

CHAPTER I

GENERAL

Captivating mountainous landscape with lush vegetation and picturesque deep valleys have brought fame to Kodagu District. Tourists flock to have glimpses of this beautiful district. Though geographically limited in area, it is one of the famous districts of the country. There are many reasons for this: it is the centre of natural beauty consisting of tall hill ranges, deep valleys and shining water falls; it has rich economic resources; one of the legendary and sacred river of India, the Cauvery takes her birth and flows here amidst beautiful surroundings; many historical and pilgrimage centres are located in the district; and the unique warrior race, 'Kodavas' of Kodagu are its inhabitants, known for their distinct way of life. Many eminent men including foreigners who have visited Kodagu have left behind excellent description of the land. The district is a nature lovers' paradise; high rising Western Ghats, series of hill ranges, green paddy fields in the valleys amidst hillocks, ever-green forests, and coffee, orange and cardamom plantations have made Kodagu a picturesque highland district. Therefore, it is but natural that city-bred people, tired of its din and polluted atmosphere find solace in the fresh air they breathe and the cool calm atmosphere they enjoy here.

Despite all its natural wealth, Kodagu is still among one of the backward districts of the State. It is not yet linked with the rest of the country by either air or rail. But it has a wide network of roads. For its products of coffee and orange it is famous. Kodagu honey is having the same medicinal properties as that from Kashmir. But no major industry exists in the district. It is a land-locked district, stretching itself on the southern part of the Sahyadris and is on the southern borders of the State. Yet, the district has retained its historical and cultural identity.

Origin of the name

It is difficult to trace the origin of the term 'Kodagu'. However, it is said that this name has been derived from 'Kudumalenadu'¹. In ancient Tamil literature, terms like 'Kudumalenadu'² or 'Kudakam'³ have been mentioned. 'Kodimalenad' meaning a dense forest land on steep hills is mentioned as the meaning of Kodagu, as *kodi* means a summit or peak. In spoken language of the Kodavas, the term 'Kodayee' means hunting ground and from this word the name of the district might have been derived, is another view. In inscription No.347 of Chamarajanagar taluk, the area has been referred as 'Kudugurunadu'. In the *puranas* it has been called as 'Matsyadesha', 'Brahmadesha' and also 'Krodhadesha'. The first name came because a king called Chandravarma hailing from Matsyadesha is believed to have ruled over the district for some time. God Brahma is believed to have worshipped Lord Vishnu from the present Brahmagiri. It is also argued that the term Kodagu is derived from the third name. (More details about 'Krodhadesha' are given in Chapter II).

Lt. O'Connor, in his *Memoirs of the Coorg Survey* is of the view that Kodagu may mean "Country of millions of hills" indicating the hilly nature of the country. According to other sources, the word 'Kodagu' means the land situated to the west, so called by the people on the Mysore plateau. Kodagu district, unlike most of the other districts of Karnataka State, is not named after its headquarters town. The British anglicised Kodagu as 'Coorg'⁴ during their rule but the original name has been restored⁵. Kodagu is often described as the "Switzerland of India", "Scotland of India" or the "Southern Kashmir", etc.

Location and Boundaries

Kodagu district lies on the summits and the eastern and western slopes of the Western Ghats, on the south-western border of Karnataka State in between northern latitudes 11° 56' and 12° 52' and eastern longitudes 72° 22' and 76° 12'. The greatest length of the district from the Hemavati river in the north to the Brahmagiri range in the south is about 96 km, and its greatest breadth from Sampaje in the west to Kushalnagar in the east is about 60 km. The district is surrounded by Hassan district in the north, Mysore district in the east, Dakshina Kannada on the west and Kerala State to the south. A land strip of about 20 km long and 10 km broad projects into the Hassan district on the north-east.

Area and Population.

Kodagu district has an area of 4,102 sq.km. and is one of the smallest district, next only to Bangalore (Urban) district in Karnataka State. Out of the total State's area of 1,91,791 sq.km, it constitutes only 2.14%. As per 1991 census (provisional) it had a total population of 4,85,229, out

1. Edurkala K. Shankaranarayana Bhat, *Shri Kaveri Vaibhava* 1987, p. 333

2. D.N. Krishnamurthy, "Kodagina Shasanagaloo Kodagoo", *Kannada Sahitya Parishat Patrike*, 7-3, 1922, pp.207-8

3. *Ibid*, p.208

4. D.N. Krishnayya, *Kodagina Itihasa*, 1974, pp.20-23

5. Order of the Karnataka Government dated 31-1-1977

of which 2,43,977 were males and 2,41,252 were females. This constituted only 1.08% of the State's population. In 1981 the rural population was 3,90,225 which was equal to 84.48% of the total population, while the urban population was only 15.52%. In 1991 it was very thinly populated like Uttara Kannada and population density per square kilometre was only 118. For administrative purposes the district has been divided into three taluks, under Madikeri sub-division. Table 1 shows detailed information in each taluk.

Table 1 : Details about each taluk.

Taluk/Hoblis	No.of villages	No.of Towns*	Municipalities.	Mandal Panchayats*
1. Madikeri		1	1	15
a. Madikeri	22			
b. Sampaje	11			
c. Bhagamandala	15			
d. Napoklu	19			
Total	67	1	1	15
2. Somvarpet		6		24
a. Somvarpet	21			
b. Shanthalli	12			
c. Kodlipet	29			
d. Shanivarsanthe	28			
e. Kushalnagar	25			
f. Suntikoppa	19			
Total	134	6	-	24
3. Virajpet.		3	-	26
a. Virajpet	23			
b. Ammatti	23			
c. Ponnampet	18			
d. Balele	9			
e. Shrimangala	12			
f. Hudikeri	10			
Total	95	3	0	26
District Total	296	10	1	65

* Hobli-wise data are not available.

Virajpet is the biggest taluk having 1,646 sq.km. area, followed by Madikeri having 1,449 sq.km. and smallest being Somvarpet having 999 sq.km. Out of total 296 villages of the district, eight are uninhabited and are located in Somvarpet taluk. The district has 16 hoblis, three Taluk Panchayat Samithis, 65 Mandal Panchayats and 10 towns. The concept of a revenue village as applicable to the adjacent districts of Karnataka State does not fully apply in the case of villages of Kodagu. What were formerly independent villages with separate village maps and records were, periodically, rearranged in a lesser number of main villages by grouping up smaller units to form

viable units. In 1901 for instance, there were 479 inhabited villages and the number dwindled to 286 by 1981. The names of such amalgamated villages too were changed in several cases in order to provide an idea about the villages that were merged. However, combined maps were not drawn up and the records too continued to be prepared separately every year. These merged units are termed as sub-villages and have been treated as hamlets without independent existence. Similarly the concept of hamlet as a distinct group of households located at some distance from a core village is not applicable in the *malnad* district. In view of the terrain, climatic conditions and social traditions, the houses are scattered in small clusters or as isolated home-steads within the limits of any given village and in some cases such clusters of houses encompass lands belonging to two or more villages as well. If each sub-village for which a separate village map is available as per original survey is regarded as an independent village, there would be then in all 538 units (Madikeri 197, Somvarpet 315 and Virajpet 126). During 1991 Census, there were 296 revenue villages of which eight are uninhabited revenue villages.

Territorial changes.

In spite of the fact that the Gangas of Talakad, Kongalvas, Changanalvas and the Hoysalas ruled over the territory, Kodagu did not have a distinct existence. At different times it belonged to different kingdoms and hence did not have well-defined boundaries. In fact prior to the seventeenth century, much of its history is not known in detail. However on the basis of Ganga inscription of Chamarajanagar, it may be presumed that Kodagu ('Kudugurunadu') had encompassed an area larger than today, and Kelsur of Mysore district was part of it. Regarding the ancient Government of Kodagu, the popular tradition states that the country was divided into 12 *Kombus* (districts) and 35 *Nadus* (sub-divisions) ruled over by petty chiefs called Nayakas who were in constant feud amongst themselves, and they gradually succumbed to the encroachment of the Haleri Palegars. However the natives of Kodagu were mentioned as 'Kodagas' in the twelfth century itself. The third king of Haleri dynasty, Mudduraja, got a hillock levelled and constructed a fort and a palace inside it in 1681. The new township was named as 'Muddurajakeri' which became Madikeri in the course of time. Mudduraja at first had his capital at Haleri and later it was shifted to Madikeri. At that time Periyapatna was part of the district. Doddaveerappa Wodeya extended his kingdom's boundary to Amarasullya, present Sullya of Dakshina Kannada district. After acquiring Panje and Bellare belonging to the same district, from Hyder Ali, boundaries between Kodagu and Mysore districts were demarcated. Mudduraja's younger brother, Lingaraja defeated the Mysore army and annexed Yelusaviraseeme located in the vicinity of Kodlipet to his kingdom. In 1834 the Britishers allowed amalgamation of Puttur (including Sullya) from the district into Canara district (at that time Canara included Uttara and Dakshina Kannada, stretching itself from Kasargod to Karwar). Following Table 2 gives details of each taluk during Dodda Veerarajendra's rule.

