

## CHAPTER III

### PHYSICO-CLIMATIC FEATURES AND AGRICULTURE STATUS OF KERALA

The different physico-climatic features of Kerala State such as its location and extent, physiography, drainage / soil types and vegetation are discussed in this chapter. A survey of the distributions of the different climatic parameters over the State and a description of the climatic types observed over the region are included in section Two. The third section gives a detailed study of the agricultural status of the State.

#### 3.1 Kerala State - General features:

Kerala State lies in the South-west corner of the Indian peninsula between  $8^{\circ} 18'$  and  $12^{\circ} 48'$  north latitudes and  $74^{\circ} 52'$  and  $77^{\circ} 22'$  east longitudes, as a long narrow strip of land, 32 to 133 km wide, between the Western Ghats in the east and the Arabian Sea in the west with a 580km long coastal line. In the south, the State is bounded by Tamil Nadu and in the north by Karnataka. The land mass of Kerala has an undulating topography, stretching from the east with a series of hills and valleys intersected by numerous streams and rivers flowing into the Arabian Sea on the west. The State has an area of 38,864 sq.km. which is only 1.2% of the total area of the country.

##### 3.1.1 Physiography

Kerala is a land highly diversified in its physical features and agro-ecological conditions. The undulating topography ranges in altitude from below mean sea level (MSL) to 2694 m above MSL. Fig 3.1 shows the physiographic features of the

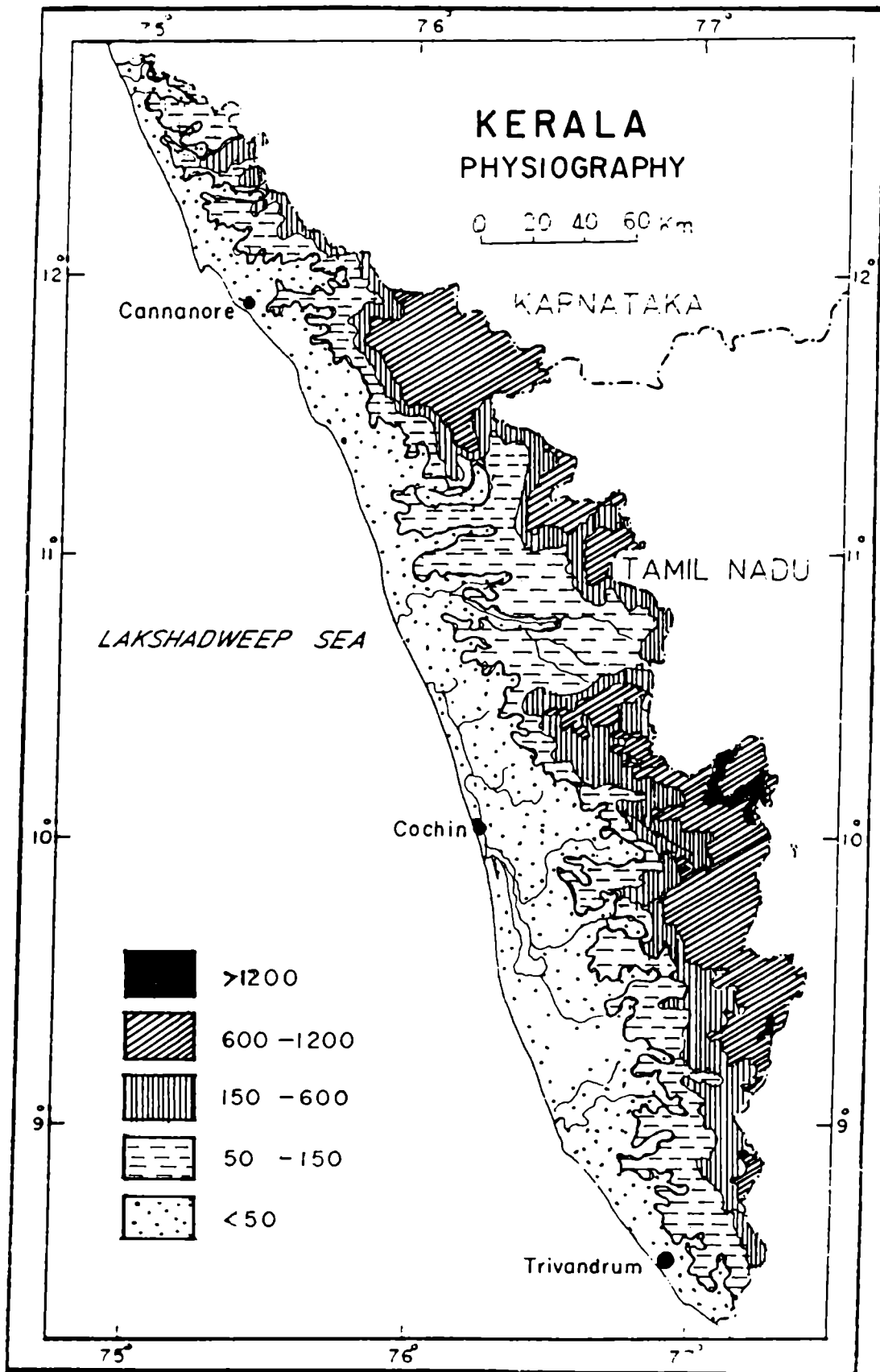


Fig 3.1 Physiography of Kerala

State.

Based on topography, the land area in the State fall generally into three well defined natural divisions each running almost parallel in north-south orientation. They are lowlands, midlands and highlands.

The highlands consists of mountain ranges in the eastern parts of the State, which form a natural wall with an average height of 1 km., separating Kerala from the adjoining States. The Anamalai and Nilgiris are the tallest mountains in the Western Ghats and are separated by 30 km. wide Palghat Gap where the elevation drops below 300 m.. The Palghat Gap has a significant role in the meteorology of Kerala. The highland regions are ideally suitable for plantation crops such as tea, coffee, cardamom and rubber. Though the area under this division is the largest (18,654 sq.km.), the density of population is very small. The main occupation of the people are activities associated with cultivation.

The lowland region is a strip of area running along the coast with a maximum width of about 25 km. from the shore near Alleppey. This lowland area has a number of lakes among which Vembanad lake is the largest, followed by Ashtamudi kayal Kuttanad region in the lowlands is a unique agricultural area covering about 875 km<sup>2</sup> in the districts of Alleppey and Kottayam. The formation and behaviour of mudbanks are peculiar phenomena of the Kerala coast: these are the regions of calm waters of monsoon season and are abundant in fish yield. This area has extensive paddy fields and scattered areas with coconut, arecanut etc. It

has an area of 3979 sq.km. where about 25% of the population of the State lives. The annual rainfall of this region varies from 190 cms. in the south to 350 cms. in the north.

Sandwiched between the lowlands and highlands is the midland region, characterised by undulating terrain. The soil in this zone is lateritic or its varieties. This area has diversity of crops like paddy, coconut, arecanut, pepper, ginger, sugarcane, tapioca, rubber etc.. Having an area of 16,231 sq. km. and elevation ranging from 8 to 75 metres, the midland has a density of population accounting for about 60% of the total. From south to north, variation of the annual rainfall is from 140 cms. to 400 cms. in this region.

### 3.1.2 Soils

Soil is an important earth resource and precise scientific information is necessary for the proper use and management of the soil. The major components of soil such as mineral matter, organic matter and soil water have to be considered for land use planning. Based on physicochemical properties and morphological features, soils of Kerala are classified into the following ten broad groups (Department of Agriculture, 1978)

1) Red loam 2) Laterite 3) Coastal alluvium 4) Riverine alluvium  
5) Greyish Onattukara 6) Brown hydromorphic 7) Hydromorphic saline 8) Acid saline 9) Black soils and 10) Forest loam. Fig 3.2 shows the different soil types of the State.

Red loams of Kerala are localised in occurrence and are found mostly in the southern parts of Trivandrum district. Soils have red colour and are essentially Kaolinitic in nature, acidic

