were analysed based on two criteria. Twelve consequences out of the eighteen were compared based on the magnitude of the consequences. The other six were ranked based on the directionality of consequences. It means that for those consequences where direction of change was towards the increase, the magnitude was taken into consideration. For those consequences whose direction of change could be positive or negative, the directionality of change was important.

Out of the twelve consequences compared, (Table 21) based on their magnitude of change, the most important consequence perceived due to conversion of marginal homesteads to rubber was outmigration of hired labour. Out of the 140 convertors who had engaged hired labour outmigration of hired labour had taken place in 66 households. With a high average rank value of 92.05 (Fig. 8). The second most important consequence as perceived by the convertors was outmigration of family labour. Out of the 200 convertors studied, outmigration of family labour had taken place in 75 households with an average rank value of 91.29. Soil loss (erosion) due to conversion of marginal homesteads to rubber was the third important consequence perceived by the convertors with an average rank value of 64.38. The fourth and fifth place was occupied by displacement of family labour (59.58 average value) and displacement of hired labour (56.86 average value) respectively The other important consequences as perceived by the convertors were, changes in dependability for subsistence, specialization of family labour, specialization of hired labour, deprivation of hired labour, land development works in relation to rubber cultivation (Plate 3 and 4), occupational diversification and leisure time availability consequent to conversion in the descending order.

The most important consequence of conversion namely outmigration of hired labour and outmigration of family labour were two closely related consequences. The migration of the farmers/labourers of a society was inextricably linked to the agricultural base of that society. For the district of Kottayam also which was a part of the

Table 21 Consequences of conversion of marginal homesteads for planting rubber as perceived by the respondents based on the magnitude of consequences

| Variable No. | Name of consequence | Number of respondent | Percentage total | Average value | Rank |
|---|---|---|---|---|---|
| $V_1$ | Displacement of family labour | 200 | 11915.63 | 59.58 | IV |
| $V_2$ | Displacement of hired labour | 140 | 7960.38 | 56.86 | V |
| $V_3$ | Specialization of family labour | 200 | 8243.00 | 41.21 | VII |
| $V_4$ | Outmigration of family labour | 75 | 6846.67 | 91.29 | II |
| $V_5$ | Leisure time available | 200 | 2616.58 | 13.08 | XII |
| $V_6$ | Deprivation of hired labour | 140 | 5500.72 | 39.29 | IX |
| $V_7$ | Specialization of hired labour | 140 | 8050.00 | 40.29 | VIII |
| $V_8$ | Outmigration of hired labour | 66 | 6075.01 | 92.05 | I |
| $V_9$ | Changes in dependability for subsistence | 200 | 10643.36 | 53.22 | VI |
| $V_{10}$ | Occupational diversification | 200 | 3060.00 | 15.3 | XI |
| $V_{11}$ | Land development works | 200 | 3875.00 | 19.37 | X |
| $V_{12}$ | Soil loss (erosion) | 200 | 12876.9 | 64.38 | III |

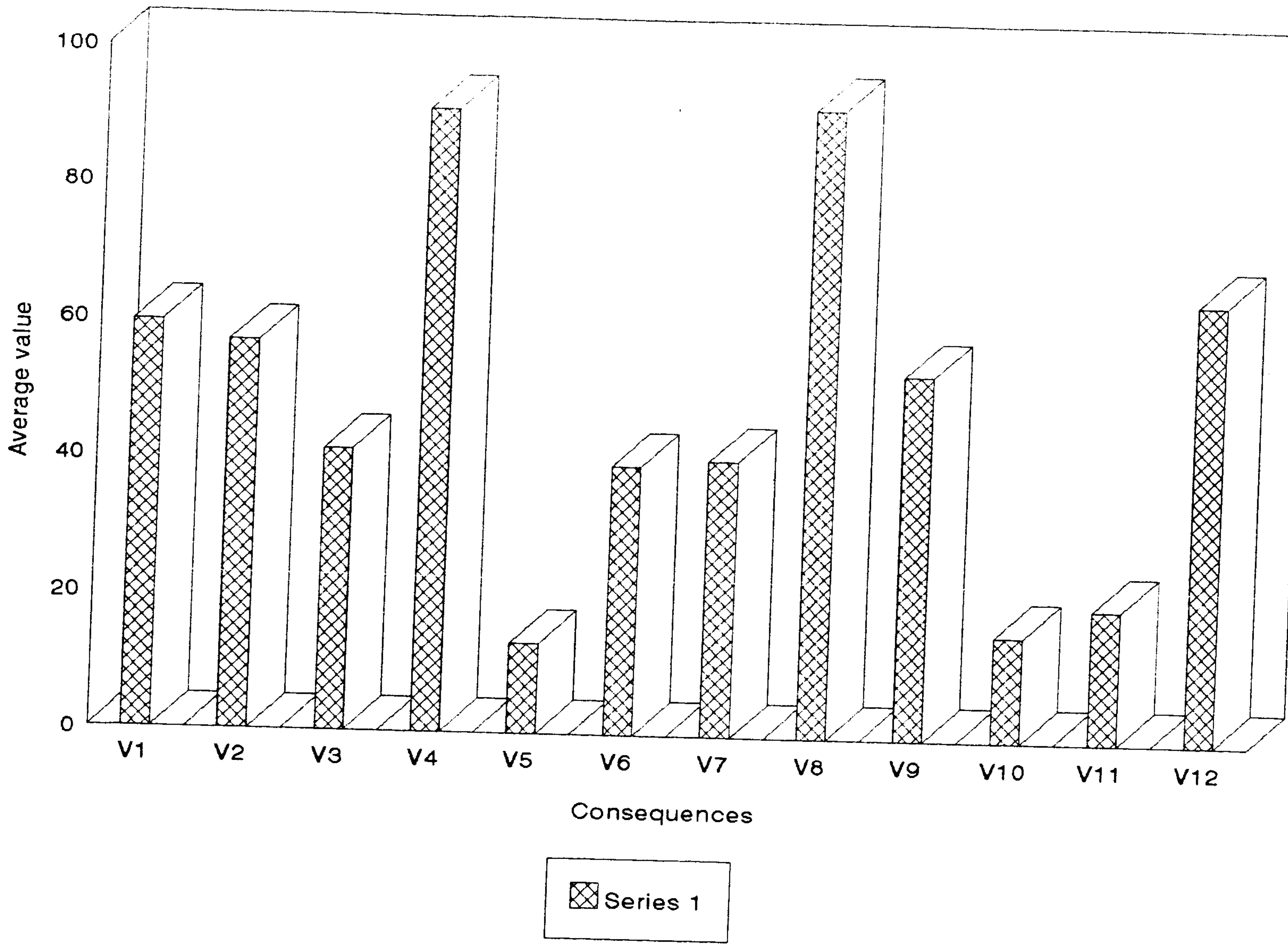



Fig.8 Consequences of conversion of marginal homesteads for planting rubber based on magnitude

Plate 3. Soil conservation bunds in Koothrapally area (Changanassery Taluk)

Plate 4. Bunds across hillslope (Uzhavoor Panchayat)

erstwhile Travancore State consequences of conversion of marginal homesteads to rubber has to be viewed from the same vein. The present impact or effect of any technology or innovation or cropping system on the society/ participants has to be traced back to its past roots.

According to a survey report of Travancore by Ward and Conner (1863) during the early decades of the 19th century (1816-1820) the desire and wants of the people were still more limited than those of other natives and with very few exceptions they supplied themselves for their own sources and they had but little inclination to imitate our manners, nor a taste agreeable to our products. The socio-economic conditions of Travancore during the major part of the 19th century were such that most of the farmers led a contented life with their needs and wants mostly met from their local resources both agricultural and non-agricultural. They had little need to migrate to other localities or occupations. Though hired labour was present, it was based on a life long traditional give and take relationship between the farmer and his labourer through generations. The labourers were treated like family members, involved in all operations and activities on-farm and off-farm. So, there was no question of migration of labour from one's farmstead or homestead.

The advent of plantations during the later half of the 19th century starting from the hilly areas and high ranges changed all this. Though the infancy of plantation agriculture could not attract much traditional labour, later on, a number of Acts and Reforms of the Travancore Government under the direction of the British Resident, released the traditional labour from the agrarian sector. The granting of permanent occupancy rights to the tenants of the Travancore Government lands, consequent to large scale land transfers and sale of agricultural land, creation of titles to common lands used by the traditional labour class, assignment of common lands to the labour classes for cultivation, recruitment of labour to the plantations in High Ranges, all these reforms facilitated the release of labour attached to traditional agricultural sector, mainly paddy. The aim of the British was to make cheap labour available in the plantations. The large scale import of paddy from other colonies of the British Raj like Burma and Thailand also resulted in large scale dispossession of paddy lands by farmers and consequent labour surplus. All these factors together created a surplus of labour in Travancore gradually. Though initially the labour migration was tardy, the circumstances forced many to work in plantations. Compared to tea and coffee, since rubber could come up at lower altitudes as well, labour attached to garden lands and homesteads was also released.

By the beginning of this century a wave of migrations had set in. Initially outmigration was focused on expansion of area under cash crops like rubber, coconut, ginger etc. to fresh areas. The farmers took the labour attached to their families wherever they went opening new areas. Along with this, the payment of wages to labourers in kind was replaced by cash by British orders. This aided further migration. The wages paid in plantations were higher in comparison to those by the traditional farmers. In other words, the relationship between the farmer and labourers based on sharing of farmer produce gave way to contract labour.

Gradually, it became easier for the labourers in the traditional agricultural sector to shift to plantations or other non-farm ventures due to the differential wage system introduced. Thus monetization of a subsistence economy in a long way assisted outmigration of both hired and family labour. As early as 1901, Changanassery taluk in Kottayam district sent the second largest migrants (6.2 per cent of the population) next to Thodupuzha from Travancore State (Joseph, 1980). By 1920s, migration had became fairly common in Travancore.

The increased export earnings from cash crops like rubber, tea, pepper, cardamom was another consequence of plantation agriculture which aided outmigration. When a society starts putting value on its resources and assets in terms of money, naturally all its actions will be oriented towards increasing its money capital at the expense of all other capital. The same was true for Travancore also. The monetization of economy and increase in export earnings from cash crops raised the level of income of the farmers in midland regions among which Kottayam district was distinct. It acted as an incentive for many farmers to use the newly gained capital to search for new lands for cultivation. Later this attitude gave way to investment of capital in new off-farm enterprises. Thus both migration related to agriculture and other non-farm occupations were an indirect consequence of conversion. In this context it is important to note that the highest intensity of migration was from Meenachil taluk of Kottayam district where the proportion of cash crops in the cropping pattern was the highest (Joseph, 1980).