Table 2 : Area of each Taluk in Dodda Veerarajendra's period

Sl.No.	Name of Taluk	Square Miles	Square Kilometres.
1.	Yelusaviraseeme	92	238
2.	Kiggatnadu	313	811
3.	Kodagu proper (Kasba)	1,180	3,056

Sl.No.	Name of Taluk	Square Miles	Square Kilometres.
4.	Sullya (including Amara)	277	717
5.	Puttur	303	785
	Total	2,165	5,607

Source : *Coorg District Gazetteer, 1965, p.2*

Before the annexation of the Kodagu by the British, the then Kodagu District had an area of 2,165 sq.mil. (5,607 sq.km). Soon after the British took over Kodagu, on popular demand and for effective administration, Puttur and Amarsullya (having a total area of 1,502 sq.km) taluks were retransferred to Dakshina Kannada district in 1834. The rest of the district was divided into six taluks consisting of twenty four *nadus* (units similar to hoblis). The *nadus* were again sub-divided into *gramas* or villages, which were made up of a number of *vargas* or *farms*, since the Kodavas generally lived on detached farms instead of village with a number of houses joined into one community. Term *hobli* was used in the place of *nadu* in some parts of Yelusaviraseeme and Nanjarayapatna taluk. Table 3 gives the details of these six taluks.

Table 3: Details of six taluks of Kodagu as in 1834.

Sl. No	Taluk/nadu	Area in		No. of villages	Seat of <i>Kacheries</i> .
		Sq.mil.	Sq. km		
1.	Madikeri Taluk	209	541	57	Madikeri
	a. Mercara - Halerinad	49	127	15	Madikeri
	b. Kagodlunad	40	104	6	Thalatmane
	c. Horuru-Nurokkalnad	39	101	11	Boykeri
	d. Hudikeri, Kanta-Murnad	49	127	14	Murnad
	e. Uluguli-Mudigeri	32	83	11	Suntikoppa
2.	Padinalknad taluk	413	1,070	57	Napoklu
	a. Padinalknad	142	368	12	Nalkunad Palace
	b. Katiednad (Kadiyat)	51	132	12	Bhavuli
	c. Tavunad	139	360	9	Bhagamandala
	d. Benganad	42	109	11	Kolegadala
	e. Kuyinkeri	39	101	13	Palur
3.	Yedenalknad taluk	210	544	49	Virarajendrapet (Virajpet)
	a. Yedenalknad	92	238	22	Virarajendrapet
	b. Beppunad	41	106	8	Arameri
	c. Ammattinad	77	199	19	Colepet (Ammathi)

Sl. No	Taluk/nadu	Area in		No. of villages	Seat of <i>Kacheries</i> .
		Sq. ml.	Sq. km		
4.	Kiggatnad taluk	400	1,036	63	Hudikeri
	a. Anjikerinad	89	231	15	Hudikeri
	b. Thavalkerinad	110	285	15	Thavalkeri
	c. Hattugatnad	112	290	13	Ponnampet
	d. Batiectnad	89	231	20	Kuntagrama
5.	Nanjarayapatna taluk	262	679	114	Fraserpet (Kushalnagar)
	a. Surlabbi - Gadinad	113	293	21	Madapur (Mahadevapur)
	b. Yedavanad	94	243	37	Somvarpet
	c. Nanjarayapatna	} 55	142	26	Fraserpet (Kushalnagar)
	d. Ramaswami-kanive			30	Kampur
6.	Yelusaviraseeme Taluk	91	236	168	Shanivarasante
	a. Kodali hobli	27	70	55	Kodlipet
	b. Bilhada hobli	18	47	40	Shanivarsanthe
	c. Nidhata hobli	46	119	73	Gaudhalli
Grand Total		1,585	4,105	508	

Source : Richter, G. *The Coorg Manual* 1870, p. 367

The total area of the Kodagu has remained the same since 1834 though there have been several changes from time to time in the internal divisions to suit administrative convenience. The number of taluks remained the same as it was at the time when Kodagu was annexed and brought under the control of the Government of India *i.e.*, six, but there were some re-adjustment in the boundaries of taluk. The names of the taluks and their area as they existed in 1891 are given in Table 4.

Table 4 : Area under each taluk as they existed in 1891.

Sl. No.	Name of Taluk	Square miles	Square km.
1.	Mercara (Madikeri)	216.30	560
2.	Padinalknad	399.90	1,036
3.	Yedenalknadu	201.45	522
4.	Nanjarayapatna	263.89	681
5.	Yelusaviraseeme	90.82	235
6.	Kiggatnad	410.45	656

There were 492 villages and five towns. In 1894 all the three hoblis of Yelusaviraseeme were merged with Nanjarayapatna. Following table 5 gives details of each taluk as they existed in 1911.

Table 5 : Taluk details as existed in 1911.

Sl. No.	Taluk	Area in		No. of villages
		Sq. miles	Sq.km.	
1.	Mercara (Madikeri)	227	288	57
2.	Padinalknad	399	1,033	60
3.	Yedenalknad	218	565	56
4.	Kiggatnad	421	1,090	68
5.	Nanjarayapatna	317	821	254

There was another re-adjustment in the boundaries of the four taluks of Nanjarayapatna, Mercara, Padinalknad and Yedenalknad in 1916 when certain revenue circles were abolished for administrative reasons and there was also a reduction in the number of villages due to grouping together of certain villages. Table six indicates the changes that were made.

Table 6 : Changes made in different taluks in 1916.

Sl. No	Taluk	Area in		No. of villages
		Sq.Miles	Sq.km	
1.	Mercara	310	803	68
2.	Padinalknad	395	1,023	64
3.	Yedenalknad	221	572	57
4.	Kiggatnad	421	1,090	68
5.	Nanjarayapatna	235	609	121

The five taluks were reduced to four in 1921 by combining the two taluks of Padi-nalknad and Yedenalknad into one, giving the name Padi-yedenalknad to the new taluk. There was yet another change in 1922 when the two taluks of Padi-yedenalknad and Kiggatnad were combined into one to form the New South Kodagu taluk with effect from 1st September 1922. The new South Kodagu taluk consisted of five *nadus viz.*, Virajpetnad, Napoklunad, Ammathinad, Ponnampetnad and Srimangalanad. In 1926, the two taluks of Madikeri and Nanjarayapatna were also amalgamated into one taluk under the name of North Kodagu. After this change, there were only two taluks consisting of 11 *nadus*, as follows:

I. South Kodagu (822.19 Sq.miles/2,129 Sq.km)	II North Kodagu (759.47 Sq. miles/1,967 Sq.km)
1. Virajpetnad	1. Madikerinad
2. Napoklunad	2. Bhagamanganad
3. Ammathinad	3. Suntikoppanad
4. Ponnampetnad	4. Somvarpetnad
5. Srimangalnad	5. Shanivarasantenad
	6. Fraserpet (Kushalanagar) Hobli.

The river Cauvery formed the dividing line between the two taluks. Simultaneously, with the reduction in the number of taluks to two, several villages were amalgamated for administrative reasons, reducing the number of villages from 378 to 298.

The area of the two taluks has also varied from time to time. The decrease in the area of the North taluk and increase in the area of the South taluk during the decade 1931-41 was due to the abolition of the *nadus* in 1938 and the redistribution of their villages among the remaining *nadus* in the two taluks. During the year 1938, Suntikoppa and Bhagamandala *nadus* of North Kodagu were abolished and the villages of these two *nadus* were distributed among Fraserpet (Kushalnagar) and Madikeri *nadus*. But these two *nadus* were revived with effect from 1st October 1952 and the number of taluks and *nadus* remained same as it was in 1926.