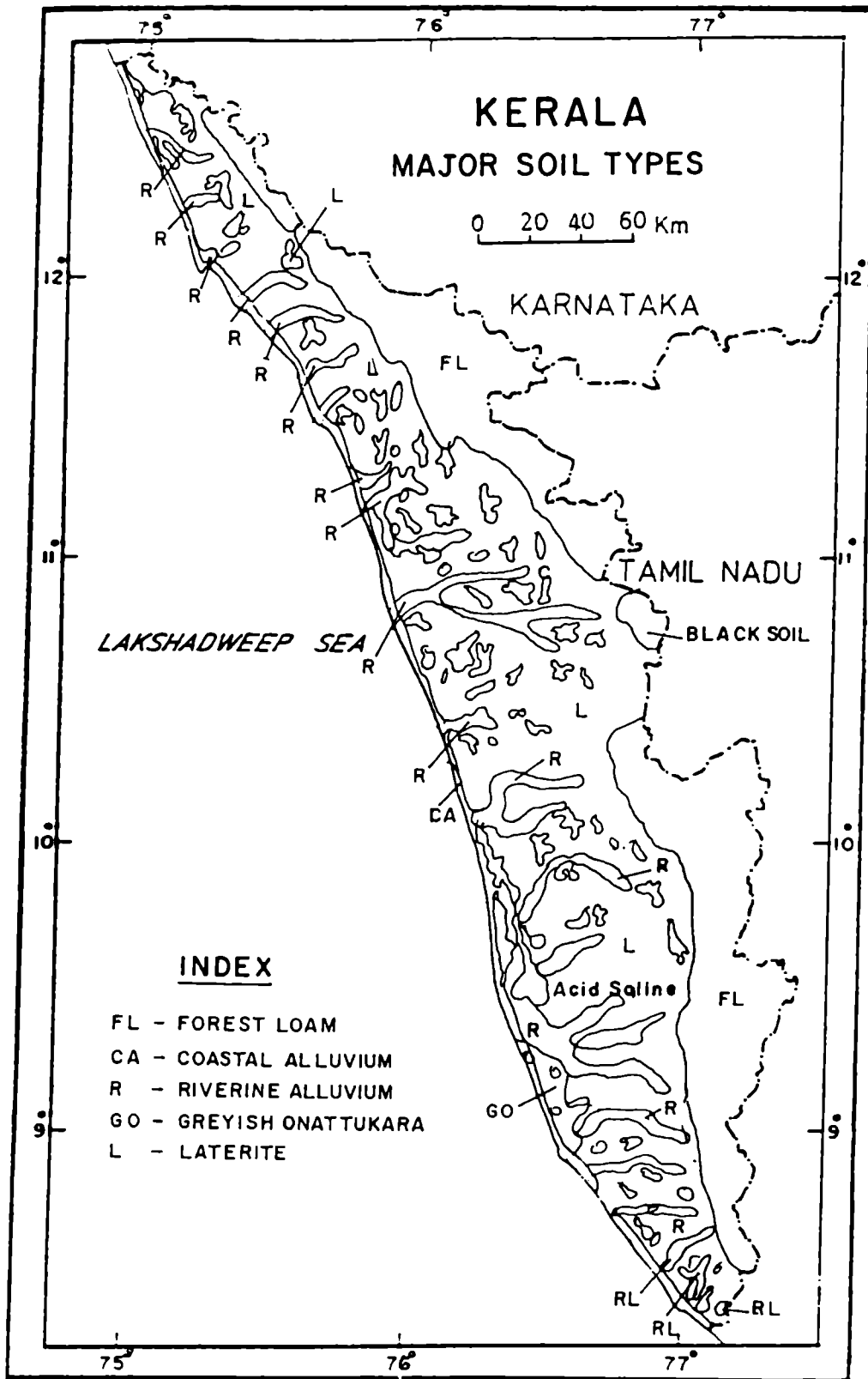


Fig 3.2 Distribution of different soil types in Kerala

in reaction, highly porous and friable. They are low in organic matter content as well as in all the essential plant nutrients.

Laterites, cover a major portion of mid and mid-upland regions and are the most extensive of soil groups found in Kerala. Heavy rainfall and high temperature prevalent in the State are conducive to the process of laterisation. In Calicut, Malappuram and Cannanore districts, extensive stretches of indurated laterites with hard surface crust are common occurrence. Laterites are in general poor in available nitrogen, phosphorus and potassium, low in bases and organic matter. These soils are well drained and respond well to management practices.

Coastal alluvium soils are seen in the coastal tracts along the west and have been developed from recent marine deposits. The water table is high in the low-lying areas. Low content of organic matter and clay are characteristics of this soil.

Riverine alluvium occurs mostly along the banks of rivers and their tributaries. It shows wide variation in its physico chemical properties depending obviously on the nature of the alluvium that is deposited and the characteristics of the catchment area through which the river flows. They are very deep soils, moderately supplied with organic matter, nitrogen and potassium.

Greyish Onattukara soils are confined to Onattukara region comprising of Karunagappally, Karthikapally and Mavelikkara taluks of Quilon and Alleppey districts. In low-lying areas, the water-table is high and drainage is a problem. These soils are acidic and are extremely difficult in all the major plant

nutrients.

Brown hydromorphic soils are mostly confined to valley bottoms of undulating topography in the mid land and in low-lying areas of coastal strip. Drainage and acidity is a major problem in some areas. They are moderately supplied with organic matter, nitrogen and potassium and are deficient in lime and phosphate.

Hydromorphic saline soils are usually met with in the coastal tracts of the districts of Ernakulam, Alleppey, Trichur and Cannanore. Wide fluctuations in the intensity of salinity have been observed. During rainy season, the fields are flooded and most of the salt is leached out, leaving the area almost free of salts. Maximum accumulation of toxic salts is observed during the summer months from March to April. In some areas under-composed organic matter is observed in lower layers, causing problem of acidity

The acid saline /salts of Kuttanad are grouped into three categories viz. Kayal soils, Karappadam soils and Kari soils.

The Kayal soils are found in the reclaimed lake beds in Kottayam and Alleppey districts. These soils are slightly acidic, medium in organic matter and poor in total and available nutrients, but are fairly rich in calcium. They are seriously affected by salinity

Karappadam soils occur along the inland waterways and rivers, and are distributed over a large part of upper Kuttanad. These soils are characterized by high acidity, high salt content and fair amount of decaying organic matter. They are highly deficient in phosphorus and lime.

Kari soils occur in patches in the districts of Alleppey, Kottayam and Ernakulam. These are black, poorly drained, heavy textured soils distributed in flat areas lying one to two meters below the sealevel. These soils are highly acidic in reaction and accumulation of salts to toxic level often affects the crop growth and yield in these region.

Black soils of the State are restricted in their occurrence to Palghat district. They are usually located in gently sloping to nearly level lands. Levels of potassuim and calcium are moderate, while the soil is low in nitrogen and phosphorus.

Forest loam are restricted in occurrence to the eastern parts of the state. These soils are generally acidic, rich in nitrogen, but poor in bases because of heavy leaching.

### 3.1.3 Vegetation

The Fig 3.3 depicts the vegetation types identified by the Forest Department through forest resources surveys. The luxurious vegetation that clothes the land of Kerala for most part of the year is a distinct feature of the State. The five main types of vegetation and their areal extent are as follows:

Wet evergreen and semi-evergreen	50.5%
Moist deciduous	33.4%
Dry deciduous	1.8%
Montane subtropical and temperate	1.7%
Plantation and others	12.6%

Wet-evergreen, semi-evergreen and moist deciduous forests are located in the rainfall zone of 200-300cms with temperature



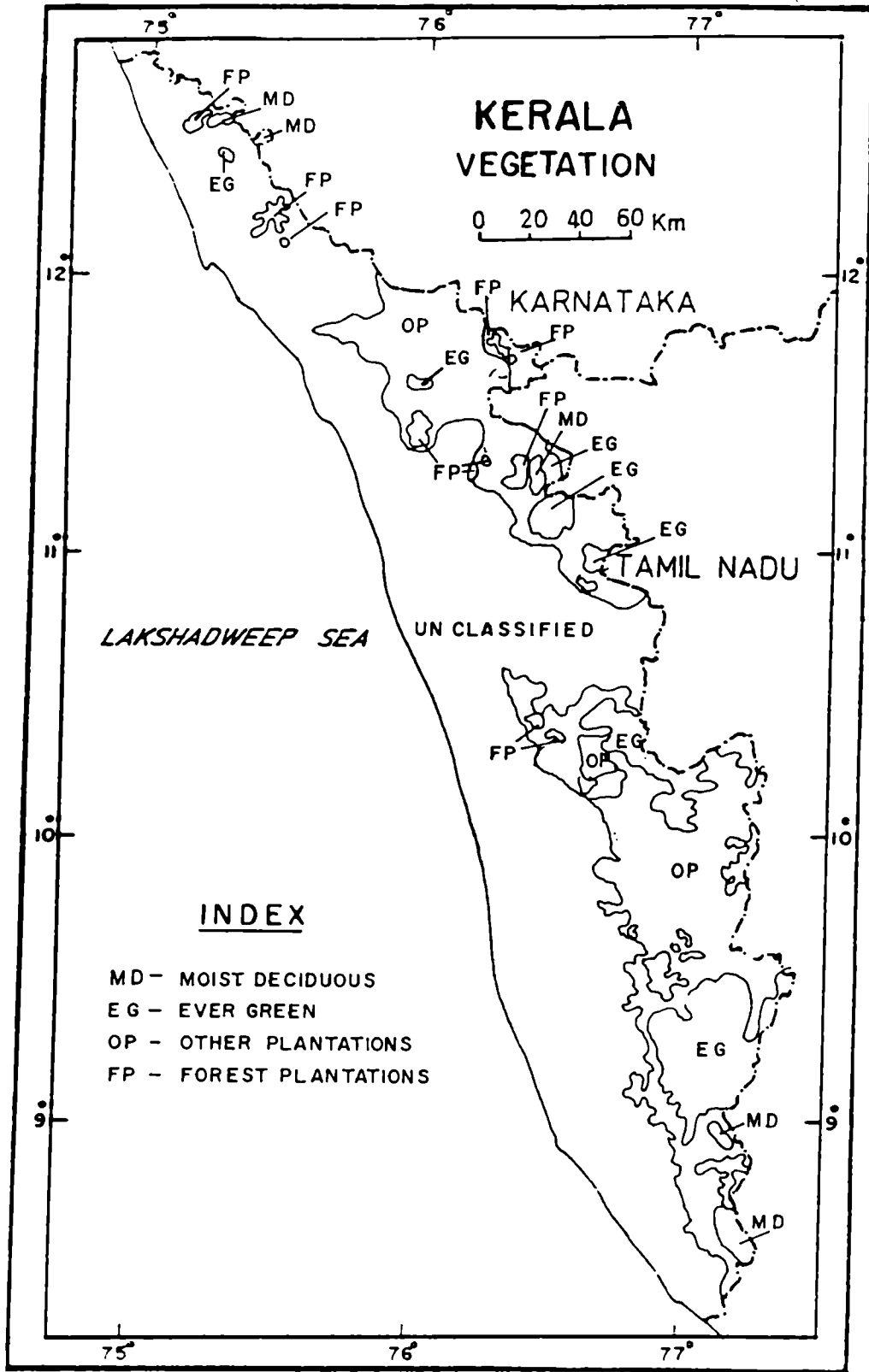


Fig 3.3 Vegetation map of Kerala

more than 20°C and elevation above 300metres. Isolated areas of tropical wet evergreen forests on the slopes of Western ghats are characterised by large and very tall trees in the first storey and an undergrowth of ferns and tall herbs in the second storey

Trees in the moist deciduous type of forests remain leafless during the period December to June. The dry deciduous forest is confined to Pambar valley, a rain-shadow region, where annual rainfall is about 100cm and temperature in winter is considerably low. The Montane wet temperate forests known as temperate shola, occur in the valleys of high ranges.