Plantations required efficient transport communication and management systems for their efficient functioning. Transportation of the produce from plantations required good road and railway networks linking hills with ports. Thus public works related to construction of roads, rails, buildings invited a considerable share of traditional labour. A large number of roads were constructed connecting the main rubber belt areas like Mundakayam, Kanjirappally, Palai, in the early decades of the century itself. Joseph, (1980) has affirmed that the opening of a road connecting Kottayam with Peerumade region towards the last quarter of 19th century facilitated the movement of men and materials to the Ghat section. Similarly the estates required the services of large number of educated persons to serve as supervisors, clerks, coolies, accountants and managers. The newly educated in Travancore availed of these opportunities.

All these above cited factors contributed to large scale outmigrations in Kottayam district both within the district and to other districts. As reported by Joseph (1980), the decade 1920-1931 marked the beginning of a massive migration from Travancore. The number of outmigrants increased from 30,000 in 1921 to 58,000 in 1931, a 96 per cent increase. Starting from peasant and labour migrations to the High Ranges and Malabar region the wave spread to other states like Madras, Bombay and then to the Gulf and western countries. Money capital enhanced the alienation from land among the people which was the root cause of these migrations. The plantation culture in turn paved the way to commercialization and consequent migrations. Taking Kottayam district in particular the same phenomenon has been responsible for the dearth of labour. For the past fifteen years migrations in connection with brick making industries on paddy lands, sandmining, quarrying and timber business have been on the increase (Plate 5,6,7,8). All these new `occupations' in turn are connected with the construction boom consequent to commercialization of the agricultural base of the society. Joseph (1980) and Nadkarni (1981) have confirmed the consequences of commercialization of agriculture on labour.

The latest among the consequences of conversion as informed personally by the marginal rubber growers of Kottayam district was the dearth of rubber tappers themselves in some pockets of the district. The migration of family members who were tappers or hired tappers in search of better avenues with more wages (economic returns) was the reason cited by many respondents. Thus the consequences of plantation agriculture have started affecting the planters themselves. This was particularly true for the marginal rubber farmers. A number of such growers depended on a single tapper due to the lesser number of trees to be tapped. A moderately good tapper could tap the latex from atleast 300-400 trees a day. So the migration of the tapper affected not one but many families. Since the past two to three years, a number of fresh latex collection centres have opened in the district apart from dealers in RMA rubber sheets. One of the reasons for this new venture could be the want of labour for processing the latex into sheets. In most cases the tapper and an assistant (his wife/some other person) would process the latex after the tapping was completed, for each family. Since individual families could not afford a roller

Plate 5. Migrant labour _ sandmining from Muvattupuzha river (Vaikom Taluk)

Plate 6. Brickmaking on flood plains of Muvattupuzha river (Vaikom Taluk)

Plate 7. Quarrying in Thengana (Changanassery Taluk) - a consequence of conversion

Plate 8. Rubber based timber industry (Nedumkunnam Panchayat) - a consequence

installation, this would be carried out on a nearby growers, land where roller was operated by the tapper himself. There was some sort of community involvement through this process. The dearth of tappers could have forced many families to directly sell their latex to the nearby dealers licensed by the Rubber Board. Rogers and Shoemaker (1971) have cited many instances of such indirect consequences which are changes in a social system that occur as a result of the direct consequences of an innovation. These may also be latent consequences or unanticipated consequences of conversion not expected or intended by the society. Later on these consequences can turn to be dysfunctional to the society also.

The third important consequence based on magnitude was the increase in soil erosion consequent to conversion as perceived by the convertors. The crops and farming systems suited for a geographical area were based on the soil type, the pattern and intensity of rainfall received, the slope of the land and other geographical peculiarities from the time humans started settled agriculture. Rather, the forest types in the surrounding areas decided the plants domesticated for food and other requirements by the society depending on it. The homesteads and their crop combinations and complexities must have evolved based on the above cited principles and factors.

The heavy rainfall lashing on the slopes of midland hills which faced the south-west monsoons were the most prone to soil erosion. Moench (1991) has quoted that development of agriculture in the humid tropics frequently led to erosion and soil fertility declines.

Actually any crop without sufficient ground cover could cause soil erosion Moench (1991) has also reported that cover at ground level reduces erosion and a high canopy can increase erosion particularly when the ground is cleared under it (Plate 9). Consequent to conversion, the rubber trees exposed the top soils due to lack of ground cover. During the heavy south-west monsoons soil was washed down the slopes even breaching the soil conservation bunds in many places. Personal observations in Palai and Pampadi areas of the district revealed severe landslides continuously in the same area (upto twelve) times, killing people and destroying rubber trees and property. The slopes facing the winds during the monsoons were also prone to soil erosion and destruction of trees. Often one could observe rubber trees held straight by props and wires to withstand winds and rains (Plate 10). Though in holdings where the ground cover of the leguminous crop *Pueraria* was present the degree of erosion was less severe, the ground cover limited to a few holdings was not adequate. Unless an entire slope planted to rubber had adequate ground cover to protect the top soil, erosion would take place. The respondents themselves pointed out areas where the soil had been washed away under the roots of rubber trees into the nearby paddy lands in the valleys.

Jackson (1989) has pointed out that the incomplete canopy of immature rubber also causes erosion. Unless good cover crops and mechanical conservation works are used erosion occurs and with the resultant deterioration in soil-infiltration capacity, this may persist into the mature stage also.

Plate 9. Exposure of roots due to soil erosion on a hillslope (Pampadi Panchayat)

Plate 10. Rubber trees held by props and wires to withstand winds

Planting of rubber trees close to river banks or on river basins or drainage channels was the cause of another type of erosion observed. Meenachil river which flows through the heartland of Kottayam district originates from the Peerumade plateau in the High Ranges of the main Western Ghats. Large scale denudation of forests in the Ghat region for establishment of plantations of tea, cardamom and for settled agriculture has caused severe erosion of the ghats. Due to lack of adequate protection by vegetation cover on the soil, tonnes of top soil are washed down every year from the Ghats, during the monsoons, along with the river flow and all along the river's course. Severe sand mining in the river has accentuated this destructive process. The flooded river also erodes the river bank due to lack of soil binding vegetation on both sides. The riverine vegetation (forests) on the banks were removed to plant rubber close to the river banks. Construction of stone and concrete walls to prevent erosion along the banks has become a frequent sight in the district. Even bunds constructed across the river to slow down the floods are washed away. Devi (1989) has also reported that on the banks of the Manimala river (another river which passes through Kanjirappally taluk of Kottayam district), there are the Syndicate, Vellanadi, Mundakayam, Ichattan, Cheravatii Choati, Vengathanam and Podimurth rubber estates stretching for ten miles. Kanjirapally taluk is covered by several feeder streams of the Manimala river. Manimala river meanders at more than six or seven places in this taluk (increasing the severity of erosion). Devi (1989) also affirmed that the trees in a plantation are planted regularly in rows, which means that the rain water has the tendency to run off to the river thus flooding it and leading to soil erosion and silting of rivers. Soemarwoto (1987) conducted a short survey in the Phuwai watershed in Khon Kaen, north-eastern Thailand and observed that in the plantation forests and upland fields there was slight to severe soil erosion, but there was almost no erosion under the homegardens. Nair and Sreedharan (1989) have also affirmed that homestead system also prevents the exposure of bare soil to the beating action of the torrential rains experienced in Kerala and consequently leads to reduction in soil erosion.

Displacement of hired labour and displacement of family labour were the fourth and fifth consequences of conversion of marginal homesteads to rubber as perceived by the convertors. In fact, these consequences were closely related to outmigration of hired and family labour, the most important consequences.

The role of a hired labour or family labour attached to traditional homesteads or such agricultural systems was a multi-functional one. As mentioned earlier in this chapter, the hired labour was treated almost as part of the homestead/farm inspite of the social hierarchy which existed. Almost the entire household including women and children used to be involved in the various activities however small of the homestead. For instance, collection of firewood, taking the cattle for grazing to the common lands, tending the poultry, caring and maintaining the vegetable gardens, collection of dung and urine were some of the activities which the typical farm women got involved in as a part of daily life. Similarly construction and repair of bunds (Kayyalas) across the slopes which served as soil conservation bunds and fences, diversion of drainage channels to divert rain water, annual thatching of cattle shed/farm shed were some of the diverse activities which the hired labour carried out for the family. Though wages were involved since changes in relations between the farmer and labour (as cited earlier) mutual trust and tradition were equally evident.

The spread of rubber holdings even into the homestead sector probably brought a change in the situation. Rubber trees did not require the intense multifunctional involvement of labour as in homestead system. Tapping the trees for latex, and processing of latex were the only important activities which required almost daily involvement. Most of the farmers had sold away their cattle due to reduction of common grazing grounds. Paddy lands were also making way for other cash crops like coconut, banana, or even rubber recently, or the construction boom (Plate 11 and 12). Hence, displacement of hired labour and family labour was experienced. Many among hired labour had acquired training as tappers. Even then, unlike in the past where a labourer was attached to a family, the tapper's time was divided between three to four households. Most tappers could extract the latex from atleast 400 trees per day. Three to four marginal farmers' holdings could thus be effectively completed by a single tapper-leading to further displacement. A survey through the district revealed different types of hired labour turned tappers.

One, the traditional tappers who were displaced long ago and have taken tapping as a profession from generations attached to a family/families in an area.

Plate 11 Paddy land reclamation for coconut plantation along Mosco road (Changanassery Taluk)

Plate 12. Paddy land reclamation for rubber plantation (Karukachal Panchayat)

Two, part time tappers who had received land from their erstwhile landlords through the Land Ceiling Act of 1960 and did tapping for the family who gave them the land (areas like Kidangur, Erumeli).

Three, expert tappers who could tap atleast 600-700 trees/day, who were the endangered species among tappers. They were often initiators of tapping and trainers themselves. They charged three times the prevailing rates for tapping.

