CONSTRAINTS TO PRODUCTIVITY GROWTH IN KERALA AGRICULTURE

A MICRO LEVEL STUDY

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PHILOSOPHY
OF THE JAWAHARLAL NEHRU UNIVERSITY

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1993

I hereby declare that the research for this dissertation titled " *Constraints to Productivity Growth in Kerala Agriculture- A Micro Level Study* " being submitted to the Jawaharlal Nehru University for the award of the Degree of Master of Philosophy was carried out entirely by me at the Centre for Development Studies, Trivandrum.

Trivandrum.
2.09.1993.

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Certified that this dissertation is the bonafide work of **Lelithabhai.K.N** and has not been considered for the award of any other Degree by any other University. This dissertation may be forwarded for evaluation.

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ACKNOWLEDGEMENT

I am expressing my sincere gratitude to my Supervisors, Dr. Thomas Issac and Dr. K. Narayanan Nair for their initiative and encouragement which helped me to complete the dissertation work. They took genuine interest and gave valuable comments and suggestions.

I am extremely grateful to Dr. K.N.S. Nair, because of whose initiative I joined for M.Phil course.

My sincere thanks are due to Dr. K. Pushpangadan, who helped me to get the relevant secondary data.

Valuable comments of Mr.D. Narayana helped me in statistical analysis needed for the dissertation. I am sincerely grateful to him.

I am thankful to R. Anandaraj for his help in statistical analysis. Mr. Pyarelal Raghavan did the final corrections of the thesis. I am thankful to him.

I relied on Kerala Sastra Sahithya Parishad, for the socio-economic survey data of Kalliasseri. From Centre for Earth Science Studies I received the Resource Maps and the scientists there helped me in measuring the Land Use Map. Integrated Rural Technology Centre also granted me permission to use the project

reports, prepared by them. I am thankful to all of them.

I would like to thank my batchmates and friends in the Centre, to whom I can never repay. Lini, Asha, Sarita, Shaheena, Meena, Niramala, Bhanumathi, Deepa, Neeta, Fabiola, Lopamudra and all others rendered much entertainment during my life in Centre. My thanks are due to Sudeep, Dennis, Sreejit, Rajeev, Murughan, Karunakaran and Mahesh for all thier friendship and cooperation.

I am thankful to the administrative and library staff of the Centre. My thanks are due to the computer staff for their valuable service.

For all the inspiration and help that I received ever since I joined the M. Phil. course leading to this thesis, I am grateful to my cousin Sulochana.

Finally, I am thankful to my husband Sathian, for all the initiatives I received and patiently suffering my absence at home, even though it is unfair and inadequate to acknowledge him in this way.

Lelithabhai K.N.

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Chapter I.

Introduction

Soil, water and associated plants and animals constitute the basic natural resource endowment of any region. But as has been remarked, in agriculture-dependent economies **"the environment-poverty trap prevails: as poverty increases, natural environments are degraded to obtain immediate food supplies"**. [David Pearce, et al., 1990] Increasing population need food and other facilities for their subsistence. Intensive cultivation imposes increasing pressure upon land. Enhancing the productivity through land development activities like soil and water conservation, improving fertility of soil, forest conservation etc. assumes paramount importance in the above context.

Agricultural sector has been assigned a vitally important role in our five year plans. Performance of this sector, which accounts for roughly one third of the GDP and two-thirds of the total labour force decisively affects macro-economic performance. Further, the issues relating to unemployment, income disparities, and the provision of better standards of living to the growing population of the country cannot be tackled without substantial and sustained increase in agricultural production.

Even though the overall performance of Indian agriculture since independence has been impressive with an average annual

growth rate of 2.8 per cent, serious questions have emerged about the sustainability of this growth rate. We shall point to some of the disquieting features that are readily discernable. In percapita terms the growth rate has been low at 0.7 per cent per annum, between 1951/52 and 1989/90.[CMIE, 1990] And this is true for both food grains and non-food grains. The employment elasticities of agriculture growth has also been rapidly declining. This is because, output growth is increasingly becoming dependant upon intensive use of fertilizers, pesticides, and farm machineries rather than land augmenting innovations. While area under cultivation increased at 1.7 per cent per annum between 1951/52 and 1964/65, it increased only at 0.3 per cent per annum between 1964/65 and 1989/90. Productivity increase has tended to become the more important source of agricultural growth. Rate of growth of productivity increased from 1.4 per cent per annum in the first period to 1.9 per cent per annum in the second period. [CMIE, 1990] No doubt, the Indian agriculture has reached extensive land use frontiers.

With land use intensities remaining stagnant or even falling, the impetus to growth is entirely dependant upon yield increase. The consequent increase in dependence on intensive use of current inputs and short sighted land use practices can result in long term problems of degradation of land. Problems associated with lowering of ground water tables are appearing in a number of regions. Traditional systems of land and water management and

local institutions that could exercise effective control are also generally being undermined. These raises serious questions of sustainability of the growth process.[Abhijit Sen, 1992]

The post independence period agriculture growth has also been characterised by severe regional imbalances. The green revolution strategy has concentrated vital inputs in regions of immediate growth potential, so much so, the percapita productivity have tended to decline in the western and southern regions and also in the eastern region with the exception of West Bengal. [Utsa Patnaik, 1992] Thus regional disparities in agricultural performance have become the hallmark of contemporary Indian agriculture.

The above situation underlines the importance of region level studies dissecting the agricultural growth. There is considerable differences in the land and water resources, the pattern of utilization, policies pursued, and gains made and distortions created, from region to region. The present thesis focuses on the agricultural performance of Kerala.

Section 1

Issues in Kerala's Agriculture: A Selective Survey.

The severe agriculture stagnation in Kerala during the decade from mid seventies has generated a large number of

studies, both overall as well as disaggregated, by crop and by region, trying to understand this phenomenon. [Kannan and Pushpangadan, 1988, 1990, Jeemol Unni,1981, P.G.K. Panikar, 1980, Joseph C.J., 1983, Narayana, D. et al, 1983, 1989, Narayana, D. 1990, Kuttappan M., 1979, P.S. George, 1979, Ninan K.N., 1984] In this process, it has also become fashionable to divide the Kerala agricultural performance into two phases viz. pre mid seventies and post mid seventies. [Kannan and Pushpangadan, 1988]

However, it has been forcibly argued by D Narayana that any analysis of trends in the growth of production and productivity of agriculture in Kerala has to take into account the perennial nature of the crops and the cosequent production cycle. According to him, the period from early seventies to early eighties, in which area, production and productivity tended to stagnate or even decline should be identified as the downward swing phase of agriculture production cycle that characterises the tree crop economies.

Even if the production cycle hypothesis turns out to be true it does not diminish the significance of plethora of studies on the constraints on agriculture growth prompted by the agriculture stagnation during the seventies and early eighties. A brief survey of this literature is given below.

Whatever be the correct periodisation of phases of growth of

Kerala agriculture, there has been a general consensus that the longrun growth performance has been relatively lower than Indian average. Further, the productivity of individual crops in Kerala is much lower than the productivity of the crops in the competing regions or what has been proved to be feasibly achieved in Kerala. [Marxist Samvadam, 1993]

The above mentioned relatively poor performance of Kerala is rather surprising given its rich resource endowments. The state benefits from both south-west and north-east monsoons. The south-west monsoon is very heavy throughout the state and it starts in May and lasts till September. The north-east monsoon starts in September and lasts till November, and is relatively less important. The annual rainfall generally exceeds 300 cm. and average number of raindays exceeds 125 days a year. Even though the rainfall is skewed in distribution, traditionally, the eastern forest system and network of paddy land valleys, canals and homestead ponds had acted as effective water conservation measures.

Geographically, Kerala is divided into: a) High ranges, the mountainous land along the Western Ghats, b) High land, the hilly tract on the western side of Western Ghats (about 43% of the land), c) Mid land, the undulating terrain with a number of rivers, hills and valleys (about 42% of the land), and d) Low land, the strip of land along the coasts of the Arabian sea. The

soil depth is adequate for rich vegetation and a variety of soil types from loamy sand to loamy red and laterite soils are found in the state.

On the recommendations of the committee on Agro-climatic Regions and Cropping Patterns, constituted by the Government of Kerala in 1974, and taking into account the physiography, climate, soil conditions, irrigation facilities, land use pattern, sea water intrusion, etc., the state is divided into five agro-climatic zones viz: 1) Northern zone, 2) Central zone, 3) Southern zone, 4) High Range, and 5) Problem areas. Given the agro-climatic diversity, Kerala is suitable for a wide variety of crops.

Agriculture of the state is characterised by intensive utilisation of the land and unique pattern of mixed cropping. [Report of the One Man Commission, 1981] Homestead system of cultivation is prevelant in all parts of the state. Homestead refers to the area surrounding the farm house. And coconut is the basic crop in almost all the homesteads and it is intermixed with seasonal, annual and perennial crops. Broadly there are four farming systems in practice in the state : 1) rice based farming system, 2) coconut based homestead farming system, and 3) tapioca based farming system and 4) plantation system.

Agricultural seasons in the state are Autumn or 'Viruppu'

(April-September), winter or 'Mundakan' (October-January) and summer or 'Puncha' (February-April). Only the first two seasons receive rainfall from south-west monsoon and north-east monsoon respectively.

Not only is Kerala rich in agricultural resource endowment, a major social impediment to agricultural growth, the feudal landlordism has been eradicated in the state. Kerala constitutes one of the few states in India which has witnessed relatively genuine land reforms. The process of land reforms climaxed in 1971 when tenancy was abolished and hutment lands were granted to all agricultural labourers. [K.N. Raj and Michel Tharakan, 1983] Therefore it becomes a puzzle as to what are the factors that are holding back Kerala from fully achieving its agricultural growth potential.

Kannan and Pushpangadan (1988, 1990) have argued that non-price factors like technology influences productivity more than price factors. The main constraints to growth in agriculture are institutional and technological factors. In the case of technology, the urgent problem is not of introducing a new technology, but of providing critical inputs which help the farmers to adopt new techniques. And the critical inputs identified in the study are water and land management. The environmental degradation affecting the micro-climate, rainfall, etc. also has been considered a cause of the stagnation in agricultural productivity in Kerala. Considering the need for

irrigation, an important point put forward is that, irrigation in Kerala has not yet given importance to the soil characteristics, topography, cropping pattern, crop-specific water demands, soil erosion and siltation problems.

In some instances water-logging problems in low-lying areas have been aggravated by the existing water control projects. Another study by K.P. Kannan (1979), drew attention to the problems created by water control projects in Kuttanad, the vast paddy area in Kerala. Lack of proper drainage, infertility of soil, widespread growth of aquatic weeds, etc. caused decline in paddy productivity, instead of facilitating growth.

Analyzing the trends in area, production and productivity of coconuts in Kerala, D. Narayana and K.N. Nair (1989) traced the cause of decline in yield per coconut tree as low input use, especially that of irrigation, which aggravates the adverse effects of the root-wilt disease and/or the increasing proportion of old palms per hectare. The study points out that the peak bearing age of a palm is governed by the moisture regime and thus the age of trees simply can not explain the low productivity of coconut. And the adverse impact of root-wilt diseases on yield, also is high if irrigation is low.

They have also described the depressive effects of moisture constraint on agriculture and raises doubts on the efficiency of

major irrigation projects in providing water in all the needed areas in Kerala, because of its diverse physical features. Canal irrigation in Kerala caters only to paddy lands. Garden land irrigation has been neglected. Major findings of the study on the impact of irrigation in stabilising and increasing yield of paddy crop in Kerala were: 1) the impact is only marginal, and 2) the management of irrigation water is far from satisfactory. [Nair, K.N. and Narayana, D., 1983]

P.G.K. Panikar found the yield rate of HYVs were less than their experimental yield potential from the survey conducted in Palghat and Kuttanad areas. And the yield from HYVs was low because of a) low fertilizer consumption, b) proneness of HYVs to pests and diseases, and c) high prices of fertilizer and plant protection materials leading to an escalation in cost of production.

The NARP Status Report of Kerala Agricultural University identifies the major constraints to growth of paddy productivity as follows:

a). Agro-ecological conditions in which paddy is cultivated in Kerala, such as modan lands, waterlogged and flooded ares, high altitude areas, coastal saline areas, etc. impose location-specific special problems on productivity growth at economically feasible investment levels.

b). Only 36 per cent of gross paddy cropped area is irrigated. Rainfed agriculture is suffering from uneven

distribution of annual rainfall. First crop of paddy (Virippu) usually suffers from drought in the early stages and by floods in the middle and/or later stages. Similarly, the second crop of paddy suffer by drought in the later stages.

c). Soil erosion due to the undulating nature of the topography of the land causes silting up of the natural drains and water courses.

d). High cost of production, low productivity of labour, etc. render cultivation less remunerative.

e). The inorganic fertilizers use is very low in the state compared to the recommended levels per hectare. And HYV seeds coverage also is low.

Productivity of coconut in Kerala is below the all India average. Causes for this are identified as:

a). incidence of root wilt disease,

b). extension of cultivation in marginal and unproductive lands,

c). inadequate input usage,

d). unscientific farming causing overcrowding of palms,

e). inadequate management practices,

f). unfavourable seasonal conditions,

g). inferior genetic base of the cultivars,

and i). incidence of pests.

Coconut is mainly a rainfed crop in Kerala. In the high

rainfall areas like North Kerala, the dry spell of five to six months from December to May adversely affects the growth and productivity of palms. Irrigation during dry months is essential for increasing the yield as well as for stability in production.

Diversity of agro-climatic conditions and regional disparities in soil-moisture content, rainfall and irrigation facilities necessitates micro level inquiries into constraints to growth of productivity in agriculture. It is specifically noted that major problems of productivity growth are related to inadequate information about the resources available and misguided interventions in the natural eco systems. The constraints related are more often area specific. All these underline the importance of the analysis of socio-economic, agro-climatic, and environmental aspects at regional/watershed/village levels.

Section 2

Objectives of the Study and Data Sources.

The objectives of the study are two-fold. First is to make an appraisal of Kerala's agricultural performance in the post independence period. Such an exercise becomes relevant given the controversies that exist about whether the Kerala agricultural growth process has been cyclical or not, and the data that are now available for the second half of 1980s. Data are analysed at

disaggregated levels for major crops and broad regions. These issues are the concern of chapter II.

The second objective of the present study is to undertake a village level case study of the land and water resources and its management to illustrate constraints to agricultural growth at micro level.

The panchayat of Kalliasseri in Kannoor district has been chosen for our case study. The district falls in the northern agro-climatic zone. The district has all the four geographical regions, high ranges, hilly tracts, mid land and low land. Kalliasseri falls in the low land area though it has a small portion of hilly tracts.

As in the rest of the district Kalliasseri also is affected by drought in summer and water logging in rainy season.[1] There is no canal irrigation scheme in the village chosen for case study.[2] The panchayat of Kalliasseri can be taken as the

[1] Though both the monsoons bless the district, the dry spell of 4 to 6 months does occur every year from December to May. Moisture stress during dry season affects the productivity of perennial crops like coconut, arecanut, and pepper. High rainfall during the months of June and July creates water-logging problem. Major types of soil are coastal alluvium, laterite and associated soils, hydromorphic saline, and forest loam. Important crops cultivated are paddy, coconut, arecanut, pepper, banana, cashew and rubber.

[2] The important rivers in the district are Pazhassi, Valapatanampuzha, Anjarakandi, and Mahi. Area under irrigation (gross) in the district in 1984-85 was 17067 ha. (ie.,7.98 per

illustrative of one of typical coastal village in the northern zone.

The micro level analysis of constraints to agricultural growth in Kalliasseri panchayat is the subject matter of the chapters III, IV, and V. In chapter III, the ecological setting of the panchayat and implications of some of the major social interventions in the eco system is described. In the next chapter, socio-economic characteristics of the households are considered. And finally, in chapter V, a statistical analysis of the factors that are affecting productivity of paddy and coconut in the village has been undertaken.

The various threads of discussion are summed up in the concluding chapter VI.

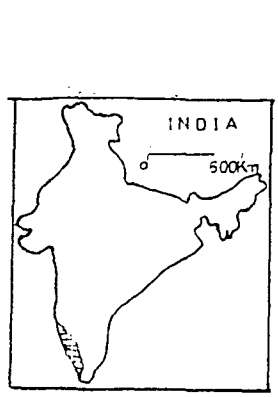
Data Sources:

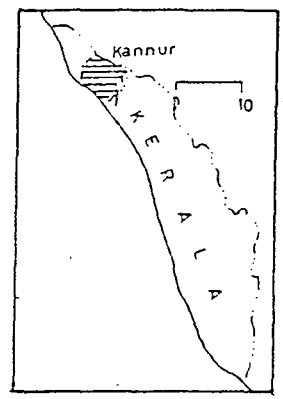
Secondary data on area and production of the major crops by districts published by Government of Kerala is the information base for analysis in chapter II. The rest of the thesis is entirely based upon the primary data generated by Panchayat Level Resource Mapping Programme for Kalliasseri. The project is a

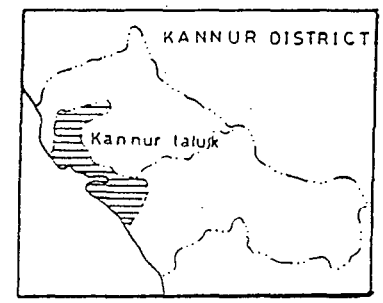
cent of the gross cropped area in the district). Pazhassi is the only irrigation project in the district, irrigating 16,000 ha. in Kannoor and Tellichery taluks. In addition to this, there are 223 minor irrigation schemes in the district covering 3572 ha. Ground water has not been used for irrigation.

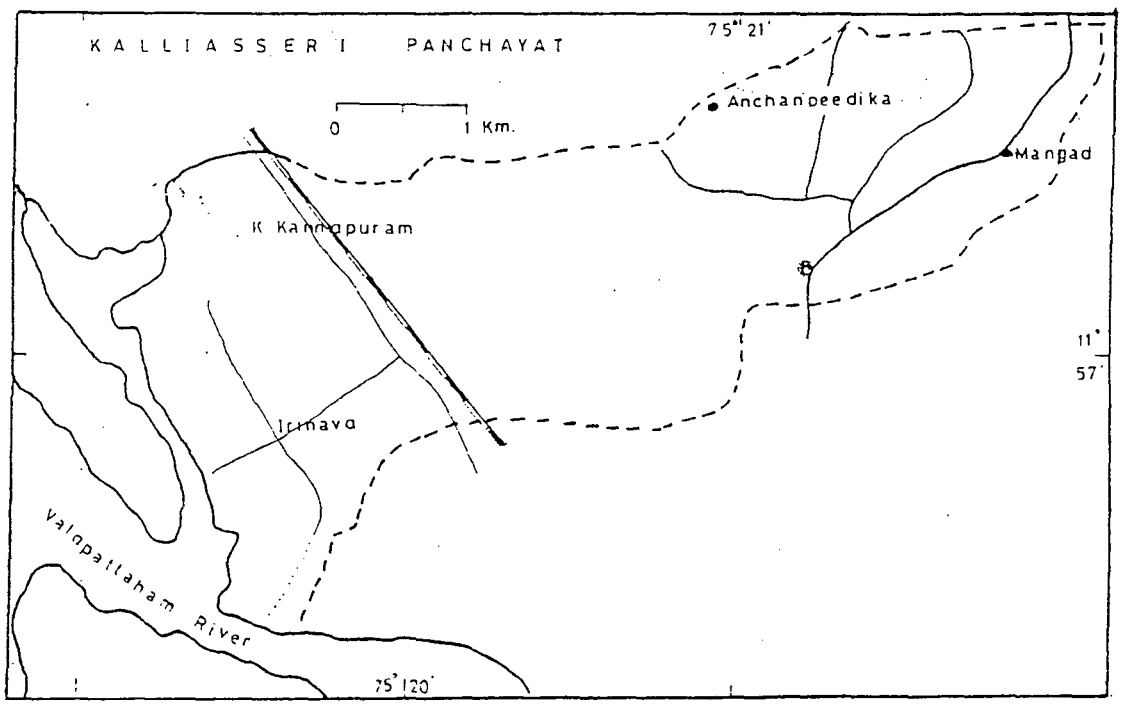
Map. I

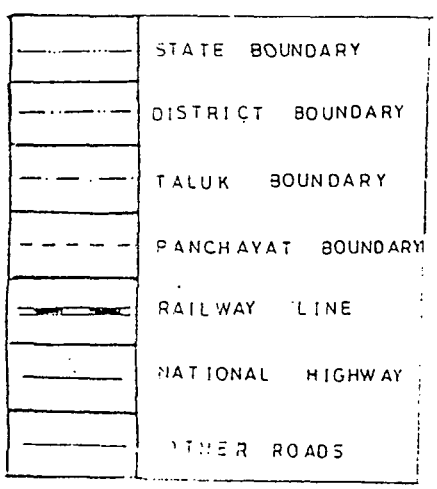
KALLIASSERI PANCHAYAT
LOCATION MAP

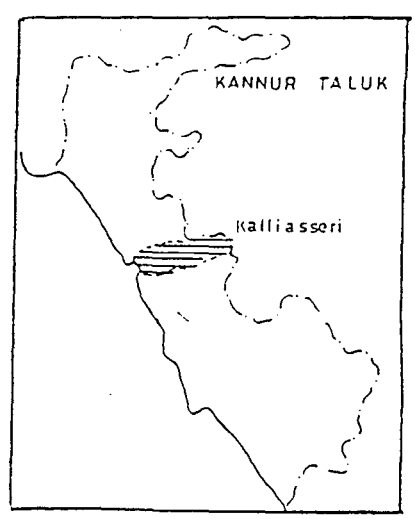












by M.Ramachandran CESS & LAND USE BOARD

joint venture between IRTC, a research organisation sponsored by Kerala Sastra Sahithya Parishad, and Centre for Earth Science Studies. The project is unique experiment in generating village level data on land and water resources and their utilization, with popular participation, on Cadastral Maps. It is hoped by the project organisers that the data collected and the popular enthusiasm generated through the campaign for data collection would form the basis of a process of participatory planning for village development.

Following sets of information have been utilized for the study.

1) Land and water resource maps have been the major data base for our discussion in chapter III.

a) Land form map. This map depicts different land form units along with the type of slopes, active processes for each of the units.

b) Surface material/soil map. This map shows the type of surface material with texture in terms of sand, silt, clay, etc. The rock exposures, laterite crust, laterite soil, etc. are also marked. Soil depth, texture and quality are also taken into account.

c) Depth to bed rock map. This map depicts the thickness of weathered/unconsolidated material over the hard rock (bed rock).

d) Potential areas of water availability map. This map

shows surface water bodies like rivers, streams and ponds, their status and the overall prospect of groundwater availability. Areas having salinity/water quality problems are also depicted.

e) Land use map of 16 inches = 1 mile (1 cm:3960 cm) scale depicts the land-use pattern in each plot, location of industries' settlements, etc.

f) Environmental appraisal map. This is an integrated map of the ones already described. [Panchayat Level Resource Mapping An Approach Paper, 1991]

2) The census of entire households in the panchayat which gives socio-economic characteristics of the households like education, housing conditions, income, assets, etc. have been the data base for our discussion in chapter IV. Broad aggregates of the characteristics have been manually tabulated by village volunteers. Minor discrepancies have been noticed between their estimates and our results from computerised exercise. It has not been fully possible to reconcile these discrepancies. But these discrepancies are not of any significance as to affect the validity of our conclusions.