#### **3.1.4 Water resources of the State**

Kerala is blessed with abundant water resources, the main sources being surface water and ground water. The availability of water from these two sources mainly depends on the rainfall and rainfed cropping system is generally followed.

Out of the 44 rivers originating from the Western Ghats, 41 flow towards west into the Arabian Sea and the remaining 3 towards east into the Bay of Bengal. The rivers of Kerala are typical monsoon-fed and fast flowing ones. The principal west flowing rivers of the State are Bharathapuzha, Periyar, Pampa and Chaliyar. The east flowing rivers are Kabani, Bhavani and Pambar. The distribution pattern of rainfall in Kerala is not uniform and during the two monsoons, heavy rains occur resulting in floods.

The general drainage pattern of Kerala is dendritic. At places, it is subparallel and radial. Most of the rivers are structurally controlled and follow conspicuous lineaments, the

general directions being NW SE and NE SW.

The annual yield, utilizable yield and other details of the river basins of Kerala are given in the Table 3.1. According to PWD estimates, the total run-off of all the rivers of the State amounts to 78,041 Mm<sup>3</sup> 70,323 Mm<sup>3</sup> is the contribution from the catchments in Kerala and the remaining from that of Karnataka and Tamil Nadu. The quantity that is considered utilizable is computed as 42,772 Mm<sup>3</sup>

Problems are always encountered in connection with the scientific development and management of surface water resources of the State. Insufficiency and inadequacy of hydrological, meteorological and allied data, lack of integrated basin plan for achieving scientific development and management, salinity intrusion and pollution concentration are some of them.

Groundwater is a resource of immense magnitude, but of uneven availability and inexhaustible. Kerala has traditionally depended on surface water for meeting most of the drinking, irrigation and industrial requirements. Even the limited utilization of ground water has been mainly through open wells in the coast and in the midlands and springs in the highlands. In the coastal region of the State, ground water occurs predominantly under water table condition in the sandy aquifers which are normally a few meters thick, while in the midland region, ground water is commonly encountered under water table condition in the lateritic aquifers. Another major source of ground water in the midland regions is the sandbeds of the rivers draining through the region. In the case of highland region,

Sl. No.	River basin	Length (Km)	Catchment area(inside Kerala) (Km <sup>2</sup> )	Annual yield (in Kerala) (Mm <sup>3</sup> )	Annual utilizable yield (in Kerala) (Mm <sup>3</sup> )	Irrigation water requirements (Mm <sup>3</sup> )
1	Manjeswar	16	90 ;	309	106	149
2	Uppala	50	76 ;			
3	Shiriyā	67	290	620	358	187
4	Moryal	34	132	1718	1218	507
5	Chandragiri	105	570			
6	Chittari	25	145			81
7	Nileswar	46	190	1356	937	329
8	Karīngode	64	429			
9	Kavvayi	31	143			
10	Peruvāba	51	300	1143	603	
11	Ramapuram	19	52			
12	Kuppam	82	469	1236	786	223
13	Valapattanam	110	1321	1784	1823	331
14	Anjarakkandy	48	412	986	503	89
15	Tellicherry	28	132	251	122	81
16	Mahe	54	394	803	445	194
17	Kuttyadi	74	583	1626	1015	352
18	Korāpuzha	40	624			
19	Kallayi	22	96			
20	Chaliyar	169	1535	7135	2616	3541
21	Kadalundi	130	1122			
22	Tirur	48	117	1165	60	221
23	Bharathapuzha	209	4400	6540	3349	46984
24	Keecheri	51	401 ;			
25	Puzhakkal	29	234 ;	1024	345	822
26	Karuvannur	48	1054	1887	963	970
27	Chalakudy	130	1404	2591	1539	1093
28	Periyar	244	5284	11391	8004	1899
29	Muvattupuzha	121	1554	3814	1812	2141
30	Meenachil	78	1272	2349	1110	1180
31	Manimala	90	847	1829	1108	402
32	Pamba	176	2235	4641	3164	1732

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Table 3.1 Details of river basins in Kerala

Contd.

Sl. No.	River basin	Length (Km)	Catchment area(inside Kerala) (Km <sup>2</sup> )	Annual yield (in Kerala) (Mm <sup>3</sup> )	Annual utilizable yield (in Kerala) (Mm <sup>3</sup> )	Irrigation water requirements (Mm <sup>3</sup> )
33	Achenkovil	128	1484	2287	1249	889
34	Pallikkal	42	220	2270	1368	1162
35	Kallada	121	1699			
36	Ithikkara	56	642	761	429	493
37	Ayroor	17	66			
38	Vamanapuram	88	687	1324	889	755
39	Mamon	27	114			
40	Karamana	68	702	836	462	466
41	Neyyar	56	497	433	229	502
42	Kabani	*	1920	4333	4333	2182
43	Bhavani		562	1019	1019	476
44	Pambar		384	708	708	298

(Source Water Resources of Kerala, 1974. Public Works Department Government of Kerala)

ground water normally occurs in the form of springs which most often are perennial.

### 3.2 Climate:

The State of Kerala has a climate which is controlled to a large extent by its position in the south-west coast of the peninsula and the undulating topography. The most conspicuous feature of Kerala's climatology is the existence of the monsoons in association with the reversal of temperature and pressure gradients over the State.

The State falls under perhumid and humid climatic types except the southern most pockets and the eastern part of the Palghat region which come under moist subhumid climatic type. The State as a whole experiences megathermal climate which shows that the crop growth is not inhibited by temperature, but governed by rainfall alone.

Based on the climatic conditions over the State, the year is divided into four seasons;

Cool weather season (winter)	January - February
Pre-monsoon	March - May
Monsoon	June - September
Post-monsoon	October - December

Winter is the coldest and the driest season over the State. The pre-monsoon season is characterised by increasing day time temperatures and thunderstorm activities. The monsoon (Southwest

monsoon) season is the primary rainy season which contributes about 66% of the annual rainfall. The post-monsoon season sometimes referred to as retreating monsoon constitutes the secondary rainfall season, especially in South Kerala.

(a) Surface air temperature

Tropical location and proximity to oceans have given rise to very small annual and diurnal temperature variations over the State. But the physiographic features comprising of low lands along the coast, the plain midlands and the high ranges are responsible for the variation in temperature in the east-west direction. The mean annual temperature varies from 25.4°C to 31.0°C in the central part of Kerala. However, major portion of the midlands experience temperature below 27.5° C. The diurnal variations are not high (5-7° C) except in the highland regions where the difference goes upto 15° C. March, April and May are the summer months during which the mean annual temperature varies between 29-31° C.

The daily maximum may shoot upto 40 ° C in summer and the minimum may come down to 16° C in winter. Due to high rainfall during the southwest monsoon, the temperature comes down during July-August and starts increasing from October onwards.

(b) Relative Humidity

Due to the proximity to the sea, the moisture content over the region is very high. The monsoon currents bring lot of moisture from the Arabian sea and the moisture content decreases towards the east, away from the coast. According to

Ananthakrishnan et al. (1979b), monthly mean relative humidity at the surface is of the order of 75% in winter mornings and increases to about 90% in the monsoon months at coastal stations. The average humidity for the plains of the State is 77% with a maximum of 88% in July and minimum of 66% in January. Both morning and evening relative humidity variation shows almost same pattern with the highest value in July and the lowest in January. The morning values vary from 91% to 72% and afternoon values vary from 85% to 60%.

#### (c) Pressure

The mean sealevel pressure in the State is about 1009 mb. during summer and about 1012 mb. during winter. In all seasons, the pressure gradient over the State is in the eastward direction. Annual range of pressure variations in the State is small, around 4 mb. only ( 3.4 mb. at Trivandrum, 4.0 mb. at Cochin and 4.5 mb. at Calicut)

Pressure exhibits a diurnal variation with maximum around 1000 LMT and 2200 LMT and minimum around 1600 LMT and 0400 LMT. This diurnal range of pressure increases from the coast to the inland regions and this range is also less than 5 mb. (IMD, 1986) The maximum diurnal pressure variations occurs in February when the cloudiness is the least while the variation is minimum during June and July.

#### (d) Winds

The wind flow over most parts of the State is thermally driven, which is governed by the differential heating of land and



water bodies. In general, easterly and northeasterly winds occur during night and early morning hours and westerly during day time because of the land and sea breezes. Notable differences in the speed and direction have been observed between the coastal and inland stations. The number of calm days are more in inland regions than coastal regions due to sheltering effects of the Western Ghats.

During the monsoon season, strong westerly winds dominate the diurnal variation of winds everywhere. One interesting feature of winds in the southwest monsoon season is that, it blows northwesterly instead of southwesterly, especially over the southern coastal areas. The maximum windspeed is observed during this season and decreases from November onwards. Alleppey, Cochin and Trivandrum have wind speeds of more than 20km/h, while Palghat and Punalur experience less than 5 km/h.

#### (e) Cloudiness

Maximum cloudiness over the State is observed during monsoon season especially in June and July when about 7 oktas of the sky remain covered with clouds. A secondary maximum is observed in October- November, especially in southern parts in association with post- monsoon activities. Minimum cloudiness over the State is observed from January to March.