Four, the new generation tappers, who were the latest in displaced labour class. They did not stick to tapping for a long time. While tapping was confined to alternate days and only in the forenoon, rest of the time was spent by them in other income generation activities like sandmining/quarrying/brick making/nursery business and the like.

Five, the migrant tappers from Marthandam, Nedumangad and such traditional rubber areas who had settled in large estates. They occasionally tapped for the marginal holders also. Women also formed this tapping category. They were probably victims of displacement from their homelands.

Six, tappers who owned a bit of land on which they did farming(rubber),the main source of income. Rest of the time was spent on tapping for other holdings mostly marginal holdings.

Seven, the local women tappers who stayed with their family and did tapping for rubber planters as well as house hold labour for their families.

As for family labour there were many farmers/sons who had acquired training in tapping since conversion and extracted the latex themselves. They were those categories of marginal planters who depended solely on income from rubber for their livelihood.

Displacement had led to migration of both hired and family labour in many cases. Women in the households were the more affected by conversion of marginal homesteads to rubber. Their activities which were centred around the home and the homestead throughout the day were now confined to homes alone. In many households one could find just the aged mother and father living in a modern house (income from rubber) alone, with all the children migrated and settled in different places both within the state, outside the state and the Gulf or West. Though these were extreme cases of displacement and migration, they indicated the general trend in the society.

In many pre-colonial African societies, it was women who assumed responsibility for sowing and choosing which crops to plant and when. Tasks such as taking goods to market and trading them were also considered women's work not men's. Men were responsible for clearing the fields, for preparing the lands for planting whilst both men and women shared the weeding and harvesting. Responsibility was shared and complementarity rather than hierarchy was the underlying principle for regulating relationships. The need to earn wages has forced men out of households while women have been enclosed within the household (Anonymous, 1992). Similar results have been observed by Alexander (1980). With economic development there is a reduction in the size of work force, increase in the number of new occupations, withdrawal of children and women from work force and increase in domestic workers, expansion of the secondary and tertiary sector by transfer of workers from primary sector.

Thus conversion has brought about displacement of both family and hired labour. Displacement in turn has led to migration, specialization and vertical mobility of labour. The role of labour has over time transformed from a multi-functional one to several specialized task oriented contractual forms. Commercialization of agriculture of which conversion to rubber is just an indicator has thus paved the way to reorganisation and restructuring of the labour sector in our society causing increased spatial, geographical and occupational displacement and mobility.

The sixth important consequence of conversion of marginal homesteads to rubber as perceived by the convertor was the increase in dependability on external resources to meet the subsistence requirements of the family. As described earlier in this chapter homesteads or homegardens were rich sources of food, fodder, fuelwood, manure, timber, natural medicines, building materials and fencing materials to the families which depended on them. There was also a tradition of sharing the surplus products among neighbourhoods and relatives. Only the excess was traded.

Conversion to a single crop has brought a change in this situation. Though many convertors have only partially converted their marginal homesteads their degree of dependence has changed from internal to external. Rubber trees were indeed a source of fuel wood and timber (the rubber wood had to undergo expensive processing method to bring it to the standards of good timber). Fodder also could be obtained to some extent if grass was allowed to grow in between the trees. The dependency of the family had suffered the most in the case of meeting the food requirements both staple and non-staple. Many studies conducted globally have proved that homesteads are important sources of nutrients. Haryadi (1975) found that homegardens of villages in Lawang, East Java produced daily average of 398,4 calories, 22.8 gm protein, 16.4 gm fat, 185 gm carbohydrate, 818.4 mg calcium, 555 mg phosphorus 14 mg iron, 8,362 IU vitamin A, 1,181.2 mg vitamin B and 305 mg vitamin C. Thaman (1985) also reported similar findings about the diversity of food species in homegardens of Moresby, Papua New Guinea, Nauru Islands and a wide range of non-food plants which were of considerable importance for handicraft, fuel, medicine, fibre, dyes, ornamental purposes, perfumes and deodorants, livestock feed and shade and construction materials. Studies in Kerala homesteads by Nair and Sreedharan (1989) (coconut based homegardens) and Salam *et al.* 1992 (pepper associated homesteads) also yielded similar observations about the multi-functional - both productive and protective - nature of homesteads.

The change in dependability is mainly brought about by reduction or loss of diversity of the homesteads replaced by rubber. Fleuret and Fleuret (1980) have pointed out that as single households due to commercialization of agriculture, place increased amounts of land into production for the market, the range of possibilities for food production is reduced. Even when supplementary non-staple foods are deleted from crop inventories in favour of commercial cultigens, the peasant household becomes less sufficient and more importantly, less able to withstand seasonal variations in the supply of staple foods and the nutritionally complementary dietary associations common in traditional settings are easily upset by new cultigens to the detriment of nutritional status among peasant consumers.

The dependency on external sources to meet the daily as well as seasonal food requirements thus increases. As for Kottayam district, most of the vegetable requirement is met from Kambam, Theni areas of Tamilnadu. Any infrastructural or transport related or even inter-state disputes in turn would affect the availability of these vegetables and other essential food items transported across such long distances.

Since the control over production of one's sustenance requirements was lost the rubber producers were forced to buy the vegetables, fruits or other food items (even cassava which was once a household name in Kottayam district) from markets. They had no other choice but to pay and buy at the prevailing market price. On the other hand, the price of rubber which they produced was not decided by them. One could observe personally people buying amaranthus the most common leafy vegetable from a vendor at a high price of Rs.17/kilo. He had brought the lot at Thengana junction enroute to Changanassery for sale. Within fifteen minutes one tempo full was sold to the last leaf. Thus dependency may also lead to competition in acquiring food.

The situation was same with respect to other food items, like paddy. Thus, the increased purchasing power due to higher income from rubber was offset by the market structure and scarce availability of essential resources. It had also led to disparity in accessibility. Only the higher income groups could afford the highly priced essential items.

Similar was the case with fodder for cattle. It was usually transported from Kuttanad and Palakkad. Many green manure trees like glyricidia, pongamia, portia, erythrina were virtually non-existent. `Aanapana' and `kodapana' (karimpana), palm varieties whose leaves were used as thatching materials were facing extinction according to the respondents themselves. In Kodungur area of Changanassery taluk, one rubber planter observed that years ago huge special hardy varieties of mango trees used to be cutdown and taken away for construction of fishing boats (`vanchi' in Malayalam). These mango varieties had just disappeared over time. Thus reduction in varieties of a species may have also taken place due to conversion to rubber. The conversion of adjoining paddy lands to other cash crops and rubber, or for construction purpose was in turn affecting the remaining grazing lands of cattle (Plate 13 and 14).

Changes in the land use in favour of cash crops like rubber had thus increased the dependability of the people on market forces to meet even their basic requirements.

The ranking based on directionality revealed that decrease in water availability was the most important consequence due to conversion with a high directionality value of -2.66.

Plate 13 & 14. Disappearing grazing lands under pressure of land use change

The second important consequence as perceived by the convertor was the increase in social status (directionality value of +2.05). Decrease in water table was the third important consequence perceived by the convertors due to conversion of marginal homesteads to rubber as revealed by a rank value of -1.79. Decrease in silt deposition in the lowlands or paddy lands consequent to conversion (-0.91 rank value), decrease in fertility status of the soil (-0.43 rank value), increase in run off rate of water (+0.42 rank value) were the other important consequences based on directionality in descending order of importance as perceived by the convertors (Table 21).

Based on the directionality of the consequences of conversion, decreased availability of water was the consequence which obtained the highest rank (Fig. 9). The topography of Kottayam district is highly uneven with hills and valleys gradually rising towards the east. The region also receives heavy rainfall and strong winds during the south-west monsoon period. The homesteads of the midlands and the densely forested ghats offered protection to the soil through canopy and litter. This in turn prevented the run-off of rain water falling on the slopes of the hills facilitating infiltration of rain water into the soil and subsequent collection into the wells, tanks and other natural water bodies. Though the rainfall was seasonal, the slow sub-surface movement of water facilitated filling up of wells and tanks. As for Kerala the topographical peculiarities are such that almost 85 per cent of the land area comprises of hills and valleys getting steeper and rugged as one moves towards the High Ranges or the Ghats proper. So the rain water has a tendency to quickly flow down the

Table 22 Consequences of conversion of marginal homesteads for planting rubber as perceived by the respondents based on the directionality of consequences

(n = 200)

| Variable No. | Consequence | Number of respondent | Total score | Directionality value | Rank |
|---|---|---|---|---|---|
| $V_1$ | Perceived change of social status | 200 | +410 | +2.05 | II |
| $V_2$ | Change in runoff rate of water | 200 | +84 | +0.42 | VI |
| $V_3$ | Silt deposition in low lands | 200 | -182 | -0.91 | IV |
| $V_4$ | Change in water table | 200 | -358 | -1.79 | III |
| $V_5$ | Change in water availability | 200 | -532 | -2.66 | I |
| $V_6$ | Change in fertility status of soil | 200 | -86 | -0.43 | V |