3) The mapping diaries maintained by the volunteers, in which are entered the remarks of volunteers on special features of the plots they noticed have also been used.

4) The sectoral project reports that are being prepared by IRTC for the village plan were made available to us and provided valuable insights.

5) Besides, we also conducted personal field enquiries at

Kalliasseri. Apart from the discussions with groups of farmers, we also made detailed case studies of 9 typical farmers, a summarised version of which are presented in Appendix 5.1.

Chapter II.

Agricultural Growth in Kerala : Trends and Patterns

Introduction:

The pattern of agricultural growth in Kerala has shown wide variations over time. The first four Five Year Plan periods witnessed significant increases in crop production [Sivanandan, P.K., 1985]. However, since the mid 1970s the performance of agriculture suffered serious set-back. According to one school of thought agriculture in Kerala has been stagnating from the mid seventies, and it is found more among food crops than in plantation crops. [Kannan and Pushpangadan, 1988] However, another school of thought argued that the tendency of production and yield to remain with out significant change during 1970's was due to production period cycles occurring due to cyclical changes in bearing periods of perennial and tree crops. [Narayana, D, 1990] In this chapter we have made an attempt to re-examine these view points on the agricultural performance of Kerala.

The organisation of this chapter is as follows.Section I describes the data and methodology used for analysis. Section II gives a brief account of agricultural growth for the state as a whole and section III examines its inter-regional variations. Section IV examines crop-wise performance of agriculture. The last section will provide a summary of the major findings.

Section I.

Data and Methodology.

Data on area, yield and output of crops cultivated in the state are collected by the Bureau of Economics and Statistics, Government of Kerala. We have used this data from 1962/63 to 1990/91 for the present analysis. The data relating to paddy, tapioca, banana, coconut, cashew, arecanut, rubber, tea coffee, pepper, cardamom and sesamum are used for the study. These twelve crops accounted for 81.83 per cent of the gross cropped area in the state in 1990/91.

We have confined our study for the period 1962/63 to 1990/91 for the following reasons. Systematic collection of data on area and yield of principal crops was started only in the early sixties under the ICAR scheme. Under this scheme the Land Utilization Surveys were started on an yearly basis from 1960/61 and estimates of yield of crops through Cropcutting Surveys from 1961/62. The estimates of area, production and yield of principal crops based on these surveys were available from 1962/63. The method of data collection was further improved by the timely reporting surveys for estimating crop statistics from 1975/76. The Directorate of Economics and Statistics has also adjusted the estimates for the pre- 1975/76 period in order to make it comparable with the post 1975/76 period.

While looking at this adjusted data we have to keep in mind the following aspects. Tree crops and spices depends not only on the changes in area under crop but also on the area under replantation, which take time to yield from that land.[Narayana, D, 1990] This pauses some problems in estimating the yield per hectare.

The total agriculture production of the state is taken as the addition of money value of production of all the crops under study. The money value is estimated by using the constant average farm prices of agriculture products for the year 1980. Prices of plantation crops were taken from the publications of the respective Commodity Boards and for other crops, from the Economic Review. The food crops production is taken as the total value of production of paddy, tapioca and banana and other plantains. The non-food crops total combines value production of the remaining crops under analysis.

Regional disparities in the growth pattern is examined by estimating growth rates of area, yield and output of the crops at the district level. All districts in the state have been included for the analysis. Because of the frequent changes in the district boundaries due to the formation of new districts, we have grouped the districts into five regions.[3]

[3] The agro-climatic characteristics of the area included under each region almost coincides. Thiruvananthapuram and Thrissoor districts have not been affected by the formation of

Growth rates of area, production and yield could be estimated using different functional forms. [Reddy, V.N., 1978] However, the components of time series model viz, seasonality, cyclicality and irregularity hold their effect on trend growth. [Snigdha Chakrabarti and Ashok Rudra, 1990] And if the periodicity of the swings in trend (up and down) are not of equal order, they have a significant bearing on secular trend. [Anandaraj, R., 1992] So the nature and periodicity of cyclical movements was looked on first to choose an unbiased estimate of trend. The OLS method was used to depict the trend of the series over time. The standard semi-log linear model for the exponential growth function,

$$\text{Log } Y = \alpha + \beta T + u \qquad (1).$$

where Y is the dependent variable, T is the time (independent variable), α and β are the parameters of the model (respectively intercept and slope) and u is error term, was used to estimate the trend of the series.

The movements in growth or swings in trend which are due to

new districts and therefore they are taken as two regions. The QPA group is formulated as a region comprising Kollam, Pathanamthitta and Alappuzha districts. KIE group is formulated by combining Kottayam, Eranakulam and Idukki districts. The MPKWKK group includes Malapuram, Palakkad, Kozhikode, Wynad, Kannoor and Kasaragode districts. The grouping of districts is the same as that followed in Sunanda. [1991]

cyclical and irregular fluctuations was analyzed by detrending the series. To eliminate irregular fluctuations from the detrended series, the conventional method of moving averages was employed. And using the three year moving average method the detrended series was smoothened for comprehending the cyclical movements in output. The graphical method of plotting the smoothened series was relied on to have a visual picture of the cyclical fluctuations in growth and the periodicity of the same.

The study has used annual average growth rate, for analyzing the growth performance period-wise. Annual growth rate was estimated by employing the following form of equations.

$$Gr = ((Y_{t+1} - Y_t)/Y_t) * 100 \qquad (2).$$

$$\text{Arithmetic mean} = Gr = \sum_{t=1}^{n-1} (Y_{t+1}/Y_t - 1)/n-1 \qquad (3).$$

The sources of growth in production are isolated by decomposing the growth rate into area effect, cropping pattern effect, yield effect and the mixed effect due to simultaneous change in both cropping pattern and yield.[Minhas, B.S. and Vaidyanathan, A, 1965, pp. 230-252] The decomposistion equation used for this purpose was,

$$Q_t - Q_o = A_t \Sigma a_{ct} Y_{ct} P_c - A_o \Sigma a_{co} Y_{co} P_c ,$$

$$\text{as} \quad Q_t - Q_o = (A_t - A_o)\sum_c a_{co} Y_{co} P_c + A_t \sum_c (a_{ct} - a_{co}) Y_{co} P_c$$

$$+ A_t \sum_c a_{co} (Y_{ct} - Y_{co}) P_c + A_t \sum_c (a_{ct} - a_{co})(Y_{ct} - Y_{co}) P_c \qquad (5).$$

where, Q_t = value of gross agricultural output at constant prices (P_c) during period t, A_t = gross cropped area during period t, a_{ct} = (A_{ct}/A_t) = proportion of area under crop c (A_{ct}) to the gross cropped area during period t, and Y_{ct} = physical output per hectare of crop c during period t.

The first three components of the equation (5) represent respectively the contribution of change in area, cropping pattern and yield in absolute change in the value of gross agricultural output. The last term shows the interaction effect of changes in cropping pattern and yield in the growth of output.

Instability is defined as the deviation from trend or the variation which is not explained by the regression fit. Trend is the mean of the time series and thus the co-efficient of variation could be treated as a measure of instability; it being a measure of dispersion of observed values of the variable from its arithmetic mean value. However, if there is a strong trend element in the time series, co-efficient of variation of the time series can be misleading. To avoid this problem, standard deviation of the detrended series can be used in estimating the co-efficient of variation. Therefor, a reliable measure of instability in production and yield is used in this study, by

estimating the co-efficient of variation [4]

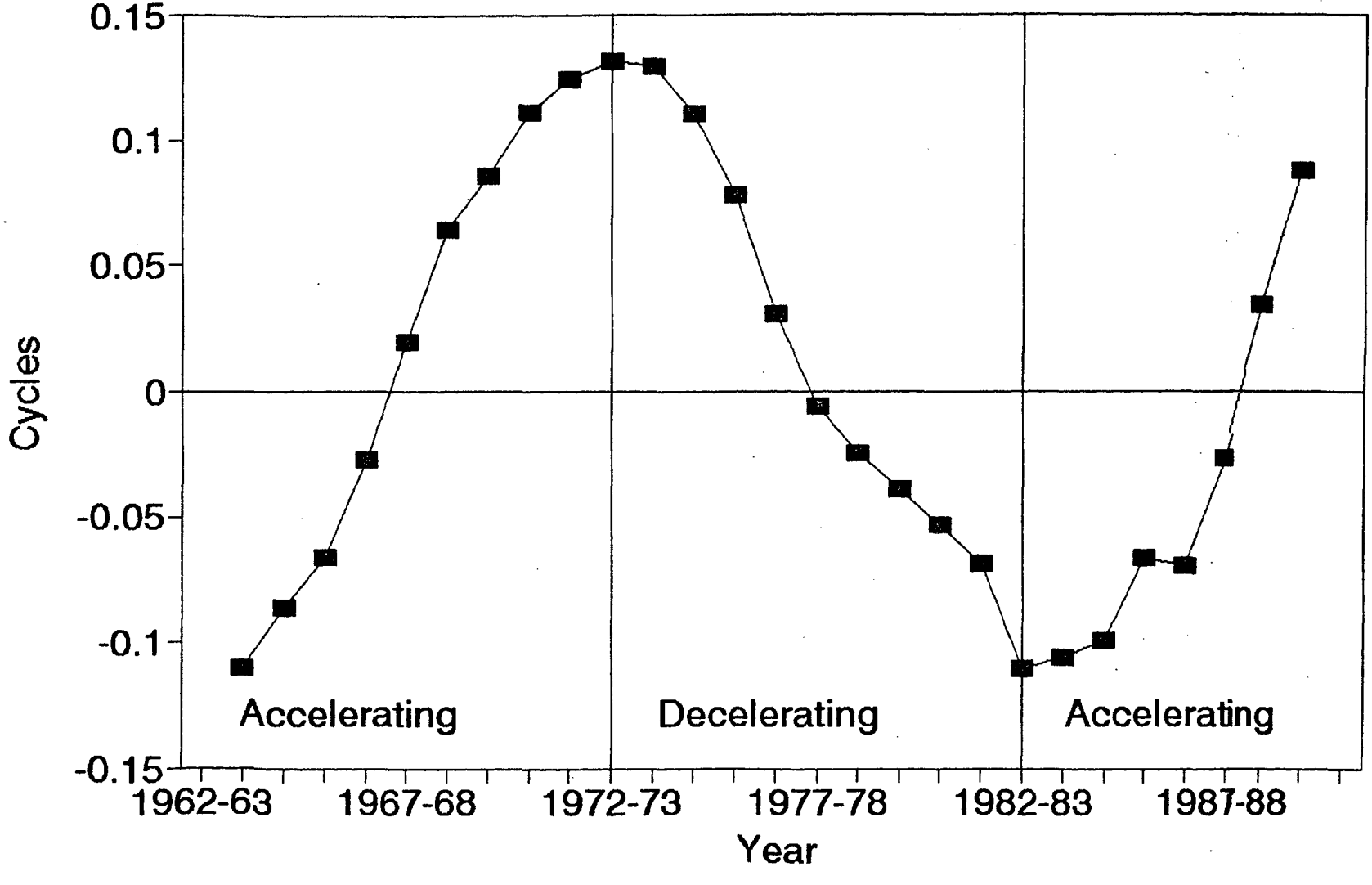
Graphical representation of the cyclicality in growth, clearly indicates the existence of three distinct phases in agricultural production in the state, and was experienced by almost all the principal crops, acceleration first, then deceleration, and further acceleration during the period under study. Though the deceleration in growth rates commenced in different regions at different years for the principal crops, for uniformity in analysis and comparability with all regions in the state, the periods relevant in the case of state agriculture have been taken for the district level analysis also. As it is evident from Graph 1, the deceleration in agricultural production for the state as a whole started in 1972/73, and recovery in 1982/83. The period I in the analysis is from 1962/63 to 1972/73, period II is from 1972/73 to 1982/83 and period III is from 1982/83 to 1990/91. [5] [See graph 1]

[4] C.V. = (Standard Deviation of the detrended series/ Arithmetic mean of the time series)*100

[5] Growth rates were averaged, of 1963/64 to 1972/73 for period I, of 1973/74 to 1982/83 for period II and of 1983/84 to 1990/91 for period III.

Graph 1

Cycle in Agricultural Output in Kerala



Section II.

Growth Rates at State Level.

The total agricultural output increased at an average annual rate of 2.11 per cent, during the period from 1962/63 to 1990/91. Between 1962/63 and 1972/73 production increased at an average annual rate of 4.08 per cent, and in the subsequent period, 1973/74 to 1982/83 it has shown a negative growth rate of -1 per cent per annum. During the last period (1983/84 to 1990/91), there has been a recovery in the growth of output, at an average annual rate of 3.53 per cent. [see Table 2.1]

Total cropped area in the state grew at an average annual rate of 0.75 per cent, during the entire period of study. Though the gross cropped area registered an increase of 2.30 per cent per annum in period I, in period II, it was declining at the rate of -0.58 per cent per annum. And in period III, average annual growth rate of area was positive, though the magnitude of the rate was small (0.46%).

Growth rate of yield, for the entire period was 1.34 per cent per annum. Yield increased at the average annual rate of 1.76 per cent in period I, but in period II, yield declined at the rate of 0.42 per cent. Period III experienced growth in yield, at an average annual rate of 3.02 per cent.

Table 2.1
Growth rates of Area, Production and Yield, in Kerala's Agriculture (Average Annual Percentage Change).

	Total Agriculture	Food crops	Non-food crops
1962/63 to 1990/91			
Area	0.75	-1.18	2.09
Production	2.11	1.00	2.50
Yield	1.34	2.20	0.38
1962/63 to 1972/73			
Area	2.30	1.43	3.17
Production	4.08	7.01	2.95
Yield	1.76	5.58	-0.20
1973/74 to 1982/83			
Area	-0.58	-1.47	0.17
Production	-1.00	-2.19	-0.45
Yield	-0.42	-0.70	-0.62
1983/84 to 1990/91			
Area	0.46	-4.08	3.14
Production	3.53	-2.51	5.61
Yield	3.02	1.61	2.34

[Sources : Computed using the data from 1) Statistics for Planning, 1986, Directorate of Economics and Statistics, Government of Kerala, and Economic Review (various issues), State Planning Board, Kerala, Thiruvananthapuram]

Sources of Growth in Production.

Analysis of the source of growth in agricultural output has shown that for the entire period of analysis the annual change in output (absolute) was Rs 237,98 million. The yield effect was depressive on the growth of output, while area effect was highly contributive, and cropping pattern effect and the effect of simultaneous change in cropping pattern and yield interacted positively.

Table 2.2
Decomposition of Absolute Change in Total Agricultural Production.

	'1962/63 to 1990/91					1962/63 to 1972/73				
	Output Change (Rs. million)	Effects of Area	Cropping Pattern	Yield	Inter-action	Output Change (Rs. million)	Effects of Area	Cropping Pattern	Yield	Inter-action
Thiruvananthapuram	1134.12	73.12	26.51	-4.92	5.29	4674.81	106.81	18.21	-22.51	-2.51
QPA Group	2699.61	41.70	-25.53	76.23	7.61	13900.64	-4.39	-6.53	111.52	-0.60
KIE Group	7788.86	64.74	10.98	23.00	1.28	9743.95	110.85	39.01	-39.45	-10.41
Thrissoor	1491.71	101.58	-26.52	20.36	4.59	3595.29	12.45	43.33	45.16	-0.95
MPKWKK Group	10683.44	6.52	27.23	67.40	-1.14	12384.77	49.29	21.14	30.74	-1.17
Kerala	23797.52	1541.68	74.37	-1633.76	117.72	44299.46	115.80	39.66	-53.57	-1.88

Table 2.2 continues.
Decomposition of Absolute Change in Total Agricultural Production.

	1972/73 to 1982/83					1982/83 to 1990/91				
	Output Change (Rs. million)	Effects of Area	Cropping Pattern	Yield	Inter-action	Output Change (Rs. million)	Effects of Area	Cropping Pattern	Yield	Inter-action
Thiruvananthapuram	-3390.72	81.00	3.80	-2.87	18.07	2364.30	21.14	65.26	14.51	-0.92
QPA Group	-10903.24	95.93	-8.74	11.63	1.18	5701.89	31.52	-70.28	112.86	25.90
KIE Group	2347.51	9.80	3.64	86.94	-0.38	12146.69	75.77	-14.90	21.14	17.99
Thrissoor	-847.35	278.10	-117.34	-71.26	10.50	1786.07	-7.67	-0.32	103.89	4.10
MPKWKK Group	-418.20	-56.18	46.24	112.21	-2.27	22433.84	31.42	11.07	57.21	0.30
Kerala	-13211.99	4223.55	119.82	-4585.59	342.22	44431.99	-28.31	60.94	80.79	-13.41

[Source : Same as in Table 2.1]

In period I the average annual change in output (Rs. 442.99 million) was higher than that for the entire period, and was mainly due to area effect and cropping pattern effect. [see Table 2.2] Change in output in period II was negative and was mainly due to yield effect. Increase in output in period III (Rs. 444.32 million) was the highest compared to the entire period and other sub-periods, and was due to yield effect and cropping pattern effect. Analysis of sources of growth in production revealed that the recovery period is characterised by a shift in cropping

pattern in favour of high valued crops and an improvement in productivity. [see Table 2.2]

Instability in Production.

To examine instability in agriculture production and yield co-efficient of variation of the detrended series was estimated for the entire period and the sub-periods. Co-efficient of variation in production for the entire period was 12.63 per cent.

Table 2.3
Co-efficient of Variation

	1962/63 to 1990/91			1962/63 to 1972/73			1972/73 to 1982/83			1982/83 to 1990/91		
	Area	Prdctn	Yield	Area	Prdctn	Yield	Area	Prdctn	Yield	Area	Prdctn	Yield
Kerala												
Total Agriculture	5.92	12.63	8.49	6.39	6.77	1.38	4.73	10.19	5.73	0.84	6.89	6.99
Food crops	10.13	17.01	10.57	9.18	15.07	6.45	3.87	9.66	7.62	7.99	8.57	1.64
Nonfood crops	6.63	14.03	7.07	4.83	3.55	2.11	6.19	10.77	3.93	3.17	10.50	8.45
Thiruvananthapuram												
Total Agriculture	8.92	19.85	13.36	9.70	10.84	4.84	6.91	15.89	9.53	2.94	9.36	8.6
Food crops	14.12	25.61	18.05	13.24	16.37	10.23	9.98	15.89	8.10	11.12	18.61	9.22
Nonfood crops	7.24	26.74	17.43	6.71	8.26	5.18	4.94	19.56	13.69	2.72	15.06	13.86
QFA Group												
Total Agriculture	9.18	20.82	13.56	7.81	12.15	4.83	8.93	18.64	10.06	1.97	6.52	6.69
Food crops	12.36	27.47	17.18	11.1	23.56	13.61	7.62	19.7	13.66	6.52	8.31	3.18
Nonfood crops	9.48	21.25	13.16	5.09	5.88	2.61	11.21	18.89	7.35	3.24	11.26	10.25
KIE Group												
Total Agriculture	4.01	9.74	8.94	4.73	2.7	4.48	3.63	8.03	5.79	2.95	5.8	5.56
Food crops	11.26	17.5	15.58	7.43	10.64	6.27	5.88	9.47	9.21	8.88	10.83	3.43
Nonfood crops	6.44	10.89	7.22	4.11	2.35	4.82	5.42	9.09	4.58	5.25	8.09	6.53
Thrissoor												
Total Agriculture	6.66	12.88	10.91	7.04	10.96	4.64	3.43	7.75	6.1	3.68	7.72	9.87
Food crops	10	12.02	8.88	6.55	12.13	6.6	5.37	6.71	6.71	9.28	8.66	8.81
Nonfood crops	9.72	16.84	9.77	9.09	10.58	5.38	9.88	10.37	4.37	2.76	11.37	10.06
MPKWKK Group												
Total Agriculture	6.17	11.91	7.24	6.02	5.25	2.07	3.89	8.52	4.78	2	8.48	8.46
Food crops	9.26	13.87	6.67	8.54	13.82	6.17	2.91	5.81	4.38	7.88	8.04	2.35
Nonfood crops	6.86	14.74	7.08	4.91	3.45	3.54	5.03	10.29	4.33	3.27	11.68	9.92

[Source : Same as in Table 2.1]

The sub-period II gave relatively unstable production as the co-efficient of variation was 10.19 per cent, which is high compared to that in period I (6.77 per cent), period III (6.89 per cent). [see Table 2.3]

Variation in yield also was low in period I, comparatively, because the co-efficient of variation of yield in period I (1.38 per cent) was lowest to those of period II (5.73 per cent), period III (6.99 per cent) and entire period (8.49 per cent).

Performance of Food Crops and Non-food Crops.

Production of food crops and non-food crops can be analyzed separately such that a better insight into the process of agricultural growth can be obtained.

Food Crops.

Production of food crops grew at an average annual rate of one per cent over the entire period. The area under food crops declined during the entire period at an average annual rate of -1.18 per cent. This decline in food crop area has taken place because of shift in area from food crops to non-food crops. [see Table 2.4] Though the area under food crops has declined, the yield increased at an average annual rate of 2.20 per cent, which was sufficient to keep production without significant

change. In period I, however, food crops production growth rate was 7.01 per cent per annum, which was contributed to a large extent due to the growth in yield (5.58% per annum) and to a certain extent (1.43% per annum) by the growth in area. On the contrary, period II experienced a decline in area under food crops at the rate of -1.47 per cent per annum. In addition to this, an average annual decline in yield at the rate of 0.70 per cent made production decline at the rate of 2.19 per cent per annum. Despite the growth in yield at the annual rate of 1.6 per cent per annum, the production in period III has declined at the rate of 2.51 per cent per annum due to the sharp decline in the area (-4.08% per annum).

Wide fluctuation was experienced in food production in period I compared to periods II and III. The co-efficient of variation of food production in period I was 15.07 per cent, while it was 9.86 per cent in period II, 8.57 per cent in period III, and 17.01 per cent during 1962/63 to 1990/91. Yield of food crops was stable in period III, with lowest co-efficient of variation (1.64 per cent), compared to 6.45 per cent in period I, 7.62 per cent in period II and 10.57 per cent for entire period. [see Table 2.3]

Table 2.4
Proportion of area under food and non-food crops to total cropped area.

Year	Food crops	Non-food crops
1962/63	51.34	48.66
1963/64	50.78	49.22
1964/65	50.07	49.93
1965/66	49.74	50.26
1966/67	48.61	51.39
1967/68	49.56	50.44
1968/69	49.26	50.71
1969/70	48.48	51.52
1970/71	47.73	52.27
1971/72	47.57	52.43
1972/73	47.05	52.95
1973/74	46.91	53.09
1974/75	47.11	52.89
1975/76	48.29	51.71
1976/77	47.86	52.14
1977/78	46.93	53.07
1978/79	45.61	54.39
1979/80	44.57	55.43
1980/81	44.58	55.42
1981/82	44.52	55.48
1982/83	42.92	57.08
1983/84	41.72	58.28
1984/85	40.43	59.57
1985/86	37.94	62.06
1986/87	36.97	63.03
1987/88	33.71	66.29
1988/89	31.95	68.05
1989/90	31.27	68.73
1990/91	29.58	70.42

[Source : Same as in Table 2.1]

Non-food Crops.

Production, yield and area of non-food crops registered positive growth rates in the entire period, but yield growth rate was found too low in magnitude, 0.38 per cent per annum. Growth rates of production, and yield were the highest in period III compared to those in the other sub-periods.