#### (f) Sunshine

Due to overcast skies during the southwest monsoon, the bright sunshine hours are less than 4 h./day while in winter it is about 10 h./day

(g) Special weather phenomenon

Monsoon are large scale seasonal wind systems which are basically thermally driven. On an average, 66% of the rainfall of Kerala is produced by southwest monsoon and about 18% by northeast monsoon. The major synoptic systems or components which causes the rainfall during the monsoon period are the monsoon trough, monsoon depressions, offshore vortices, mid-tropospheric cyclones, orographic influences etc..

The State experiences the influence of storms and depressions mainly in the post-monsoon season and in the month of May. Storms in the post- monsoon period usually originate in the Bay of Bengal between 5° N and 13°N latitude and in the month of May between latitude 7° N and 12° N. Only a few of the storms develop into their full strength: most of the systems remain as lows or depressions. These tropical storms cause intensive winds and heavy rainfall over the whole State, especially in South Kerala depending upon the track of movement.

Thunderstorms occur in the pre- monsoon and post-monsoon periods, especially the South Kerala. Thunderstorms in the north east monsoon season occur mostly at night or early morning hours. Maximum thunderstorm activity occurs in month of April and a secondary maximum in the month of October.

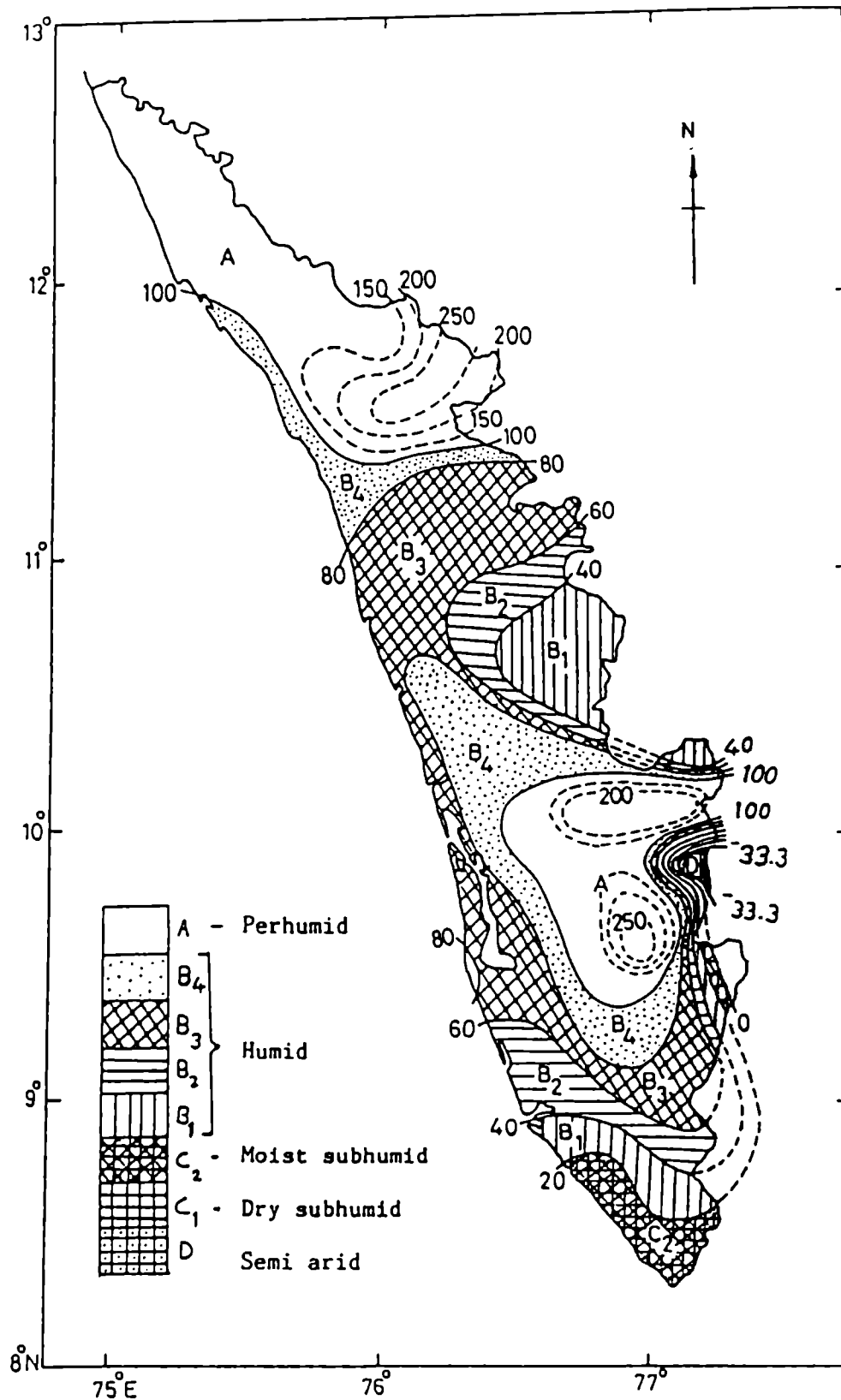
(h) Climatic Classification

The basic idea behind climatic classification is to provide a concise description of various climatic types in terms of effective factors, which are primarily related to heat and

moisture. Several methods have been suggested for the classification of climates. Attempts have been made for obtaining a classification that will permit the establishment of regional boundaries between areas of uniform climatic conditions. But this task is beset with lot of difficulties. For, in addition to changes in micro- environmental factors, sets of limiting conditions for the classification of climates will vary according to the purpose for which classification is made, such as establishment of limits of areas suitable for a crop or pasture or regions suitable for human settlements. Most widely known climatic classifications are bio- climatological in nature and actually attempt to relate the extent and type of natural vegetation on the surface of the earth to climatic conditions.

Employing the moisture and thermal regimes of climatic classification (Thorntwaite(1948)and Carter & Mather(1966)), Kerala state was classified by James(1991) One salient feature of this classification is that there is no arid climate over Kerala State (Fig 3.4). Northeast Kerala and areas surrounded by the southern pocket of heavy rainfall have the perhumid type of climate. In the extreme south, moist subhumid prevails and in the remaining region, the climate is of the humid type. In the thermal regime of climatic classification, most parts of the State, except eastern high altitude stations have megathermal type of climate (Fig 3.5) This confirms the findings of Subrahmanyam (1958)<sup>a</sup> that the distribution of thermal efficiency is more than adequate to support an efficient and luxuriant growth of vegetation.

Taking into consideration the physiography climate, soil



**Fig 3.4 Climatic classification of Kerala - moisture regime (After James (1991))**

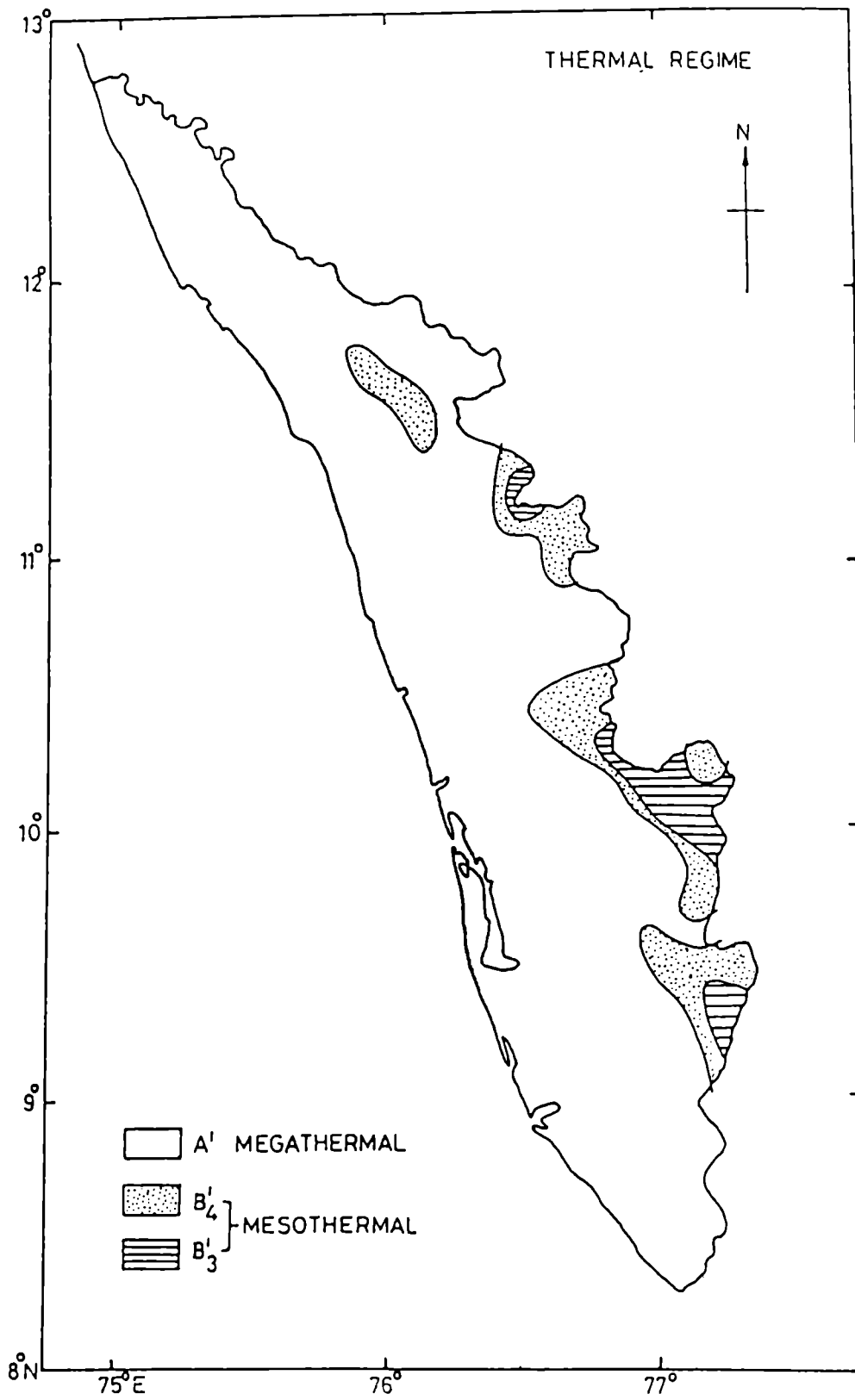


Fig 3.5 Climatic classification of Kerala - thermal regime  
(After James (1991))

characteristics, sea water intrusion, irrigation facilities, land use pattern and the recommendations of the Committee on Agroclimatic Regions and Cropping Patterns Constituted by the Government of Kerala in 1974, the State was divided into five Agroclimatic regions. These zones are Northern Central, Southern, High Range and Problem areas.