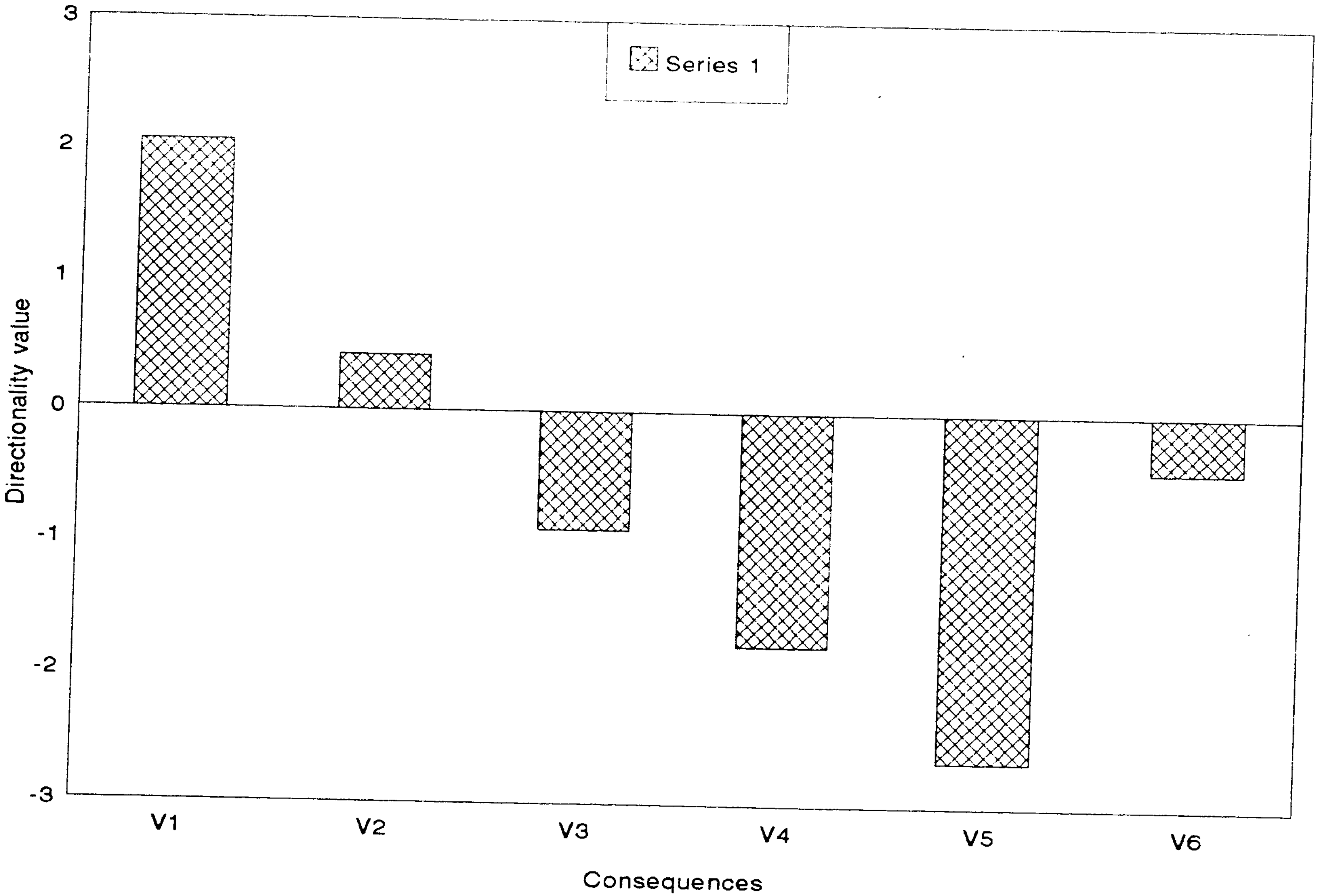



Fig.9 Consequences of conversion of marginal homesteads for planting rubber based on directionality

valleys to the oceans. The chances for formation of aquifers is also very low (Jacob, 1989). The soil cover is also very thin. This situation is very much true for Kottayam district. A good soil cover of vegetation with varying rooting depths alone could collect the run-off and store it for future use.

The change in land use and management from a polycultural homestead to monocultural rubber might have changed the situation. The run-off loss had increased due to exposure of top soil to rains and winds. This in turn probably had reduced the infiltration of rain water into the soil affecting the recharge of wells and other water bodies. So heavy floods during rainy seasons and acute scarcity of drinking or irrigation water during the summer was a common phenomenon in most parts of the district. Moreover, the paddy fields which were once natural reservoirs of rain water and such water harvesting swampy and marshy areas in the valleys were fast disappearing making way for crops like banana, rubber or for construction purpose through reclamation. For instance Karukachal is a famous rubber pocket in Kottayam district. The word Karukachal originated from the terms `karuka' meaning a type of grass and `chal' meaning a water way ie., waterway with karuka grass. The swamp or `chal' was reclaimed into a bus stand by the Municipal authorities. The disappearance of natural rain water harvesting structures was another reason for water scarcity.

Sand mining of Meenachil river was another severe problem which had contributed to water scarcity in the district. Every year, during summer months, tonnes of river sand was mined from the river extending upstream. This process not only deepened the river bottom but also caused rain water during heavy monsoons to rush down to the ocean. Due to the rugged topography and narrow width of land between the Western Ghats and the Arabian sea, most rivers in Kerala travel a relatively short distance to reach the ocean. River sand brought down by the river through the process of gradual weathering, acted as a filter regulating the flow of river, preventing the natural tendency of water to flow down quickly from higher to lower elevations. Heavy sand mining in turn hastened the flow of river to the ocean, often flooding the river banks in the process. The river bottom in many places like Kidangur, for instance was much lower than the bottom of open dry wells on the river banks and inland. This affected the flow of water into the wells due to reverse gradient causing drying up of wells by December itself when the river flow ebbed.

The third important consequence perceived by the convertors, viz., reduction in water table was closely related to the reduced availability of water. The type of plant cover or vegetation, the slope of the land, the length of slope, the intensity and duration of rainfall received are all important factors influencing the amount of water that infiltrates into the soil and becomes available to plants or man. Unless care is taken to give good ground cover to the rubber trees on the slopes, runoff loss of water, flooding of lower lands and further reduction in water table may be the result. As Jackson (1989) has pointed out, by increasing the proportion of rainfall lost as surface run-off, problems of flooding and downstream erosion arise following rains and because less water percolates down to provide base flow for streams, the dry season flow may be greatly lowered or even reduced to zero. Lowering of water table can lead to loss of well water. During the survey it was noted that decrease of water level in wells and drying up was reported more by respondents living on sloppy lands or higher elevations rather than in the valleys or lowlands.

For instance, Kodungur, Peruva, Nedumkuannam, Erattupettah areas (all hilly slopes) reported acute shortage of water and gradual lowering of water table in their wells over years. In Nedumkunnam the wells dried up by December itself in many places and water from Manimala river nearby was brought in tanker lorries and pumped into the wells. The phenomenon of acute water scarcity during summer due to absence or reduction of recharge into wells or ground water storage cannot be attributed to rubber cultivation alone. Any cropping pattern which does not provide good soil protection through ground cover or litter and whose rooting system cannot hold back rain water or prevent runoff or erosion, which is not suited to slopes or soil prevailing in an area can probably cause loss of water and soil. Since rubber was the most predominant crop in the study district occupying almost all available land type hills or valleys, the problems of water shortage and reduction in water table could be attributed to this crop also.

The second important consequence cited by the respondents was increase in social status perceived due to conversion. This was a most natural perception. Rubber was the most important crop, area and production wise in the district. During the period of survey (1995 March to May) rubber prices had touched an all time high of Rs.60-65/kg. Combined with a strong lobby of industrialists and politicians supporting the expansion of the crop and the high rate of subsidies and incentives offered by the Rubber Board (not available to any other plantation crop in Kerala) rubber growers naturally enjoyed a superior status in the society. Coconut crop was gradually sidelined due to the high incidence of root (wilt) disease. In the district, coffee or tea area could not be expanded below a certain altitude. Rubber was a crop thus suggested as an alternative for increased income. Paddy cultivation was also highly unremunerative under present conditions. Besides, Kottayam district had a history of rubber planting as old as 150 years. Rubber had become a household name long back. Thus conversion of one's marginal homesteads however small which had a lower social value to rubber which had a higher social value was perceived to increase one's status in the society. Even marriages were fixed based on the number of trees planted or the rubber sheets sold by the family of the girl. Expansion of rubber was also promoted by religious institutions. Compounds of temples and churches were seen planted extensively with rubber in many places. Maximum number of new two wheeler and four wheeler registration had been also recorded in this district especially since the boom in rubber prices during 1995. .. Industrial development had been centred around rubber based products. All these aspects were indicators of the superior status enjoyed by rubber as a crop and commodity in the society.

The value systems of a society are deeply influenced by the values of the basic institutions on which the society is founded. These in turn reflect the culture of the society. In this case, rubber an introduced crop, has become inextricably a part of our culture due to its influence over the society for generations. Its deep rooted presence has in turn brought a new set of value systems based on commoditization and commercialization of agriculture, western concepts of consumerism and life style, real estate and share investments, business orientation and nuclear family setups. Perception of increased social status was probably an indicator of this value system.

## 4. A suitable strategy for rationalizing the land use pattern of marginal homesteads in the study area

Agriculture has always involved change in land use. Kerala, over years of experience had evolved a land use system of isolated homesteads on midlands and plains and paddy cultivation in the fertile, well drained valleys of hills and mountains. The Western Ghats topped by rainforests were more or less left intact. The water from the abundant rainfall and the 41 west flowing rivers evolving from the Western Ghats was more than enough to meet the irrigation and domestic needs of the population. Even though the land use followed was more or less in tune with the peculiar topography of Kerala, some sort of land management was necessary.

The colonial forces which landed on Kerala coast about 500 years ago left their indelible mark by introducing a variety of crops as they left like cassava, pineapple, *Atrocarpus* sp. to name a few. The British introduced the plantation agriculture of tea, coffee, cardamom and rubber assisted by the natives. The erstwhile Travancore state was the first to take initiative allowing the British in large scale planting of plantation crops by massive deforestation of the Western Ghats. Tea, coffee and cardamom were mostly planted in the High Ranges (more than 900 m MSL). Rubber which came later did not require such a high attitude. Large rubber estates were opened in the highlands by the early British planters by cutting down the forests and acquiring common lands and grazing lands. Later, when the estate sector became saturated rubber spread further most to the midlands and plains. With the support of various subsidies and incentives of the Rubber Board, rubber gradually became a small holding crop by the 1970s. This period has seen large scale conversion of homesteads and other garden lands and even paddy lands to rubber holdings.

If one compares the change in area under food crops and non-food crops for Kottayam district over the period, 1975-76 to 1992-93; while the area under food crops has plummeted by 45.4%, the area under non-food crops has registered an equally steep increase of 40.46%. If the share of rubber is taken, over the same period the area under rubber (non-food crop) in the district has risen from 52,600 ha to 1,06,200 ha, a 102% increase. A comparison of these figures with those at the state level reveal that over the same period, while the area under food crops has come down by 23%, the area under non-food crops has registered a 47% increase. Thus the reduction in area under food crops for Kottayam district has been double the state average over the period 1975-76 to 1992-93. This reduction could be attributed to the expansion of rubber.

The figures and statistics and the findings of the study clearly revealed the shift in land use towards monoculture of rubber. An overview of the consequences indicated that change in land use had adversely affected the labour sector, food availability and the ecosystem of the area. To delve into the details of the consequences would invite redundancy.