With effect from 15th December 1953, the internal divisions of Kodagu State were regrouped to facilitate efficient administration and the third taluk known as Madikeri taluk comprising Madikeri *nadu* and Bhagamandala *nadu* of the North Kodagu taluk (33 villages and one town) and Napoklu *nadu* of the South Kodagu taluk (37 villages). The remaining portions of the North and South Kodagu taluks were merged to form Somvarpet taluk (135 villages transferred from North Kodagu and four villages from the South Kodagu taluk) and Virajpet taluk (103 villages and one town transferred from the South Kodagu taluk). The original name of Kushalnagar which had been changed as Fraserpet in honour of Lt.Col.Fraser is now again called as Kushalnagar. During 1977, the names Madikeri and Kodagu came to replace Mercara and Coorg respectively. Details of re-organisation after 1953 is given in Table.7.

Table 7 : Administrative divisions of Kodagu after reorganisation in 1956.

Sl. No.	Taluk	Particular	Area in	
			Sq.miles	Sq.km
i.	Madikeri	1. New taluk after rearrangement (Following a and b included)	560.5	1,451.7
		a. 33 villages and one town transferred from North Kodagu taluk	237.5	615.1
		b. 37 villages transferred from South Kodagu taluk	323.0	836.6
ii.	Somvarpet	2. New taluk by rearrangement (by transferring a and b)	384.9	996.9
		a. 135 villages transferred from North Kodagu taluk	371.5	962.2
		b. 4 villages transferred from South Kodagu taluk.	13.4	34.7
iii.	Virajpet	3. Formed by the transfer of 103 villages and one town from former South Kodagu taluk	649.3	1,681.7
Total			1,594.7	4,130.3

According to 1981 Census, Kodagu comprises three taluks, having a total area of 4,102 sq.km. Following table 8 gives the details:

Table 8 : Area and Population of Kodagu District - Taluk-wise.

Sl. No.	Taluk	Area in Sq.km*	Area as per 1981 census Sq. km. **	Population in 1981			Population 1991 (provisional)
				Rural	Urban	Total	
1.	Madikeri	1,450.45	1,449.1	93,002	24,724	1,17,726	1,26,482
2.	Somvarpet	999.99	998.7	1,38,327	25,505	1,63,832	1,81,513
3.	Virajpet	1,657.31	1,646.4	1,58,896	21,434	1,80,330	1,77,234
4.	Total	4,107.75	4,102.0	3,90,225	71,663	4,61,888	4,85,229
5.	Karnataka Total	1,91,791	1,91,791	2,64,06,108	1,07,29,606	3,71,35,714	4,48,06,468
6.	Per cent of the State	2.14	2.14	1.48	0.67	1.24	1.06

* Geographical area as per village records supplied by the Director of Survey, Settlement and Land Records.

** Data supplied by the Surveyor General of India. The total area for the taluk represents the land use area. The total of the area of all the taluks may not tally with district's total.

Source: District Statistical Officer, Madikeri, *Census of India, Kodagu district 1981* and Provisional Census figures, 1991

TOPOGRAPHY

Situated on the eastern and western slopes of the Western Ghats, clothed with lush green forests, plantations and cultivated valleys, Kodagu is a picturesque high-land. Its physical features are varied. The southern, western and north-western portions are intersected by hill ranges and forests, subjected to heavy rainfall. The landscape on north-eastern and eastern portions, is different and resembles that of the adjoining Mysore district. The main drainage is eastwards though there are a few mountain torrents of the Western declivities on the ghats which flow west-ward. The old fort at Madikeri is situated at about 1,140 metres above MSL and the elevation is maintained for a considerable distance towards the north. Towards the east, the country slopes down towards the flow of the Cauvery, the elevation of Kushalnagar being some 330 metres lower than that of Madikeri.

The general appearance of the district varies considerably in its different parts of the district. In the vicinity of Somvarpet, in the north of the district, the hills are gently rounded, alternating with sloping grades, interspersed with clumps of forest trees, resembling the finest park scenery. Near Madikeri, the hills are closer together, and more abrupt, and the ravines are deeper and more wild. Towards Kushalnagar, the country assumes the character of the Mysore plateau, with scattered solitary hills. To the south of Madikeri, in the direction of Virajpet, the country is open, the woods are neither dense nor high, and beautiful grassy doures/dowse rise from extensive rice valleys. The eastern frontier between the Cauvery and the Lakshmanatirtha rivers exhibits an almost uninterrupted and an impervious forest mostly inhabited by wandering tribes earlier, deciduous in character. West of this forest is evergreen, largely intermixed with bamboos, forming

what is known as the Bamboo district. Viewed from an eminence, the whole of the southern portion of the country presents the appearance of one great forest interspersed by valleys which after August appear green with paddy crop. In the north, the country becomes open towards east while to the west and north, the country rises to high peaks measuring from 1,140 metres to 1,870 metres from MSL. Wherever possible, the valleys of the Kodagu are formed into flats and terraces for rice cultivation and high lying lands are cultivated with coffee, orange, cardamom and pepper.

The nearest coast to this land-locked district is at about 34 km from the western border of the district. The visitor will be delighted as much with the variety as with the beauty of the country. Standing on a bright November morning on the summit of the Brahmagiri near Talakaveri, one is filled with delight and admiration of the grand view that opens out before him. As far as an eye can reach to the north-west and south-east, it beholds ridge after ridge of grassy or forest-clad hills, now sloping down in gentle wavy lines, now bold and abrupt, raising their steep summits into the clear, blue sky. Kudremukhabetta, the far seen land marks of the mariner, burst into view from Dakshina Kannada; the Bettadapura and the Chamundi Hill in Mysore, the Wynad mountains of Kerala and Dodda-betta of the distant Nilgiris are clearly visible, and in the west at a distance of about 48 km. below the steep precipices of the Ghats, the Coast-line of Cannanore and Dakshina Kannada, intersected by broad, bright, serpentine rivers and the dark blue sea beyond with its sailing crafts fascinate the spectator. Kodagu is mostly covered by forest, here and there the clearing of a coffee plantation or a paddy field is the park-like open glades with these beautiful green sward and varied foliage, lending a charming variety to the landscape.

The district has a mountainous configuration which presents a grand panorama of verdant valleys, ravines, fast flowing streams, lofty peaks and awe-inspiring spurs. From the table-land of old Mysore, the approach to Kodagu is through the eastern spur while the headquarters town of Madikeri is situated towards the west. The summits of the Western Ghats attain great heights with precipitous drops. The entire western portion of the district is an unbroken chain of hills which appears like a formidable wall from the foot-hills on the side of Kerala. The principal range from a point in the north of Kodagu to a point in the south is described as the Western Barrier. The main range of the Western Ghats extends to nearly 96 km from Subramanya in the north-west to the Brahmagiri in the south. This range is the backbone of the western chain of hills. From this, several long and elevated ridges run from west to east, comprising the entire district of Kodagu. There is also a sub-division of the Ghats towards the south. The lofty barrier range of the Western Ghats form a continuous western frontier and the Brahmagiri range affords a natural barrier between Kodagu and the Malabar hill ranges of Kerala. From the eastern spur, the ascent towards the west is gradual.

The most conspicuous sub-divisions of the ghats in the south are the Brahmagiris or the Marenad ranges which form the southern boundary of the district separating it from Kerala. This height averages some 1,350 metres above the mean sea level. In Kodagu, the name Brahmagiri, is applied to the whole range of hills that separate Kodagu from Kerala and there is also another peak near Bhagamandala known as Brahmagiri which is the source of the river Cauvery. To the west of the Brahmagiri range, are the Hanuman Betta, the Kadangamale and Perumalmale. The whole of Virajpet contains many spurs branching off in different directions. The eastern basin of the Cauvery river has on its sides number of ridges in the confines like Ambata-betta near Virajpet, the

Bittangala Betta, the Hattur hill also known as Kundada Betta, the Siddeshwara hill and the Mankal Betta. The valleys down the spurs, which subside the undulating slopes of the eastern elevation, enclose the richest paddy fields in the district.

Between the Periyambadi pass, near the Kerala frontier and the Todikana pass, close to the source of the Cauvery, the main chain of Western Ghats extends in a north-westerly direction as a straight line having a length of 45 km. The Ghats here fall suddenly towards the west in a precipice. The ascent from the feet is steep and tortuous. It is in this range and behind the Nalknad Palace that the highest peak of the district, Tadiandamol (5,744 feet/1,717 metres), is situated. The Tadiandamol is not altogether inaccessible. The top-most portion is rather difficult of ascent. About 10 km to the south-east of Tadiandamol rises the Somamale, highest mountain in Kadiatnad hobli in the former Padinalkad taluk. It has the sacred Maletambiran shrine and it overlooks the Kodantara pass. About three km to the north east of Tadiandamol, there is another hill called the Iggutappa near the Paditora, and 5 km further on, is the Perur point and 6 km still further, the Srimangala point. The last notable mountain is the Brahmagiri, the source of the river Cauvery.