The northern zone consists of the four northern districts of Kerala viz. Kasargode, Cannanore, Calicut and Malappuram, covering 28.2 percent of the area of the State. This comes under the perhumid and humid type of moisture regime of climatic classification. The zone receives rains during both the monsoons. Although the zone is endowed with plentiful rainfall, a prolonged dry spell of 4 to 5 months duration does occur every year from December to May. The mean maximum and minimum temperatures of the region are 33°C and 23°C respectively. The major types of soils are coastal alluvium, laterite and forest loam. Rice and coconut, arecanut, pepper, banana, cashew and rubber are the important crops of the zone.

The central zone consists of three central districts of Kerala viz. Palghat, Trichur, and Ernakulam excluding the high ranges, coastal saline tracts and other isolated areas like Kole lands with special soil and physiographic conditions. This zone covers 25 percent of the area of the state. This zone also comes under the perhumid and humid type of the climatic classification of moisture regime. The zone is characterized by comparatively heavier rainfall during the South- West monsoon and less rainfall during the North East monsoon period leaving in between a dry spell of 6 months from December to May. The mean maximum and

minimum temperatures of the zone are  $31.4^{\circ}$  C and  $21.1^{\circ}$  C , respectively. The soil type is mainly laterite. The crops raised are mainly rainfed. This zone is the major rice growing tract of the State. Coconut, arecanut, ground nut, sesamum, pulses, banana and pineapple are the other important crops of the zone.

The southern zone comprises the districts of Trivandrum, Quilon, Pathanamthitta, Alleppey and Kottayam. This zone covers 18.68 percent of the area of the State. This zone comes under the Perhumid, humid and moist sub humid categories of the moisture regime. The region has a tropical humid climate, with an aggressive summer and plentiful seasonal rainfall. The hot season from March to May is followed by the South-West monsoon from June to September. The Northeast monsoon occurs from October to November. Unlike in the other regions of the State, the rainfall is comparatively well distributed with the result that the effective annual rainfall is more than that in the other four zones. The mean maximum and minimum temperatures are  $36.76^{\circ}$  C and  $21.15^{\circ}$  C, respectively. The soils are lateritic, the texture ranging from sandy to sandy loam and clay loam. The major crops of the region are rice, coconut, tapioca, pepper, cashew, rubber, arecanut, sugar cane, pulses and banana.

The high range zone comprises the districts of Wynad and Idukki, Hill ranges of Palghat, Quilon and Trivandrum districts. Since the districts of the region are not contiguous, the agricultural characteristics differ widely. The Wynad range is situated at an elevation ranging from 700 to 2100m above MSL. The region receives heavy rainfall during the South- West monsoon (June-September) North-East monsoon and Pre-monsoon showers

account for the major portion of the remaining precipitation. The dry spell occurs during December to March. The mean maximum and minimum temperatures are 29.6°C and 19.6° C, respectively. The soil type is forest loam, characterized by a surface layer of humus and other organic matter at various stages of decomposition. This region is famous for plantation crops and spices. Coffee, the most widely cultivated crop, is the main source of income to the vast majority of small farmers. Pepper, Cardamom, ginger, tea etc. are the other important crops of this region.

The Idukki range is situated at an elevation ranging from 800 to 1100M above MSL. The district receives both South -West and North- East monsoon rains. Very heavy rainfall occurs during the months of June, July and August while the rainfall is very low during December to March. Mainly, two types of soils viz. forest loam and laterite are seen in this district. Plantation crops like tea, cardamom and rubber are largely grown in these soils. The other important crops are coconut, pepper, coffee, banana, and vegetables.

The special zone of "problem areas" comprises of 5 areas viz. Onattukara, Kuttanad Pokkali, Kole and Sugarcane lands spread over the six districts of Kerala viz. Alleppey, Quilon, Kottayam, Ernakulam, Trichur and Malappuram. In the first four areas coconut and rice are the principal crops. The coconut plantation in the entire area is affected by the complex diseases of Root Wilt. Tapioca, and other tubers, fruit trees, banana and vegetables are the other important crops of these areas.



Geographically the Sugarcane land lies towards the east as an ascending narrow strip of land with mountains and sea in the east and west, respectively. The soils are mainly laterite and alluvium. This region gets rainfall during both the months of May to September. The winter during December-January is mild and dry spell occurs during February-April. Rice and Sugarcane are the important crops in low lying and submersible areas and coconut in the plains. Tuber, condiments and spices, vegetables and banana are the other important crops.

### **3.3 Agriculture status of the State:**

#### **3.3.1 Land use pattern**

From the climate of the State it is clear that, the temperatures ranging between 22°C and 30°C and high rainfall amounts during monsoon season, have given rise to a wide variety in landuse in the State. This section deals with the present status of landuse pattern in the State.

According to 1992-93 figures, out of the total geographical area of the State, the net sown area is 22.49 lakh ha. and total cropped area 30.46 lakh ha.. Table 3.2 gives a detailed picture of classification of area under utilization, district - wise and for the State as a whole according to 1992 - 93 records. Here the total geographical area is divided into four classes (a) net sown area (b) non-agricultural (c) forest and (d) miscellaneous, which includes barren uncultivated land, pastures, grazing land, miscellaneous tree crops, cultivable waste and fallow and current fallow. The percentage distribution of land in the State according to use is also given.

Districts	Geographical area(Ha.)	Net Sown area(Ha.)	Non-agriculture (Ha.)	Forest (Ha.)	Misc. (Ha.)
Trivandrum	218600	144621 (66.15)	20952 (9.58)	49861 (22.8)	3166 (1.4)
Quilon	251838	143116 (56.83)	23882 (9.48)	81438 (32.34)	3402 (1.35)
Pathanam-thitta	268750	99585 (37.05)	10985 (4.09)	155214 (57.75)	2966 (1.10)
Alleppey	136058	105027 (77.19)	23890 (17.56)	---- (---)	7141 (5.25)
Kottayam	219550	181175 (82.52)	21831 (9.94)	8141 (3.7)	8403 (3.83)
Idukki	514962	187161 (36.34)	16930 (32.88)	260907 (50.66)	49964 (9.7)
Ernakulam	235319	182229 (77.44)	34684 (14.74)	8123 (3.45)	10283 (4.37)
Trichur	299390	154692 (51.67)	27613 (9.22)	103619 (34.61)	13766 (4.6)
Palghat	438980	2198456 (49.76)	33038 (7.53)	136257 (31.04)	51229 (11.67)
Malappuram	363230	208439 (57.39)	21975 (6.05)	103417 (28.47)	29399 (8.09)
Calicut	233330	162821 (69.78)	21181 (9.08)	41386 (17.73)	7942 (3.4)
Wynad	212560	115895 (54.52)	7308 (3.44)	78787 (37.07)	10570 (4.97)
Cannanore	296797	204457 (68.89)	23140 (7.79)	48734 (16.42)	20466 (6.87)
Kasargode	196133	141919 (72.36)	15389 (7.85)	5625 (2.87)	33200 (16.93)
State	3885497	2249593 (57.89)	302798 (7.79)	1081509 (27.83)	251134 (6.46)

**Table 3.2 Classification of area under land utilisation and its percentage distribution in the State (1992-1993)**

The suitability of land and climate for a number of crops tempted the farmers to cultivate a host of crops in the same piece of land in mixed stands. This has resulted in an intensive cultivation of dry land in the State. The overall intensity of cropping in Kerala is fairly high. The ratio between gross cropped and net area sown is 1.35 as against the national level of 1.18. But this parameter in the context of Kerala is deceptive because nearly 45 per cent of the net area sown is under perennial crops.

Fig 3.6(a) gives the classification of area under land utilization in the State (district-wise) and its percentage distribution.

From the percentage value of net sown area, it is evident that, even though Alleppey is the smallest district it is ranking second (77.19%) in the State, while Idukki the largest district contributes the least. Alleppey, Kottayam, Ernakulam and Kasargode have more than 70% of its land area under cultivation. The percentage values of non - agricultural area shows that all the districts except Alleppey, Idukki and Ernakulam contribute less than 10% of their land for non - agricultural use - Idukki ranks first with 32.88%. Coming to land under forest, Pathanamthitta contributes the most for forest (57.75%) while Alleppey has no forest at all.