Monoculture of rubber involved higher efficiency in utilization of labour. The routine nature of operations like tapping, sheet production and once/twice in a year fertilizer application reduced the intensive requirement of labour. At the same time homestead was a labour intensive farming system with labour requirement throughout the year. Nair and Sreedharan (1989) have reported that the average requirement of labour on a one hectare homegarden with an intensive crop mix and livestock was about 1000 man days per year as compared to 150 man days for coconut monocropping and 400 man days for rice monocropping. Gliessman (1983) has reported that multiple cropping tends to spread labour demand throughout the growing season rather than in peaks. Also polyculture systems that involve planting, harvesting and other labour-intensive activities throughout the growing season are likely to make full use of rural labour force. A land use strategy which reduced the requirement of local labour was bound to cause imbalances in labour availability leading to migration or scarcity eventually. The spreading of risks was also possible due to the diverse crop mixture in homesteads. A monocrop required less labour and higher risk due to concentration of capital on a single crop.

Labour shortage was actually a product of change in farming systems to monoculture. The people responded by further conversion of their homegardens/paddy fields to rubber causing further shortage closing the vicious cycle gradually. A land use strategy which could utilize and sustain the local labour potential fruitfully, alone could in turn sustain the population of the area.

The declining proportion of area under food crops in the district could itself explain the increased dependability of the respondents for meeting their subsistence requirements on external sources. Kerala has always followed a land use policy of growing non-food crops (mainly cash crops) and meeting the food requirement of the population from the revenue raised through export of exchange of cash crops (non-food crops) with neighbouring states or countries. This process could be continued more of less steadily atleast five years ago. Not anymore. In fact land use change towards monocrops like rubber, coconut, orchards, or aquaculture has accelerated in other states as well. The world over faces acute food scarcity as the present statistics say. According to World Watch Institute (1995), after nearly tripling from 1950 to 1990, the world grain harvest has not increased during the five years since then. Many exporters of food grains are emerging as major importers. For instance, China, in 1944 was a net exporter of 8 million tons of corn; in 1995, it was a net importer of 16 million tons, mostly wheat. During 1995, the world prices of wheat, corn and rice have risen by one-third, much of the rise coming during harvest season, a time when prices typically decline. Wheat prices were at the highest level in 14 years, the Institute reported. Land scarcity for food crops all over the globe was the main reason cited. These price rises and scarcity of essential food grains are more bound to affect the low income groups and the slum-dwellers who could not simply afford the high prices. The report of World Watch Institute (1995) also pointed out that spreading water scarcity was making it more difficult to expand food production. Water tables were falling in the major food producing countries ie., several states in India, including the Punjab - the breadbasket of India.

All these facts though projected globally were equally relevant to a state like Kerala and the study area. Revenue from cash crops alone could not meet the rising food requirement of the population. The same was true for other basic necessities like vegetables, fodder grain, manure, medicinal plants, fuelwood and timber. Competition for import or purchase of food grains and other necessities between different states and countries would take place in the near future. The equity of distribution of essential items among all sections of the population may also be hampered.

The above cited factors, point towards a rethinking of the present land use strategy followed all over the study area. Natural ecosystems have evolved over millennia through trial and error to survive under the conditions and situations which they evolved. Similarly traditional agriculture had also evolved adapted to a particular geographical area. It was tuned to the duration and intensity of rainfall, slope of the land, length of the slope, climate, soil peculiarities, availability of water, ground water resources and other peculiarities. Actually human needs had evolved based on the ecosystem in which they thrived. Modern agriculture in turn has moulded the ecosystem to suit its commercial needs. It may not be practically possible to trace back the path of traditional agriculture under the present circumstances when so much irrecoverable change in land use has already occurred. In the existing rubber holdings itself changes can be introduced to increase its diversity and meet the food and other basic requirements of the farm family. Decreasing the density of planting of rubber trees (in other words increasing the row to row spacing) and introducing other perennials in between the rows (fruit bearing fodder and green manure bearing)of annuals like vegetables, tubers, banana, pulses which would provide the food needs providing live fences of perennials or climbers around the family holding could meet both the food and cash requirement of the family. The crop mixture and crop types to be introduced could be decided based on the local needs and availability.

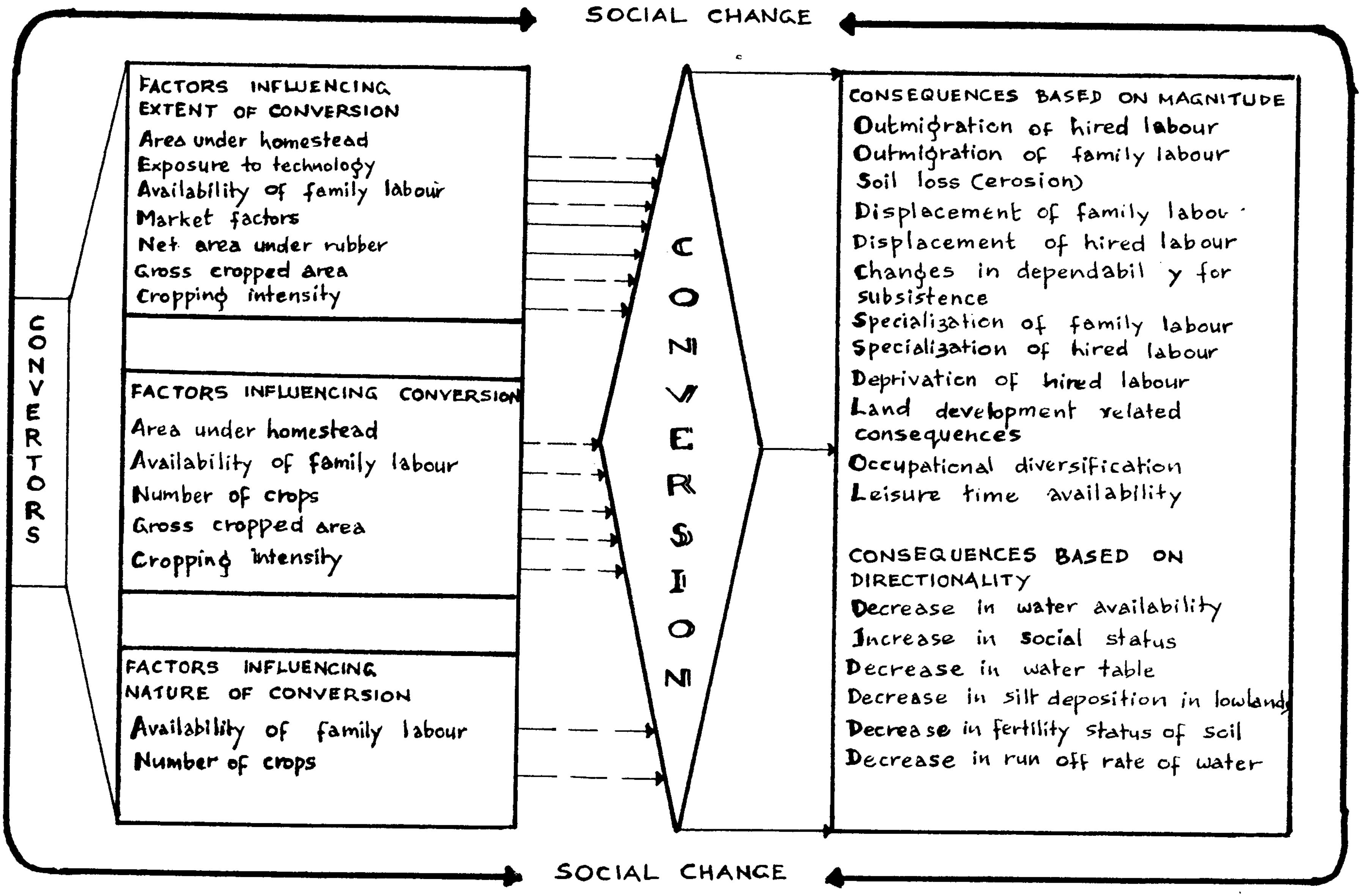
Alvin and Nair (1986) have reported that new rubber plantations are now being established in the flat lands of south east Asia as a consequence of the subsidy and credit schemes implemented by the Brazilian Government. In these areas especially near the market outlets, the farmers interplant a variety of food crops and vegetables with young rubber trees. In fact the UPASI's R&D centre has introduced this type of alternate land use of rubber holdings at experimental level in four districts of Kerala. A land use system which would ensure the use of local resources to sustain the community which depends on it would alone survive in the long run. The peculiarity of

Kerala is the very small land holding size. Thus the diverse sustenance needs of a family may not always be met from its holding alone. Often, the dependence on off-farm employment is a result of this fragmentation of land holding size. Thus in the future a land use strategy which would meet the requirements on a community basis have to be evolved. These communities in turn should preferably be selected/evolved based on similarity of topographical conditions, water resources dependence, soil type and peculiarities, lay of the land and irrigation facilities like wells, ponds, drainage channels etc. Such an interdependence in turn would require the community to protect and conserve its water resources and drainage channels which divert rain or flood water or surface flow, conserve its available ground water potential by judicious use, facilitate recharge of ground water during dry seasons through suitable land development works, prevention of erosion by rain or wind of the top soil, suitable soil conservation works to protect the soil, cultivation of crops based on the slope of land and ability to withstand strong winds and storms based on the direction and gradient of slope (windbreaks), sharing of produce among the members on economic/non-economic terms to name a few.

As a general rule community feeling among the farming population of Kerala has been very weak as evidenced by the isolated homesteads dotting the landscape of Kerala. Even then, under the present changed circumstances of marginal land size and land conversion to rubber, community based land use strategy alone can meet the increasing scarcity of the basic sustenance resources. For this, a change in the mindset of the highly individualized market oriented Kerala farmer may be inevitable. In the eventuality of decreasing land space to urbanization and commercialization, the maximum efficient utilization of the available cultivable land would be the only viable strategy; socially, economically and ecologically.