At an acute angle from this line, the main chain of the ghats continues in the easterly direction as the Bengunad range till, nearing Madikeri, it makes a sudden turn to the north-west and forms the Sampaje valley which leads by a gradual slope into the district of Dakshina Kannada. At the head of the valley and supported by a high ridge with steep abutments on its southern front, the Madikeri table-land is situated. This ridge branches off into two directions, one towards the south-eastern elbow of the Cauvery, culminating in the peak of Nurokal-betta and the other, the Horur branch, due east in a zig-zag line towards Kushalnagar with several rugged hills, the most remarkable of which is Kallurubetta clothed with teak forest.

The Nurokkal and Bengunad ranges are the lateral formations or spurs extending from the Western Ghats. Also the confines of the hilly tract form the watershed of the upper basin of the river Cauvery. This basin which lies between Madikeri and Nalknad is 24 km broad. From the main chain of ghats and to Bengunad range, innumerable ridges jut out on either side. These are diminutive when compared with the parent stock; and they decrease in height as they recede but have almost everywhere narrow summits and declivities.

The table-land of Madikeri maintains throughout an average altitude of 1,050 metres above the mean sea level, and may be said to extend as far as Somvarpet, a distance of 32 km, but on the east it slopes down to the Cauvery which near Kushalnagar is at an elevation of 816 metres above the mean sea level. This plateau, crossed in all directions by minor hills and ridges, is bounded on the west by the continuation of the ghats which culminate near the Bisle Pass in the Subramanya or Pushpagiri hill, which is about 1,665 metres above the mean sea level. This is a remarkable two pointed hill of precipitous height and peculiar shape, and resembles, as seen from Madikeri, a gigantic bullock hump. The ascent, which on account of the precipices of the southern and western face of the hill, can only be effected by a circuitous route, is more difficult than that of the Tadiandamol starting from Bhagati, at the base of the Pushpagiri, it is about 10 km walking, the ascent taking a good walker two hours and 40 minutes, and the descent to Hiridigadde of the village Bidehalli, two hours. A dense jungle, dear to wild elephants, has to be penetrated and ascent is severe; but this Pushpagiri summit commends an extensive prospect over Kodagu,

Dakshina Kannada and Mysore. There are on the hill numerous Hindu memorials in the shape of stone mounds with an enclosure. There are two rude stone structures, with a customary imprint of two footprints.

Among the many ridges that branch off from the Subramanya range of the ghats, the most remarkable is that which attains its greatest height in Kotebetta, about 15 km north of Madikeri. Its elevation is over 1,500 metres and its base covers a very large extent. Its summit is divided into two peaks, one rather pointed and the other flat while its sides are clothed with forest, and innumerable cultivated valleys occupy the recesses. The pointed peak is the Harangal betta. Close to the apex, there are two reservoirs and close to the summit on a spacious platform is a small temple of rough granite slabs dedicated to Shiva. This hill as well as Nurokal Betta offer, on account of their height and central position, the finest general view of Kodagu. The Shanthalli Hill running parallel to Kotabetta has near it a bluff-like ridge with precipitous declivity on its western side. This is the Mukri Betta. There is another range extending from the northern boundary of Kodagu down to the Cauvery river which is called the Yelusavira hills having the Malambi and Kamangala peaks. The Malambi peak which is 18 km from Somvarpet, has a conical shape and reaches a height of 1,346 metres. There is a Shiva temple and a tank. In general, the chain is unequal in its elevation and irregular in its direction with the curvature at the head of Todikana Ghat. Of the other peaks in Somvarpet taluk, the Surlabbi, Chaudlu, Takeri and the Mukuri are notable. The whole of the western portion of Kodagu is an unbroken chain, presenting itself as a wall, ever protecting this little district. From the foothills in Kerala, the Kodagu mountain system appears as a formidable wall, with lofty peaks here and there. In general the summit of the hills are covered with coarse grass, the valleys with evergreen forest and the mountain-sides with woods in the hollows, through which flow streams and rivulets.

RIVERS

The major rivers of the Deccan originate in Western Ghats and drain eastwards. However, there are mountain torrents of the western declivities of the Ghats which flow westwards. The largest river in the district is the Cauvery, which with its principal tributaries, the Hemavathi, the Lakshmanathirtha, the Kakkabbe and the Suvarnavati flows in an easterly direction and the Barapole is the only river worth the name that flows towards west.

The Cauvery

The river Cauvery rises at Talakaveri, a place located in the Brahmagiri Hill, from a height of 1,356 metres (4,447 ft). Known as the 'Ganges of the South', the river has innumerable holy spots on its either banks including many in Kodagu district. *Kaveri Mahatmye*, a part of *Skanda Purana* describes the river as the adopted daughter of Sage Kavera who secured her as a boon from God Brahma, on whom the sage had meditated at the Brahmagiri. Cauvery was married to sage Agastya. (See Chapter II for details)

The Cauvery follows a tortuous route. Her banks are covered with luxurious vegetation and her bed is rocky. In the dry season she is fordable in Kodagu, but during rains, she swells into a

torrent of six to nine metres deep. The river forms a natural boundary between Kodagu and Mysore districts beyond Kushalnagar, covering a length of 80 km in Kodagu from Talakaveri.

First, she flows in the south-eastern direction and at Siddapur she turns towards north-east. Numerous tributaries join her in the district. The Kannika, originating from the north of the Brahmagiri joins the Cauvery at the foot of the hill at Bhagamandala, and an invisible river, Sujyoti is believed to join these two at the confluence, making Bhagamandala, a *Triveni Kshetra*. At Edakal, six km north of Bhagamandala the Niduhole joins the Cauvery. The Cheruvuhole becomes a part of the Cauvery at Charandeti, which is nine km to the north of Bhagamandala, and at Pulikota, 16 km to the north of Bhagamandala, the Tantrinadi joins her. All these tributaries are on the southern bank. The Kadanuru hole joins the Cauvery near Virajpet and the Kumma river at Yedanalknad. The Muttaramudi flowing from the southern part of Madikeri joins the Cauvery on her north bank. The Chikkahole is another tributary. The Kakkabbe river has her confluence with the Cauvery near Napoklu from the southern bank. The Kadanuru Hole joins her from the south beyond Balamuri. The Harangi or the Suvarnavathi gets that name from Gargandur where the Madapur' river (originating at the Boro Hill in Madikeri taluk) and the Hattihole join, the latter flowing down from the Kotebetta. The Harangi's confluence with the Cauvery is at Kudige, and the former changes her course in different directions. The tributaries of the Harangi are the Kakkehole, originating in the Somvarpet hills and the Chorana hole, flowing from Kalakandur near Shanthalli. There is a reservoir across the Harangi at Hudgur.

The fast flowing Cauvery loses 450 metres height from its source, within eight kilometres of its origin. However at Bhagamandala she loses her furore and flows very gently. This marked differences might be because of recent geological changes in its course. At several places bridges have been constructed across this river. One that is constructed at Siddapur links Virajpet and Kushalnagar. Second one is between Madikeri and Kushalnagar which links Kodagu with Mysore. She has a catchment area of 3,400 sq.km. she flows for a total length of 804 km. through Karnataka and Tamilnadu and of this 320 km length is in Karnataka. There are a number of falls in the bed of the river and she forms three well known islands. The Cauvery is part and parcel of the life of the Kodagu people and hence they worship the river as their mother. Talakaveri, Bhagamandala, Harischandra, Balamuri, Guhya and Ramaswamy Kanive are some of the holy places located on the bank of the river. (See Chapter XVII). The Cauvery is reputed to be one of the important sacred rivers of the Hindus. It is believed that even the river Ganga (Ganges) resorts underground in the Cauvery once a year in the month of *Tula* (October-November) to wash herself free of the pollution contacted by her from the crowds of sinners who bathe in her waters. (This is on the day sun enters Libra - the Solar month of *Tula*)

The Hemavati

The Hemavati river or Yenne-hole has her source near Javali in the Mudigere taluk of Chikmagalur dt. and is one of the chief tributaries of the Cauvery. After passing through Sakleshpur taluk of Hassan District, she forms the boundary of Kodagu for a few km and joins the Cauvery in Krishnarajanagar taluk of Mysore dt. The Aiguru and the Kattchalla rivulets from Kodagu join the Hemavati.