Fig 3.6(b) gives the percentage distribution of land in the State as a whole, with 57.89% of the land under net sown area category followed by forest (27.83%), 6.46% under miscellaneous category and 7.79% under non agricultural category

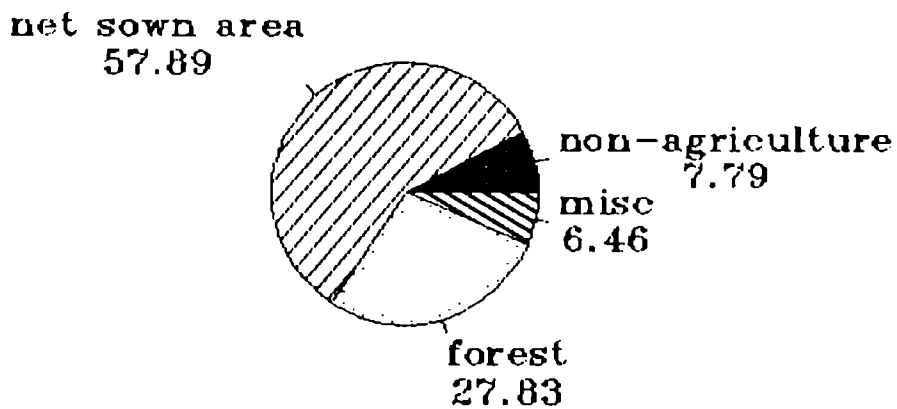
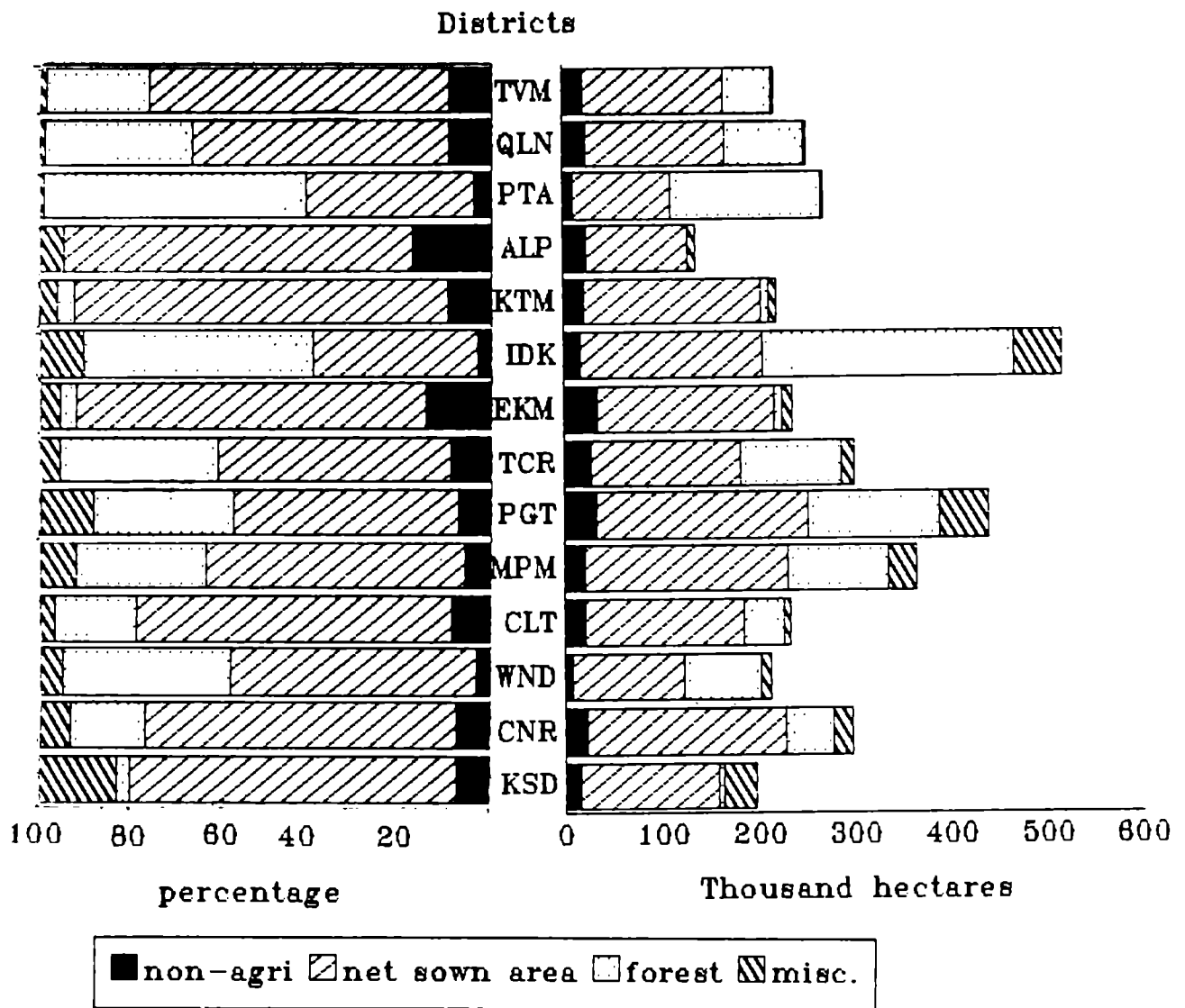


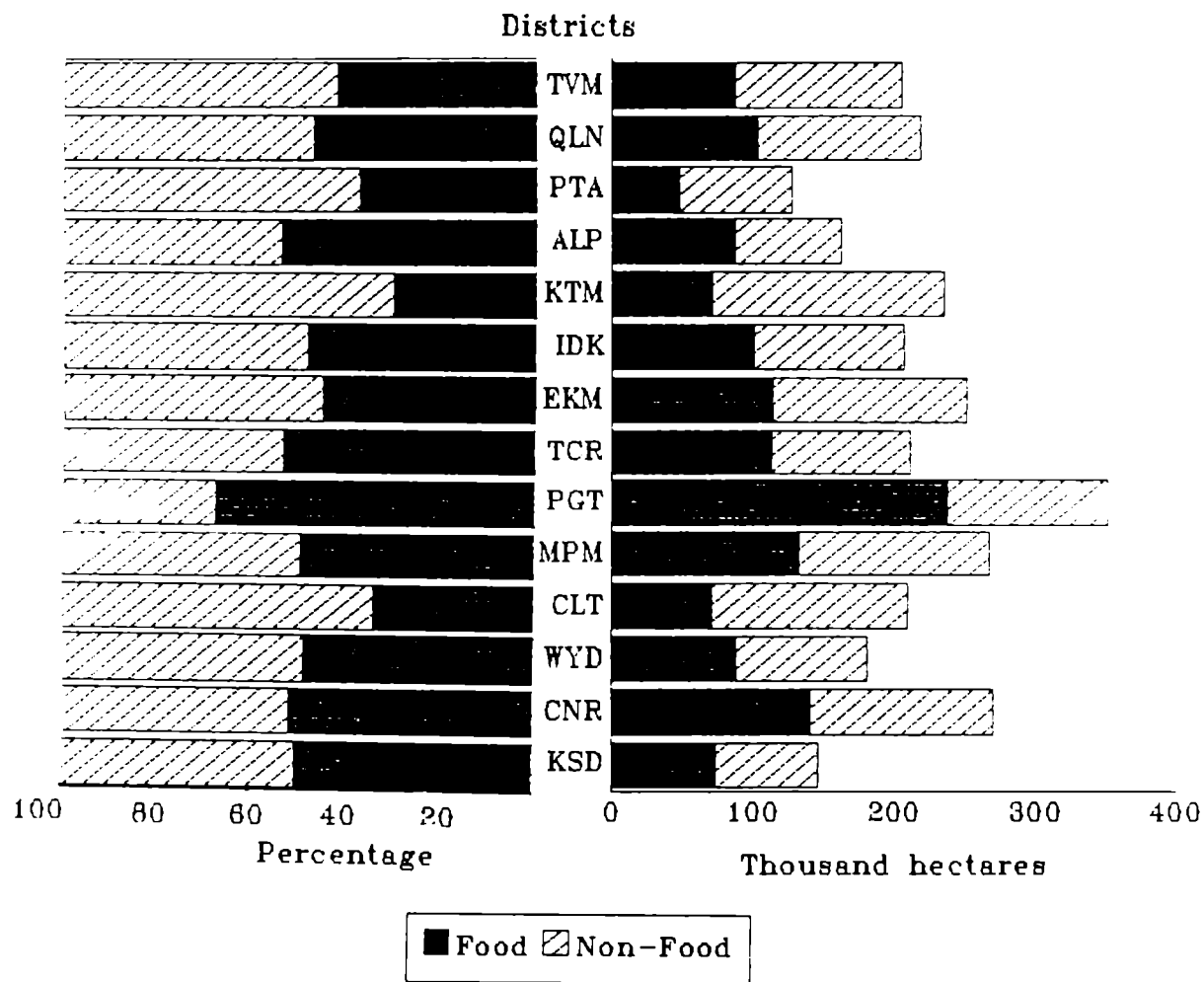
Fig 3.6 Area under different land uses - Kerala (1992 - 1993)

Table 3.3 and Fig3.7(a) give the area contributed for food crops and non - food crops under total cropped area of the State and in each district. In order to investigate the contribution of food crops and non food crops in the total cropped area of the State, the percentage distribution is calculated and presented in Table 3.3 and Fig 3.7(b) Cereals and millets, pulses, sugar crops, spices and condiments, fruits and vegetables come under food crops. Oil seeds, drugs and narcotics, plantation crops, fodder grass etc. are grouped under non food crops. 46.09% of the total cropped area of the State is contributed by food crops and 51.75% by non food crops. The districts Alleppey, Trichur, Palghat, Cannanore and Kasargode contribute more than 50% of their total cropped area for food crops. Under the non-food crops category, Kottayam, Pathanamthitta and Calicut contribute more than 60%. The extensive rubber plantation in Kottayam and coconut farms in Calicut district is the prime reason.