The rates of growth in production, area and yield, achieved by non-food crops has more than compensated by the poor growth performance of food crops in period III. And this has contributed to the recovery of agricultural growth in this period.

Production of non-food crops was comparatively stable in period I (C.V.=3.55%). The sub-periods II and III gave almost equal measure of variability (C.V. respectively, 10.77% and 10.50%), and the entire period of analysis showed the high fluctuation with the co-efficient of variation 14.03 per cent. [see Table 2.3]

Section III.

Growth Rates at Region Level

All Crops.

Thiruvananthapuram, Kollam, Pathanamthitta, Alappuzha and Thrissoor districts registered only very low rates of growth in area and production in agriculture during the entire period under study. Kottayam, Idukki and Eranakulam districts experienced relatively high average annual growth in area (1.06 % per annum), production (2.76% per annum) and yield (1.73% per annum). Thrissoor also experienced the same rate of growth in yield (1.73%). Districts of Malappuram, Palakkad, Kozhikode, Wyanad, Kannoor and Kasaragode also realised 1.06 per cent growth in area and 2.36 per cent growth in production, annually, however, yield

growth rate attained was low (1.27% per annum). [see Table 2.5] Variation in production also was high in KIE group region (C.V. = 16.90%). Yield instability in total agriculture during the entire period was more in the case of Thrissoor. [see Table 2.3]

For the period as a whole, all the regions witnessed absolute increase in the growth of agricultural output. [see Table 2.2] In the regions of Thrissoor, KIE Group and Thiruvananthapuram, the contribution of area effect was very high in output growth compared to yield effect, while yield effect was more, in QPA and MPKWKK Groups. Cropping pattern effect on output change was relatively low in all regions for the whole period (and was depressive in the case of QPA Group and Thrissoor).

In period I, all the regions experienced more than 2 per cent growth in gross cropped area with the exception of Thrissoor, which realised only 1.95 per cent growth. QPA group stood first in output growth (5.62 per cent per annum), and next to it was Thiruvananthapuram (with average annual growth rate of 5.18 per cent). Yield growth rate was highest in the case of QPA region (3.34 per cent per annum), and MPKWKK region experienced the least annual rates of growth in production (3.11 per cent, per annum) and yield (0.70 per cent). [see Table 2.5] The growth in production experienced in period I was mainly due to the high growth rate in cropped area. Area contributed more to average change in absolute production in Thiruvananthapuram and KIE group

regions, while yield was the major contributor in the case of QPA group. Considerable effect of cropping pattern on output change also was identified in all regions except QPA Group in period I. Thrissoor experienced almost equal effects of cropping pattern and yield in output change. [see Table 2.2]

Period II witnessed deceleration in agriculture in all the regions. Kollam, Pathanamthitta and Alappuzha districts experienced considerable decline in area under cultivation and in production during 1973/74 to 1982/83. Absolute change in output was negative in all regions, except KIE group. Area effect was found more on output change in all regions except KIE group and MPKWKK Group, which experienced the effects of yield more.

In the third phase, all regions experienced average annual rates of growth in production at a rate of about 2 per cent per annum. With a more than one per cent growth per annum, in area under cultivation, MPKWKK region recorded the highest rate of growth in agricultural output (4.44 per cent per annum), during 1983/84 to 1990/91. All the regions experienced growth in production mainly through increase in yield. Yield increase was highest (3.71 per cent per annum) in Thiruvananthapuram region and was least in QPA group in period III. [see Table 2.5] Change in absolute production annually was mainly due to cropping pattern effect in Thiruvananthapuram, area effect in KIE Group, and yield effect in other regions. [see Table 2.2]

Table 2.5

Region-wise Average Annual growth rates of Area, Production and Yield.

Region	1962/63 to 1990/91			1962/63 to 1972/73			1972/73 to 1982/83			1982/83 to 1990/91		
	Area	Prodctn	Yield	Area	Prodctn	Yield	Area	Prodctn	Yield	Area	Prodctn	Yield
Thiruvananthapuram												
Total Agriculture	0.28	1.82	1.42	2.83	5.18	2.24	-1.55	-2.66	-1.22	-0.64	3.24	3.71
Food crops	-1.30	2.08	3.30	2.74	10.42	7.41	-2.62	-1.15	1.45	-4.70	-4.31	0.45
Nonfood crops	1.60	2.42	0.67	3.00	3.09	0.14	-0.30	-3.67	-3.28	2.24	9.19	6.28
QPA Group												
Total Agriculture	0.30	1.46	1.17	2.26	5.62	3.34	-1.67	-3.70	-2.03	0.32	2.70	2.46
Food crops	-0.94	1.55	2.49	1.79	9.96	8.07	-2.11	-4.34	-2.16	-2.88	-1.61	1.32
Nonfood crops	1.39	1.61	0.30	2.84	3.65	0.81	-1.19	-3.24	-2.07	2.81	5.11	2.62
KIE Group												
Total Agriculture	1.06	2.76	1.73	2.19	4.01	1.83	0.15	0.84	0.76	0.77	3.60	2.83
Food crops	-1.05	1.69	2.80	1.17	8.23	7.08	-0.44	-0.41	0.14	-4.60	-3.87	0.78
Nonfood crops	2.07	3.08	1.04	2.86	2.90	0.10	0.56	1.42	0.89	2.98	5.39	2.41
Thrissoor												
Total Agriculture	0.28	1.95	1.73	1.95	4.47	2.49	-0.45	-0.71	-0.14	-0.89	2.12	3.12
Food crops	-1.04	0.35	1.48	0.65	3.50	2.79	-0.31	-1.21	-0.70	-4.08	-1.64	2.57
Nonfood crops	2.13	2.73	0.68	4.15	5.02	1.06	-0.26	-0.27	0.01	2.58	3.62	1.05
MPKWKK Group												
Total Agriculture	1.06	2.36	1.27	2.40	3.11	0.70	-0.26	-0.06	0.20	1.04	4.44	3.32
Food crops	-1.05	0.85	1.92	1.36	5.30	3.93	-1.45	-1.61	-0.14	-3.57	-1.63	1.97
Nonfood crops	2.54	2.86	0.28	3.46	2.31	-1.11	0.73	0.63	-0.08	3.65	6.32	2.46

[Source : Same as in Table 2.1]

Food Crops.

Area under food crops declined in all regions during the entire period. Decline in area under food crops was more in Thiruvananthapuram and was least in QPA Group.

Although area under food crops declined during the whole period, production registered positive growth rate due to growth in yield in all the regions. Highest growth in food crops' production and yield was attained in Thiruvananthapuram region (2.08% and 3.3% per annum,respectively), and the lowest was in

Thrissoor (0.35% and 1.48% per annum, respectively).

In period I area, production, and yield of food crops registered positive growth rates in all the regions. Thiruvananthapuram registered high growth rate in area and production, while yield growth rate was high for QPA Group. During this period performance of Thrissoor was the least impressive.

Period II showed decline in area and production, in all regions. Only Thiruvananthapuram and KIE group registered positive growth rate of yield, in period II.

In period III, annual rate of decline in area under food crops (varied between 2.88 per cent in QPA Group to 4.70 per cent in Thiruvananthapuram) increased from that of period II (below 3 per cent). Food production also declined in all regions, in spite of the low rates of growth in yield attained. Thiruvananthapuram and KIE group experienced sharp decline in food crops production.

Non-food Crops

Area under non-food crops as well as its production registered a positive growth rate in the whole period, in all regions. Production growth rate was highest in the region of KIE Group (3.08% per annum) and QPA group registered the least

growth rate (1.61% per annum). Yield growth rates were low in magnitude, though all positive. However, this need be explained with due attention to some other factors like bearing period of perennial and tree crops, replanting practices followed, etc., which were not brought into analysis here.

Period I showed a faster rate of increase in non-food crop area than that of food crops in all the regions [see Appendix 2.3]. However, production grew at low rates, compared to that of food crops in all regions except Thrissoor. Highest average annual growth rate in non-food crops production was attained by Thrissoor (5.02 per cent), in period I, and the lowest by MPKWKK Group (2.31 per cent).

Period II showed decline in area under non-food crops and production in all regions, except KIE Group and MPKWKK group. Yield of non-food crops also was declining in all regions, except KIE group and Thrissoor regions.

Period III marks high growth rates in non-food crops production, in all regions (more than 5% per annum) except Thrissoor. The highest average annual growth rate of area (3.65 per cent) was experienced by MPKWKK Group. Thiruvananthapuram experienced the highest growth rate in non-food crops production (9.19 per cent), and yield (6.28 per cent).

The region-wise analysis points out that there is a remarkable similarity across regions in terms of area change and yield growth for food and non-food crops. However, Thiruvananthapuram deviates from the performance of the other regions, in terms of growth in the case of non-food crops.

Section IV.

Crop-wise Growth Rates.

Crop-wise analysis of growth rates at state and district levels help to identify crop specific factors influencing its respective performance. Growth rates of major crops have been examined at state and district level.

1. Paddy

Paddy is the major food crop produced in Kerala. About 72 per cent of area under food crops was occupied by paddy in 1990/91. However, area under paddy declined considerably over the period of analysis and the rate of decline was of 1.34 per cent per annum. In period I area under paddy in the state grew at an average annual rate of 0.88 per cent, which was more than off-set by a decreasing growth rate of -1.13 per cent in period II. Period III experienced a sharp decline in paddy area, at the rate of 4.39 per cent per annum.

Growth rate of paddy production was only 0.17 per cent per annum, during the entire period studied. Period I experienced a positive growth rate (2.51% per annum), while in periods II & III it had declined. The rate of decline in paddy production was high in period III (G.R.=-2.03%) compared to that in period II (G.R.=-0.42%). Yield registered an average annual growth rate of 1.39 per cent during the entire period, while Period III realised, comparatively, the highest rate of growth (1.94 per cent).

Regional analysis of paddy growth rates over the whole period gave the following results. Thiruvananthapuram experienced sharp decline in both area and production, while the OPA group including Kollam, Pathanamthitta and Alappuzha districts registered lowest rate of decline in area (G.R.=-0.64% per annum) and at the same time experienced the highest growth rates regionally, in both production (1.01% per annum) and yield (1.77% per annum). All regions experienced negative growth rate in area. Although yield grew at average annual rate of more than one per cent in all regions, the least rate of growth was registered by Thiruvananthapuram (1.05%).

In period I, both Thrissoor and Thiruvananthapuram regions registered low growth rates, while KIE group experienced the highest rates of growth in area, yield and production. In period II, Thiruvananthapuram witnessed more decline in area and production compared to other regions. All the regions experienced

decline in area under paddy, in period II, and the growth in production realised by QPA group and KIE group regions was due to the growth in yield. The regions of Thrissoor, Thiruvananthapuram and MPKWKK group registered only too low growth rates of yield (G.R.<0.5% per annum). However, QPA group and KIE group regions registered yield growth rates of 1.88 per cent and 2.06 per cent, per annum, respectively.

Period III showed sharp decline in paddy area in all regions (varying from 2.61% per annum in QPA group to 4.73% per annum in KIE group). Production also showed dismal results. The rate of decline in paddy production was the highest in KIE region (G.R.= -3.92% per annum), and the rate of growth it attained in yield also was too low (0.68 per cent per annum). [see Appendix 2.1]

At the state level production instability was more compared to that of area and yield of paddy, in the entire period. Instability in area and production was more in KIE, while in Thrissoor and Thiruvananthapuram yield varied more. Production and yield varied more in period I, compared to other sub-periods. [see Appendix 2.2].

2. Tapioca

Tapioca is used as a cereal substitute as well as for

industrial production. It occupies the second place in food crops production. Though the area under tapioca declined (G.R.=-1.25% per annum) over the whole period under analysis, production grew at the average annual rate of 3.01 per cent, at state level. Yield growth rate was considerable in the entire period (4.5% per annum). In period I, area, production and yield experienced high growth rates. But period II gave sharp decline in production, because of decline in both area and yield. Period III registered the highest rate of decline in area (5.29 per cent per annum), compared to other periods and this reduced output at the average annual rate of 3.8 per cent, despite the increase in yield at the rate of 1.64 per cent.

Area under tapioca in Thiruvananthapuram, QPA and KIE regions declined, while Thrissoor and MPKWKK regions experienced growth in area. But production grew in all regions at rates more than 2.5 per cent per annum, during entire period. During the same period, yield growth rates varied between 4.36 per cent in QPA to 6.57 per cent, per annum, in KIE region. In period I, MPKWKK ranked first in area and production growth rates, but yield growth rate was high in the KIE group region. And in periods II and III decline in area and production was found sharp, in all regions. However, yield of tapioca in period III was increasing in all regions.

Production was highly fluctuating than area and yield for

the entire period. Production showed high co-efficient of variation in period I than in periods II and III, while yield variation was more in period II. Regionally, Thrissoor suffered more, although all regions experienced highly unstable production and yield.

3. Banana & Other Plantains

Production and yield of banana & other plantains registered average annual growth rates of 2.69 per cent and 1.18 per cent respectively during the whole period under study. Area under banana and other plantains increased at an average annual rate of 1.65 per cent in the entire period. However, periods I and II showed poor performance in area, production and yield. In period III, bananas & other plantains registered considerable average annual rates of growth in area (4.00 per cent), production (6.96 per cent) and yield (2.56 per cent) indicating a recovery from the poor performance experienced in previous sub-periods.

Region-wise, KIE experienced highest growth rates in production and yield, while Thiruvananthapuram ranked first in rates of growth of area, in entire period. Thiruvananthapuram registered high growth rates in area and production in period I, and continued the same growth performance in area only in period II. In period II, production and yield growth rates were high in KIE region. In period III, however, all other regions except

Thiruvananthapuram experienced high rates of growth in production (more than 5.8% per annum). Regions of QPA and MPKWKK realised more than 8 per cent growth in output per annum. Yield registered positive growth rates in all regions, but was the highest in QPA region (6.18% per annum). [see Appendix 2.1]

Production and yield of banana & other plantains fluctuated more compared to area, in the entire period, at the state level. But instability in production and yield was more in period II compared to periods I and III. Production was severely unstable in Thrissoor and KIE regions during the whole period, while in period I Thiruvananthapuram and Thrissoor regions, in period II KIE and in period III MPKWKK region, suffered relatively high fluctuation in production.

4. Coconut

Area under coconut registered a growth rate of 1.77 per cent per annum, from 1962/63 to 1990/91. Production grew only at an average annual rate (1.29%), and yield has shown a declining trend. In period I, area under coconut grew at the rate of 3.31 per cent per annum, but production growth rate was only 1.76 per cent per annum. In period II, area, production and yield declined. Period III registered high average annual growth rates in area (3.28 per cent) and production (4.76 per cent), with a positive rate of change in yield (1.45% per annum). [see Appendix

2.1]

Region-wise, Thrissoor and MPKWKK experienced considerable growth in area (3.21% and 2.58% per annum, respectively), during whole period.

All regions registered positive growth rates in area and production in period I. But only Thrissoor realised a positive growth in area in period II. MPKWKK and Thrissoor regions experienced tremendous rates of growth in area (5.45% and 4.5% per annum, respectively), and Thiruvananthapuram region realised highest rates of growth in production (10.16% per annum) and yield (7.49% per annum) in period III.

Cocohut production in the state fluctuated more, than area and yield, during the whole period of analysis, but production was relatively unstable than yield and area under crop in periods II & III. Production instability was high in regions of Thiruvananthapuram and QPA group, and yield instability in the region of Thiruvananthapuram, in the entire period studied. Co-efficient of variation in production ranged from 4.49 per cent (MPKWKK group) to 10.01 per cent (Thrissoor) in period I, from 9.12 per cent (Thrissoor) to 23.10 per cent (Thiruvananthapuram) in period II, and from 12.49 per cent (KIE group) to 17.58 per cent (Thiruvananthapuram) in period III.

5. Arecanut

Production as well as area under arecanut registered only a low rate of growth (0.74% per annum), during the entire period studied. However, production and yield of arecanut in Kerala grew at average annual rates of 1.96 per cent and 1.27 per cent, respectively. All the regions except MPKWKK suffered a set-back in area under the crop, and Thiruvananthapuram experienced sharp decline in production, in the entire period.

In period I there was high growth rates in area (more than 4.5% per annum) and production in the state as well as in all regions except Thiruvananthapuram (for which growth rates were less than 2% per annum). But in period II area under the crop declined in the state as well as in all districts. Production was declining in Thiruvananthapuram, QPA and Thrissoor regions with decline in yield in Thiruvananthapuram and QPA regions, in period II.

At state level, period III was a phase of revival in growth performance. Area, production and yield increased at the annual rates of 0.85 per cent, 2.88 per cent and 2.01 per cent respectively. MPKWKK realised high annual rates of growth in area (4.38 per cent) and production (5.84 per cent), but all other regions suffered sharp decline in area. Highest yield growth rate was that of KIE group, 5.71 per cent per annum.

Area and production of arecanut in Kerala was significantly unstable in the entire period and in period II. Period I also experienced unstable performance, except in yield. In period III, production and yield varied considerably. Regionally, QPA and Thrissoor experienced wide fluctuation in area, and Thiruvananthapuram and QPA in production and yield, in entire period. In the sub-periods also fluctuation in area, production, and yield were high.

6. Cashew

Area under cashew in Kerala grew at the rate of 1.34 per cent per annum for the entire period, while production increased at a low average annual rate of 0.85 per cent. Yield declined, though at a low rate (G.R.=-0.25% per annum). Period I growth rate of area was 2.25 per cent and of production was 2.30 per cent, per annum. In period II, area under cashew increased in Kerala at the average annual rate of 3.43 per cent, but production and yield declined sharply. A recovery in production (G.R.=4.63% per annum) and yield (G.R.=7.01% per annum) of cashew in the state was experienced in period III, though area under the crop declined.

Considering the whole period of analysis MPKWKK and QPA regions experienced growth in area under cashew. A sharp decline in production was experienced in KIE region, while all other

regions registered growth in production. Yield was declining in QPA and KIE regions, in the entire period. Region of MPKWKK experienced high growth rates in area and production in period I, but the growth rates it realised in period II was highly depressive in production and yield. It is important to note that KIE region registered sharp decline in area, production and yield in the entire period.

In period III also decline in area was at high rates in all regions with an exception of QPA. Production in Thiruvananthapuram, QPA and MPKWKK regions registered high growth rates, while other regions showed decline in production.

Cashew production and yield in the state experienced considerable fluctuation over the whole period studied. Instability in production and yield was more in periods II and III, than in period I. Production and yield instability was high in the regions of Thrissoor and Thiruvananthapuram, for the entire period.

7. Sesamum

Production and yield of sesamum in the state registered low rates of growth (0.54% and 1.22% per annum, respectively) during the entire period studied. But area under sesamum in Kerala declined, at the average annual rate of 0.39 per cent. In period

I, production and yield grew at the rates of 3.91 per cent and 3.80 per cent, per annum, while change in area was insignificant. Period II experienced growth in area and production, at low rates. Sharp decline in area (-4.75% per annum) and production (-4.63% per annum) was experienced at the state level in period III.

Thiruvananthapuram, KIE and MPKWKK region registered high growth rates in area and production. Other regions performed badly in production and yield. In period I, production and yield increased at the rates of 5.83 per cent and 5.56 per cent, per annum, respectively in QPA region. But in period II this region experienced sharp decline in production and yield. The growth rates attained in production and yield in Thrissoor, in period I was counteracted by the decline experienced in period II. In period II, yield growth in MPKWKK group region was distinct (4.47 per cent, per annum). Period III was a phase of decline in area under sesamum and production (except in Thiruvananthapuram and KIE regions), in spite of the growth in yield attained in all regions, except MPKWKK region.

Fluctuation in production and yield of sesamum in Kerala was significant in the entire period as well as in all the sub-periods considered, except period II. Variation in area and production was high in Thiruvananthapuram and Thrissoor regions during entire period.

8. Rubber

Rubber is the most attractive plantation crop to farmers, because of the prospective earnings it assure due to dynamic industrial demand. Even small farmers in midland and high land regions of the state are turning to rubber cultivation. Area, production and yield of rubber in Kerala experienced high growth rates during entire period. Growth rate of area increased from 3.58 per cent per annum in period I to 6.16 per cent in period III. However, area under rubber in the state increased at the average annual rate of 4.03 per cent in the entire period. Though there arise much difficulties in estimating yield, production data reported by Rubber Board is reliable.

Growth rate of production in period I was 17.22 per cent per annum and in period II, it was only 5.61 per cent. Period III showed average annual growth at the rate of 9.29 per cent in production, and 3 per cent in yield. As rubber has reported increasing productivity, low growth rate in output in period II might be due to decline in yielding area. [see Appendix 2.1]

Thiruvananthapuram experienced high rate of growth in area and KIE registered highest rate of growth in output in the entire period analyzed, while Thrissoor performed poorly. Period I showed considerable growth in rubber production and yield in all regions. In period II also rubber production grew at high rates

(more than 5% per annum) in all regions except Thrissoor. High rates of growth in production (11.8 per cent, per annum in Thiruvananthapuram and 10.17 per cent in MPKWKK) and yield (12.63 per cent in Thrissoor) were achieved in period III. However, Thrissoor registered a sharp decline in area at an average annual rate of 3.47 per cent in period III.

Fluctuation in production and yield of rubber in the state was high in the entire period studied. Instability was greater in period II compared to periods I & III. Variation in area was high in Thiruvananthapuram, in the entire period considered, while rubber production and yield were unstable in KIE region. [see Appendix 2.2]

9. Pepper

Kerala is the land of spices, and pepper production in India is confined to the states of Kerala and Karnataka. About 97 per cent of India's pepper production is in Kerala. However, area, production and yield of pepper in the state increased only at low rates of 2.07 per cent, 4.34 per cent and 1.69 per cent per annum respectively, during 1962/63 to 1990/91. In period I growth rate of area (1.76 per cent) was higher than the growth rate of production (0.48 per cent). In period II area under pepper declined, but production and yield grew at low rates. Production grew at a higher rate (13.94 per cent per annum) than area (5.93

per cent) in period III, because of the growth in yield at the average annual rate of 6.27 per cent.

Regionally, Thrissoor district registered relatively high growth rates in area and production, during the entire period studied. Production and yield increased in all regions, while Kollam, Pathanamthitta and Alappuzha districts together registered fairly high growth rates in area and production with a low rate of growth in yield. Kottayam, Idukki and Eranakulam region experienced an increase in area under pepper at the rate of 3. 82 per cent per annum with a significant rate of growth in output (7.90 per cent per annum). Thrissoor, Thiruvananthapuram and OPA group rank respectively in giving high growth rates in output and yield in period I. In period II, OPA group and Thrissoor regions experienced high rates of growth in area and production. But yield grew in MPKWKK only. In period III production grew at high rates in all regions, while area under pepper increased considerably in KIE, Thrissoor and MPKWKK regions. Only Thiruvananthapuram experienced decline in area under pepper. Yield grew at the rate of 17.79 per cent in KIE group region in period III, though all other regions also realised high rates of growth in yield. [see Appendix 2.1]

Pepper production in Kerala was highly unstable in the entire period and in period II. All the regions experienced wide fluctuation in area, production and yield in the entire period.

10. Cardamom

Cardamom also is an important spice produced in Kerala. At the all India level it ranks next to Sikkim, the highest producer. However, area under cardamom is more in Kerala compared to the other four states producing cardamom, viz. West Bengal, Karnataka, Tamil Nadu and Sikkim. Area under the crop and production in the state grew at the rates of 2.47 per cent and 6.83 per cent, per annum, respectively during the whole period of analysis. Growth rate of yield was 6.19 per cent per annum, in the entire period, at state level. Only in period I area registered a significant growth rate. In period II also area under cardamom increased, but at a low rate per annum. However, production and yield registered significantly high rates of growth in period II. Period III experienced a decline in area under cardamom, but the rates of growth attained in production (10.31 per cent per annum) and yield (15.14 per cent per annum) was very impressive.