Efforts at community level should be sufficiently supported by Government level interventions and policies. Right from the Agrarian Relations Act of 1969 when land ceilings were enacted, area under plantation crops have been exempted. We have a land utilization order also which strictly prohibits cultivation of non-food crops or use of land under food crops for any other purpose. If one glances through the change in area under food crops for Kottayam district over the period 1975-76 to 1992-93 (Government of Kerala,1994) the area under food crops has drastically declined from 52.6 per cent to 30 per cent of total cropped area. This calls for a land use strategy which would strictly enforce the Land Utilization Act preventing any further conversions of land for commercial crops or urbanization. Any economy based on agriculture can survive only if it is productive and sustainable. Sustainability also signifies diversity. As rightly pointed out by Conway (1985) increasing diversity for its own sake will not improve sustainability and purely designed diversity may destabilize the agro-eco system. Similarly seeking global stability would clearly be fruitless; local stability should be the goal. In other words the agro-eco-system diversity and stability should ensure that something is always there to be harvested throughout the year in every season for food and sale or exchange of surplus as possible. It also means the other basic sustenance requirements like fuelwood, fodder, timber, manure, building materials and the like are available throughout the year from different sources or plant/animal components of the system. This would reduce the over exploitation of certain species at the expenses of other species. In such a land use system inclusion of cash crops could be justified. The exclusion of basic sustenance requirements for cash crops alone is not a rational land use. Finally such land use communities could be grouped under watershed areas based on the major water source (wells, tanks, canals, tributaries of river Meenachil) on which they depend. Plans could be prepared for rational land use and management on watershed basis. The grouping should not be limited by political or revenue boundaries. Rather it should be based on broad geographical similarities and dependence on water resources. This watershed based land use strategy would also ensure protection and conservation of the water sources by the communities themselves. Revival of unused wells, tanks, ponds, swamps and such water bodies to improve water availability both drinking and irrigation may be undertaken at community initiative. The proposed land use strategy cannot be implemented on a crash programme or short term basis. A slow and systematic study of the past forms of land use followed in each area, the changes that occurred over time, the soil and water resources affected, the inventory of crop species mix that was followed and that could adapt to the landscape, the drainage pattern, impact of rainfall, wind and most important the traditional wisdom of the native population is to be considered. Only such a strategy would ensure the long term survival of the community which depends on the land.

FIG. 10 EMPIRICAL DIAGRAM DEPICTING THE RELATIONSHIP BETWEEN INDEPENDENT, VARIABLES, DEPENDENT VARIABLE AND CONSEQUENCES



CHAPTER V

# SUMMARY AND CONCLUSION

The advent of European traders in the sixteenth and seventeenth century laid the foundations of commercialization of trade related to agriculture in Kerala. The British colonial forces in the nineteenth century later on introduced the plantation crops like tea, coffee, cardamom and rubber based on geographical suitability for revenue generation. The first rubber plantation on a commercial basis was started in 1902 on the banks of Periyar river in Kerala. Gradually rubber established itself as an estate crop spreading to 12000 ha by 1910. The need for rubber received a boost with the First World War and the consequent expansion of automobile and tyre industries. The setting up of the Rubber Board in 1947 and the Rubber Research Institute in 1955, in Kottayam district provided further impetus to expansion. By 1970s, the area expansion under estate sector was saturated and gradually replaced by spread to small holdings. Since then, rubber area in the state has been on the increase at the expense of any other cash crop or plantation crop.

The trends in land use in Kerala indicate a gradual shift from subsistence oriented farming systems to farming for commercial exchange. The spread of rubber to the small holding sector has resulted in the conversion of homesteads to rubber as well. Due to the high density of population, highly undulating topography of the state and very less area actually available for cultivation, homesteads have evolved as the major farming systems of Kerala. A typical homestead consists of a dwelling place and a wide variety of crops both annuals and perennials, grown around it to meet the diverse requirements of food, fodder, fuelwood, timber and manure of the farm family dependant on it. More than 50% of the cultivated area is under this system.

Any change from a mixed cropping system like the homestead to a monocrop like rubber was believed to bring about socio-economic, psychological and ecological consequences in the society. So far, no study has been reported in this area of research. Further, the various structural intermixes of the crop components and the functions of the crops replaced by rubber was believed to throw light on the qualitative conversion of homesteads apart from the area converted for planting rubber. Hence this study was conducted with the following objectives.

1. To find out the nature and extent of conversion of marginal homesteads for planting rubber;
2. To develop a discriminant function to differentiate between the convertors and non-convertors of marginal homesteads for planting rubber with respect to the selected factors influencing conversion/non-conversion;
3. To find out the influence of the selected factors on the nature of conversion, extent of conversion and conversion of marginal homesteads for planting rubber by the rubber farmers;
4. To analyse the consequences of conversion of marginal homesteads for planting rubber; and
5. based on the findings, to suggest a suitable strategy for rationalizing the land use pattern of marginal homesteads in the study area.

Kottayam district was purposively selected as the study area due to the maximum area under small holdings of rubber and the active presence of the Rubber Board. The study was conducted during the period 1994-95. Purposive sampling was adopted for selecting the 200 convertors and 100 non-convertors in the study. Twenty Panchayats of the 5 taluks in Kottayam district were purposively selected based on the presence of non-convertors which was a rarity in the district. The 200 convertors from the 20 Panchayats were selected based on proximity to non-convertors.

Extent of conversion. nature of conversion and conversion (composite index) were the three dependent variables selected for the study. Thirteen factors which were assumed to influence conversion as well as non-conversion were selected. They were age, family size, occupation, farming experience, area under wet land, area under homestead, exposure to technology, availability of family labour, availability of hired labour, outmigration of family labour, outmigration of hired labour, market factors and perception about attributes of rubber cultivation. Five factors believed to be applicable only to convertors were also selected, such as number of crops, net area under rubber, gross cropped area, cropping intensity and dispersion of crops in the homestead.

The list of consequences selected for the study included, displacement of family labour, occupational diversification, specialisation of family labour, outmigration of family labour, leisure time availability, perceived change of social status, displacement of hired labour, deprivation of hired labour, specialization of hired labour, outmigration of hired labour, changes in dependability for subsistence, land development related consequences, soil loss (erosion), changes in run-off rate of water, change in silt deposition in low lands, change in water table, change in water availability and change in fertility status of the soil.

The data were collected using a structured interview schedule developed for the purpose of the study. Analysis of the data was carried out using discriminant analysis, simple correlation, multiple linear regression, step-down regression, path analysis and percentage analysis.

The salient findings of the study are summarized and presented below:

1. Distribution of convertors revealed that majority of the convertors belonged to medium low category with respect to nature and extent of conversion;
2. Discriminant analysis revealed that outmigration of hired labour, availability of hired labour, perception of attributes of rubber cultivation and farming experience were the four factors which could explain the maximum discrimination between convertors and non-convertors;
3. The results of simple correlation analysis were as follows:
   (a) Area under homestead, availability of family labour, gross cropped area and cropping intensity were found to have negative but significant relationship with extent of conversion while exposure to technology, market factors and net area under rubber had positive and significant relationship with extent of conversion.

(b) Both availability of family labour and number of crops in the homestead replaced to rubber had a negative and significant relationship with nature of conversion.

(c) Area under homestead, availability of family labour, number of crops, gross cropped area and cropping intensity of the homesteads replaced were found to have negative and significant relationship with conversion of marginal homesteads to rubber.

4. The results of multiple linear regression analysis were as follows:

(a) Number of crops, net area under rubber, gross cropped area, cropping intensity and dispersion of crops made significant contribution towards extent of conversion out of the 18 factors selected.

(b) Only a single factor viz., number of crops made significant contribution towards nature of conversion.

(c) Four factors such as number of crops, net area under rubber, gross cropped area and dispersion of crops could make significant contribution towards conversion (composite index).

5. The results of step-down regression analysis were as follows:

(a) Family size, number of crops, net area under rubber, gross cropped area, cropping intensity and dispersion of crops could together explain 75.76 per cent variation in the dependable variable, extent of conversion,

(b) Occupation, availability of hired labour, number of crops, gross cropped area, and cropping intensity could together explain the maximum variability in the nature of conversion,

(c) Similarly, occupation, availability of family labour, number of crops, net area under rubber, gross cropped area and dispersion of crops explained the maximum variability of conversion, the composite variable.

6. Results of path analysis are presented below:

(a) The highest total indirect effect on the extent of conversion was exerted by the variables, net area under rubber followed by gross cropped area, area under homestead, number of crops and availability of hired labour. The largest indirect effect was exerted by the variable gross cropped area through the variable net area under rubber

(b) As for nature of conversion, the highest total indirect effect was exerted by the independent variables, net area under rubber, gross cropped area, availability of hired labour, availability of family labour and area under homestead. The largest indirect effect was exerted through the variable number of crops in the homesteads in most cases

(c) The factors, gross cropped area, net area under rubber, number of crops, availability of hired labour and cropping intensity exerted the highest total indirect effect on the composite index of conversion. Most variables exerted indirect influence through the factor net area under rubber

7. Comparison of perception of attributes of rubber cultivation versus homestead farming among convertors and non-convertors revealed that wind direction, marketability, perceived risk, profitability and regularity of returns were the most important attributes in the descending order as expressed by non-convertors, while marketability, profitability, wind direction, regularity of returns and security need were the most important attributes of rubber cultivation as expressed by convertor farmers.

8. Analysis of consequences of conversion of marginal homesteads to rubber revealed that:

    (a) Based on magnitude of consequences, outmigration of hired labour, outmigration of family labour, soil loss (erosion), displacement of family labour, displacement of hired labour and changes in dependability for subsistence were most important consequences perceived in the descending order,

    (b) Based on directionality, change in water availability, perceived change of social status, change in water table, and silt deposition in low lands were the major consequences perceived by the convertors.

9. Suggestion of suitable strategy for rationalizing land use pattern of marginal homesteads in the study area.

The change in area under food crops and non-food crops for Kottayam district, over the period 1975-76 to 1992-93 revealed a steep increase in area under non-food crops, mainly rubber at the expense of food crops. The analysis of consequences has indicated a change in land use adversely affecting the labour sector, food availability, diversity of crops and ecosystem of the area.

A land use strategy which could utilize and sustain the local labour potential of the area fruitfully alone, could sustain the population of the area. The concentration of capital on a single crop leads to lesser labour requirement, lesser skill higher specialization and higher risk. Diverse crop mixtures afforded spreading of risks, better utilization of skills and labour throughout the harvest season. A land use pattern which could maintain the diverse fundamental requirements of food, fodder, fuelwood, timber and manures of the community dependent on it alone could accommodate cash crops into its fold.