The Lakshmanatirtha

The Lakshmanatirtha, a tributary of the Cauvery, rises in the Munikadu forest on the plateau of Devasi Hills of the Brahmagiri of the Western Ghats. The Lakshmanatirtha, together with Ramatirtha and Kerehole drains nearly the whole of the south-eastern part of Virajpet taluk. In its descent over an almost perpendicular mountain wall it forms a celebrated cataract (the Irpu falls) which has been invested with cleansing virtue, and is consequently visited during the Irpu *jatire* by thousands of devotees. (There is the Rameshwara temple near the falls.) The sandy river banks and deep fertile soils of the area support lush forests. It enters the Mysore district near Chikkahejjur, south-west of Konana Hosahalli in Hunsur taluk and flows through Hanagodu, Hunsur and Kattamalalavadi before its confluence with the Cauvery on the right side at Sagarakatte in Krishnarajanagar taluk.

The Barapole

The most important of the rivers that flows to the west is the Barapole. The name Barapole is derived from the word *bara* meaning steep and *pole* is river. It rises in the Brahmagiri hills and is soon joined by Kenganhole and the Kakkattuhole tributaries. Later the Sarathhole also joins and forms 134 metres deep water falls, known as the Sarath Abbi, located at Bittangala village. The river forms another water falls near Kerala border. Around these two falls the landscape is very beautiful. The river flows for 64 km in Kodagu and then for 10 km, it forms the common border between Kerala and Karnataka. It is proposed to construct a dam at Kuttani near Ponnampet, 17 km, south-east of Virajpet. The proposed hydro-electric project will spread over an area of 608 sq.km and is expected to generate 1,80,000 kw. power when executed. Another tributary, Kalluhole, arising from the northern valley of Heggala, joins the river near the border. In Kerala State it assumes the name Chiralpuyya and receives the tributary which also flows from Brahmagiri. Further it joins the Arabian sea at Charkal. The catchment area of the river is 1,905 sq.km. (608 sq.km in Karnataka and 1,299 sq.km in Kerala.)

The Kumaradhara

The Kumaradhara originates at the Subramanya mountain range, becomes boundary between Kodagu and Hassan district and enters into the western portion of the Manjarabad (Sakleshpur) taluk of Hassan district. Further it enters into Dakshina Kannada through the Bisle Ghat region, and unites with the Netravati river at Uppinangadi in Dakshina Kannada. The holy place Subramanya is located not far away from its bank. The combined river the Netravati passes over a rocky bed with many rapids up to Bantwal and then through richly wooded banks and joins the Arabian sea near Mangalore.

The Nojekallu or Najikal river originates in the Sampaje valley, flows through Dakshina Kannada district and joins the Arabian sea near Kasaragod in Kerala State, where it is known as Basvani or Payaswini river. Another tributary, which also originates in the Sampaje Valley joins the river.

Hydrologically the district has been divided into six basins, the details of which are as follows:-

Sl. No.	Name of sub-basin	Sub-basin area (sq.km)	Drainage density range km/km ²
1.	Velapattanam	67.9	2.2 - 3.02
2.	Kuppam	117.2	> 3
3.	Ariyakadavu	107.4	2.3 - 3.15
4.	Netravati	143.5	2.1 - 2.85
5.	Payaswini	264.8	> 3
6.	Cauvery	3,402.2	1.85 - 3.04

The Cauvery basin constitutes 63.4% of water resources of the district. Remaining 36.6% is contributed by west flowing rivers. Throughout the district, there is not a lake or tank of size worth-mentioning. About 715 tanks are regulated by the Public Works Department and another 212 controlled by Mandal Panchayats of the district. The Honnammanakere is located about five kilometres north of Somvarpet. The Kolli reservoir in Virajpet and the Harangi reservoir in Somvarpet taluk are the other major sources of water. It is proposed to construct a dam across the Chikli stream so as to provide irrigation facilities for 2,752 hectares. The Halagote tank located at Torenuru has a waterspread area of 35 acres. Five kilometres from Madikeri, the Madikeri or the Muttaramudi stream forms the Abbi Water falls.

GEOLOGY

The bulk of the geological formations in the district falls within Archaean era which is about 2,600 million years old. The early Archaean era appears to have been characterised by the development of shallow basins of small size. Rocks of this group occur mostly as narrow linear sub-parallel belts and as lenticular enclaves of supracrustal sequences folded along with the migmatitic gneissic complex. The Sargur supracrustal rocks are largely composed of meta-ultramafics and meta-basalts with associated quartzites, carbonated and aluminous sediments. The metamorphism ranges from upper amphibolite to lower granulite facies. Rocks falling within this group are extensively migmatized. The narrow greenstone belt of Siddapur is considered to belong to this complex.

The high-grade granulite terrain is confined to the western and southern part of the district. Structural and metamorphic continuity is observed between the low-grade and the high-grade terrain which extends further south into Kerala. The commonest rocks are granulite to upper amphibolite gneisses. A characteristic rock type, which is seen in the high-grade terrain, is charnockite. It is a coarse-grained, dark-coloured, greasy looking granitic rock containing the mineral hypersthene.

The stratigraphic sequence of the rock types found in the district is as follows:-

Stratigraphic sequence.

1. Litho units, Alluvium, Colluvium		Recent to sub-recent
2. Laterites		Pleistocene
3.	- Unconformity -	
4. Basic and Ultramafic dykes]	Late Proterozoic
Pegmatite and quartz veins		
5. Amphibolite		Archaen era
6. Granites and Gneisses		Archaen era
7. Charnockites		Archaen era

Description of Rock types

Charnockite occurs mainly in western part of the district adjoining Kerala State occupying NW-SE trending Tadiandamol range and also these ellipsoidal bands in Somvarpet and Virajpet taluks of the district. The rocks are generally hard, compact and less resistant to weathering.

Granite gneisses occupy nearly 68 per cent of the district area. These gneisses appear to be granitised products of older metamorphics with preservation of relic structural trends varying from NW-SE to NNW-SSE directions. Granitic gneisses are pinkish to greyish, mesocratic, medium to coarse grained exhibiting porphyroblastic textures. Coarser varieties occur in Malambi- Gangavara plains which is the western fringe of Mysore plateau.

Amphibolites trending NW-SE constitute small ridges and occur as lenses and bands in gneisses in and around Madikeri - Chettalli, Betageri, Kadakala and Tavurpatti sectors. The rock is medium to fine grained melanocratic with predominance of hornblende minerals and hypersthene and exhibit gneissic structure. They are extremely hard and compact with fewer joints. Contacts are generally weaker zones.

Dykes of ultrabasic include peridotites and pyroxinites while basic ones are dolerites and pyroxene granulites. These intrusives are in conformity with foliation trend of gneisses (NNW-SSE) and lineaments. These dykes at places attain upto 150 metres width and run approximately 12 to 16 km length with interruptions. Thin laterite crusts of heterogenous nature, mainly of transported origin are seen in flat upland areas in the Netravati and the Kakkabbe river valleys.

Sandy to clayey alluvium is the neo-recent depositional features along the Cauvery river between Betri and Sirangala villages. It has a thickness of 2.6 to 6.00 metres with an average width of 60 metres. Gravelly and sandy deposits in the river bed near Kushalnagar has a thickness of 3 to 5 metres. At the foot of steeper slopes of narrow valleys, colluvial deposits upto 8 to 15 metres thick are seen in the catchment areas of the westerly flowing rivers and hilly tributaries of the Cauvery.

Rock Structures

Charnockites have NW-SE foliation direction with moderate to steep (45° - 69°) south-westerly dips. Two sets of joints noticed are $S15^{\circ} E$ and $15^{\circ}W$ and NW-SE with varying dips of 10° to 85° in different directions. The joints are wide apart (spacing 15 to 35 metres) and openings in them vary from hairy thin width to 10 mm. The major lineaments in this unit are nearly parallel to gneissosity and three sets of secondary lineaments have NE-SE, ENE-WSW and WNW-ESE trends.

Granite gneisses have recorded gneissosity in NW-SE direction with minor variations. Foliation dips are south-westerly with 48° to 15° inclinations. Three sets of predominant joints trend N-S, $N40^{\circ}W$ - $S40^{\circ}E$ and $N15^{\circ} E$ - $S15^{\circ} W$. Sheet joints are also well developed. Joint spacings in the gneisses are in the range of 0.8 to 4.5 metres and openings vary from 20-60 mm. Major lineaments trend $N52^{\circ} W$ $S52^{\circ} W$ and $N28^{\circ} W$ - $S20^{\circ} E$ near Kodlipet (Northern part of Somvarpet) which swing in North-South direction.