Idukki district accounts for the lion share of cardamom production in the state. Only two regions are worth the comparison for the performance in cardamom cultivation. The region of MPKWKK group experienced high growth rates in area compared to the other, KIE group, during the entire period studied. However, production and yield grew at higher rates in KIE group region during the whole period. The MPKWKK group region

registered highest growth rate in production in period II, but KIE group region registered highest production growth in period III. The region of KIE group experienced high growth rate of area in period I (7.74% per annum) and in period III, area under cardamom declined at the average annual rate of 2.6 per cent.

Fluctuation in production and yield of cardamom in Kerala was high in all the periods analyzed.

11. Coffee

Coffee production in Kerala is mainly from Palakkad, Kozhikode, Kannoor, Idukki and Kottayam districts. Area under coffee in the state registered growth rates of 5.17 per cent and during the entire period under consideration.[6] Average annual growth rate of production and yield shows high magnitude (54.71 per cent and 48.34 per cent, respectively) because of the wide fluctuation in production experienced during early 1980s. In period I also the rates of growth were high in both area and production. In period II area grew significantly (5.65% per annum), but in period III, the rate of growth was very low (3.41% per annum).

The region-wise analysis of coffee production was not done,

[6] Growth rates of coffee are estimated for the years from 1962/63 to 1989/90 only.

because of insufficient data (district-wise). Instability in area, production and yield of coffee was significant at state level during the whole period analyzed. The sub-period III, showed wide fluctuation in coffee production (C.V.=57.99%) and yield (C.V.=59.66%).

12. Tea

Tea is an important plantation crop in Kerala. The agro-climatic conditions of Idukki district which is suitable for tea, is the major producer of tea in Kerala. At the state level, area under tea declined over entire period of analysis. However, production and yield grew at the rate of 2.21 per cent and 2.58 per cent per annum, respectively. In period I area change was not significant, but it declined in periods II & III. Production and yield registered high growth rates in period III.

The regions of KIE group and MPKWKK group registered growth in tea production in the entire period, (at rates more than 2% per annum). The MPKWKK group region registered high rate of growth in yield (5.61% per annum) for the whole period. In period I all the regions performed poorly in tea production and yield, except QPA group region, while in period II, only MPKWKK group region did well in production and yield of tea. All the regions experienced considerable growth in production and yield in period III.

Conclusions

From the analysis of agricultural performance in Kerala at state and regional levels one could see that the growth is recovering from decline since early 1980s. Total agriculture showed growth in production and yield due to a shift in cropping pattern in favour of high valued nonfood crops. Regional disparities in agriculture is noticeable. Even non-food crops production and yield growth rates varied considerably in different regions.

As we have noted in the introductory chapter, the factors underlying the trends and patterns of agricultural growth in Kerala has been attempted by a number of earlier studies. On a general plane , these studies attempted to explain it in terms of economic, technological, institutional and environmental factors. However, what is lacking in such studies is the manner in which these factors interact each other and influences the performance of agriculture. In a state where there is considerable variations in the micro environment in which agriculture is carried out, insight into the process of interaction can be best understood by undertaking micro level case studies. In the rest of this study we have made an attempt in this direction.

Chapter III

Kalliasseri Panchayat : The Ecological Setting.

In the last chapter we have examined the trend in the growth of agriculture in Kerala. Even though there are definite signs of recovery during the 1980s, the longrun trend growth rate from 1962/63 to 1990/91 is below all India average. What are the economic, institutional, technological and environmental factors that stand in the way of Kerala realising its full growth potential? Some insights into these questions can be obtained through a micro level case study. As mentioned in the introductory chapter, Kalliasseri panchayat of Kannoor district is the case chosen. In the present chapter we shall be focusing up on the ecological and environmental aspects, with special reference to land and water resources of the panchayat.

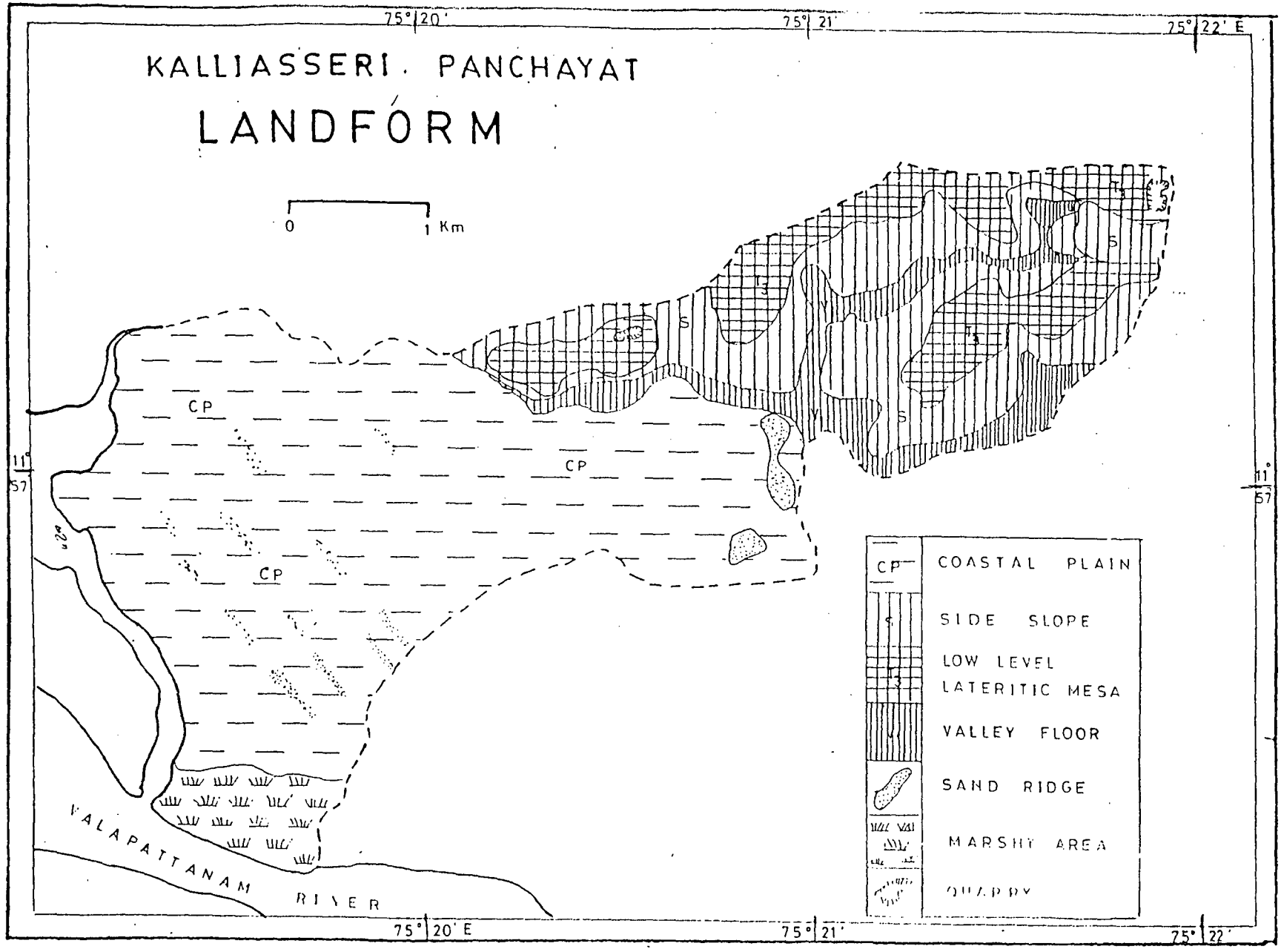
Even though Kalliasseri is a coastal panchayat with major pattern of the land area being typical coastal plain, it also contain a hilly terrain which is more akin to the mid land region of Kerala. The hilly terrain which is confined to the North-Eastern part of the panchayat may be further divided into the three distinct zones : the hill terraces, side slopes and the valley floor. A small portion of the panchayat in the South-Western corner adjoining the Valapatanam river is tidal marshy land. The panchayat contains a variety of land forms and they are examined in greater detail in section 1. A brief discussion of

the water resources of the panchayat is presented in section 2. Combining the land forms, water availability and land use potential, the panchayat is divided into broad five zones. Section 3 of the chapter shall examine the major social interventions in the natural system and their impact, particularly during the last half a century. Our discussion is based on the Land and Water Resources Maps of the panchayat prepared as a part of PLRMP. We have also liberally borrowed from the various notes being prepared for the Panchayat Level Action Programme Report drawn up at Integrated Rural Technology Centre.

Section 1.
Land Resources.

The map 2 gives a bird's eye view of the location of the five major land forms in the panchayat namely laterite terrace, laterite slopes, valleys, coastal plain and marsh lands.

Table 3.1 gives area under each of the land types estimated through map measurement. The coastal plain contributed the single largest land form covering 60 per cent of the area of the panchayat. The laterite terrace and valley floor each contribute around 11 per cent of the total area.



M. Ramachandran.

Map 2

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Table 3.1
Estimated Area of the Major Land Forms in Kalliasseri Panchayat (sq. metre).

			% to total
1. Hill Terrace		17819	11.59
Laterite without soil covering	6316		
Terrace with laterite soil covering	11503		
2. Slopes		27011	17.57
Gentle slope	11225		
Moderate slope	14886		
Steep slope	900		
3. Valley floor		16821	10.94
4. Sandy Plain		85351	55.50
Salinity affected	16975		
Not affected by salinity	66724		
Sand ridges	1652		
5. Tidal Marsh		6771	4.40
Total Area		153773	

[Source : Estimated from Land Use Map, Kalliasseri Panchayat, Centre for Earth Science Studies and Kerala Land Use Board]

1. Hill Terrace :

The hill terrace zone is generally 20 to 40 metre above the sea level and consists of laterite formations. Only a small portion of the hill terrace of less than 5 per cent of the terrace area is higher than 40 metres and the peak is around 60 metres. Around 40 per cent of the terrace is hard weathered laterite rock or duri crest with only patches of 1 to 2 cm of soil cover or no soil cover at all. The soil drainage is poor and the surface water run off is very high. These render the duri

crust zone unsuitable for cultivation. But for occasional cashew trees and non-crop trees, the vegetation is limited to grass that come up during the monsoon. The waste lands traditionally were therefore used as grazing fields for cattle. The grass was also used for thatching purposes.

The rest of the terrace has a laterite gravely loamy soil cover suitable for various types of the crops like coconut, jack fruit, arecanut, and the various mixed crops typical of homestead farms of Kerala. The surface water run off is high here also. Soil drainage is moderate.

2. Side slopes :

Because the height of the laterite terrace is only 20 to 40 metres the hill slopes are not too steep. Moderately steep side slopes with 10° to 15° of slope contributes only 3 per cent of the slope area. There exists only few patches of serap faces that suffer from acute soil erosion problem. 41 per cent of the slopes are of gentle radiant less than 5°. The soil and drainage conditions are similar to the non duri crest hill terrace. Therefore the vegetation cover constitutes a continuum.

3. The valley :

The valley floors constitute a narrow strip along the foot

hills stretching from East to West in the North-Eastern part of the panchayat. It forks into two in the midway. The upper fork constitutes a micro watershed which falls fully within the panchayat, while the lower fork constitutes a part of a larger watershed, major portion of which falls in the adjoining panchayat of Pappinisseri. The valley soil is riverine alluvium deposited by the rivulets that flow through the valley. The valley soil in the eastern ends of the valley system has higher sand content (sandy clay - sandy clay loam), while in that in the western reaches have higher silt content (silty clay - silty clay loam). The soil is imperfectly drained. The valley floor is generally 0-20 metres from sea level.

The valley constitutes most fertile part of the panchayat enriched by silt and water of the rivulets. The area is ideal for paddy cultivation. Nearly 60 per cent of the paddy fields, situated in the upper reaches and those nearer to rivulets used to be double cropped. In certain plots even three crops were being raised. Pulses were grown as a third crop in most parts of the valley in the past.

4. Sandy Plain :

Sandy plain, typical of Kerala coastal plain is below 20 metres contour. The soil is coastal alluvium loamy sand type and is of low fertility in the absence of organic-bio ingredients.

Because of the clay layer 1.5 metre below the surface, the soil is imperfectly drained. The plain is inter spersed with sand ridges running parallel to the coastline creating shallow sand basins in between. Today the remnants of the sand ridges which have been severely modified by human intervention constitutes mere one per cent of the sandy plain. It is evident that coastal plain was formed through marine actions.

The soil is suitable for a variety of crops including paddy and coconut. Paddy varieties suitable for rainfed dryland cultivation is raised here. The natural tree vegetation is much lower in the sandy plain when compared to the slope or the terrace.

5. The Marsh Lands :

The 67 hectares of land in the Southern most part of the panchayat adjoining Valapatanam river constitutes the tidal marsh. There is also a smaller inland portion of marshy land in North-Eastern part of the panchayat by the Iranavu Thodu. The soil is riverine alluvium type of black clay and poorly drained. The marsh is ideal for fish culture or could even be utilized for paddy cultivation if properly drained.

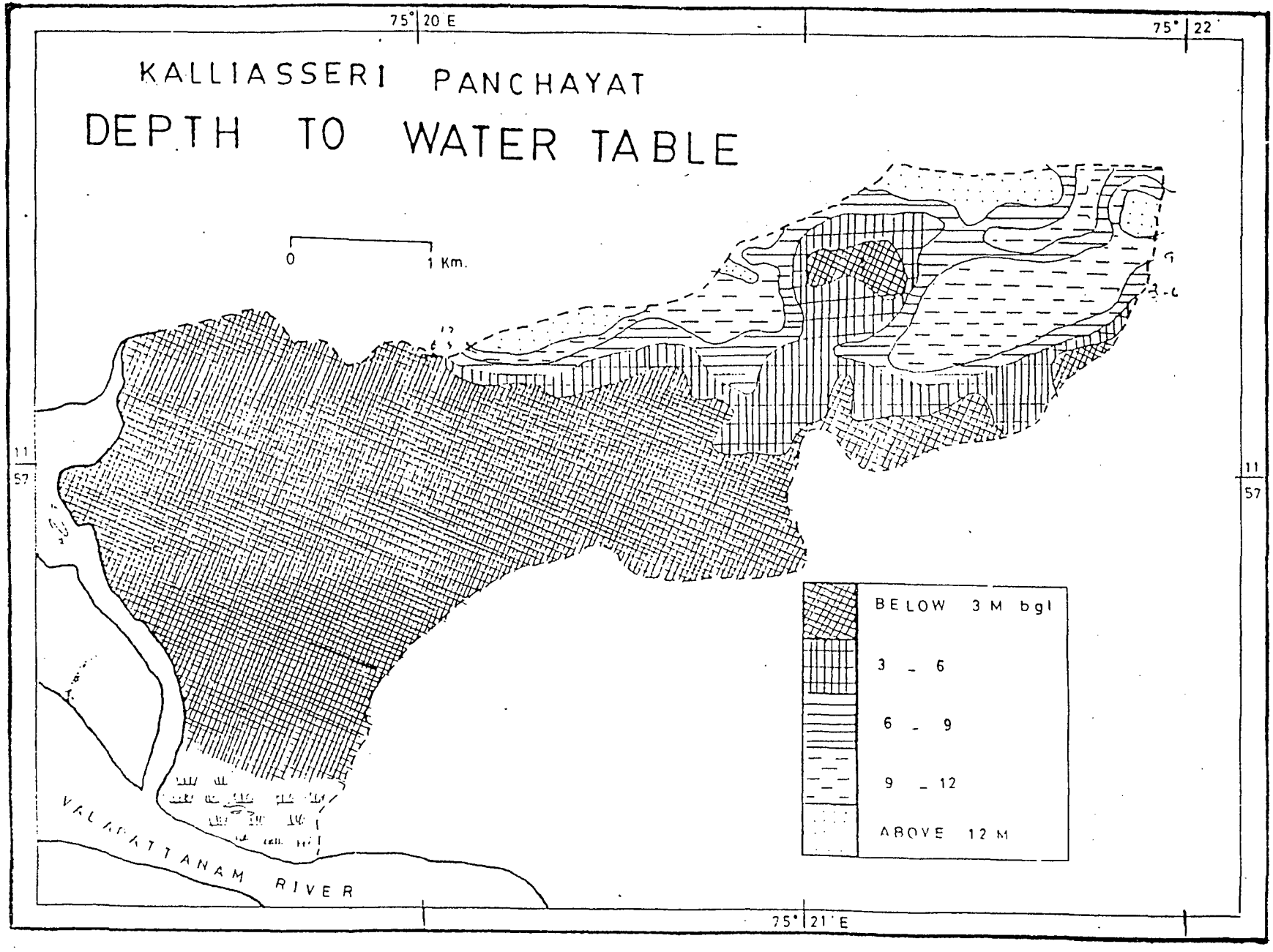
Section 2.

Water Resources.

There are four hydrological factors that influence the water resources of the panchayat namely, 1) the South West monsoon, 2) the Valapatanam river system, 3) the valley rivulets, and 4) drainage system in the coastal plain.

The rainfall pattern at Thalipparamba weather station near to the panchayat gives the seasonality of and quantum of rainfall during the last seven years. The following observations may be made from table 3.2. The average rainfall in the panchayat has been 259.7 cm for last seven years. Around 76.71 per cent of it falls in the months of June, July and August. The second monsoon during October-November contributes 9.56 per cent of the rainfall only. The heavy concentration of the rainfall within a short duration raises two sets of issues, a) problem of drainage during monsoon season and b) problems of water scarcity in the summer. These problems are aggravated by the high run off from laterite hills.

The Valapatanam river touches the panchayat only at its southern tip. The major drainage canal from the pancahayat constituting the southern boundary of the panchayat joins the Valapatanam river near the southern marshy lands. Being close to the mouth of the river, the river water is brackish during the



Map 3

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monsoon. The salt water intrusion increases in the summer. As a result, at present 20 per cent of the coastal plain zone is affected by salinity.

Table 3.2
Monthly Rainfall recorded at Thalipparamba.

Months	Years							Average
	1985	1986	1987	1988	1989	1990	1991	
January	7.3	3.0	..	..	..	..	..	1.5
February	..	16.8	..	..	..	..	..	2.4
March	..	12.9	..	..	..	..	..	1.8
April	45.2	6.1	..	67.4	51.2	..	..	24.3
May	186.6	46.4	73.9	169.4	179.8	636.6	118.7	201.6
June	1179.9	1178.7	700.8	886.6	1135.1	892.4	890.2	980.5
July	587.9	522.4	448.0	868.4	795.1	1075.6	1296.6	799.1
August	684.7	495.6	458.9	627.8	521.4	742.6	746.2	611.0
September	95.8	174.5	117.9	444.8	203.6	192.6	62.0	184.5
October	260.8	152.7	186.8	47.7	193.0	226.9	173.8	177.4
November	100.8	187.3	212.2	35.9	120.6	68.2	122.4	121.1
December	24.4	6.2	47.8	..	..	..	..	11.2
Total	3173.4	2802.6	2246.3	3148.0	3199.8	3834.9	3409.9	3116.4
Average	264.5	233.6	187.2	262.3	266.6	319.6	284.2	259.7

[Source: Thalipparamba Weather Recording Station]

The rivulets that flow through the valley is mostly rainfed. This is particularly so for the rivulet in the upper fork of the valley which originates in the laterite terrace zone. The catchment area of this rivulet is relatively small and it dries up for most part of the summer. The second rivulet flowing through the lower fork of the valley along the panchayat boundary has a larger catchment area and originates from a head pond in the upper portion of the second valley. But even this rivulet would dry up in the height of summer. The two rivulets join together at the fork junction and flow through the eastern lower

portion of the valley and then along the north-eastern border of the coastal plain and is known as Kandachira Thodu. It finally drains into Iranavu Thodu. The valley rivers largely perform the function of drainage channels during monsoon and to a lesser extent function as irrigation source during post monsoon season.

Attention may also be drawn to the natural drainage system for the coastal plain. Given the sand ridges that run parallel to the coastline and shallow basins, natural drainage during monsoon must have been towards the north western direction into the Kandachira Thodu. It is not possible to clearly delineate these drainage flows due to widespread human intervention in the natural system. The flow data during the recent monsoon has not yet been analyzed. All that we wish to emphasise here is the importance of such a net work of drainage channels given flat terrain and imperfect soil drainage quality in order to prevent water logging.

Finally, some remarks may also be made on the ground water availability. Only data on the depth to water table as measured from wells has been analyzed and therefore no rigorous statement can yet be made on ground water potential. Ground water is available in less than three metres depth throughout the coastal plain. There is also smaller patch of such area in the upper fork of the valley. In the rest of the valley zone depth to the water table is 3 to 6 metres. In most part of the laterite terrace the

water table is between 9 to 12 metres of depth. In around less than a quarter of the laterite terrace the water table is deeper than 12 metres from the surface. [see Map 3]

To conclude, based upon land form, soil type, depth of water table, drainage, and vegetation, the panchayat may be divided into five eco-zones. These zones and their salient features are summarised in the chart below.

Chart 3.1

Zone	% of total area	Soil type	Elevation	Depth of water table	Vegetation	Density (Home per sq.km)	Rank order of agril. potential
1A. Laterite Duri Crest	4.11	Laterite out crop (2 cm of soil yellow - brick	20-40 m.	9-12 m. ()12 m.)	Cashew, grass	546 (1A+1B)	6
1B. Laterite Soil Terrace	7.48	Loam - reddish brown	20-40 m.	9-12 m.	Coconut, tree crops, bananas, pepper		3
2. Side Slope	17.56	Laterite soil, loam - reddish brown	--	6-9 m.	,,	195	2
3. Valley Floor	10.94	Riverine alluvium: sandy clay, silty clay loam, yellow brown	(20	3-6	Paddy	98	1
4. Coastal Plain	55.58	loam sand, white	(20	(3	Paddy, Pulse, Coconut	265	4
5. Marshy land	4.33	Clay, black	--	--	Mangroves	12	5

[Source : Estimated from Land Use Map, Kalliasseri Panchayat, Centre for Earth Science Studies and Kerala Land Use Board]

Note : Rank order in terms of agricultural potential has been made after indepth discussion with agronomists connected with IRTC.

Section 3

Major Social Intervention in the Eco-system.

The most important social intervention has been the extension of agriculture. But for the duri crest laterite zone which is uncultivable and marshy, there is virtually no waste land today in the panchayat.