The fragmentation of land holdings, declining area suitable for cultivation, declining natural resource base, all call for a land use strategy which could meet requirements of society on community basis. Communities selected based on similarity of topography, water resources dependence, soil type should interact as a mutual dependence basis generating and sharing the produce in individual holdings protecting and conserving their resource systems at the same time. A change in the mind set of the highly individualistic market oriented Kerala farmer maybe inevitable for such a community based land use and management system for future survival.

## Suggestions for future research

The present study was confined to Kottayam district, an area saturated with rubber and where the consequences have already been felt tangibly. Areas where land use faces transition stages like Kannur or Malappuram district maybe taken up to suggest viable alternatives for maintaining efficient balance of the homestead systems.

Studies may be taken up at community and regional levels to find out the possibilities and develop working plans for implementing the community based land use strategy.

Another exhaustive study on the changes in land use patterns, particularly in the locations of transitions to commercialised monoculture may be of worth consideration with the use of indepth economic analysis of such changes.

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# Appendices

# APPENDIX I

Nature of conversion-weightage

| Sl. No. | Components | Weightage |
|---|---|---|
| | Function of homesteads replaced by rubber | |
| a.1 | Productive functions | |
| a.1.1 | Food - Field crops | 0.354 |
| | - Pulses/legumes | 0.379 |
| | - Vegetables | 0.367 |
| | - Fruits | 0.421 |
| | - Roots and tubers | 0.390 |
| | - Spices and condiments | 0.491 |
| a.1.2 | Fodder - Grasses | 0.427 |
| | - Tree fodder | 0.406 |
| | - Other plant parts | 0.448 |
| a.1.3 | Fuel wood | 0.473 |
| a.1.4 | Manures | 0.381 |
| a.1.5 | Timber | 0.461 |
| a.1.6 | Beverages | 0.512 |
| a.1.7 | Cash generation | 0.612 |
| a.2 | Protective functions | |
| a.2.1 | Medicinal value | 0.318 |
| a.2.2 | Rituals/religious purposes | 0.421 |
| a.2.3 | Fencing/wind break | 0.467 |
| a.2.4 | Stakes/props | 0.476 |
| a.2.5 | Shade trees - Home shade | 0.403 |
| | - Animal shade | 0.436 |
| | - Other crop shade | 0.430 |
| a.2.6 | Mulching | 0.421 |
| | Total | 9.494 |

# APPENDIX II

The Actual Functional Weightage Index for the crops commonly found in homesteads of Kottayam district

| Sl. No. | Crop | AFWI |
|---|---|---|
| 1 | Coconut | 52.75 |
| 2 | Arecanut | 43.56 |
| 3 | Pepper | 18.69 |
| 4 | Cocoa | 24.01 |
| 5 | Coffee | 20.00 |
| 6 | Tea | 20.00 |
| 7 | Nutmeg | 28.07 |
| 8 | Clove | 23.68 |
| 9 | Tamarind | 29.40 |
| 10 | Ginger | 29.40 |
| 11 | Turmeric | 27.56 |
| 12 | Curry leaf | 8.52 |
| 13 | Cassava | 24.18 |
| 14 | Guinea grass | 8.22 |
| 15 | Lemon grass | 14.78 |
| 16 | Banana | 28.20 |
| 17 | Mango | 41.77 |
| 18 | Jack | 42.86 |
| 19 | Bread fruit | 8.85 |
| 20 | Papaya | 11.65 |
| 21 | Pineapple | 19.04 |
| 22 | Vegetable | 19.46 |
| 23 | Cowpea | 17.16 |
| 24 | Guava | 7.78 |
| 25 | Erythrina | 19.35 |
| 26 | Moringa | 17.15 |

Appendix II contd....

| | | |
|---|---|---|
| 27 | Matti | 30.51 |
| 28 | Neem | 30.99 |
| 29 | Wild jack (Angili) | 48.06 |
| 30 | Maruthu | 38.68 |
| 31 | Teak | 21.20 |
| 32 | Elavu | 20.72 |
| 33 | Mangium | 21.20 |
| 34 | Cashew | 21.40 |
| 35 | Cassia | 30.99 |
| 36 | Elanji | 18.09 |
| 37 | Njaval | 21.76 |
| 38 | Vatta | 18.35 |
| 39 | Pongamia | 14.27 |
| 40 | Pala | 31.23 |
| 41 | Jamba | 17.80 |
| 42 | Champaka | 21.81 |
| 43 | Bamboo | 26.22 |
| 44 | Palms | 20.88 |
| 45 | Badam | 13.24 |
| 46 | Citrus | 4.43 |
| 47 | Tubers | 14.31 |

## APPENDIX III

Results of relevancy rating of items on factors influencing conversion of marginal homesteads for planting rubber in Kottayam district:

| Sl. No. | Factors selected | Rating |
|---|---|---|
| 1 | Age | 0.702 |
| 2 | Religion-caste | 0.714 |
| 3 | Farming experience | 0.743 |
| 4 | Family size | 0.703 |
| 5 | Occupation | 0.775 |
| 6 | Wet land area | 0.740 |
| 7 | Area under homestead retained | 0.743 |
| 8 | Indebtedness | 0.775 |
| 9 | Incentives | 0.781 |
| 10 | Exposure to technology | 0.750 |
| 11 | Availability of family labour | 0.756 |
| 12 | Availability of hired labour | 0.750 |
| 13 | Cost of hired labour | 0.725 |
| 14 | Outmigration of family labour | 0.712 |
| 15 | Outmigration of hired labour | 0.712 |
| 16 | Market factors | 0.750 |
| 17 | Attributes of rubber cultivation | |
| a | Ecological Attributes | |
| $a_1$ | Slope of land | 0.725 |
| $a_2$ | Type of the soil | 0.731 |
| $a_3$ | Wind direction | 0.706 |
| $a_4$ | Local Resource utilization | 0.725 |

Appendix III Contd.....

| | | |
|---|---|---|
| b | Economic Attributes | |
| $b_1$ | Profitability | 0.918 |
| $b_2$ | Marketability | 0.868 |
| $b_3$ | Economic efficiency | 0.881 |
| $b_4$ | Regularity of returns | 0.875 |
| c | Temporal Attributes | |
| $c_1$ | Immediacy of returns | 0.750 |
| $c_2$ | Leisure time availability | 0.706 |
| d | Socio-psychological Attributes | |
| $d_1$ | Perceived risk | 0.743 |
| $d_2$ | Cultural compatibility | 0.718 |
| $d_3$ | Security need | 0.750 |
| $d_4$ | Status need | 0.718 |
| 18 | Number of crops | 0.750 |
| 19 | Net area under rubber | 0.868 |
| 20 | Gross cropped area | 0.725 |
| 21 | Cropping intensity | 0.750 |
| 22 | Dispersion of crops in the homestead | 0.712 |

## APPENDIX IV

Relevancy rating of selected items of proforma on consequences of conversion of marginal homesteads for planting rubber in Kottayam District

| Sl. No. | Consequences | Rating |
|---|---|---|
| 1 | Displacement of family labour | 0.729 |
| 2 | Occupational diversification | 0.729 |
| 3 | Specialisation of family labour | 0.741 |
| 4 | Outmigration of family labour | 0.735 |
| 5 | Leisure time availability | 0.735 |
| 6 | Perceived change of social status | 0.756 |
| 7 | Displacement of hired labour | 0.725 |
| 8 | Deprivation of hired labour | 0.725 |
| 9 | Specialisation of hired labour | 0.80 |
| 10 | Outmigration of hired labour | 0.731 |
| 11 | Changes in dependability for subsistence | 0.838 |
| 12 | Land development related consequences | 0.735 |
| 13 | Soil loss (erosion) | 0.768 |
| 14 | Change in run-off rate of water | 0.729 |
| 15 | Change in silt deposition in low lands | 0.774 |
| 16 | Change in water table | 0.80 |
| 17 | Change in water availability | 0.774 |
| 18 | Change in fertility status of soil | 0.793 |

## APPENDIX V

Consequences of conversion of marginal homesteads for planting Rubber in Kottayam District

**Interview Schedule**

A. Name and address of the Farmer :

B. Factors influencing conversion/non-conversion of marginal homesteads for planting rubber

1. Age :

2. Family size :

3. Farming experience (Please indicate the number of years since you have started farming) :

4. Size of landholding

   - Wetland :
   - Area under homestead :

5. Occupation :

6. Exposure to technology (Please indicate which all sources of information you have utilized and the frequency of their utilization which in turn has influenced the conversion/non-conversion of marginal homesteads to rubber)

| Sl. No. | Source of information on technology | Frequency | | |
|---|---|---|---|---|
| | | Always | Sometimes | Never |
| A | **Personal** | | | |
| 1 | Relatives | | | |
| 2 | Friends | | | |
| 3 | Rubber Board Officials | | | |
| 4 | Agricultural Officer | | | |
| 5 | Agricultural Assistant | | | |
| 6 | Neighbours | | | |
| 7 | Any other | | | |

| | | |
|---|---|---|
| B | **Social Political** | |
| | 1 | Panchayat |
| | 2 | Credit Co-operatives |
| | 3 | Service Co-operatives |
| | 4 | Marketing Co-operatives |
| | 5 | Political organisation |
| | 6 | Religious institution/organisation |
| | 7 | Trade Unions |
| | 8 | Any other |
| C | **Mass media** | |
| | 1 | `Rubber' Magazine |
| | 2 | News Papers |
| | 3 | Radio |
| | 4 | Television |
| | 5 | Farm Magazines of KAU/SDA |
| | 6 | Any other |

7. Availability of family labour and hired labour

Do you utilize

(a) Family labour for any farm operation? YES/NO

(b) Hired labour for any farm operations? YES/NO

(If `Yes', then please indicate the easiness in availability of family labour/hired labour on the four point continuum provided for the purpose)

| Sl. No. | Particulars of labour utilized | Availability | | | |
|---|---|---|---|---|---|
| | | Difficult | Available | Easily available | Not available |
| 1 | 2 | 3 | 4 | 5 | 6 |
| A | Family labour/hired labour | | | | |
| 1 | Land preparation | | | | |

Appendix V contd.....