Laterite is a peculiar type of residual porous clay rock, full of worm-like tubes, mainly made up of hydrated oxides of iron and alumina, formed as the product of the weathering of underlying rocks. The laterite-capping over bed-rocks are found in the Kakkabbe and the Netravati river basins. Recent sediments of alluvium has been found at Betri and Sirangala villages located on the banks of the Cauvery. This rock range in thickness from three to six metres and has a breadth of sixty metres. At Kushalnagar the thickness of the rock varies between three to five metres. The colluvium rocks have a thickness of eight to fifteen metres and are located at the western flowing river beds and mountainous section of the Cauvery river.

Minerals and Ores

Kodagu is considered to be very poor in regard to its mineral resources. This explains lack of any industry in the district. However intensive and extensive surveys by the Geological Survey of India and the State Department of Mines and Geology may change the scenario. Corundum is found as small, hexagonal crystals. It is an aluminium oxide mineral. The finer varieties are used as gems, the coarser as abrasives. Emery is impure corundum. Mica is silicate of aluminium and potassium. It splits into thin, elastic sheets. Mica deposits have been reported from Polibetta area. Granite is hard igneous rock of coarse structure, commonly containing quartz and feldspar. It takes a high polish and is used for buildings and monuments, low quality granite is found in gneiss and schist. Magnesite rocks are found on the banks of the Cauvery river near Sirangal and Kushalnagar. It is a magnesium carbonate mineral, white yellow or grey. Kyanite is aluminium silicate occurring commonly in blue thin-bladed triclinic crystals, used in furnaces. It has been found among gneisses schist located six kilometre south of Madikeri. It has been also reported from Siddapur area. However, quantity available is too small for its industrial exploitation. Muscovite having a diametre of fifteen centimetres has been located at Marenadu and Parakatageri of Shrimangalanadu, three kilometre north-west of Madikeri. Deposits of mica, lodestones and quartz are found in this area.

Ground Water

Groundwater in Kodagu occurs in various geological formations, under-water-table conditions and the ground-water recharge is mainly through precipitation. The water bearing formations include the altered and weathered gneisses and laterites. The depth to the unconfined water is related to the altitude of the land surface. There is notable fluctuation in water-table between summer and monsoon seasons. It is assessed that about 50% of the rain that is precipitated, is lost through evaporation; another 25% through run-off as streams and rivers. Only 25% of precipitation eventually seeps through and reaches the ground-water reservoir. The hard crystalline rocks which are impervious to water, help in accumulation of abundant water. There is generally a mantle of loose soil and decomposed rocks of varying thickness, and this capping varies between 12 to 30 metres. Charnockites and granites and gneisses form 97% of water bearing rocks of the district.

Taluk-wise estimation of annual utilisable ground water reserve in the district is given in Table.9.

Table 9 : Estimation of Annual utilisable ground water resource.

Sl.No.	Particulars	Madikeri	Somvarpet	Virajpet
1.	Total Geographical area in sq.km.	1,449	999	1,654
2.	Area suitable for ground water development in sq.km.	407.84	451.59	634.33
3.	Year of estimation	1984	1984	1985
4.	Water table fluctuation (between November and April) in Metres.	2.25	3.02	2.86
5.	IMD Yearly normal rainfall in mm (1951-1980)	3,264	2,245	2,655
6.	Monsoon recharge (by GEC norms) in MCM	32.12	47.73	63.50
7.	Total annual recharge in MCM	55.32	85.72	119.55
8.	Net Annual ground water draft in MCM	3.04	4.35	4.77
9.	Annual utilisable ground water recharge in MCM	47.56	74.45	102.49
10.	Groundwater balance available for development in MCM	44.42	70.10	97.72
11.	Level of ground water development as on 31.3.88	6.44%	5.85%	4.68%
12.	Estimated balance in 1990 in MCM	43.99	67.01	96.34
13.	Estimated net draft in 1990 in MCM	3.57	7.44	6.15

* MCM - Million Cubic Metres.

Source : *Hydro Geological Frame Work and Ground Water Potential in Kodagu District*, Central Ground Water Board, Government of India, 1990.

Landslides

Kodagu district is a land of steep mountains and hence periodic landslides are inevitable. In the rainy season loose soil and rocks absorb water, which increase their weight and lessens friction. Thus a mass of rock and earth slip down a slope, and result in blocking of roads and high-ways, similar blocking of streams and rivers may cause floods. It may also destroy forest, agricultural land, habitations and live-stock. In recent years the landslides in mountain ranges near Irpu village inflicted heavy losses to local population.

FAUNA

Kodagu has a rich and colourful heritage in respect of wild life. The natural distribution of animals, especially of mammals is regulated by vegetation of a given area. Animals such as heterotrophs depend upon primary production which should be able to maintain a biotic diversity to the ecosystem. A study of the feed-potential in the various vegetation types reveals that ever-green forests are mainly suited to many species of arboreal animals like the monkeys. The deciduous forests offer a more congenial habitat for the larger herbivores, such as the gaur, the elephant and the deer. In order to avoid heavy down-pour wild animals migrate to the forest of adjacent district and return later. Their population is highest in northern, eastern and southern part of district.

Conspicuous among primates are three types of monkeys. The Nilgiri-langur, *presbytis johni* is confined to Western Ghats from Kodagu to Kanyakumari. Its favourite haunts are the sholas, at levels ranging from 1,000 to 2,300 metres above mean sea level. They are seen in troops each of 5 to 15 individuals. The social organization is on the line of dominance, the most rigorous gaining supremacy and a harem of females. Hanuman langur has a black face, ears and soles and usually found in the forest and semi-urban surroundings. They live mainly on fruits, flowers, buds and leaves. They are locally known in Kannada as *muscia* (*Presbytis entellus*). The bonnet monkey or macaque, *Macaca radiata* (*kapi*, *kothi*, *manga* all in Kannada), is the familiar red monkey, common around shrines and jungle side towns. They are omnivorous, often found near water and are excellent swimmers.

The Indian wild dog *Cuon dukhunensis* (*Silunayi* or *Kennayi*) resembles very much the wolf, *Canis naria* (*tola*). It has shorter legs and muzzle and a distinctive red coat. They entirely keep to the forest and hunt in groups during the day. They prey upon deer, both large and small, wild pig and young ones of larger hoofed animals. While on scent of their intended or injured prey, they do not tolerate any interference even by the larger beasts of prey like the panther, bear or the tiger.

The mongooses are characterised by a long body, short limbs, bright eyes, a sharp snout and a trailing bushy tail. They take shelter in bushes, hollows of trees and holes in the ground. They feed on small rodents, snakes, lizards, birds, ground-dwelling invertebrates, and also on fruits and roots. Three species of mongooses are commonly seen in the district. They are the stripenecked, *Herpestes vitticollis* (*patte kattina mungali*), brown mongoose, *Herpestes fuscus* (*nilagiri kandu mungali*) and grey mongoose, *Herpestes edwardsii* (*boodu mungali*). They are not immune to the snake poison but they prevent a cobra from biting by counter-attacking with lightning speed and

dismembering its hood. The young ones of mongoose are captured and trained by the snake-charmers.

Numerous species of mice and rat are found in the district, both in the open cultivation areas and the forests. Rodents are known for their destruction of crops and fruits. They are easily distinguished from all other mammals by the presence of two large incisors separated by a large gap from the grinding teeth. The house rat, *Rattus rattus (ili)* and the house mouse, *Mus musculus (mushaka)* are responsible for destruction of more than ten per cent of stored food grains. Similarly, bush rat, *Golunda ellioti (hullu ili)* and field mouse, *Mus booduga (kadu ili)* destroy standing agricultural crops. The large bandicoot rat, *Bandicota indica (heggana)* and the lesser bandicoot rat, *Bandicota bengalensis (kiriheggana)* usually live in the field and forest but if they get a chance to enter a house, then they play havoc with the farm produce.

The three-striped palm squirrel, *Funambulus palmarum (alilu)*, lives in trees and makes a low chirping call. The giant squirrel, *Ratufa indica* is the largest of all squirrels, arboreal and diurnal. It builds globular nest in the top branches of tall trees. The large brown flying squirrel, *Petaurista petaurista (haruva bekku)* is even bigger than the giant squirrel and lives in hollows in the holes of tall trees. It sleep in day time and will be out at night. It does not fly, but can cover sixty metres in a glide, airborne on the flaps of skin on either side which expands to a parachute from one tree top to another. The Indian hare, *Lepus nigricollis (mola)*, and black naped hare *Lepus nigricollis nigricollis (kappu hedkina mola)* are nocturnal. Hares form diet of all predators but they are not easily caught, being capable of surprising jumps and a fine turn of speed.