### 3.3.2 Major crops in the State

Agriculture in Kerala is unique in the sense that home stead system of cultivation is prevalent in almost all parts of the State. The nature of crops in the home steads depends mainly upon the requirements of the farmer and ranges from purely seasonal to perennial crops. One principal feature is that coconut constitutes the base crop in almost every home stead and it is intermixed with other seasonal, annual and perennial crops. Rice is the staple food of Keralites. Tapioca is a subsidiary food crop. The major crops include plantation crops such as coconut, arecanut, cashewnut, pepper, coffee, tea, rubber, annual crops like rice, tapioca, pulses, sesamum, cotton, ground nut,

(a) District - wise



(b) State

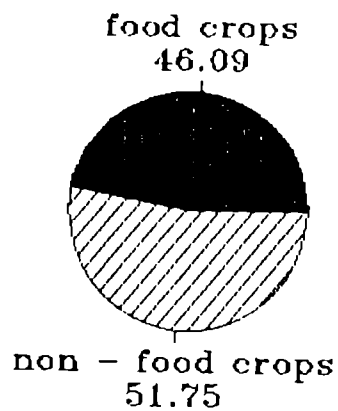


Fig 3.7 Area under food crops and non-food - Kerala (1992 - 1993)

District	Non Food (Hectare)	Food (Hectare)	Total Cropped area(Hectare)
Trivandrum	118360 (57.62)	87062 (42.38)	205422 {6.74}
Quilon	115198 (52.64)	103628 (47.36)	218826 {7.18}
Pathanam- thitta	80059 (62.65)	47733 (37.35)	127792 {4.19}
Alleppey	74923 (46.08)	87657 (53.92)	162580 {5.34}
Kottayam	164710 (69.86)	71068 (30.14)	235778 {7.74}
Idukki	106832 (51.58)	100289 (48.42)	207121 {6.71}
Ernakulam	137293 (54.68)	113807 (45.32)	251100 {8.24}
Trichur	98590 (46.56)	113158 (53.44)	211748 {6.95}
Palghat	113522 (32.29)	237995 (67.71)	351517 {11.54}
Malappuram	134556 (50.28)	133049 (49.72)	267605 {8.78}
Calicut	137886 (65.79)	71695 (34.21)	209581 {6.88}
Waynad	92526 (51.12)	88440 (48.87)	180966 {5.94}
Cannanore	129915 (48.04)	140544 (51.96)	270459 {8.88}
Kasargode	72140 (49.42)	73836 (50.58)	145976 {4.79}
State	1576510 (51.75)	1403995 (46.09)	3046471

**Table 3.3 Classification of area under food crops and non-food crops and their percentage distributions in Kerala (1992-1993)**

ragi, tobacco and fruit crops like mango, banana, pineapple, jack seasonal crop like cowpea, blackgram, redgram etc. In addition to this, in homesteads vegetables and tubers are largely grown. In recent years, Cocoa is also cultivated as an intercrop in coconut gardens as well as in homesteads.

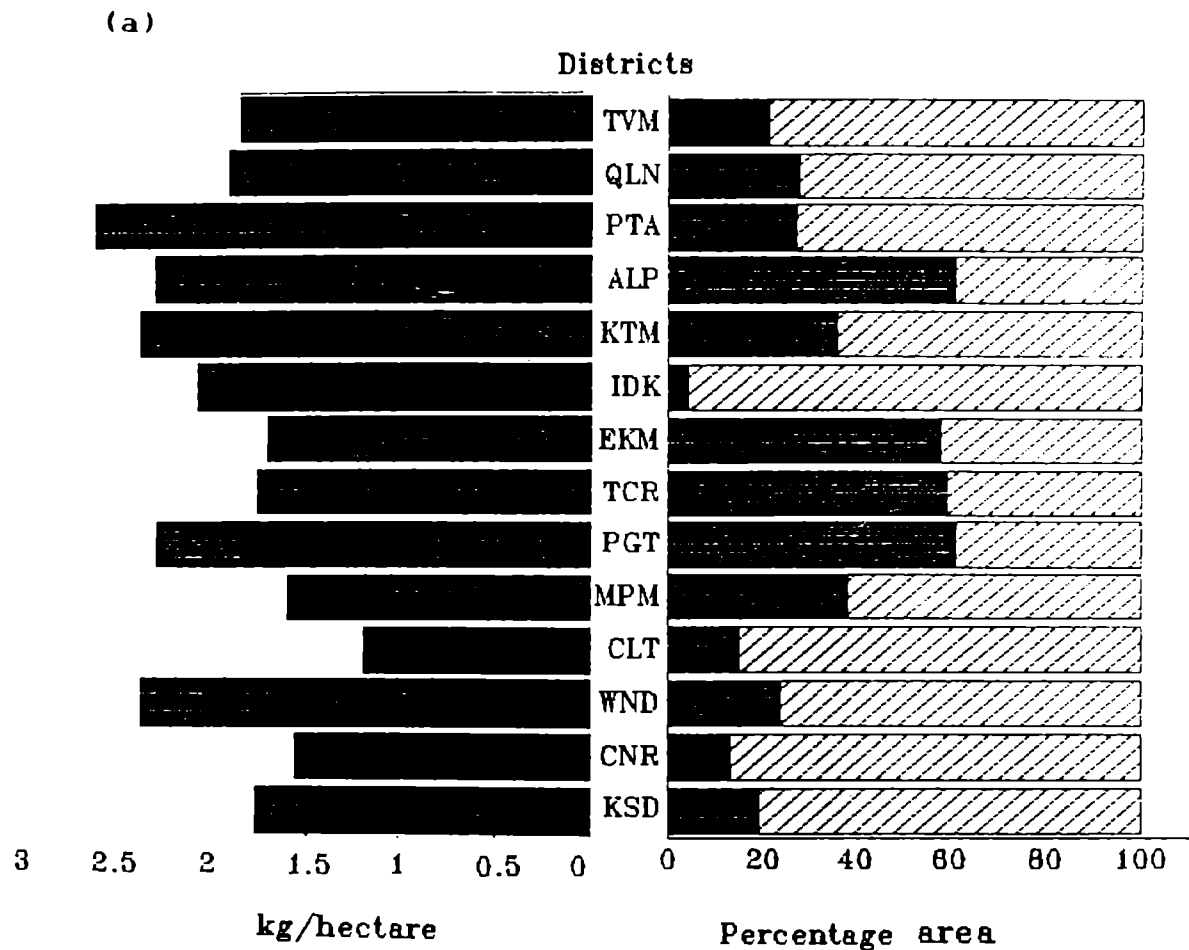
### 3.3.3 Area and productivity of principal crops

A wide variety of crops are cultivated in Kerala. The Table 3.4 and Table 3.5 gives area and productivity of principal crops in the State and in each district.

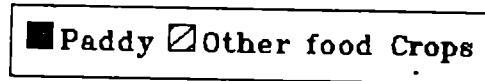
Rice is the staple food of Kerala. According to the figures ( Table 3.6, Fig 3.8), 5.37 lakh ha. of the State is under paddy cultivation with a productivity of 2.02 kg/ha. While considering the area under the crop in each district Palghat ranks first followed by Trichur and Ernakulam. On the other hand, productivity wise Pathanamthitta is the first with 2.62 kg/ha., which is higher than the State value. Pathanamthitta is one district where area under the crop is very less compared to other districts (2.4% of State total) Districts which have rice productivity values more than 2 kg/ha. are Pathanamthitta, Alleppey, Kottayam, Idukki, Palakkad and Wynad. Here, Alleppey is the only district in the lowlands, while all the others are either in the midlands or highlands.

Tapioca (cassava) is a crop of great economic significance in Kerala and easily fits into the cropping systems prevailing in the State. Coming to the area and productivity of tapioca in the State, 1.35 lakh ha. land is under tapioca cultivation and the productivity is 19.5 kg/ha. When investigated at district





Productivity of paddy



(b)

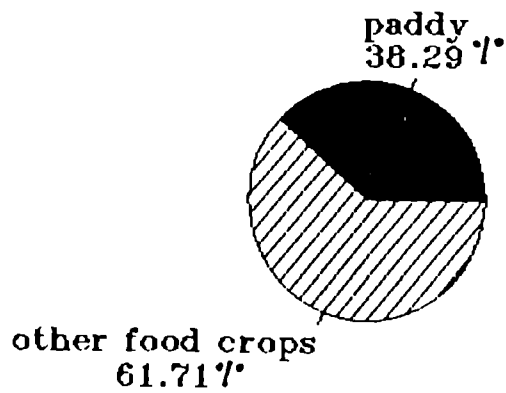


Fig 3.8 (a) Productivity of paddy and percentage area under paddy and other food crops - Kerala (district - wise)

(b) Percentage area under paddy and other food crops - Kerala (State)

Districts	Paddy	Coconut	Tapioca	Pepper	Rubber
Trivandrum	18361	86601	31760	4161	27864
Quilon	28460	76658	29748	8164	32819
Pathanam- thitta	12892	25635	8918	5117	50492
Alleppey	53344	67501	6274	1947	2569
Kottayam	25448	44992	10827	9704	110997
Idukki	4397	17298	5662	39163	35785
Ernakulam	66158	65201	5710	6963	65757
Trichur	67151	85600	3101	5596	7571
Palghat	146095	39514	10075	3359	25531
Malappuram	50908	98931	9471	8785	21723
Calicut	10755	122007	3157	14690	12189
Wynad	21135	5605	1420	32613	5567
Cannanore	18334	93304	6634	35654	27015
Kasargode	14170	48165	2276	7562	18217
<b>State</b>	<b>537608</b>	<b>877012</b>	<b>135033</b>	<b>183478</b>	<b>444096</b>