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| 2 | Planting | | | | |
| 3 | Irrigation | | | | |
| 4 | Fertilizer/manure application | | | | |
| 5 | Interculture operations | | | | |
| 6 | Harvesting and processing | | | | |

8. Outmigration of labour (Family and hired)

Please indicate whether anybody from your family/hired labour who was assisting in your farm operations shifted his/her occupation to other occupations or shifted to other areas as agricultural labourers

| Sl. No. | Particulars | Male | Female | Type of occupation to which shifted | Place |
|---|---|---|---|---|---|
| a | Family labour | | | | |
| | (1) | | | | |
| | (2) | | | | |
| | (3) | | | | |
| | (4) | | | | |
| | (5) | | | | |
| b | Hired labour | | | | |
| | (1) | | | | |
| | (2) | | | | |
| | (3) | | | | |
| | (4) | | | | |
| | (5) | | | | |

Appendix V contd.....

9. Please indicate what all marketing facilities/co-operatives/transportation facilities/processing facilities exist for rubber

| Sl. No. | Facilities | Nature/Type of facility |
|---|---|---|
| 1 | Service Co-operatives | |
| 2 | Marketing | |
| 3 | Processing | |
| 4 | Transportation | |

10. Perceived attributes of rubber cultivation influencing conversion/non-conversion of marginal homesteads to rubber

| Sl. No. | Attributes | Degree of perception | | | |
|---|---|---|---|---|---|
| a) | Ecological Attributes | | | | |
| i) | Slope of the land What is the approximate slope of the land and the direction of slope. The degree to which the slope of the land is perceived to be suitable for rubber cultivation | Highly suitable | Moderately suitable | Less suitable | Least suitable |
| ii) | Type of the soil<br><br>What is the predominant soil type in the area? Degree to which soil type is perceived to be suitable for successful cultivation of rubber | HS | MS | LS | Les |
| iii) | Wind direction The degree to which the direction of the wind is perceived to be influencing the cultivation of rubber | High influence | Moderate influence | Less influence | Least influence |
| iv) | Local resource utilization. Comparing homesteads and rubber, the degree to which effective utilization of local resources like water, labour, manures etc. can be carried out without external dependence as perceived by you | High in effective utiliza-tion | Moderate in effective utiliza-tion | Low in effective utiliza-tion | No utiliza-tion |

Appendix V contd....

| | | | | | |
|---|---|---|---|---|---|
| b) | Economic attributes | | | | |
| v) | Profitability The degree to which maximum financial returns can be obtained from the cultivation of rubber as perceived by you | Highly profitable | Moderately profitable | Less profitable | Least profitable |
| vi) | Marketability Your perception about the degree to which products from rubber can be marketed easily without delay | Easily marketable | Marketable | Difficult | Very difficult |
| viii) | Economic efficiency Your perception about the degree to which maximum output/returns can be obtained for every rupee invested in a rubber holding minus subsidy | Highly efficient | Moderately efficient | Less efficient | Least efficient |
| vii) | Regularity of returns Indicate your perception about the degree to which rubber cultivation can provide returns on a regular basis | Regular | Seasonal | Irregular | |
| c | Temporal attributes | | | | |
| ix) | Time availability Comparing homestead farming with rubber cultivation, your perception about the extent of free time (in hours) available to you/members of the family that can be utilized for any subsidiary activity other than farming | Substantial increase | Increase | No change | Decrease / Substantial decrease |
| x) | Immediacy of return Your perception about the degree to which rubber cultivation can provide immediate returns | Immediate | Slow | Very | Slow |
| d) | Socio-psychological attributes | | | | |
| xi) | Perceived risk What is your perception about the degree of risk involved while engaging in rubber cultivation? | High risk | Moderate risk | Less risk | Least risk |

| | | | | | |
|---|---|---|---|---|---|
| xii) | Cultural compatibility<br>The degree to which cultivation of rubber is consistent with your values, beliefs and philosophy behind farming as part of human culture | Highly compatible | Some what compatible | Less compatible | Least compatible |
| xiii) | Security need<br>Your perception about the degree to which rubber cultivation satisfied your need for a secure life (physical and psychological) | Highly satisfying | Moderately satisfying | Less satisfying | Least satisfying |
| xiv) | Status need<br>Your perception about the degree to which rubber cultivation can bring status to you in the society | Highly satisfying | Moderately satisfying | Less satisfying | Least satisfying |

C. Factors influencing conversion of marginal homesteads to rubber

1. Number of crops in homestead :
2. Net area under rubber :
3. Gross cropped area :
4. Cropping intensity of the homestead :
5. Dispersion of crops in the homestead :

## PART B

Consequences of conversion of marginal homesteads for planting rubber

A. Occupational consequences

1. Displacement of family labour

Has there been a change in your occupation since conversion of your homestead to rubber?

YES/NO

If yes, then indicate the nature of change. The degree of shift/redirecting of your occupation from a homestead farmer

High Moderate Low

Appendix V contd......

2. Specialisation of family labour

i) How many members in your family are engaged in income generation activities :

ii) What is the approximate time spent by each member for:

1) rubber cultivation and allied aspects
2) other income generating activities

| Sl. No. | Member | Time spent for rubber | Time spent for other income generating activities |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| | Total | | |

3. Outmigration of family labour

Have you/your family members moved out of your locality to any other area/locality in search of new occupation/to pursue the same occupation (farming) consequent to conversion of homestead to rubber: YES/NO

If Yes, please indicate

| Sl. No. | Family member | Occupation to which shifted | Place |
|---|---|---|---|
| | | | |

Appendix V contd.....

4. Occupational diversification

If you have started investment of resources in any of the off-farm ventures listed below consequent to conversion of homesteads to rubber, please mark a (✓) against the same:

1. Shares in business :
2. Landed property :
3. Other assets (like buildings) :
4. New enterprises (business, automobile etc.) :
5. Any other :

5. Leisure time availability

a) Has leisure time availability changed since the conversion of your homesteads to rubber? INCREASED/DECREASED

b) Average leisure time availability:
Before conversion :
After conversion :

c) How do you effectively utilize the leisure time compared to time utilized before conversion?

6. Perceived change of social status

Please indicate your perceived change of social status on the five point continuum provided for the purpose

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| ↓ | ↓ | ↓ | ↓ | ↓ |
| Substantially increased | Increased | No change | Decreased | Substantially decreased |

B. Hired labour related consequences
7. Displacement of hired labour

i) Have you changed/been tried to change your occupation as agricultural labourer since the conversion of homesteads to rubber? YES/NO

ii) If yes, then indicate the nature of change and the degree of shift
Nature :
Degree High Moderate Low

8. Deprivation of hired labour:

Your degree of perception that you (the labourers) have lost/been forced to lose/dispossessed of your occupation as an agricultural labour due to conversion
High Moderate Low

Appendix V contd.....

9. Specialization of hired labour

   i) What is the total time spent for income generating activities by you? (Hired labour) :

   ii) Out of the total time spent please indicate the time spent for rubber cultivation and related activities :

10. Outmigration of hired labour

Please indicate whether hired labour engaged by you, who was previously engaged in agricultural labour shifted his/her occupation to other occupations/moved out of the locality in search of other occupations? YES/NO

If Yes, then please indicate the nature of migration

| Sl. No. | Particulars | Male | Female | Type of occupation | Place |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

C (11) Changes in dependability for subsistence

Please indicate the degree of dependability for resources in terms of their availability from own farm before and after conversion of homesteads to rubber

| Sl. No. | Items | Before conversion | | | | After conversion | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Sur-plus | Suffi-cient | Defi-cient | Not at all | Sur-plus | Suffi-cient | Defi-cient | Not at all |
| 1 | Food | | | | | | | | |
| 2 | Fuel wood | | | | | | | | |
| 3 | Timber | | | | | | | | |
| 4 | Manures | | | | | | | | |
| 5 | Fodder | | | | | | | | |

Appendix V contd....

D. Perceived ecological consequences

Please indicate whether you have perceived any change in the following ecological parameters and resource base since the conversion of your homesteads to rubber in the locality

12. Land development related consequences
    i) Has any land development work been undertaken since the conversion of your homesteads to rubber? YES/NO
    ii) If yes, then please indicate the nature of work marking a (✓) against the appropriate column:
    1. Levelling of land for rubber cultivation
    2. Bunding across slopes (contours)
    3. Construction of water harvesting structures (trenches, pits)
    4. Terracing of land
    5. Any other land development work
13. Do you perceive any change in the run-off rate of water down the slopes where rubber is cultivated?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Substantially increased | Increase | No change | Decreased | Substantially decreased |

14. Whether rubber cultivation in the uplands has affected silt deposition in the lowlands

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Substantially increased | Increase | No change | Decreased | Substantially decreased |

15. Water related consequences

    1. Has there been any change in water table in your wells/ponds in the locality?
       Decrease/Decrease/No change

    2. If so, indicate, the extent (degree) of change
       High/Moderate/Low

16. Has there been any change in water availability for home consumption?
    Increase/decrease/no change

    If so, indicate the degree of change:
    High/Moderate/Low

Soil related consequences:

i) Has there been any change in soil qualities? YES/NO

ii) If yes, then indicate the nature and extent of change in:

17. Soil loss (erosion) High / Moderate / Low

18. Fertility status Improved / No change / Depleted

# CONSEQUENCES OF CONVERSION OF MARGINAL HOMESTEADS FOR PLANTING RUBBER IN KOTTAYAM DISTRICT

By

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## ABSTRACT OF THE THESIS

Submitted in partial fulfilment of the requirement
for the degree of

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# ABSTRACT

A study was conducted in Kottayam district to find out the causes and consequences with respect to the nature, extent and conversion (composite index developed from nature and extent) of marginal homesteads for planting rubber. The respondents included 200 convertors and 100 non-convertors.

The study revealed that outmigration of hired labour, availability of hired labour, farming experience and perception about attributes of rubber cultivation could explain the maximum discrimination between convertors and non-convertors.

Among the eighteen independent variables selected, availability of family labour and number of crops emerged as the most important factors influencing conversion. Gross cropped area and number of crops could explain the maximum variability of conversion. Net area under rubber was the factor which exerted maximum influence on other variables effecting conversion.

The most important consequences of conversion expressed by convertors were outmigration of hired labour, outmigration of family labour, soil loss (erosion) based on magnitude and decrease in water availability, increase in social status and decrease in water table based on directionality.

Community based land use strategy which involved production and sharing of farm produce among groups of individual homesteads based on similarity of topography, soil type, water resource dependence, local needs may become inevitable to sustain and maintain the diverse requirements of local communities in place of conversion of homesteads to monocrops like rubber alone. Rubber could only become a part of such land use systems.