The predatory carnivores like the tiger, *Panthera tigris tigris (huli)*, panther, *Panthera pardus (chiratey)*, are seen more frequently in the dry deciduous forest than in ever-green area. Tigers are solitary animals and congregate only for mating or when a tigress moves about with her cubs. They hunt primarily at night between dusk and dawn and their usual prey consists of the chital, sambar, hog deer and the pig. Starvation compel them to kill domesticated animals such as cows, buffaloes and goats. The quest for food occupies a large part of the tiger's life. Of all forms of wild life, the tiger is the most feared. But people familiar with the animal know that it is a shy animal and avoids man. Tiger-hunting was a favourite pastime for the ruler Lingaraja and there was a tradition in Kodagu, to arrange a wedding ('Narimangala') between the hunter and the killed tiger. This indicates that tigers were more numerous until recently and their indiscriminate slaughter and the destruction of their habitat have caused alarming depletion of their numbers. Fears of the total extinction of the tiger have resulted in the animal's protection by law as envisaged by the 'Project Tiger'.

The panther or leopard is next in importance only to the tiger. Unlike the tiger it is able to live and thrive almost anywhere. It feeds on cattle, deer, monkey and even smaller prey. Like the tiger, the panther follows the paths of animals through the forest and waits for its prey on hiding. It seizes its quarry either from the ground or leaps on it from a height such as an overhanging branch. The Panther's habits brings it into far more frequent contact with man than the tiger and as such it runs the greater risk of being killed. Hence the number of panthers is being grossly depleted.

The Indian elephants, *Elephas maximus (ane)*, prefer to live in areas covered with tall forests, where ground is hilly or undulating and where bamboo grows in profusion. They are extremely

adaptable and when undisturbed, pursue a regular and ordered routine, drinking and feeding accustomed places. Their food consists of various kinds of grass and leaves, wild bamboos and also all species of crops. The big tuskers are usually seen feeding at some distance from the main herd. Period of gestation in the elephant lasts for about twenty months and generally one calf is born at a time. Elephants have very poor eye-sight, the sense of smell and hearing is acute. As they require lot of food for their enormous bodies, they keep on moving in herds and cover almost every part of the habitat. Elephants are common sight at Pushpagiri, Subramanya, Sampaje, Brahmagiri, Makutta, Bhagamandala, Nagarhole, Titimathi, Kallahalla and Murkal areas of the district. In order to protect themselves from torrential rains, they migrate to Bandipur and Madumalai forests. Indiscriminate slaughter of the elephants for their tusks and the destruction of their habitat have resulted in reduction in their numbers. This has necessitated introduction of the 'Project Elephant' in the district.

The Indian bison, *Bibos gaurus (kademme)*, symbolises both vigour and strength. They are by nature shy and timid animals. Their main defence is their massive size and a well developed sense of smell. Forests are essential to their existence and the herds chiefly feed on grass. Sambar, *Rusa unicolor (kadave)* is the largest Indian deer possessing very beautiful horns. It feeds mainly at night and its food consists of grass, leaves and different kinds of wild fruits. The spotted deer, *Axis axis (chukke jinke)*, is beautiful in build and to look at. Its favourite resort is bushes and trees, near water-courses or bamboo jungles. It is gregarious and scores of individuals are sometimes found in a large herd. The animal do not shun the village and often enter cultivated areas. Indian wild pig, *Sus cristatus (kadu handi)*, is known for its great adaptability. It is a solitary animal, found during day in high grass. The pig is very fond of digging up the soft soil with its tusks while searching for under ground root tubers. Porcupine, *Hystrix leucura (mullu handi)*, often damages the agricultural and plantation crops. It is not preferred as food by the majority of wild animals because of its quills. The sloth bear, *Melursus ursinus (kappu karadi)* feeds on honey, tender grass, bamboo shoots and fruits. The barking deer, *Muntiacus muntjak (bogaluva jinke)* is diurnal feeding on leaves, tender shoots, flowers and fruits.

Reptiles are well represented in the district and occupy a multiplicity of niches on land and in water. The 'Flying Dragon', *Draco dussumieri (haruva halli)*, possesses an extraordinary structure called 'parachute', an expansion of lateral skin folds, which enables the animal to glide to some distance. The South Indian monitor, *Varanus bengalensis (uda)*, is nocturnal and attains a considerable dimension. The poisonous quality attributed to this lizard is entirely without any basis. The chameleon, *Chameleon calcaratus (usarvalli or othi)*, is highly specialised and is known for changing the colour of its skin.

Snakes are limbless reptiles adapted to gliding movement. The non-poisonous snakes include rat snake (*kerehavu*), green snake (*hasiru havu*), whip snake (*chati havu*) and the like. The common green snake is popularly believed to strike at the eye. However, its body colour is an example of protective adaptation with the foliage amidst which it lives. It also occurs in the hilly and forest area. The spectacled cobra, *Naja naja (nagarahavu)*, is the most sensational of Kodagu poisonous snakes. The kind cobra *Naja hannah (rajanaga)* is highly dreaded and attains a great length.

The tortoises are represented by the soft shelled species *Triomys leithii* (*niru ame*). They also live in the grassy forest at foothills. The marsh crocodile, *Crocodylus palustris* (*mosale*) was once quite common all along the Cauvery river basin. However, their number is dwindling because of trapping, hunting and killing with poison baits. Efforts are being made to rehabilitate them by suitable safeguards.

The Amphibians of Kodagu are unique in their variety. In rainy season common frog, *Rana tigerina* (*neerkappe*) could be seen in abundance. The burrowing frog, *Rana breviceps* (*nelakappe*), the tree frog, *Rhacophorus maculatus* (*marakappe*), the Indian toad, *Bufo melanostictus* (*irulu kappe*) are the other species. Fishes are abundant in both river and tanks. The principal fishes are carps, cat fishes and eels.

The Avifauna are abundant and varied in Kodagu. The availability of a large supply of insects and plant food in the forests, supports rich bird life. Summer is the time to look for birds with so many forest trees in flowers and fruits. Only a few important species are mentioned here.

The order Ciconiformes includes birds like the grey heron, *Ardea cinerea* (*boodu krauncha*), Pond heron, *Ardeola grayii* (*narayana pakshi*), cattle egret, *Dubulcus ibis* (*bellakki*), and the interesting night heron, *Nycticorax nycticorax* (*irulu kokkare*). The order also includes the open billed stork, *Anastomus oscitans* (*bakapakshi*), white ibis, *Threskiornis melanocephala* (*bili bannada ibis*), and the spoon bill, *Platalea laucorodia* (*chamach kokkina bellakki*). The order Falconiformes is represented by the pariah kite, *Milvus migrans* (*haddu*), brahmny kite, *Haliastur indus* (*garuda pakshi*), and the white scavenger vulture, *Neophron percnopterus* (*biliya rana haddu*). The order Galliformes includes our national bird, the peacock, *Pavo cristatus* (*navilu*), the red-spur fowl, *Galliperdix spadicea* (*kadu koli*), the grey quail, *Cournix cournix* (*budi bannada quail*), and the grey partridge, *Francolinus pondicariamus* (*budu bannada ganjiga hakki*). The order Cuculiformes is represented by the song bird, Cuckoo, *Eudynamis scolopacea* (*kogile*). The order Coraciiformes has the roller (blue jay) *Coracias bengalensis* (*maina hakki*), the hoopoe, *Upupa epops* (*shikheyulla hoopoe*), the small green bee-eater, *Mirops orientalis* (*jenu bhakshaka*) and the grey hornbill, *Tockus birostris* (*budi bannada ongile*)

Mention must be made of some of curious forms like the spotted owl, *Athene broma* (*chukke goobe*), barn owl, *Tyto alba* (*kanajada goobe*) and the mottled wood owl, *Strin ocellata* (*mara goobe*). Biologically important birds like the cuckoo, the large Indian parakeet, *Psittacula eupatria* (*dodda gini*), the house swift, *Apus affinis* (*vegada hakki*) the blue rock pigeon, *Columbia livia* (*neeli parivala*), the common babbler, *Turdoides caudatus* paradise fly catcher, *Terpsiphone paradisi* and the Baya Weaver bird, *Ploceus phillippinus* (*nekar pakshi*) should not be forgotten. The ubiquitous house crow, *Corvus splendens* (*uru kage*) is all too familiar and is close to its counterpart, the jungle crow *Corvus macrorhynchos* (*Kadu kage*).