Table 3.3
Kalliasseri Land Use (Area in 100 sq.M)

Land-Use	Coastal Strand Plain	CP without salinity	CP salinity affected	Sand Ridges	Tidal Marsh	Valley Floor	Hilly Area	Gentle Slope (S1)	Moderat Slope (S2)	Steep Slope (S3)	Total Terrace	Laterit Mesa (T3)	Duri Crest (T3+)	Row Total
P1	18218	16960	1258		170	4978								23366
P2						6515								6515
P3						681								681
Coconut	62658	47268	13910	1480	291	2045	9562	3644	5579	339	7879	7879		82435
Mixed Crops	904	401	346	157		787	8212	4351	3700	161	2231	1558	673	12134
Mixed Trees	92	92				924	4399	1872	2527		1278	1049	229	6693
Waste Land	317	302		15		33	700	199	449	52	4032	141	3891	5082
Cultivable wastela	70		70		451									521
Paddy wit Pulses	2809	1418	1391		48									2857
Paddy Pulses,Veget	283	283												283
Fisci Land					1583									1583
Marshy Land					4228									4228
Pepper						10	1030	779	251		505	505		1545
Arecanut						75	394	128	266		59	59		528
Cashew						736	2437	252	1837	348	1435	204	1231	4608
Laterite Quarry						37	138		138		292		292	467
Tapioca											12	12		12
Banana							139		139		96	96		235
Column Total	85351	66724	16975	1652	6771	16821	27011	11225	14886	900	17819	11503	6316	153773

[Source : Estimated from Land Use Map, Kalliasseri Panchayat, Centre for Earth Science Studies and Kerala Land Use Board]

The cropping pattern of the panchayat by the eco-zones are given in table 3.3. The following points may be borne in mind :

The area under each crop is estimated from Land Use Map in which major crop in each plot had been marked. A plot which could not be identified with a major crop has been identified as mixed crops/trees. Further the proportion of land in each plot utilized for non agricultural purposes such as for building, etc. has not been deducted from the area under cultivation. Therefore there is an element of over-estimation in the area under each crop. The table may, however, be used to have an understanding of the relative cropping pattern under various land forms.

Coconut is the most important crop accounting for 53.61 per cent of the area. The proportion of area under coconut is high as 73.41 per cent in coastal plain and 68.50 per cent in laterite soil terrace. Coconut is also an important component of the 'mixed crops' and 'mixed trees'. These latter categories dominate the side slopes. Pepper and arecanut are also important slope crops. Cashew is confined to terrace.

Paddy today is grown only in 337.02 hectares or 21.92 per cent of area. It is still the dominant crop in the valley, even though it is seen that 12.16 per cent of the valley also is coconut land. Pulses and vegetables are grown in 9.32 per cent of the paddy area as a third crop, mostly in the coastal plain.

A major transformation of the cropping pattern has been a shift to paddy cultivation, particularly in the plains. According to the settlement map of 1928, the entire area of the coastal

plain was under paddy but for the sand ridges. Coastal plain can not be considered ideal paddy land, but it is surprising that conversion of coastal plain into paddy land started in any significant scale only from late 1950s and gained momentum from early 1970s. The reason for this phenomenon lies in the agrarian relations. The tenurial conditions in the coastal plain did not permit the tenants growing tree crops. The area under paddy in coastal plain has declined from 2068.20 acre in 1928 to 526.57 acre in 1992. The tenancy legislation at the end of 1950s that gave security of tenure gave virtual fillip towards conversion. The process accelerated with land reforms Act of 1971.

According to farmers with whom we had discussion, there were two factors that influenced this crop shift. First reason was that coconut cultivation was considered to be more profitable than the 'Vadakan' paddy that was traditionally cultivated in the coastal land giving a mere 6 fold yield. Secondly coconut cultivation was less labour intensive. In Kalliasseri, the incidence of traditional agricultural labour caste was always relatively low and most of the farm operations were undertaken by the farmers themselves. As the occupational diversification of the younger generations intensified with the growth of non-agricultural employment opportunities in the vicinity, a less labour intensive crop proved to be attractive.

The crop shift to coconut cultivation is unlikely to have

caused serious ecological problems on its own in the coastal plain. The land, we would consider, is more suited for coconut cultivation than paddy. But the present tendency of coconut extension into the valley, if not socially regulated, will in future generate serious disruptions in the valley paddy cultivation. Around 12.16 per cent of the valley area today is under coconut.

Paddy cultivation has already became extinct in marsh lands. Though it has not been possible to ascertain the exact area a significant portion of the marsh lands were single crop paddy fields till a decade ago. Two reasons have been stated by farmers for the withdrawal from marsh land cultivation. First is the tendency for increasing brackishness of the river water due to decline in non monsoon season water discharge through the river over time. Thus some of the paddy fields were abandoned to mangroves which soon became nesting ground for migratory birds which turned to be menace to the remaining paddy crop. At present no paddy is cultivated in the marsh lands.

A second major social intervention has been the spread of human habitat throughout the village. Traditionally the hilly terrace and slopes were the settlement area. The ridges above in the coastal plains were populated. Today the residential density in the hilly area and coastal plain are even. The major factor has been the natural population increase itself. Between 1971 and

1981 the population in Kalliasseri increased from 16397 to 20497. It is difficult to get pre 1971 population figure for the panchayat as it was formed only in 1962.

Apart from the natural population increase there was also significant migration into the panchayat for residential purposes. Since the productivity of land was low in the coastal plain, the land prices were low. Therefore many of the workers in the adjoining industrial belt that emerged in 1970s preferred to buy residential plot in the coastal plain. It was not uncommon for those living in the terrace area or adjoining panchayat to sell their house plots and move into the coastal plain to take advantage of the land prices.

With the spread of residential houses, road net works also increased. Special mention must be made of one major infrastructural investment - the railway line from Kannoor to Mangalore which initially divided coastal plain into two halves. [see Map 1] The railway line has permanently disrupted any surface water flow from the eastern half of the coastal plain westwards into Thaliparamba river. Besides a number of larger road links have came up in the recent period, two of which run parallel to the railway line further dividing the two halves of the coastal plain. Another road from the midway running eastern river border crossing the railway line has also come up. These and other smaller road net works have been built with scant

attention to drainage flows and rarely the precaution of culverts been under-taken. The net work of traditional drainage channels which were already under severe strain from building and coconut planting activities have fully disrupted by road net work. The net result is that during the monsoon season there is water logging in considerable portions of the coastal plain unlike in the past when the water used to be drained away rapidly.

The drainage problems in the valley area has also increased. The main reason for it has been neglect of the maintenance of the valley rivulets which was traditionally undertaken by the community as a whole. The silt has accumulated so much that in certain areas river bed is higher than the paddy field ! Encroachments for planting coconut on the bund and weed growth have also tend to check the river flow. Fishing in the river by creating temporary bunds also have aggravated the problem.

The net result is that, parts of the valley tends to get flooded in monsoon threatening the first crop, and decline in the storage capacity by reducing the irrigation potential of the river threatening the second crop. The area under double crop has drastically declined in the recent past. Traditional water storage ponds in the valley also suffer siltation problem.

We also suspect that over time there has been a decline in the organic manure input into agriculture because of two reasons

: a) reduction in the non commercial tree foliage in the terrace area and b) reduction in the cattle population. The cowdung was an important traditional bio-fertilizer. In fact major manuring of the paddy lands in the coastal plain used to be from the cattle that used to be tethered there after the harvest.

Finally the salt water intrusion into the ground water system has been increasing over time. Conversion to coconut necessitated irrigation during summer as the water retention capacity of sand is very low. Ground water drawn from wells is the major source of supply. Uncontrolled drawing of ground water for coconut irrigation has been a factor that have accelerated the salinity problem in the western border of coastal plain. Already area of 169.75 hectares is affected by salinity. How these micro level ecological problems along with other socio-economic factors affect the productivity of crops will be taken up in chapter V.

Chapter IV

Social and Economic Characteristics of Kalliasseri Village.

Our discussion in the final section of the last chapter have already underlined the importance of social and economic factors in understanding the changes in the efficiency of resource utilization. We shall now turn our attention to the socio-economic characteristics of the households in Kallisseri panchayat.

Our data base for the analysis consists of the socio-economic census of the households in the panchayat conducted as a part of the PLRMP. One serious flaw was discovered in the census while procesing the data. The total land owned by the households as per the survey came to only around 50 per cent of the total land area of the panchayat. A part of the discrepancy could be explained by the village land owned by non-residents of the village and institutional land holdings such as of industrial units, hospitals and other public offices and Government purampoke, etc. Even if these factors are taken into consideration it is evident that there was a considerable under reporting of the land owned by the households. It could possibly be that the respondants reported only holding directly under him/her. Despite this serious limitation of the data it is possible to delienate certain important characteristics of the village population.

Section 1

Land Distribution.

There are 3936 households with a total population of 24484 at the end of 1992 in the panchayat. Table 4.1 gives the distribution of households and population by sex according to land size class. The average household size is seen to be 6.22 and the household size tended to increase with land size group.

Table 4.1
Distribution of Population by Land size group.

Land size class (cents)	Households Number	%	Population Male	Female	Total	% of Total Population	Average Household size
<10	886	22.51	2422	2533	4955	20.24	5.59
10-50	1972	50.10	6053	6043	12096	49.40	6.13
50-100	651	16.54	2146	2102	4248	17.35	6.52
100-200	306	7.77	1185	1042	2227	9.10	7.28
>200	121	3.07	509	449	958	3.91	7.92
Total	3936	100.00	12315	12169	24484	100.00	6.22

[Source : Socio-economic Census, Kalliasseri, 1992]

Around 3.6 per cent of the households are landless and another 19 per cent have less than 10 cents of land. [see Table 4.2] Average size of land holding as per the survey is 48.39 cents. [see Table 4.5] For reasons already cited it would not be useful to go into much finer details of the land distribution using the survey data. At the same time the data with all its limitations shows that the panchayat is dominated by small and marginal holdings.[see Table 4.2]

Table 4.3 presents the age distribution of population by land size group. Eight per cent of the population is less than 5 years of age and another 20 per cent between 6 to 15 years of age. The proportion of children below 15 in the population tends to decline with the land size group. Conversily the proportion of the aged tend to rise with the land size group.

Table 4.2
Distribution of Holdings by Land Size Class.

Holding Size (cents)	Households Number	%	Area Holding (cents)	%
0	140	3.6	0.00	0.0
0.1-10	745	18.9	5647.10	3.0
10-50	1973	50.1	50291.77	26.6
50-100	651	16.6	47607.63	25.1
100-200	306	7.8	43103.16	22.6
200-500	108	2.7	30978.72	16.4
500 & above	13	0.3	11876.48	6.3
Total	3936	100.0	189504.86	100.0

[Source : Same as in Table 4.1]

Around 4 per cent of the holdings are reportedly outside the panchayat. Proportion of area outside the village to total land area tends to rise with size class.[see Table 4.4]

Small holdings is the feature of the village and the fragmentation of holdings aggravate the problem. Land holdings of households are in different plots. A household may have upto 8 plots as per the survey. The average number of plots of land holdings of different holding size groups is tabulated in Table 4.5.

Table 4.3
Age distribution of population by land size class.
(with row percentage)

Land size class (cents)	Age Group (years) 5 & less	6-15	16-35	36-70	71 & above	Total
<10	450	1080	1912	1417	96	4955
	9.08	21.80	38.59	28.60	1.94	100.00
10-50	953	2549	4785	3566	243	12096
	7.88	21.07	39.56	29.48	2.01	100.00
50-100	355	774	1719	1270	130	4248
	8.36	18.22	40.47	29.90	3.06	100.00
100-200	241	362	937	621	66	2227
	10.82	16.26	42.07	27.89	2.96	100.00
>200	101	159	386	272	40	958
	10.54	16.60	40.29	28.39	4.18	100.00
Total	2100	4924	9739	7146	575	24484
	8.58	20.11	39.78	29.19	2.35	100.00

[Source : Same as in Table 4.1]

Table 4.4
Area Owned by the Villagers outside the Panchayat.

Holding Size	Area Holding (cents)	Proportion of area outside the village to total land area
0	0.00	0.0
0.1-10	5647.10	0.6
10-50	50291.77	0.5
50-100	47607.63	1.6
100-200	43103.16	2.7
200-500	30978.72	7.5
500 & above	11876.48	30.8
Total	189504.86	4.3

[Source : Same as in Table 4.1]

Table 4.5

Average Number of Plots by Land Size Holdings.

Holding Size (cents)	% of Total Area Holdings	Average Size of Holdings (cents)	Average Number of Plots	Average Size of a Plot (cents)
0	0.0	0.00	0.00	0.00
0.1-10	3.0	7.59	1.01	7.55
10-50	26.5	25.49	1.18	21.66
50-100	25.1	73.13	1.69	43.20
100-200	22.8	140.86	2.53	55.76
200-500	16.4	286.84	3.12	91.92
500-1000	2.7	649.31	4.13	157.41
1000-2000	3.5	1336.40	3.40	393.06
Population	100.0	48.39	1.36	35.59

[Source : Same as in Table 4.1]

Marginal holdings less than 50 cents are almost single plots. Holdings above 50 cents are fragmented to two or three plots at least. Although a farmer ownes a relatively large area of land, if it is fragmented and the plots of land are situated at significant distance from each other, access to economies of scale will be denied to him. The cultivation techniques which necessitates large plots of land can not be practised if holdings are fragmented to small pieces.

Section 2

Caste and Religion.

In the traditional society ownership of land was very closely determined by caste and community. At the time of settlement of 1928, of almost the entire village land area was owned by two Janmis, Raja of Chirakkal and two Devaswams. Only

Nairs had Janmam rights. Those savarnas (forward castes) who did not enjoy Janmam rights were superior tenants like kuzhikanam tenants. The lower caste of ezhavas were entirely tenants at will of paddy lands under varum tenure. The agricultural labour castes had no right to land what-so-ever and were tied to the property of the Janmis and employed in the valley cultivation. It is important to examine, to what extend this relationship still holds.

In Kalliasseri 83 per cent of the households are Hindus and 16.3 per cent Muslims. Christians are negligible. Among the Hindus Ezhavas are numerically the most dominant constituting 43 per cent of the households and 41 per cent of the population of the panchayat. The savarna population among whom Nairs are the most numerous would come to only 1/3rd of the Ezhavas. In tables 4.6 and 4.7 Christains numbering 27 were divided into either Forward Castes or Backward Castes depending on whether they are Syrian Christians or not.

Table 4.6
Frequency distribution of households by caste and land size class.

Holding Size (cents)	0	Brahmin	Nair	Syrian Christian	OFC	Muslim	Ezhava	Backward Christian	OBC	SC	ST	Row Total
<10	3		53	4	25	146	340	4	195	111	5	886
10-50	1	2	228	4	50	325	883	8	401	69	1	1972
50-100	1	1	123		19	91	288	5	115	8		651
100-200		2	59	1	7	51	151		34	1		306
200-500		3	25			20	42		18			108
550 & above			5				6		1	1		13
Column total	5	8	493	9	101	633	1710	17	764	190	6	3936
	(.1)	(.2)	(12.5)	(.2)	(2.6)	(16.1)	(43.4)	(.4)	(19.4)	(4.8)	(.2)	(100)

[Source : Same as in Table 4.1]

Table 4.7

Distribution of households and Population by major castes.

Caste	Households Number	%	% of Village Popula-tion	Average Holding Size (Cents)	% of Total Area
Brahmin	8	0.2	0.2	139.13	0.6
Nair	493	12.5	11.2	70.02	18.2
OFC[7]	110	2.8	2.4	37.20	2.1
Muslim	633	16.1	22.2	45.46	15.2
Ezhava	1710	43.4	40.7	50.30	45.4
OBC[8]	781	19.8	18.7	38.96	16.0
SC & ST	196	5.0	4.7	22.41	2.3

[Source : Same as in Table 4.1]

The tables show that land ownership has been diffused among all castes and the dominance of the upper castes in land ownership has ceased. They today own only 20 per cent of the area. The Ezhavas have emerged as the dominant land owning caste with a share of 45 per cent of the total area.

The land reforms in the post independence period has been responsible for this transformation. The tenants has become the owners of the land. The backward caste tenantry were the most important gainers of the reform. Majority of the Scheduled Castes own only hutment land. The average size of holding of Nairs and

[7] OFC = Other Forward Castes.

[8] OBC = Other Backward Castes.

Brahmins are still highest. But it is evident that the caste control over land has dramatically declined .

Section 3

Occupational Distribution.

Totally, 6732 people are employed in the panchayat. Thus the labour participation rate in the village is 34 per cent. As can be seen from Table 4.8 the labour force participation rate tends to decline by land size group from the 37 per cent in the smallest land size group and 32 per cent in the largest size group. The unemployment rate of the panchayat is 18 per cent. Surprisingly, unemployment rate does not exhibit any relationship to land size class.[see Table 4.8] Table 4.9 presents detailed statement of the distribution of workers by sector of employment and land size class. The same data has been presented in Table 4.10.

Table 4.8
Employed and unemployed by land size class.

Land size class (cents) (1)	Number of workers (2)	Unemployed (3)	Work force (2+3)=(4)	Participation rate (5)	Unemployment rate (3/4)=(6)
<10	1498	330	1828	0.37	0.18
10-50	3307	767	4074	0.34	0.19
50-100	1110	228	1338	0.31	0.17
100-200	562	126	688	0.31	0.18
>200	255	50	305	0.32	0.16
Total	6732	1501	8233	0.34	0.18

[Source : Same as in Table 4.1]

Table 4.10
Distribution of Workers by Broad Sectors.

Sector of Employment	Land size class (cents) (10	%	10-50	%	50-100	%	100-20	%	)200	%	Total	%
Agriculture	243	16.22	426	12.88	175	15.77	109	19.40	46	18.04	999	14.84
Other Primary sectors	103	6.88	167	5.05	40	3.60	13	2.31	7	2.75	330	4.90
Mining	34	2.27	38	1.15	22	1.98	12	2.14	3	1.18	109	1.62
Industry	555	37.05	1172	35.44	334	30.09	159	28.29	66	25.88	2286	33.96
Elcty., gas, water	13	0.87	25	0.76	9	0.81	4	0.71	2	0.78	53	0.79
Construction	192	12.82	372	11.25	110	9.91	32	5.69	5	1.96	711	10.56
Trade	98	6.54	271	8.19	107	9.64	56	9.96	29	11.37	561	8.33
Transport	72	4.81	196	5.93	58	5.23	36	6.41	10	3.92	372	5.53
Money & finance	30	2.00	102	3.08	28	2.52	20	3.56	12	4.71	192	2.85
Service sector	158	10.55	538	16.27	227	20.45	121	21.53	75	29.41	1119	16.62
Total	1498	100.00	3307	100.00	1110	100.00	562	100.00	255	100.00	6732	100.00

[Source : Same as in Table 4.1]

The first point that emerges from the industrial distribution of the workers in the panchayat is the non-agricultural nature of the workers. Only 14.84 per cent of the workers are employed in agriculture. Even if the primary sectors are included the proportion would still be only 20 per cent. The employment is dominated by industrial sector which claims 33.96 per cent of the workforce. Nearly an equal proportion of the workforce is employed in trade and other tertiary occupations. The proportion of the population employed in the industries is seen to be systematically declining with land size class. Conversily, the

Table 4.9 Detailed Statement of the Sectoral Distribution of Workers by Land size class.

Sector of Employment	Land size class (10	10-50	50-100	100-200	)200	Total
Agriculture	243	426	175	109	46	999
Hunting	6	4				10
Fishing	19	13	2			34
Animal rearing	4	8	2	1		15
Other primary sectors	74	142	36	12	7	271
Laterite cutting	34	38	22	12	3	109
Handloom	143	272	61	24	3	503
Coir	17	12	4			33
Beedi	51	77	16	2	1	147
Other traditional industries	11	14	3			28
Cottage industries	29	39	10	8		86
Small scale factories	73	149	48	23	15	308
Factories	113	317	101	63	28	622
Repair shops	24	59	28	15	1	127
Other industrial sectors	94	233	63	24	18	432
Electricity	9	24	8	4	2	47
Gas	2	1				3
Water	2		1			3
Road construction	6	7	6	2		21
Building construction	94	203	59	16	1	373
Budding constn. helpers	92	162	45	14	4	317
Whole sale trade	3	10	11	8	1	33
Retail trade	83	230	93	45	21	472
Bunks	7	19	3	2		31
Streat vending	5	13	2	1	4	25
Head loading	11	24	2	1		38
Bullock cart			1			1
Motor vehicles	54	152	49	28	12	295
Communication	7	20	6	5		38
Finance	20	72	20	17	8	137
Insurance	6	10	1	1	3	21
Land transactions	3	13	5	1	2	24
Other financial	1	6	2	1		10
College	3	7	9	2	3	24
School	36	147	48	29	21	281
Tution & parallel	4	3	18	10	4	39
Govt. offices	24	85	41	16	18	184
Police/defence	15	70	40	17	10	152
Professional	10	26	8	5	2	51
Others	66	200	61	44	17	388
Total	1498	3307	1110	562	255	6732

[Source : Same as in Table 4.1]

service sector employment tends to rise with the land ownership. As can be seen from the detailed sectoral distribution [Table 4.9] traditional industries are not any more major source of industrial employment. 602 workers are employed in factories and another 307 in small scale industries. On the other hand, the traditional industries altogether employ only 771 workers. Handloom is the most important industry. Construction employs around 10 per cent of the work force. About 5 per cent of the work force are in Government service.

Table 4.11
Occupational Distribution of Workers by Size Class.

Occupational category	Landsize class (cents) <10	%	10-50	%	50-100	%	100-20	%	>200	%	Total	%
Agriculturists	2	0.13	78	2.36	72	6.49	50	8.90	30	11.76	232	3.45
Agriculture labour	241	16.09	348	10.52	103	9.28	59	10.50	16	6.27	767	11.39
Other primary sectors	103	6.88	167	5.05	40	3.60	13	2.31	7	2.75	330	4.90
Employers in non-agri.	39	2.60	134	4.05	72	6.49	38	6.76	34	13.33	317	4.71
Self employed in nonagri	107	7.14	215	6.50	59	5.32	20	3.56	12	4.71	413	6.13
Unskilled wage workers in non-agri. sector	304	20.29	581	17.57	155	13.96	58	10.32	17	6.67	1115	16.56
Skilled wage workers in non-agri. sector	494	32.98	1084	32.78	324	29.19	153	27.22	46	18.04	2101	31.21
Last grade salaried	49	3.27	166	5.02	48	4.32	22	3.91	3	1.18	288	4.28
Medium grade salaried	138	9.21	454	13.73	189	17.03	116	20.64	70	27.45	967	14.36
Higher grade salaried	21	1.40	44	1.33	30	2.70	9	1.60	9	3.53	113	1.68
Others			36	1.09	18	1.62	24	4.27	11	4.31	89	1.32
Total	1498	100.00	3307	100.00	1110	100.00	562	100.00	255	100.00	6732	100.00

[Source : Same as in Table 4.1]

Table 4.11 gives the occupational distribution of the work force by land size class. The agricultural labour outnumber the agriculturists by a factor of 3. It is seen that, 60 per cent of the work force are wage labourers and 20 per cent, salaried

employees. What is striking is the low level of self employment. Including agriculturists, the self employed would be less than 10 per cent.

As regards the occupational distribution and land ownership following points may be noted. The proportion of agriculturists tend to rise with land holdings and conversily fall with agricultural labours. This is not very surprising finding. But it should be surprising that only 11 per cent of the workforce in the largest land size group are agriculturists. The proportion of wage labours sharply declines from 34 per cent in the lowest land size group to 20 per cent in the largest land size group. Similar is the trend for the last grade employees. But the proportion of medium and high grade salaried employees tend to rise with land size group.

According to the survey in 1992, 27.50 per cent of the village population are matriculate or with higher education, and 3.13 per cent of the population have atleast a university degree or higher. However it is seen that those with technical qualification are relatively low. The rise in educational qualification, however, raised the occupational expectation of the people and accelerated the shift towards non agricultural occupations.

Table 4.12

Distribution of population above six years by education and land size class.