**Table 3.4 Area under principal crops in Kerala  
(1992-1993)**

Districts	Paddy	Coconut	Tapioca	Pepper	Rubber
Trivandrum	1.86	5970	18.8	0.23	0.77
Quilon	1.92	5120	19.3	0.309	0.96
Pathanam-thitta	2.62	5500	20.3	0.35	0.83
Alleppey	2.31	4548	17.7	0.105	0.99
Kottayam	2.39	4512	25.5	0.1616	0.87
Idukki	2.09	4914	25.5	0.36	0.89
Ernakulam	1.72	6626	20.8	0.194	0.72
Trichur	1.77	7407	17.4	0.17	1.4
Palghat	2.3	4125	18.6	0.12	0.62
Malappuram	1.61	5863	17.2	0.18	0.84
Calicut	1.21	7442	12.1	0.197	1.18
Wynad	2.38	1427	28.8	0.31	0.46
Cannanore	1.57	5337	17.0	0.26	0.72
Kasargode	1.78	5191	13.2	0.22	0.80
State	2.02	5843	19.5	0.27	0.83

Table 3.5 Productivity of principal crops in Kerala (1992-1993)

District	Paddy (Ha.)	Other Food Crops (Ha.)
Trivandrum	18361 (21.09)	68701 (78.91)
Quilon	28460 (27.46)	75168 (72.54)
Pathanam- thitta	12892 (27.01)	34841 (72.99)
Alleppey	53344 (60.86)	34313 (39.14)
Kottayam	25448 (35.81)	45620 (64.19)
Idukki	4397 (4.38)	95892 (95.62)
Ernakulam	66158 (58.13)	47649 (41.87)
Trichur	67151 (59.34)	46007 (40.66)
Palghat	146095 (61.39)	91900 (38.61)
Malappuram	50908 (38.26)	82141 (61.74)
Calicut	10755 (15.00)	60940 (85.00)
Wynad	21135 (23.9)	67305 (76.1)
Cannanore	18334 (13.05)	122210 (86.95)
Kasargode	14170 (19.19)	59666 (80.81)
State	537608 (38.29)	571000 (61.71)

**Table 3.6 Area under paddy and other food crops in Kerala (1992-1993)**

District	Coconut (Hectare)	Other Nonfood (Hectare)
Trivandrum	86601 (73.17)	31759 (26.83)
Quilon	76658 (66.55)	38540 (33.45)
Pathanam- thitta	25635 (32.02)	54424 (67.98)
Alleppey	67501 (90.09)	7422 (9.91)
Kottayam	44992 (27.30)	119718 (72.70)
Idukki	17298 (16.19)	105104 (83.81)
Ernakulam	65201 (47.49)	72092 (52.21)
Trichur	85600 (86.82)	12990 (13.18)
Palghat	39514 (34.81)	74008 (65.19)
Malappuram	98931 (73.52)	35625 (26.48)
Calicut	122007 (88.48)	15879 (11.52)
Wynad	5605 (6.06)	86921 (93.94)
Cannanore	93304 (71.82)	36611 (28.18)
Kasargode	48165 (66.77)	23975 (33.23)
State	877012 (55.63)	699498 (44.37)

Table 3.7 Area under coconut and other non-food crops in Kerala (1992-1993)

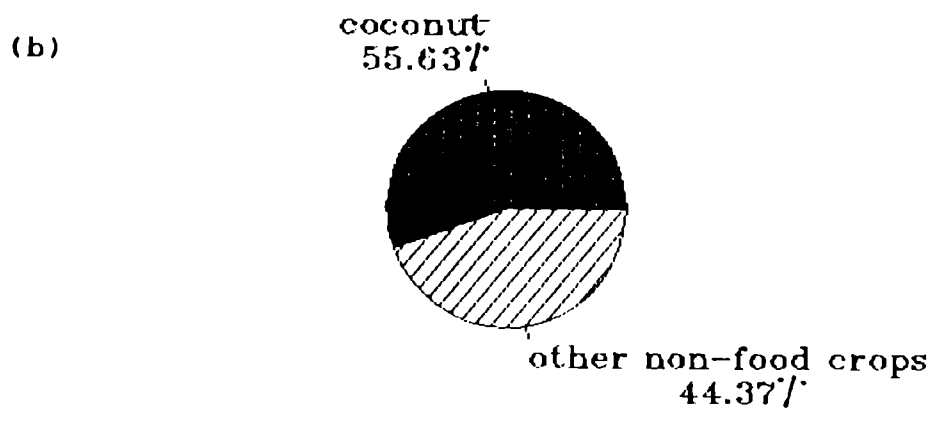
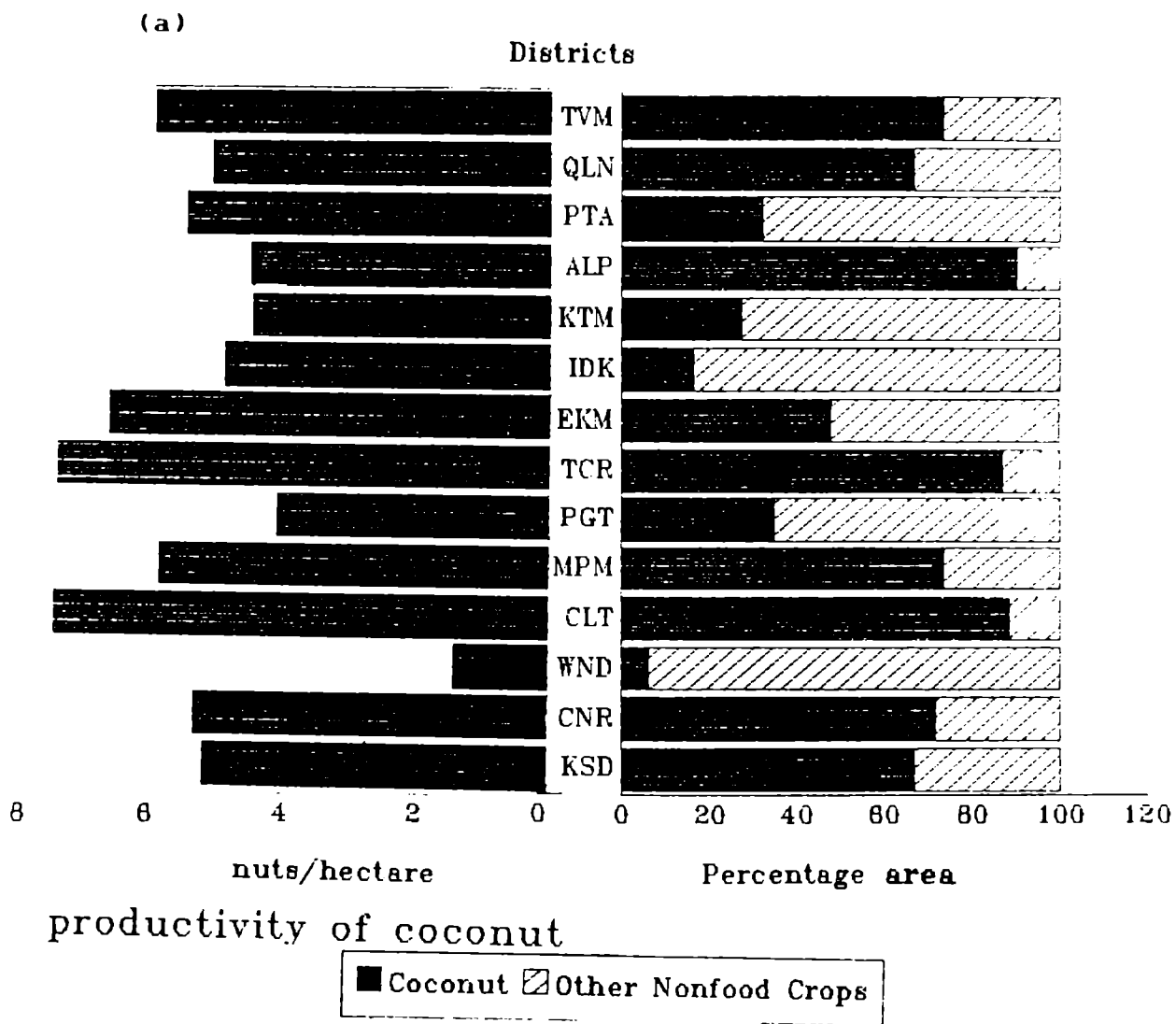


Fig 3.9 (a) Productivity of coconut and percentage area under coconut and other non-food crops - Kerala (district - wise)

(b) Percentage area under coconut and other non-food crops - Kerala (State)

level, Trivandrum ranks first followed by Quilon. Kottayam, Idukki and Wynad are the districts with productivity more than 25 kg/ha.. It is evident from this that Tapioca is a highland crop.

India is the third largest producer of coconut in the world. The country with 1.1 million hectares accounts for nearly 1/8th area under coconut in the world. Kerala has nearly 8.77 lakh hectares under cultivation (1992-'93) The productivity is 5843 nuts/ha.(Table 3.7, Fig 3.9) Calicut, Trichur and Ernakulam are the districts which rank high in the case of coconut productivity. All the three districts have a long coast line.

Pepper, an important export oriented commodity, is also a crop of small and marginal farmers. The area under its cultivation in the State is 1.8 lakh ha. with Cannanore and Idukki contributing the most. The State productivity is 0.27 kg/ha. and Idukki, Quilon and Pathanamthitta contribute the most.

Rubber is the one crop which has registered substantial increase in area by about 1.05 lakh hectares during the decade, an increase of about 50.7 percent. The State area under the crop is 4.4 lakh ha. with productivity 0.83 kg/ha. Kottayam, Ernakulam and Pathanamthitta contribute the most (51.1%) About 25% of the State area is in Kottayam district. While State productivity is 0.83 kg/ha ; Calicut, Alleppey and Quilon have productivity more than 0.9 kg/ha..