Land size class (cents)	Without formal schooling		Below Secondary		Secondary		III, Deploma & others		Pre Degree		Degree		P.G. & Proff.	
	number	%	number	%	number	%	number	%	number	%	number	%	number	%
<10	619	27.87	2986	21.70	620	14.89	37	12.01	149	13.28	57	10.71	29	11.79
10-50	1074	48.36	6914	50.25	2144	51.49	137	44.48	534	47.59	213	40.04	104	42.28
50-100	329	14.81	2281	16.58	776	18.64	76	24.68	249	22.19	150	28.20	49	19.92
100-200	148	6.66	1144	8.31	428	10.28	33	10.71	117	10.43	64	12.03	36	14.63
>200	51	2.30	434	3.15	196	4.71	25	8.12	73	6.51	48	9.02	28	11.38
Total	2221	100.00	13759	100.00	4164	100.00	308	100.00	1122	100.00	532	100.00	246	100.00

[Source : Same as in Table 4.1]

Section 4

Income Distribution.

Average per capita income distribution shows that members of 64.27 per cent of the households have less than Rs. 300 per month. The average per capita income of the village people is Rs. 313.65, because of the low monthly average household income of Rs. 1807.08. Only 14.32 per cent of the households have per capita income higher than Rs. 500 per month.

Table 4.13

Frequency Distribution of the Households by Per Capita Income classes.

Percapita Income Class (Rs.)	Average Income (Rs.)	Households Number	%
<100	69.17	513	13.06
100-200	152.91	1153	29.35
200-300	249.51	859	21.86
300-500	385.86	841	21.40
500-1000	675.66	446	11.35
1000 & above	1541.71	117	2.98
Total	313.65	3929	100.00

[Source : Same as in Table 4.1]

Table 4.14
Average Income by Land size class.

Holding Size (cents)	Average Income (Rs.)	% of Total Income	Avg. Agri. Income (Rs.)	Proporrtion of agri. income to total income
0	1668.90	3.0	0.00	0.0
0.1-10	1294.40	13.5	35.79	2.8
10-50	1611.48	44.9	105.43	6.5
50-100	2075.98	19.1	279.63	13.5
100-200	2704.14	11.7	585.83	21.7
200-500	4251.94	6.5	1260.59	29.6
500-1000	7739.13	0.9	3002.25	38.8
1000-2000	5818.40	0.4	2528.40	43.5
Total	1807.08	100.0	196.27	10.9

[Source : Same as in Table 4.1]

Average monthly income per household in the village is Rs.1807. It is seen to be positively related to land ownership. Size of land holdings and monthly income of the households show a significant level (at 5%) of association with the magnitude of association, 35.79 per cent. Measurement of association is based on Pearson co-efficient of correlation. Household size and monthly income also have a positive correlation, with a magnitude of association, 31.48 per cent (significant at 5% level).

Average monthly income from agriculture naturally tends to rise with the land ownership. It is also seen that the proportion of agricultural income in total household income also tend to rise with the land size group. Households with more than 10 acres of land derive 43.5 per cent of their income from agriculture.[see Table 4.14] However, only around 6 per cent of the households are dependants on agriculture for more than 1/2 of

their household income [see Table 4.15]. The six households who have less than 10 cents of land and derive major source of income from agriculture, are one member households. For 70 per cent of the households agriculture provides less than 10 per cent of the household income. On the whole, share of agriculture in the total household income is only 11 per cent. Even if the data is adjusted for the under-reporting of land, it is evident that agriculture no more constitute a major source of village income.

Table 4.15
Frequency distribution of households according to proportion of income from agriculture to total income per month.

Land size clas (cents)	Proportion of agricultural income to monthly income (%). <10	10-25	25-50	50-75	>75	Total (%)
<10	792	60	9	1	5	867 22.16
10-50	1462	316	111	22	57	1968 50.29
50-100	358	143	89	29	32	651 16.64
100-200	106	99	66	15	20	306 7.82
>200	28	30	41	13	9	121 3.09
Total	2746	648	316	80	123	3913
(%)	70.18	16.56	8.08	2.04	3.14	100.00

[Source : Same as in Table 4.1]

The non agricultural income is also seen to be positively related to size class. This is not surprising as we have already noted a significant correlation between education and occupational distribution and land ownership.

Table 4.16
Monthly Non-agricultural Income.

Holding Size(cents)	Average Nonagri-cultural Income(Rs.)	Proportion of NAI to Monthly
0	1668.90	100.0
0.1-10	1258.68	97.2
10-50	1506.06	93.5
50-100	1796.36	86.5
100-200	2118.32	78.3
200-500	2991.35	70.4
500-1000	4736.88	61.2
1000-2000	3290.00	56.5
Total	1610.81	89.1

[Source : Same as in Table 4.1]

The housing conditions of the households tend to bring out relatively better economic status of the households in Kalliasseri. The data on housing of particular households gives the possible under estimation in household income.

Table 4.17
Holdings size and House construction Pattern 1.

	House Roof					
Holding Size (cents)	0	Grass /Palm Leaves	Sheet	Tiles	Concr-ete	Others
0	1	5	1	113	27	1
0.1-10		20	8	643	76	1
10-50		21	8	1545	416	3
50-100		4	1	519	118	1
100-200		2	2	228	68	
200-500				74	20	
500 & above				9	1	
Column total	1 (.0)	52 (1.3)	20 (.5)	3131 (79.5)	726 (18.4)	6 (.2)

Table 4.18
Holdings size and House construction Pattern 2.

	House Wall			
Holding Size (cents)	0	Bamboo/ Palm leaves	Clay	Wood/ Sheet	Bricks/ Stone
0	1	1	29		117
0.1-10		9	318	7	414
10-50		11	435	8	1539
50-100			96	3	544
100-200			21	2	277
200-500		1	6		87
500 & above			2		8
Column total	1	22 (.6)	907 (23)	20 (.5)	2986 (75.9)

[Source for tables 4.17 and 4.18 : Same as in Table 4.1]

Table 4.19

Holdings size and House construction Pattern 3.

Holding Size (cents)	House Floor					
	0 Clay	Cowdung	Cement	Mosaic	Others	
0	1	5	64	69	7	2
0.1-10		25	563	142	17	1
10-50		39	1160	690	101	3
50-100		4	314	282	41	2
100-200		3	135	139	23	
200-500			23	59	11	1
500 & above			2	5	2	1
Column total	1	76	2261	1386	202	10
		(1.9)	(57.4)	(35.2)	(5.1)	(.3)

Table 4.20

Holdings size and House construction Pattern 4.

Holding Size (cents)	House Area					
	0	Below 200 sq.f	200 to 500 sq.	500 to 1000	1000 to 1500	Above 1500
0	1	32	66	37	11	1
0.1-10		211	365	169	2	1
10-50		238	800	813	129	13
50-100		32	214	302	90	5
100-200		9	60	178	46	7
200-500		1	7	50	28	8
500 & above		1		3	4	2
Column total	1	524	1512	1552	310	37
		(13.3)	(38.4)	(39.4)	(7.9)	(.9)

[Source for the tables 4.19 & 4.20 : Same as in Table 4.1]

It is seen from Table 4.17 that 79.5 per cent of the houses are tiled and another 18.4 per cent of concrete. Traditional thatching with palm leaves and grass have virtually disappeared. As can be seen in the table 4.18, 76 per cent of the house-walls are with bricks or stone. It is in the house-floor material that traditional method of clay floor with cow dung paste have survived. As to the plinth area, around 38 per cent of the houses are of 200 to 500 sq. feet or small houses, yet they cannot be described as huts, given the wall and roof materials used. The survey found only 15.88 per cent of the households need urgent maintenance or repair. 72 per cent of the houses were electrified and 75 per cent of the households had their own well or pond.

To conclude, the panchayat of Kalliasseri may be characterised as exhibiting some of the typical characteristic features of Kerala villages in an extreme form. A distinctive

feature of Kerala villages is relatively higher non-agricultural occupations compared to the rest of India. Because of being the hinterland of the district headquarters and the growth of the adjoining industrial belt, non-agricultural occupations have come to dominate the village under investigation. Only 20 per cent of the households are in agriculture. Further it was seen that only a very small proportion of households has agriculture as the primary source of income. With the spread of education, job expectations tended to move away from agriculture. This social miliue itself would constitute a major constraint for agricultural improvement.

Chapter V

Productivity Of Paddy And Coconut - An Analysis.

Keeping in back ground our discussion on the ecological and environmental problems of the study area, and the socio-economic characteristics of the households in the previous two chapters we shall now examine the specific reasons for low productivity of two crops in the panchayat namely coconut and paddy. They together account for 91.38 per cent of the cropped area in the village. A statistical analysis of the factors that influence the productivity of these two crops are attempted on the basis of the data generated by a socio-economic census. These are supplemented by the insights gained by our discussions with the farmers during field visits. Case histories of 9 farmers are presented as an annexure to the thesis.

Section 1

Coconut.

Coconut is essentially a tropical plant. The coconut palm will grow on many different types of soil provided that they are free-draining and allow unrestricted root development and aeration. Among the best coconut soils are rich river or estuarine alluvial deposits with sufficient sand content for good drainage. [R. Child, 1974] Deep loamy sands rich in plant

nutrients are best for coconut. However, if rainfall is high, water-logging become an important problem in such lands. [C.J. Piggott, 1964] The presence of salt in the soil improves growth when the palm is short of potash. [C.J. Piggott, 1964] But high salinity adversily affects productivity. Coconut is also grown in laterite soils in Kerala and Sri Lanka. A mean annual temperature of 80 degree F and an annual rainfall of 50 in to 100 inches is needed for coconut.

As we have already noted the area under coconut has rapidly increased during the last quarter of the century. Particularly remarkable has been the expansion of coconut land in coastal plain replacing paddy which was the dominant crop. As we have already commented the sandy land is most suitable for coconut cultivation than paddy.

Nearness to sea has considerable effect on the climate as well as on the soil. The coastal climate is always more humid and less subject to wide fluctuations of temperature and these conditions are favourable to the palm. The sub-soil water is better suited for coconut palm, and the ground water near the coast is kept under constant movement by the ebb and flow of the tide and all these are considered well suited for coconut growth.

Table 5.1 presents the percentage of area under coconut cultivation, total number of coconut palms and the proportion of

the non yielding palms in each of the eco-zones. To calculate the percentage of area under coconut, mixed crops and mixed trees have also been taken as coconut lands.

Table 5.1
Number of Coconut Palms and Yielding Palms by Eco-zones.

Zone	% of area under Coconut	Number of Coconut Palms	Yielding Palms number	% to total Palms
I. Laterite Terrace	44.22	20531	9711	47.3
II. Side slope	35.40	12291	6584	53.6
III. Valley	12.16	4667	1996	42.8
IV. Sandy area	73.41	92761	53181	57.3
V. Marshy land	4.30	189	93	49.2
Entire Village	53.61	130439	71565	54.9

[Source : Socio-economic Census Kalliasseri, 1992]

It is evident from Table 5.1 that only valley remains relatively immune from the spell cast by shift to coconut cropping pattern. Around 45 per cent of the coconut plants have been seen to be non yielding young palms, or palms of less than 5 to 6 years of age. The proportion of non yielding palms are highest in the valley. This is not surprising because the crop shift to coconut in the valley area is still only gathering momentum. But what is surprising is the relatively high proportion of non-bearing palms in the laterite terrace zone which traditionaly has been a coconut crop land. Expansion of coconut in laterite zone is taking place at the expense of other traditional fruit trees like jack fruit and mango, and timber trees. There is a shift towards coconut monoculture in the

laterite zone.

Table 5.2 presents the average nut yield per coconut tree for different eco-zones by size of holdings. Following conclusions may be drawn from the table :

a) the average yield per tree in Kalliasseri is 26.5 nuts. This level of productivity is low compared to state average level of 38 nuts per tree per year.

b) It is also seen that the productivity tends to vary across eco-zones. The productivity is highest, nearly 29 nuts/tree per year in the sandy coastal plain and lowest in the marshy lands at 18 nuts. Both in the laterite and valley soils the coconut yield is around 21 nuts per year.

c) And finally it is seen that the productivity has tended to increase systematicaly with land size class, 24.3 nuts/tree for coconut land size class less than 10 cents to 43 nuts/tree for coconut land holdings more than two acres, for the panchayat as a whole. This positive relationship of production vs land size class is sharpest in the coastal plain. In the valley zones relationship is not clear, while in the marshy area there is an inverse relationship between land size and productivity. The overall positive relationship between land size and productivity contradicts widely prevalent notion of higher productivity in smaller holdings. Reason for this inverse relationship are stated to be two fold. Firstly, smaller the holding size the coconut tends to get greater attention and higher labour inputs.

Secondly, the organic waste from the kitchen as well as waste water generally goes into the coconut patch adjacent to the house. Thus the fertilizer inputs to the small holdings is relatively higher. Obvously in the case of Kalliasseri there have been other counterveiling factors at work tending to reduce the productivity in the smaller holdings. The most important of such counterveiling influence has been the density of coconut trees.

Table 5.2
Distribution of Average Nut Yield per Coconut Tree by Garden Land Holding Size Class and Eco-zones.

Garden land (cents)	Zone I	II	III	IV	V	Entire Village
<10	16.39	20.11	21.00	21.07	22.78	20.67
10-50	18.69	20.86	24.30	25.01	15.24	23.77
50-100	21.41	22.42	15.47	29.45	10.00	26.81
100-200	20.75	22.74	21.31	35.10	..	29.84
200 & above	21.29	20.12	20.00	38.75	..	33.10
Entire zone	20.13	21.62	21.37	28.90	18.49	26.50

[Source : Same as in Table 5.1]

Density of coconut trees is measured by the estimated average number of trees per acre. The density of coconut trees by land size and eco-zones are given in table 5.3.

In most of the coconut tracts of India, very little care is confered on the the proper spacing of trees. [C.M. John, 1970] In the case of the study village, coconut palms are planted irregularly leading to overcrowding of trees. This may be because the holdings are rather small and cultivators are eager to increase the value of the land by putting in as many trees as

possible. Coconut palms are supposed to be planted at distace of 21 to 30 ft. from each other. [C.J. Piggott, 1964] The optimal spacing pattern obviously would change from one locality to another. Spacing pattern at the lower limit allows a maximum of 100 palms per acre, and if distance between trees is 30 ft., the density of trees would decline to 48 per acre. Instead of square type arrangement of plants, quincunx pattern, would permit planting more trees with the same distance between trees. But, such scientific measures are possible only if the coconut plantation is well planned and the area under cultivation is reasonably sufficient for establishing a proper planting pattern. The village under study is characterised by small holdings. And space is reduced by constructing houses and other buildings in the tiny holdings. Inaddition to this, mixed cropping pattern adopted, especially in zones I and II, reduces the optimum number of trees that can be planted in an acre. It should be noted that, to permit intercropping on a more systematic and intensified basis, coconut tree stand recommended was 70 per acre by the Coconut Development Programme.[K.M. Balakrishnan, 1982]

It is seen that on an average in 10 cents, density was 80 per acre. This may not apparently look very high given the fact that 50-100 palms could be planted per acre depending on the locality, spacing pattern employed and the nature of the intercrops. But one has to bear in mind that a substantial portion of the area of smaller holding would have to neccesarily be devoted to

residential sites. Therefore the actual density per acre is much higher than the average figure given in the Table 5.3

Table 5.3
Distribution of Density of Coconut by Land Size Class and Eco-zones.

Garden Land (cents)	Zone I	II	III	IV	V	Entire Village
<10	60.70	71.06	104.41	159.98	289.29	126.78
10-50	63.76	63.65	82.18	135.21	28.82	107.70
50-100	53.12	57.17	54.26	100.20	15.15	78.59
100-200	40.77	49.15	48.45	107.05	..	81.08
200 & above	38.00	39.42	36.56	50.68	..	46.83
Entire zone	53.00	55.67	64.49	110.48	43.55	86.84

[Source : Same as in Table 5.1]

The average density is the highest in the coastal plain. But more importantly we can also see a relationship between the size class of holdings and the average density. Average density declines from 160 in the smallest holdings less than 10 cents to 50 in land holdings above 2 acres, in the coastal plain. Similar broad tendency is evident in all eco-zones. In the marsh land the density of coconut is astoundingly high. We cannot say to what extend this can be attributed to data problems. But our field visits to the area reveal that in the tiny plots in the marshy area contains much more coconut palms than in the plains. In the coastal plains the tiny plots are essentially house plots, while in the marshy lands residential plots were rare. Planting coconut was a land reclamation measure in the marshy areas.

As can be seen in the table 5.3 density of coconut in plots of less than 10 cents size is 2.5 fold higher than holdings more than two acres. An important reason for high density of cococonut in tiny plots is the practice of planting coconut trees along the borders. It was noticed that in many places the spaces between the coconut in the adjacent plots were as narrow as 2-3 feets. The farmers are reluctant to cut off the old palms and under take replantation. Instead, they plant seedlings together with the old palms so that the new palms may start yielding when the old ones die up. Because the new palms grow below the old and tall palms, they get no sunlight and their their growth is stunted. Thus the small palms remain unproductive for a long time. The result is high density of trees and very low yield per tree.

High density severely reduces the sunlight availability to each of the plants which is very important for healthy growth of the plants. If trees are overcrowded, they will grow tall and lanky in their struggle to get at sunlight and cosiderable energy will be utilized in producing a tall trunk at the expense of yield.

As can be seen from table 5.4 given below, in every zone the yield per coconut tree tends to decline with size class of density. In areas with density of trees more than 100, productivity is very low. The average productivity of coconut in the village is highly influenced by the productivity of coconut

in densely cropped areas.

Table 5.4
Avarage yield per coconut tree by size class of density and Eco-zones.

Density of coconut trees	Yield per Zone I	II	III	IV	V	Entire Village
<40	19.33	23.80	23.00	31.00	..	29.34
40-60	19.71	22.67	22.56	27.82	..	25.79
60-80	17.86	21.67	21.57	27.81	25.00	25.42
80-100	17.40	19.83	16.52	25.03	13.75	23.18
100 & above	16.20	17.35	15.28	18.49	..	17.62
Total	16.58	17.72	15.96	21.31	15.00	19.56

[Source : Same as in Table 5.1]

Wrong cultural practices are exhibited not only in number of trees per unit of area but also in the inappropriate methods of planting adopted particularly in the water logged areas or areas of high soil moisture content in the coastal plain. In chapter III we had drawn attention to the growing drainage problems in the coastal plain. It was noticed, in most places trenches were taken at the ground level itself for planting coconut trees. Only in areas where water logging is severe, mounts were being prepared to plant coconut seedlings. But even these mounts are seen to be of insufficient size. Coconut needs well drained soil with adequate airation. High moisture content of the soil or water logging forces root growth on the coconut stem above the soil surface. In some of the cocoonut trees root growth was observed at about 5 to 6 feets above the surface level. Absence of sufficient underground roots causes severe under-nourishment of the plant and severe under-productivity. Even though stastical

proof is lacking it is our observation that the productivity of palms in areas of water logging was relatively lower. In the water logged areas wherever trenches were taken to drain water, productivity was seen to be visibly better. Scant attention has been so far given to coconut lands in drainage problem.

Seedlings used are not of HYV in most cases, because the traditional varieties of coconut have longer life. The farmers also feel that the latter also have better yield than HYV. Average life of an HYV palm in the village is 60 years while that of traditional varieties is above 100 years. Traditional varieties are said to be resistant to adversities of climate and rainfall compared to HYV. And the farmers were suspicious of the quality of seedlings distributed other than those by the Payyannoor Coconut Research Station.

The labour and fertilizer input for the coconuts was observed to be scanty . The only wide spread cultural practice adopted in the village is making of shallow bunds around each coconut. However, very little fertilizer is seen to be going into the coconut beds. Few farmers were seen to be using artificial fertilizer. In the absence of adequate green manure in the panchayat and the decline in bovine population, the organic manure given to the coconut are also very low. The only positive sign has been the tendency for small scale well irrigation in the coastal plain. But uncontrolled withdrawl of ground water is

giving rise to the problem of salt water intrusion in the western border of the panchayat. Water logging in the monsoon season and scarcity of water in the summer season seems to alternatively plague the coconut in the coastal plain .

Table 5.5
Productivity (nuts) per Coconut Tree per Year.

Proportion of agricultural income to total income	Coconut land holding size (cents)		
	less than 100	100 and more	Total
zone I:			
less than 25%	19	21	19.7
25 to 50%	23	22	22.8
more than 50%	26	24	25.1
zone II:			
less than 25%	21	25	22.0
25 to 50%	23	18	21.0
more than 50%	25	22	23.2
zone III:			
less than 25%	22	7	19.4
25 to 50%	18	28	24.0
more than 50%	16	15	15.4
zone IV:			
less than 25%	23	24	23.2
25 to 50%	31	34	31.9
more than 50%	31	39	33.4
zone V:			
less than 25%	15	..	15.0
25 to 50%	25	..	25.0
more than 50%	10	..	10.0
Entire Village:			
less than 25%	21	22	21.0
25 to 50%	28	28	28.0
more than 50%	26	32	26.2
Total	22	30	26.5

[Source : Same as in Table 5.1]

There has been very little open interest exhibited in adopting scientific practices which would have required greater labour inputs and managerial attention. A major reason for the shift to coconut from paddy is that it required less personal

attention from the land owners. The high wages and lack of commitment from the agricultural labourers was a common complaint. For most of the land holders, cultivation was only a subsidiary source of income. Interestingly, it can be seen from the Table 5.5, the productivity of the coconut trees tend to rise with the proportion of agricultural income to total income of the households. However, in valley area the pattern is not significant because coconut is not the main crop in valley.

Section 2

Paddy.

The situation of paddy, the second major crop of the panchayat, is worse than that of coconut. Farmers themselves have expressed their preference by large shifts away from paddy cultivation. Paddy has been abandoned in the marsh land and to a great extend in the coastal plain too. Even in the valley coconut was making inroads. Table 5.6 gives proportion of land under paddy and the proportion of area under paddy double crop by eco zones.

Unlike coconut paddy requires annual investment and the return is crucially dependent upon weather. This uncertainity in contrast to the regularity of income from coconut land has been a major factor influencing the crop choise. The productivity of paddy land is very low in Kalliasseri. On an average, it comes to

only 680 kg/acre, while the productivity of paddy in the state was above 792 kg/acre in the year 1992. Not only the output per harvest has been low but the cropping intensity has also been declining adversly affecting the income from paddy crop.

Table 5.6
Distribution of Proportion of Land under Paddy by Eco Zones

Zone	% of area under Paddy	% share in the total Paddy Area	Proportion of double cropped Area to Paddy Land in each zone
III. Valley	71.81	34.83	54.95
IV. Sandy Area	26.45	65.10	4.85
V. Marshy Land	0.37	0.07	0.00
Entire Village	22.55	100.00	22.29

[Source : Same as in Table 5.1]

About 38.73 per cent of the valley area is double cropped. But in actual practice the double cropped area in the last season would have been less than half of the estimate given in the land use map. Due to the absence of any assured irrigation facilities the paddy cultivation is dependent upon the vagaries of monsoon. As seen in chapter III, the rivers in the valley are rainfed. We have already discussed how the lack of maintanace of valley rivers and fishing activities have created impediment for drainage during the monsoon periods and serious reduction in the storage capacity of rivers for irrigation in non- monsoon season. The water logging during the monsoon forces farmers to adopt long duration tradtional varieties like 'Mundakan' which can survive water logging. The dependence on long duration varieties makes

it difficult to increase the cropping intensities. Yield of such varieties have also seen relatively very low.

In those areas of valley that there is no threat of water logging, short duration HYVs are first grown. A second crop could be raised in such land during September. But the second monsoon is very weak in northern Kerala and as already noted, there is no irrigation facility other than the water stored in the river system and a dozen ponds in the valley. By the decay of traditional water harvesting measures, the water scarcity during the second crop has increased making the venture a risky affair. These has been responsible for the sharp decline in the area under double crop in the valley.

Scarcity of agriculture labour has also been emerging as a major problem for the paddy cultivators. Paddy cultivation activities should be done within specific time, because it is highly seasonal crop. The agricultural labour is not available according to needs. Only aged women labourers are now mostly available and are not sufficient in number to meet the demand of all the farmers. Young women are not interested in agriculture labour. They are now seeking job in construction sector, handloom, etc. because in construction sector the wages are higher, and the handloom and other traditional industries provide job security and social status, though rewards are low compared to wages in agriculture sector. It is important that because

agriculture labour demand is seasonal, the labouers find it difficult to make up for off-season. The wage have also tend to sharply rise and today it is Rs. 25 for women labour and Rs. 50 to 60 for male labour. The tilling operation is now largely mechanised. But this has not so reduced the labour scarcity problems.

There is a marked preference in recent years to traditional varieties of seeds which are low yielding but are more sturdy and versatile. Most of the farmers do use chemical fertilizers, but the organic manure input is very low due to indaequate availability in the village. The crop rotation with pulses as a third crop has also been severly reduced.

The productivity of paddy by land size groups and zones is given in Table 5.7. About 4.6 and 1.7 per cent of the paddy land was misclassified as in zone 1 and zone 2 respectively, in the socio-economic census. Therefore, these plots has been excluded in the calculation of Tables 5.7 and 5.8.

Three points are brought out sharply by the data preceeding Table 5.7.

a) Overall paddy productivity in the panchayat is low.

b) Productiviy of paddy in valley is 50 per cent higher than in the coastal plain.

c) The average productivity tends to rise with area of paddy

land holdings. It holds true for both the valley as well as the coastal plain. The difference between small and large is too high to know.

Table 5.7
Productivity of Paddy (in kg.) per acre by Land Size Groups and Eco-zones.

Paddy Land (cents)	Zone III	IV	V	Total
<10	694	387	..	392
10-50	844	500	270	570
50-100	772	628	..	740
100-200	1202	803	..	1085
200 & above	1440	993	..	1213
Entire zone	840	570	270	680

[Source : Same as in Table 5.1]

Table 5.8 gives results on the relationship between proportion of agricultural income to total income and productivity of paddy, holding size class-wise. Paddy productivity is seen to be higher in the case of those households with the proportion of agricultural income to total income is between 25 to 50 per cent, for the entire village.

It was noted by us during our discussion with farmers that the inputs into agriculture in the smaller plots were much smaller than the larger cultivators who tend to use more bio and chemical fertilizers and tractors for tilling and more hybrid seeds. Even direct labour inputs in the smaller plots are lower as it is rare in the village for even the small holder to

directly participate in cultivation. The dependency of paddy on agricultural income is very low in the smaller holdings, and given the primacy of alternative sources of income there is no compulsion to maximise agricultural production. However, the relation with productivity of paddy land and proportion of agricultural income to total income is not so sharp as the case in coconut .

Table 5.8
Productivity of paddy (in kg.) per acre a Year.

Proportion of agricultural income to total income	Paddy land holding size (cents)		
	less than 100	100 and more	Total
zone III:			
less than 25%	780	1114	820
25 to 50%	1024	1200	1089
more than 50%	857	1020	940
zone IV:			
less than 25%	570	702	630
25 to 50%	490	894	614
more than 50%	558	986	620
zone V:			
less than 25%	..	..	..
25 to 50%	270	..	270
more than 50%	..	..	..
Entire Village:			
less than 25%	595	725	620
25 to 50%	980	994	986
more than 50%	720	914	745
Total	618	1095	680

[Source : Same as in Table 5.1]

Conclusion

Our discussion on the coconut productivity is broadly summarised in the correlation matrix of coconut productivity and

various factors that we have identified to be significant.

Table 5.9
Correlation Matrix of Coconut Productivity and Associated Sectors.

	Product-ivity	Size of land holding	Coconut trees	Paddy single crop area	Propn. of agri. income to total Inc.	Density of CN trees
Coconut Productivity	1.0000	.1814**	.2645**	.0869**	.3198**	-.6484**
Size of land holding	.1814**	1.0000	.4905**	.1857**	.2685**	-.5641**
Coconut trees	.2645**	.4905**	1.0000	.6453**	.3498**	.0564*
Paddy single crop area	.0869**	.1857**	.6453**	1.0000	.1840**	-.5423*
Proportion of agri. income to total income	.3198**	.2685**	.3498**	.1840**	1.0000	.0248**
Density of CN trees	-.6484**	-.5641**	.0564*	-.5423*	.0248**	1.0000

* Significant at 10% level ** Significant at 1% level

The coconut productivity is positively related to the size of land and the total number of trees, the later being a more appropriate index of scale of coconut cultivation. It is positively related to the proportion of agricultural income to total household income and negatively to the coconut density. Surprisingly, a significant relationship is hold between area of paddy single crop owned and productivity of coconut. This is because coconut trees that are on the outer bunds of paddy lands have relatively much better productivity due to better drainage, sunlight and soil fertility.

Productivity of paddy also was seen to be positively related to land size, largely reflecting greater input use by larger holders. Given the ecological conditions, little can be done to increase the productivity of paddy in the coastal plain. But

significant scope for improvement exists in the valley. Greater utilization of high productivity seeds and significant increase in the cropping intensity could be achieved through better water control measures.

Chapter VI

Summary and Conclusion

As already stated in the introduction, the objectives of our study have been two-fold: a) a reappraisal of the overall agricultural performance of the state of Kerala and b) a micro level enquiry into the constraints to agricultural growth in the state. Now in this concluding chapter, we shall highlight some of the salient findings of our exercise.

In chapter II of our study we have undertaken a detailed statistical analysis of the trends in area, yield, and output of crops between 1962/63 and 1990/91. Our exercise tends to conform the hypothesis of cyclical agricultural growth pattern of the state determined by the nature of its perennial tree crops. Between 1962/63 and 1972/73, production increased at an average annual rate of 4.05 per cent and in the subsequent period 1973/74 to 1982/83 it has shown a negative growth rate of -1 per cent. During the last period (1983/84 to 1990/91) there has been a recovery in the growth of output at an annual rate of 3.53 per cent. [see Table 2.1]

The limit to extensive land frontier was reached by the end of the first period itself. In fact there was a decline in the gross cropped area in the second period. The source of growth in the recovery period was yield effect and shift in the cropping

pattern to high valued non-food crops. Significant regional disparities in the agricultural growth pattern are also discernable. The yield growth rates also varied considerably in different regions.

However, on the whole, total agricultural output increased only at an annual rate of 2.11 per cent during the period from 1962/63 to 1990/91. Further, as is well known, the level of productivity of individual crops in Kerala are relatively low when compared to the competing regions. These disquieting features of agricultural performance prompted us to pursue the second objective of the study - micro level analysis of constraints to agricultural growth. Given the ecological diversity, differences in cultivation practices, social traditions and characteristics of farm households, it is important to analyze locale specific factors. The panchayat of Kalliasseri in Kannoor district was the case study chosen. Even a small village like Kalliasseri, on close analysis reveal a surprising degree of ecological diversity, from laterite hill terrace, slopes, valleys, sandy plains to marsh lands.[Chapter III] Even in a micro level intervention to improve agricultural productivity, these differences would have to be borne in mind.

Our statistical analysis in chapter V showed that the average yields of coconut and paddy in the panchayat of Kalliasseri was significantly lower than even the state averages.

And interesting finding is that the productivity of the crops are positively correlated to size of holdings. Due to the commercial nature of the inputs, both of labour as well as material, the larger size holders enjoy greater advantage. Particularly in the case of coconut it was noticed that the cultivation practices that have been followed were inappropriate. Not only the coconut seedlings were planted in an unscientific manner in areas of excess moisture but also they were too densely planted. Yield was seen to be declining with density and density was seen to be significantly higher in smaller holdings.

The above discussion underlines the importance of extension work in improving the cultivation practices and adoption of scientific packages. But this alone would not solve the problems of productivity in Kalliasseri. Our discussion in chapter III has drawn attention to some of the major environmental problems that have been created due to misguided social interventions. Three of such major problems identified may be noted: 1) the drainage problems in the coastal plain caused by changes in the cropping pattern, infrastructural development and spread of human habitation, 2) the increasing problem of salinity as a result of unrestricted groundwater utilization in the coastal plain, and 3) the siltation of the valley rivers causing floods in monsoon and causing water scarcity in summer. The extension work in improving the cultivation practices should be accompanied by community interventions to solve the above problems to attain sustainable

increase in productivity.

Our discussion in chapter IV has brought out some of the important social constraints in planning and implementing the above productivity enhancing programmes. There is a high level of fragmentation of holdings and occupational shift away from agriculture so that agriculture has already become a subsidiary occupation. In such a social environment, how could so sufficient social enthusiasm be generated for agricultural rejuvenation, or appropriate social institutions be created for better utilization of land and water resources? These are the questions for which the social activists in the panchayat of Kalliasseri, who generated the data used for much of our analysis, are trying to grapple with. We would only state that the future of Kalliasseri's agriculture depends upon to a large measure on their success.

Appendix 2.1

Crop-wiseAverage Annual Growth Rates (Annual Percentage Change).

	1962/63 to 1990/91			1962/63 to 1972/73			1972/73 to 1982/83			1982/83 to 1990/91		
1. Paddy	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Thiruvananthapuram	-1.97	-0.95	1.05	0.25	1.10	0.84	-2.85	-2.71	0.30	-3.66	-1.32	2.26
GPA Group	-0.64	1.01	1.77	0.80	1.71	0.98	-0.52	1.30	1.98	-2.61	-0.23	2.62
KIE Group	-0.87	0.87	1.78	1.57	3.87	2.15	-0.22	1.71	2.06	-4.73	-3.92	0.68
Thrissoor	-1.24	0.00	1.37	0.23	1.39	1.20	-0.06	-0.04	0.20	-4.55	-1.67	3.05
MPKWKK Group	-1.41	0.09	1.48	0.94	3.01	2.04	-1.67	-1.33	0.41	-4.00	-1.77	2.11
Kerala	-1.34	0.17	1.39	0.88	2.51	1.61	-1.13	-0.42	0.73	-4.39	-2.03	1.94
2. Tapioca												
Thiruvananthapuram	-1.09	3.53	4.73	4.27	14.37	10.06	-2.76	-0.67	2.36	-5.71	-4.76	1.02
GPA Group	-1.58	2.53	4.36	3.60	15.98	12.66	-4.52	-6.47	-1.67	-4.38	-2.93	1.51
KIE Group	-2.41	3.84	6.57	-0.18	15.73	16.36	-1.76	-1.47	0.48	-6.82	-4.37	1.95
Thrissoor	0.77	4.92	6.87	8.17	19.42	13.49	-2.48	-3.51	1.83	-4.43	-2.66	2.88
MPKWKK Group	1.96	6.24	4.43	9.16	20.96	11.77	0.66	-2.00	-2.42	-5.39	-1.85	3.81
Kerala	-1.25	3.81	4.58	3.48	15.11	11.98	-2.73	-3.64	-0.78	-5.29	-3.88	1.64
3. Banana & Other Plantains												
Thiruvananthapuram	4.35	4.69	1.14	8.39	8.54	0.07	4.55	3.97	1.16	-0.94	0.79	2.46
GPA Group	1.45	2.31	1.14	1.09	1.16	0.87	-0.52	-3.16	-1.82	4.35	10.59	6.18
KIE Group	3.45	5.85	2.36	4.97	5.09	0.09	3.47	6.62	2.91	1.51	5.82	4.82
Thrissoor	3.24	3.52	0.24	6.91	5.24	-1.63	-1.54	-0.63	0.82	4.64	6.63	1.86
MPKWKK Group	0.87	1.88	1.02	-1.89	-1.89	0.00	-1.17	0.14	1.62	6.88	8.76	1.56
Kerala	1.65	2.69	1.18	1.14	1.03	-0.11	0.28	0.93	1.16	4.00	6.96	2.56
4. Arecanut												
Thiruvananthapuram	-2.39	-2.15	0.35	1.40	1.76	0.34	-2.98	-6.41	-3.58	-6.39	-1.73	5.29
GPA Group	-1.42	0.54	1.75	5.20	7.59	2.31	-5.74	-7.39	-1.98	-4.31	1.63	5.71
KIE Group	-0.87	0.87	1.63	4.64	2.20	-2.38	-2.55	0.92	3.58	-5.65	-1.98	4.28
Thrissoor	-0.65	0.93	1.82	6.71	6.60	-0.10	-6.99	-2.17	5.47	-1.92	-2.31	-0.32
MPKWKK Group	2.20	3.66	1.58	4.96	4.63	-0.19	-2.19	0.80	3.31	4.38	5.84	1.34
Kerala	0.74	1.96	1.27	4.87	4.73	-0.14	-3.48	-1.54	2.09	0.85	2.88	2.01
5. Coconut												
Thiruvananthapuram	1.66	2.59	0.81	3.37	3.01	-0.28	-0.28	-3.90	-3.51	1.95	10.16	7.49
GPA Group	0.87	0.34	-0.17	3.04	2.88	-0.12	-2.27	-4.44	-2.27	2.06	3.82	2.39
KIE Group	0.72	0.24	-0.36	3.02	1.02	-1.92	-0.98	-1.58	-0.66	-0.15	1.53	1.95
Thrissoor	3.21	3.59	0.58	5.21	5.49	0.78	0.19	0.59	0.42	4.58	4.98	0.53
MPKWKK Group	2.58	2.05	-0.56	3.38	0.51	-2.77	-0.51	0.19	0.71	5.45	6.38	0.63
Kerala	1.77	1.29	-0.47	3.31	1.76	-1.49	-0.96	-1.95	-0.99	3.28	4.76	1.45
6. Cashew												
Thiruvananthapuram	-0.10	4.14	5.43	0.28	0.29	0.01	4.58	-2.21	-5.13	-6.31	16.87	25.36
GPA Group	0.78	0.48	-0.06	0.22	0.24	0.02	0.14	-6.39	-6.43	2.28	9.38	7.80
KIE Group	-2.11	-4.39	-2.15	-2.00	-1.87	0.13	0.33	-4.87	-4.27	-5.35	-7.64	-2.31
Thrissoor	-1.43	0.90	2.60	-2.25	-2.29	0.05	0.88	7.49	5.99	-3.35	-3.34	1.55
MPKWKK Group	2.43	2.45	0.43	4.39	4.62	1.05	4.44	-2.68	-6.78	-2.53	6.16	8.58
Kerala	1.34	0.85	-0.25	2.25	2.30	0.39	3.43	-3.63	-6.69	-2.41	4.63	7.81

Appendix 2.1 continues.

Crop-wiseAverage Annual Growth Rates (Annual Percentage Change).

	1962/63 to 1990/91			1962/63 to 1972/73			1972/73 to 1982/83			1982/83 to 1990/91		
7. Sesamum	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Thiruvananthapuram	13.00	11.38	3.69	-2.47	1.80	4.46	24.23	18.10	1.94	18.30	24.96	4.92
GPA Group	-1.00	1.36	2.92	0.42	5.83	5.56	0.56	-1.89	-2.44	-5.00	-0.16	6.34
KIE Group	3.86	5.36	3.24	-1.51	-0.19	1.41	17.73	13.50	-0.80	-6.78	2.11	10.58
Thrissoor	-0.38	5.09	5.53	-0.01	16.52	16.53	1.90	-1.91	-3.80	-3.70	-0.45	3.53
MPKWKK Group	1.16	3.12	0.74	-0.62	-0.59	0.03	6.16	14.10	4.47	-2.87	-5.98	-3.04
Kerala	-0.39	0.54	1.22	-0.06	3.91	3.80	2.77	1.31	-0.99	-4.75	-4.63	0.76
8. Rubber												
Thiruvananthapuram	6.43	12.24	5.51	5.85	19.20	12.62	3.49	5.65	2.30	10.83	11.80	0.64
GPA Group	4.16	8.54	4.49	3.50	11.08	7.29	1.98	5.03	3.17	7.71	9.75	2.65
KIE Group	4.36	18.27	13.54	3.07	38.26	34.89	2.86	6.03	3.17	7.86	8.57	0.84
Thrissoor	0.25	5.55	5.57	3.57	8.45	4.73	-0.89	0.89	0.76	-3.47	7.75	12.63
MPKWKK Group	3.62	10.65	6.93	4.34	14.10	9.60	3.63	7.58	3.81	3.40	10.17	7.50
Kerala	4.03	10.81	6.58	3.58	17.22	13.22	2.79	5.61	2.82	6.16	9.29	3.00
9. Pepper												
Thiruvananthapuram	-0.90	1.37	1.78	2.14	2.66	0.53	-2.19	-3.09	-3.43	-3.10	6.01	9.87
GPA Group	6.42	4.91	0.96	1.89	2.15	0.25	15.45	3.22	-4.58	0.78	10.46	8.78
KIE Group	3.82	7.90	3.40	1.89	0.21	-1.67	2.93	-1.00	-3.04	7.34	28.73	17.79
Thrissoor	19.82	11.54	3.58	0.23	6.42	6.18	51.94	17.11	-0.84	4.16	11.00	5.86
MPKWKK Group	1.63	4.88	3.19	1.67	-0.33	-2.00	-3.04	4.59	8.30	7.41	11.77	3.30
Kerala	2.07	4.34	1.69	1.76	0.48	-1.28	-0.71	0.51	0.99	5.93	13.94	6.27
10. Cardamom												
Thiruvananthapuram	..	..	..	..	..	..	..	..	..	3.16	63.96	91.58
GPA Group	..	..	..	..	..	..	..	..	..	64.74	91.24	75.75
KIE Group	2.19	7.27	7.77	7.74	1.17	-3.53	0.47	9.84	9.38	-2.60	11.68	19.90
Thrissoor	..	..	..	..	..	..	..	..	..	..	..	..
MPKWKK Group	5.38	6.77	3.28	0.12	3.50	3.38	13.07	9.89	1.10	2.35	7.96	5.89
Kerala	2.47	6.83	6.19	6.95	1.29	-3.87	1.50	9.58	8.29	-1.82	10.31	15.14
$- Data used for Tvm. & GPA is from 1976/77 to 1990/91												
11. Coffee												
Thiruvananthapuram	..	..	..	..	..	..	33.44	69.49	10.52	56.79	..	..
GPA Group	12.86	..	..	6.51	49.58	42.65	29.45	79.60	22.39	0.06	..	..
KIE Group	10.25	..	..	1.62	7.80	6.19	17.63	32.93	12.06	11.00	..	..
Thrissoor	..	..	..	..	..	..	..	..	..	..	..	..
MPKWKK Group	4.91	83.07	77.43	6.61	5.78	-0.77	5.23	6.84	0.58	2.38	274.97	271.35
Kerala	5.17	54.71	48.34	6.11	5.86	-0.24	5.65	8.12	1.24	3.41	173.99	167.92
¢ Data used for Tvm. is for 1964/65 to 1989/90¢¢ Data used for Kannur is from 1962/63 to 1988/81												
12. Tea												
Thiruvananthapuram	102.07	100.99	1.53	0.29	1.29	1.26	285.41	279.09	0.38	0.12	2.98	3.32
GPA Group	-1.87	-0.54	2.93	-0.53	5.25	9.92	-3.45	-10.01	-5.86	-1.58	4.04	5.16
KIE Group	-0.36	2.29	2.67	0.05	0.86	0.84	-0.90	1.51	2.42	-0.20	5.07	5.27
Thrissoor	..	..	..	0.90	0.47	-0.54	..	..	..	0.52	10.00	9.49
MPKWKK Group	0.87	6.93	5.61	0.96	3.56	2.56	1.51	11.70	8.97	-0.03	5.19	5.21
Kerala	-0.36	2.21	2.58	0.00	1.39	1.41	-0.85	0.94	1.78	-0.21	4.04	5.05

Source : Estimated using data from Directorate of Economics and Statistics, Government of Kerala, Economic Review (various issues), State Planning Board Thiruvananthapuram.

Appendix 2.2

Co-efficient of variation

	1962/63 to 1990/91			1962/63 to 1972/73			1972/73 to 1982/83			1982/83 to 1990/91		
1. Paddy	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Thiruvananthapuram	9.36	10.72	7.54	5.90	8.75	4.59	5.82	8.03	5.40	6.04	9.54	7.56
QPA Group	7.94	9.30	5.91	4.94	8.44	5.96	4.38	4.17	3.35	7.14	7.25	4.73
KIE Group	11.59	13.16	6.68	9.29	14.62	7.79	4.76	6.56	5.34	8.87	9.57	3.67
Thrissoor	9.75	7.96	8.19	5.49	7.57	5.54	5.03	5.98	4.86	10.85	8.63	3.34
MPKWKK Group	8.81	10.71	5.52	7.99	9.27	3.99	3.35	4.00	3.82	8.35	9.36	4.44
Kerala	8.79	9.00	4.15	7.54	9.52	4.06	1.98	2.29	1.93	8.10	7.26	3.52
2. Tapioca												
Thiruvananthapuram	18.67	33.77	29.51	18.11	18.72	13.99	14.63	19.44	10.67	14.71	25.47	13.81
QPA Group	22.63	41.33	25.83	21.14	31.52	13.98	14.82	30.06	19.44	8.56	13.48	7.14
KIE Group	13.21	36.32	43.25	6.03	9.93	8.89	9.53	19.58	28.03	13.60	21.70	14.48
Thrissoor	32.74	54.81	54.36	25.21	41.07	19.08	24.78	32.96	28.18	17.22	30.20	23.70
MPKWKK Group	26.88	37.40	25.44	24.75	40.30	15.84	12.44	16.29	16.56	18.94	22.21	8.43
Kerala	18.27	31.33	24.18	17.83	22.60	7.11	10.60	20.87	14.92	12.36	16.19	6.72
3. Banana & Other Plantains												
Thiruvananthapuram	18.96	34.32	29.17	16.53	16.82	3.27	12.88	21.78	29.17	15.14	11.44	9.99
QPA Group	11.41	30.33	22.87	4.71	6.24	3.34	8.62	35.58	30.27	6.55	5.92	5.49
KIE Group	15.15	47.48	28.06	6.67	6.95	7.00	12.24	40.75	31.59	6.95	12.87	3.93
Thrissoor	24.98	49.93	20.11	18.00	16.82	8.75	18.67	34.24	20.11	2.98	7.58	9.74
MPKWKK Group	17.58	31.82	18.12	9.11	13.13	3.10	10.25	27.21	21.28	13.36	13.24	3.20
Kerala	9.25	29.24	28.91	5.45	7.25	3.49	6.31	29.28	25.53	4.91	5.54	2.83
4. Arecanut												
Thiruvananthapuram	14.16	25.44	18.26	10.67	11.02	0.98	11.64	29.43	20.02	13.57	13.04	11.07
QPA Group	25.78	48.54	31.18	13.88	13.82	5.61	25.37	49.83	24.60	7.57	22.94	20.00
KIE Group	17.46	12.74	13.54	17.18	11.69	13.55	11.19	9.01	10.45	13.75	15.94	14.36
Thrissoor	32.00	26.35	11.73	24.16	20.76	5.96	33.26	18.67	11.80	4.66	6.54	4.50
MPKWKK Group	20.29	24.40	9.23	11.20	7.80	5.50	17.54	11.92	8.50	8.51	10.86	5.99
Kerala	19.90	20.36	6.79	13.61	10.40	4.42	18.87	14.11	4.22	2.90	7.76	7.13
5. Coconut												
Thiruvananthapuram	8.45	31.40	21.19	7.40	9.21	6.77	6.56	23.10	15.40	3.47	17.50	16.19
QPA Group	12.56	23.46	14.14	7.64	6.84	3.46	12.62	19.05	6.52	5.52	13.15	12.62
KIE Group	8.48	13.69	9.17	7.12	5.42	3.87	6.31	12.83	7.60	3.52	12.49	12.20
Thrissoor	12.82	20.06	11.47	9.55	10.01	8.35	10.10	9.12	4.56	4.75	14.24	11.85
MPKWKK Group	12.49	18.15	7.35	5.26	4.49	5.35	11.80	13.04	6.13	6.56	12.72	8.45
Kerala	10.46	16.63	7.48	6.33	4.77	2.37	9.44	12.03	2.73	4.93	12.91	10.29
6. Cashew												
Thiruvananthapuram	21.53	48.12	48.88	11.04	8.44	20.41	13.26	48.25	89.06	17.41	45.59	66.96
QPA Group	8.49	33.36	28.71	6.66	6.05	0.31	3.26	23.01	22.61	4.45	31.86	31.21
KIE Group	9.29	23.51	25.15	6.07	6.13	4.65	11.82	25.56	27.11	8.62	11.68	14.90
Thrissoor	18.18	62.91	84.31	3.70	6.59	9.81	11.81	64.73	77.02	8.93	35.16	42.41
MPKWKK Group	15.35	22.88	30.63	8.30	9.08	8.16	10.41	22.11	32.62	11.95	10.35	19.93
Kerala	11.46	19.48	26.41	4.76	6.27	5.83	9.45	20.36	29.86	9.35	12.68	20.96

Appendix 2.2 continues.
Co-efficient of variation

	1962/63 to 1990/91			1962/63 to 1972/73			1972/73 to 1982/83			1982/83 to 1990/91		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
7. Sesamum												
Thiruvananthapuram	70.96	65.19	32.16	8.55	9.68	8.08	111.79	95.84	33.83	30.63	41.63	24.59
OPA Group	17.10	30.22	33.40	4.96	25.80	21.80	13.29	19.46	18.99	15.20	33.44	30.06
KIE Group	36.29	63.76	55.25	19.43	21.30	11.09	26.46	22.78	21.07	26.86	45.62	27.29
Thrissoor	21.85	97.25	99.70	1.85	32.79	32.20	22.72	43.28	48.90	17.14	82.56	74.20
MPKWKK Group	16.76	42.20	33.88	6.35	14.41	9.23	17.99	28.62	19.26	14.88	44.92	28.67
Kerala	17.38	23.48	28.87	2.85	28.39	19.87	14.09	11.43	7.32	14.18	27.63	19.98
8. Rubber												
Thiruvananthapuram	18.56	32.66	26.87	3.18	32.62	27.60	17.09	18.88	9.27	4.38	13.11	11.41
OPA Group	10.34	17.49	21.35	2.86	10.65	9.89	8.33	15.54	10.88	4.41	3.43	6.35
KIE Group	11.74	74.54	54.36	5.16	14.41	11.61	9.05	39.93	27.95	6.77	64.35	58.35
Thrissoor	10.67	29.54	45.85	8.88	9.58	3.95	4.63	18.84	26.42	14.92	8.67	17.77
MPKWKK Group	6.56	31.25	29.49	4.32	13.29	12.95	3.79	21.81	21.68	5.90	6.71	7.30
Kerala	7.26	26.47	27.16	2.28	14.59	11.90	6.33	17.18	13.94	3.56	8.81	10.26
9. Pepper												
Thiruvananthapuram	25.97	75.31	47.41	11.74	9.82	11.51	14.78	21.56	19.49	5.97	23.42	20.05
OPA Group	50.98	41.31	28.89	16.72	12.31	6.67	29.77	28.53	12.45	24.87	19.06	20.50
KIE Group	13.72	57.33	32.08	6.83	30.58	16.72	13.86	64.85	40.16	12.10	29.80	24.00
Thrissoor	62.99	42.97	59.79	8.71	27.24	26.84	24.74	29.33	23.73	15.79	27.38	26.23
MPKWKK Group	23.82	44.16	23.36	4.82	18.20	16.63	12.85	17.64	11.15	16.53	14.83	19.50
Kerala	13.63	39.91	14.63	4.49	12.90	8.56	10.81	22.90	8.88	11.97	18.85	15.42
10. Cardamom												
Thiruvananthapuram	17.87	54.04	53.03	..	..	..	67.59	80.29	79.88	18.82	46.78	54.73
OPA Group	89.04	97.35	46.29	..	..	..	65.54	72.02	72.01	59.88	91.98	51.82
KIE Group	14.76	34.93	36.35	24.38	17.42	37.86	4.14	26.50	26.43	14.74	28.73	38.40
Thrissoor	..	..	..	..	..	..	..	..	..	..	..	..
MPKWKK Group	27.60	43.78	39.99	19.78	16.02	5.65	21.47	27.93	26.27	15.81	32.10	26.50
Kerala	12.14	72.98	98.17	17.88	35.02	59.52	3.74	28.49	41.91	12.91	32.31	51.67
11. Coffee												
Thiruvananthapuram	135.71	117.08	56.01	196.89	196.89	47.14	53.36	67.91	36.14	91.52	87.59	87.90
OPA Group	43.83	124.00	99.44	33.10	78.24	63.59	47.43	89.41	63.14	8.24	98.21	98.32
KIE Group	57.64	88.18	55.63	4.43	26.63	23.47	28.43	54.00	39.62	38.30	106.73	103.97
Thrissoor	93.59	132.84	126.42	..	..	..	58.27	79.91	69.24	1.34	87.67	98.27
MPKWKK Group	45.21	53.13	31.48	20.03	17.97	3.14	19.28	26.34	14.31	3.42	64.53	65.11
Kerala	38.97	51.21	29.85	18.61	18.38	1.84	18.28	28.28	15.07	6.77	57.99	59.66
12. Tea												
Thiruvananthapuram	18.59	23.73	14.92	4.45	6.41	8.16	32.19	33.78	9.98	2.78	19.97	19.06
OPA Group	13.88	61.32	83.62	18.43	16.17	23.71	18.65	49.81	52.14	4.47	24.82	30.42
KIE Group	2.88	11.17	10.55	3.18	6.64	6.87	1.59	8.15	7.65	0.51	12.46	12.21
Thrissoor	19.27	34.92	33.64	5.44	9.34	5.66	33.35	35.18	35.13	1.42	19.84	19.46
MPKWKK Group	9.83	87.77	74.57	3.64	22.17	18.47	12.28	47.65	36.75	2.28	46.65	31.21
Kerala	2.58	11.98	11.11	2.53	6.68	6.41	1.44	9.78	9.18	0.49	10.99	10.78

Source : Same as in Appendix 2.1

Appendix 5.1

Case Studies.

Case studies of selected farmers in the village are summarised in this Appendix. Relatively successful farmers from all the zones have been chosen for the presentation.

Case 1:

Sri. Muthar Gangadharan Master, Ozhacrome, cultivates 0.70 acre of paddy field in the valley and 2.86 acres of coconut and other mixed crops in laterite terrace zone. Paddy double crop is the practice, however, no third crop of even pulses or vegetables is possible, due to lack of irrigation water. He uses only modern HYV seed, Jaya, for both first and second crop, because there is no water-logging problem.

'Natti' is the paddy cultivation practise followed. Labour scarcity is the main problem according to Sri. Muthar Gangadharan. Tiller and Oxes are used for ploughing the field. It is very difficult to finish the transplanting in time because of labour scarcity and competition among farmers to get a hired triller and/or oxes for ploughing the field.

Both bio-chemical and chemical fertilizers were used for every cropping. He uses more of bio-chemical fertilizer, and for

that compost is prepared using nutritious plant leaves and cow dung. His experience in manuring suggests that both bio-chemical and chemical fertilizers are needed to get better yields as both are complementary. In his experience, the first crop is almost free of pests, but the second crop suffers much. Pesticide use was found effective in controlling the pests.

He uses about 85 kg. seeds per acre. Average cost incurred for paddy production is around Rs.3715 per acre and average yield of 1250 kg. of paddy is obtained per acre. At 1992 price, the average earning per acre of paddy is Rs. 4364. The money value of paddy production is estimated at the rate of Rs. 5 per one seer of paddy.

In his agricultural land other than paddy field, 200 coconut palms and mixed crops of pepper, cashew, plantain, etc. are cultivated. With inter cropping of other trees, 72 coconut palms per acre means high density of plants. Yield per coconut tree is only 20 nuts a year, on an average, inspite of the regular use of chemical and bio-chemical fertilizers in every two year. According to Sri. Muthar Gangadharan, dense planting of trees and inter cropping of plantain beneath the trees will keep the wetness of the soil in summer season. Lack of irrigation facilities and the highly draining nature of soil reduces yield from coconut. And in recent years, coconut palms were affected by an infectious desease, the cause and remedy of which has not been

found out.

Cashew was said highly profitable. The annual maintenance cost of it was nil. He gets 4 quintal cashew a year. And dry pepper of 20 kg. a year adds to his agricultural income. He had not utilized agriculture credit.

Agriculture is profitable if monsoom from June to November is good, and productivity could be improved if irrigation water is available in summer season.

Case 2:

Sri. T.P. Govindan Nambiar, Theeyyancherri Parakkadavu, cultivates 50 cents of paddy fields in the valley and 1 acre of coconut land, fragmented in Side Slope Zone and in Terrace (zone I). Paddy double crop and pulses is the practice in his field (Paddy 'Virippu' first, pulses second, and paddy 'Puncha', third). Both traditional varieties and HYV seeds were used. Traditional paddy seed 'Varokey' only is used for first cropping, because water-logging is a problem during first cropping period. 'Varokey' is somewhat resistant to water-logging as it is lengthy and strong plant compared to the moden HYVs. For the second cropping only HYV 'Jaya' is used. Seed needed for 50 cents is about 10 seers per crop.

'Njeri' is the cultivation practice for paddy first crop, while for second crop it is 'Natti'. Only tiller (hired for Rs. 70 per hour, including operating charge) is used for ploughing. Although chemical and bio-chemical fertilizers are being used he prefers bio-chemical fertilizer. Pesticides are used only in second crop and its application is found effective in controlling pests. Scarcity of labour and the high wage rate makes paddy cultivation unattractive. Output of paddy per acre will only be 890 kg. per crop (ie, Rs. 4200/crop), while cultivating cost and manuring expenses amount to Rs. 3500-4000. However, pulses production is highly profitable if climate and rainfall permits. According to Sri. T.P. Govindan Nambiar, people are no more giving interest in agriculture as in the past.

In his one acre of coconut land 100 palms were planted. No inter-cropping is practised in coconut land because of agricultural labour scarcity. Seedlings used are both HYV and traditional varieties. HYV seedlings from Payyannoor Coconut Research Station has been planted. He is hoping that some of them yield around 200 nuts per tree a year. However, high yielding trees are too few in number. Trees of seedlings brought from other Agricultural Offices yield on an average only 10 nuts per tree a year. Fragmented holdings caused difficulties in management. The infectious desease to palms is a problem in almost all parts of the village.

Case 3:

Sri. Mangattu Koran's garden land holdings are in Side Slope Zone. He cultivates 65 cents of paddy field in the valley and 50 cent of coconut and other mixed crops. Paddy double cropping is the practice, but a third cropping of pulses not possible because of lack of irrigation facilities. Only modern HYV 'Jaya' is used as seed. Organic fertilizer only was used. The high price of chemical fertilizers makes him to reduce its use. He uses about 65 kg. seeds per acre per crop. Average cost of production comes is Rs. 3850 per acre of paddy yielding 1662 kg. paddy. An average earning of Rs. 4940 is obtained.

Pests are not creating much problem, however, birds like 'Ela' eat up the grains. Seeds distributed from Agricultutral Offices were bad last year.

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In 50 cents of coconut land 50 palms are planted with inter-crops of pepper and plantain. Impenetrable planting of palms and other plants was the system followed because it helps to retain the surface moisture of the soil. Cow dung and lime were used for manuring. Average yield of 40 nuts per coconut tree a year, was obtained. The age of the palms come up to 20 years at the most. Lack of irrigation facilities prevents growth of coconut productivity. The infectious desease that affected palms all over the village is a problem in Sri. Koran's land also. The border

lines of his paddy fields also was planted by coconut palms which have not yet started yielding.

Coconut is preferred more compared to paddy and other crops because of the low annual inputs for coconut required. If irrigation water is available during the summer the yield from coconut palms will be very high. Although Sri. Koran is a successful farmer, agriculture is not his primary employment.

Case 4:

Sri. K. Govindan Nair is a farmer relying only on agriculture for income. His holdings of 75 cents of paddy fields and 25 cents of mixed crops is in zone III. Earlier in his fields only paddy single crop system was followed and was profitable. Now paddy double crop is the practice. However, the water-logging problems during the first crop and the lack of irrigation water during the second crop made paddy cultivation a loss making proposition. Second crop is relatively costly because 'Natti' is the cultivation practice for second crop and the problem of pests are more severe.

In the mixed crop area, coconut, arecanut and plantain are the important crops. Yield from coconut is low. Arecanut is found good for clay soil and is high yielding. Even then, agriculture is not profitable because of scarcity of labour as well as high

wage rate. Wage for woman labour is Rs.25 per day in agriculture. But it is very low compared to that of Rs. 50 per day for a woman construction worker. To the farmer, wage cost is too high, and to the labourer, wage in agriculture sector is too low to be attractive.

Sri. Govindan Nair has utilised agricultural credit facilities. The problem is not of the lack of credit institutions and/or facilities, but of repaying debt if production fails. One bad crop will be enough to break the backbone of a farmer with debt.

Case 5:

Sri. Thuthi Kunjampu cultivates 3 acres of paddy fields in zone III. The valley floor is fertile for paddy. Double cropping was practised in most part of the fields. However, no third crop possible because of water scarcity. In the valley floor first crop is affected by water-logging and second by scarcity of water.

Traditional varieties of seeds like 'Mundakan', 'Vrokey', and 'Kururai' are used during first crop, because these seeds are highly resistant to water-logging problems. Sowing is the cultivation practice in the case of the traditional varieties of seeds. Modern HYVs like 'Jaya', 'IR8', and 'Masuri' are used for

second crop, and 'Natti' is the cultivation practice.

Hired tiller is used for ploughing the fields. Scarcity of labour (especially women) is severe. This problem confronting paddy cultivation may cause its doom, for once the old agricultural labours retire from job nobody will be available to do paddy cultivation. And the youngsters do not have training and skill in paddy field work. Labour scarcity causes delay in finishing planting of seedlings grown in nursery, in time. Actually 30^{th} day of sowing the seeds is optimal for transplantation, but labour scarcity causes delay in planting even upto 60th day after sowing. Such delays in finishing 'Natti' works retards the growth of plants. Wage rate also is high because of scarcity of labour.

Both traditional and chemical fertilizers used for manuring, but the high price in chemical fertilizer reduced its use this year. Break up of 'Jenmi' system and decline in holding size caused decline of vegetation cover traditionally used for compost manure. Pests severely affect 'Mundakan'. However, pesticides are not used because it is difficult to apply them in 'Mundakan' fields due to the height of the plant. Now-a-days pests are becoming resistant to pesticides. Around 72 kg. seeds per acre is used. An average yield of 1440 kg. paddy per acre is obtained in his fields. Cost of production of paddy per acres is Rs. 3500. And the earnings amount to Rs. 4100 per acre. Value of straw acts

as an incentive to cultivate.

Drainage problem is severe in valley area because people build bunds in the stream flowing through the valley for fishing purposes. This causes water-logging during rainy season. Smmer season dries off the clay soil. Lack of irrigation water prevents a third cropping of paddy or pulses.

Because electric lines are drawn through the paddy fields, hundreds of thousands of birds like 'Ela', 'Pigeon', etc. come to perch on them and destroy grains. This problem is severe in valley area. However, paddy fields in valley floor still remains under paddy, because it is low land difficult to reclaim, for dwelling or coconut cultivation.

Since valley is low land, those who have holdings in valley area reside in other zones and the manure and seeds need be carried from home to the fields. Only old aged people are interested in agriculture and this causes difficulties in managing agriculture. Abolition of Government subsidies also is a dis-incentive for cultivation.

Case 6

Sri. Karikkan Kumaran got 2 acres of paddy fields and 45 cents of coconut land holdings in zone III. He uses only modern HYV seeds like 'Masuri', 'Jaya' and 'Ponni' for paddy

cultivation. 'Natti' is the planting practice followed. Two crops of paddy and a third crop of pulses is taken. Scarcity of labour is a problem and this causes delay in finishing 'Natti' works in time. More than that, change in the pattern of food consumption reduced the ability of women labour in doing agricultural works. Earlier labours used to eat rice gruel and curry for breakfast, but now-a-days they prefer tea and snacks. Yield declines if trasplantation is delayed. Family labour reduces the dependency on hired workers and to that extent the problem of scarcity of labour.

First crop is affected by water-logging, and the second crop by pests. Pesticides are found effective in controlling pests. The HYV 'Jaya' is more vulnerable to pests. Sometimes, 'Chittayini', a traditional variety is cultivated as second crop to get more straw. Scarcity of water has not become a problem in paddy fields. However, if irrigation water is available, third crop of paddy is possible.

Hired tiller is used for ploughing the fields at Rs. 70 per hour. Animal ploughing would be costlier. Compost is used for manuring the fields. High price of chemical fertilizer has reduced its use. He uses bank credit to meet cost of cultivation and is satisfied with the available credit facilities in the village. According to Sri. Kumaran, paddy is profitable if climate and rainfall is good and there is timely labour supply.

And the third crop of pulses and/or sesamum is profitable.

Coconut on border lines of paddy fields and in the coconut land adds to his income. Density of coconut palms is high, planting 50 palms in 45 cents. Aging of the palms and the disease prompted him to plant more palms in the limited area. He is expecting a regular income from coconut even if some palms perish. Yield per tree is only 30 nuts a year, on an average. Productivity per tree could have been increased if irrigation water was available. But scarcity of water prevents irrigating coconut land. The traditional varieties of coconut was used for seeds, because of their long duration and resistance to most of the plant deseases. But the yields are not high as the hybrid ones.

Case 7:

Sri. C. Govindan, Pulikkandi house, cultivates 2.32 acres of paddy fields in zone IV. Paddy cultivation in coastal strand plain is troubled with water-logging. However, a traditional variety, 'Vadakan' grown in coastal plain is a dry land paddy crop. Only paddy single crop is taken. No second or third cropping of pulses or vegetables possible because of scarcity of water.

About 135 seers of modern HYV like 'Jaya' and 'IR8' were

used as seed last time. 'Natti' is the planting practice. In the month of May itself fields will be prepared for planting and seedlings be made ready in nursery. In June planting will be over. Wages are high relative to productivity of labour. Wage of a woman labour is Rs. 24 a day and for male labour it is Rs. 70 per day. Scarcity of labour creates much trouble in finishing the 'Natti' works in time. The harvesting charges are usually paid in kind. Last harvesting cost was around 390 kg./acre. After allowing for harvesting charges, he got 620 kg. of paddy per acre.

Productivity of HYVs are declining in his fields. Only bio-chemical fertilizer (about 200 kg. per crop) is used, especially cow dung. Chemical fertilizer is not used because once it is used, it necessitates continous use. Although pests are destroying the plants and production, he is reluctant to use pesticides because production is for home consumption only.

Modern machines were not used for cultivation and traditional labour intensive techniques are being followed. Labour tilling is more suitable, than using tiller or oxes for ploughing. Considering all the efforts paddy cultivation is a loss for Sri. Govindan.

Coconut is planted on the border lines of paddy fields. In coastal plain coconut palms start yielding at the 5th year of

planting and usually have a life span of 60 years. Palms on the border lines of fields yield high, and he gets 50 nuts per tree a year. Borderline cultivation of coconut is an incentive to continue paddy cultivation.

Salinity of water is not a problem in his land. However, fear of spreading salinity into drinking water well, if well is further deepened for irrigation purposes, prevents him from doing so. No other means of irrigation available other than the well.

Case 8:

Sri. Kakamani Narayanan cultivates 2.44 acres of paddy fields and 75 cents of coconut in zone IV. Earler a traditional variety of paddy called 'Vadakkan' was used for cultivation, but in recent years only modern HYVs like 'Jaya', 'Masuri' and 'IR8' are used. Paddy single crop and a second crop of pulses were cultivated. Water-logging or water scarcity problems are not affecting cultivation. Sometimes the stream flowing through the borderline of the paddy land overflows, because it is becoming too narrow due to increased reclaiming of the banks for planting coconut. Salinity has not affected his land. Although water is available in the stream through out the year, irrigated paddy cultivation is not being practised.

Labour tilling was the practice followed and now he is planning to invest to buy machines. Both chemical and organic fertilizer was used for paddy. Yield per acre obtained is 1475 kg. and the cost of production amounted to Rs. 3450 per acre. Earnings per acre is Rs. 6100. Usually he gets straw worth Rs. 2500. However, according to Sri. Narayanan, paddy cultivation is not sufficiently profitable.

Coconut palms in the borderlines of paddy fields yield about 60 nuts per tree a year, while those palms in sand ridges yield only 10 nuts per tree. Inspite of the use of both chemical and bio-chemical fertilizers, yield of coconut is very low because of lack of irrigation. In 1989 Mulberri was cultivated in the coconut land in sand riges for growing cocoons and it was irrigated. Because of irrigation coconut yield increased and after two years when Mulberri cultivation and irrigation stopped, yield from coconut declined.

Seedlings of coconut used for planting were only of traditional varieties, because HYVs were not suited for the land. Sri. Narayanan had holdings in Marshy area, but sold it recently for Pisci-culture.

Case 9:

Sri. C.T. Kunjikkannan cultivates 10 acres of paddy fields

and 7.10 acres of coconut in zone IV. His paddy fields are fragmented to plots of 50 cents to 3 acres. Paddy single crop and a second crop of pulses is undertaken. Water in his land is slightly salinity affected. He does not face water-logging problems due to drainage facilities available naturally.

For ploughing the fields, his own oxes are used. Rearing cows and oxes help increasing the supply of cow dung for fertilizer. Although 'Natti' was the cultivation practice till 1992, this time he shifted to sowing of seeds to save wage cost. Scarcity of labour and increase in wage made agriculture unattractive. Both traditional ('Vadakkan') and modern high yielding varieties ('IR8' & 'Jaya') are used for seeds. Mainly organic fertilizer is used for manuring.

Yield per acre was 1440 kg. of paddy. Harvesting charge is 1/8th of the produce. Considering all the costs, according to Sri. Kunjikkannan, paddy is not worth cultivating. Paddy cultivation is continued only because produce is for home consumption. Even if some surplus is made it is difficult to market. He had reclaimed a significant portion of his paddy fields to cultivate coconut, because coconut is more profitable than paddy.

In 7 acres, about 1200 palms are planted (more than 170 trees per acre). Density of coconut palms is high in borderlines

of holdings. Despite the use of bio fertilizer (mainly fish), coconut productivity is only 10 nuts per tree a year. Yield in irrigated coconut land is double of that the unirrigated ones.

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