There are many varieties of invertebrates in Kodagu. The Indian cattle leech, *Hirudinaria granulosa* (*jigane*) and earthworms, *Pheretima* Spp (*erehula*) are the common annelids of the district. The crustaceans that are commonly found are; the fresh water-prawn, crab, water flea and cyclops. The common arachnids are : scorpions, spiders, pseudo-scorpions, whip-scorpions, ticks and mites. Centipede, *Scolopendra* sp., the millipede, *Julus* sp. are found in the district. Molluscs like the fresh water mussel, garden snail and the slugs are commonly found.

Nagarhole National Park

Not too long ago three-fourth of the district was covered with forest and wild life was a common sight. British officers from Bangalore and Cannanore were frequenting these forests on hunting expeditions. In one of such expeditions to Kusbur forest, Kodagu king, Dodda Veera Rajendra Wodeya is credited with killing seventy three wild animals in a seven-hour operation. Gradual depletion of game animals forced the Government to declare 285 square kilometre area as wild life sanctuary, in the year 1955. The sanctuary was named after the river Nagarhole that flows in the area. In 1975 the area was expanded to 571 square kilometres. In 1983 it was declared as national park. At present the total area of the park is 642 square kilometres. Kabini Reservoir separates Bandipur National Park from the Nagarhole National Park. At Karapura there is nice guest house which could accommodate tourists. The wild-life lovers are also accommodated in cottages, forest lodges and dormitories. The guided tours are conducted from 6.30 A.M. to 9.30 A.M. and 4.30 P.M. to 6.30 P.M in vehicles run by the Forest Department. A large number of visitors from all over the country and abroad are attracted to this park. They have a chance to see bisons, elephants, tigers, panthers, spotted deer, sambars, barking deers, wild bears and four-horned antelopes in their natural habitat. The district has other wild life sancturies located at Brahmagiri (181.29 sq.km.) Pushpagiri (102 sq.km.) and Talakaveri (105 sq.km.).

FLORA

An introductory essay in *Flora Indica* by Hooker and Thomson (1885) is the earliest available record about the vegetation of the Kodagu district wherein it has been described as a part of 'Malabar province'; a mention of plant collections and collectors is also made in this work. The mountains of Kodagu were first explored by Captain William Munro and Captain George Stevens Gough (1934). Rev.Metz. also made large collections of Kodagu plants mostly in the surroundings of Madikeri, which were distributed by Hohenacker and named by Miquel. Gideon Thomson of Madras included material obtained through collectors in his large herbarium which comprised of plants from Peninsular India.

Rice (1877 and 1897) in *Gazetteer* has dealt with the vegetation of Mysore and Kodagu. Van Someran (1879) and John Cameron (1894) have published their work on forest trees in Mysore and Kodagu. Champion (1936) in the book *Forest Types of India and Burma* has mentioned about the various forest types from Kodagu district as examples. Betts (1951) in his paper on "Birds of Coorg district" has mentioned about the general features of Kodagu district. I.M. Muthanna (1953) has given an account of forest wealth and management in his book on Kodagu district. Several others have worked and published on the forests and vegetation of the district mainly for the working plan and other related works of the forest department (Nanayya, 1949; Somaiah 1957, Tirumurti 1955, Khader Hussain 1974-75, Balaiah 1975, Chinnappa 1975, Adkoli 1976 and 1980, Lakshmana and Subramaniam 1976 and 1977 and Akbar Shah 1987).

Arora 1960, 1964, 1965 and 1968 besides listing 530 species of Angiosperms has described the general geographical features of vegetation. Suryanarayana (1966, 1975) enumerated 675 species (including cultivars) which have importance in apiculture. Among others who have made stray contributions to the *flora* of this district, mention may be made of Singh *et al* (1976), Rolla

S.Rao (1978), A.S.Rao (1963), Kelanjar (1976-77) and Subramanian (1980). Mallikarjunappa (1981) worked on *flora of Kushalnagar* while Bhat (1983) on *Grasses and Sedges of Coorg and South Kanara*. *The Flora of Karnataka* (Vol.1) by Dr.Saldanha with the help of other contributors (1984) also discusses a few plants from this district. Recently Bhat (1989) described a new species of *Amomum* while Keshava Murthy *et al* (1987) have described six new taxa from the district.*

Kodagu has a rich and varied vegetation. The natural vegetation of the district is broadly classified into the following categories. 1. the Scrub type, 2. the Moist deciduous type. 3. the Evergreen and semi-evergreen type 4. the Sholas and grassland type. The above types intermix with one another and hence it is difficult to delimit them rigidly.

1. The Scrub type

In better climatic and soil conditions, the xerophytes merge with thorn-scrub associations. This type of vegetation occurs in patches around areas like Hunisekatte and Kallahalla of Nagarhole range, where rainfall is sparse. The trees are stunted and do not grow more than twelve metres. The constituents of the vegetation chiefly consists of thorny elements with a few stranded, crooked and malformed trees. Lack of plant nutrients results in twisting and bending of the trunks. They are protected from browsing animals by their thorns and other protrubarences. *Andrographis serpyllifolia* with its radiating, prostrate branches is a common sight in the area. There is a ground cover of plant which are ephemeral or perennate by underground root stocks. Most of the shrubs are strongly armed. *Tephrosia tinctoria* is also found in abundance. Some of the more common species which belong to this type are: *Asparagus, racemosus, Argyreia cuneata, Barleria buxifolia, Blepharis asperrima, Catunaregam spinosa, Elephantopus scaber, Flacourtia indica, Gardenia turgida, Hamidesmus indicus, Ichnocarpus frutescens, Lantana camara, Leonotis nepetifolia, Opuntia stricta, Pavetta indica, Plecospermum spinosum, Rungia pectinata, Stachytarpheta indica* and *Toddalia asiatica*.

2. Moist deciduous type

The climax moist deciduous forest occurs at the higher slopes of the mountains located in Murkal, Nagarhole, Ponnampet, Somvarpet, Shanivarsanthe, lower parts of Karike and Sampaje hills. The plants form a more compact canopy and the interval between leaf fall and leaf flush is relatively short. The stratum of shrubs is well developed as also the herbaceous ground *flora*. Twiners are common while orchidaceous epiphytes abound in undisturbed regions. Many useful trees are native or naturalised in these forests.

The Secondary moist deciduous forests are better preserved towards the foot-hill of Western Ghats. The decreasing rainfall on the leeward side of the mountain gives rise to another climax type-upland moist deciduous vegetation. While in leaf, the canopy of these forests is dense but during the dry months there is a short period of leaf-fall to avoid loss of water due to transpiration. Flowering of the trees occurs during this leafless period. Fruiting is well on its way before a new flush of leaves appears soon after convectional rains in March-April. This moist belt is the habitat

* Keshavamurthy and Yoganarasimhan, Flora of Coorg, (Kodagu), Bangalore, 1990, p.59

of the *Tectona-Dillenia-Lagerstroemia - Terminalia* series. The leaf litter in these forests is thick and acts as a mulch protecting the soil. Numerous shrubs and epiphytes protected during the wet season are exposed to the strong sunlight during the hot months. They also come into flower during April and May just after the convectional showers. Those early rains trigger a spurt of activity in the ground cover. Several lilies and aroids that perennate by underground parts bud forth into inflorescences of intriguing shapes and striking colours.

Extensive areas of the eastern fringe of the Ghats were once covered with clumps of bamboos especially of *Bambusa arundinacea* and *Dendrocalamus strictus*. Each clump sends up fast growing shoots at the beginning of the monsoon. Once every 40 to 60 years, there is a gregarious flowering of whole population after which the clumps die and have to be regenerated from seed which litter the forest floor. These bamboos once supplied adequate material for a number of tribal handicrafts and were also a source of pulp for the paper industry. Over exploitation and lack of proper regeneration after the massive flowering in the late sixties has resulted in a serious problems both for the tribals and for the bamboo based industries. There has been an influx of settlers into this area mostly from neighbouring State. Forests have been cleared and low lying areas converted into paddy fields. While the hilly terrain is often planted with rubber, the native trees have been clear felled and the area replanted with rubber. In other slightly wetter areas, the canopy has been left standing but the understoreys replaced by Cocoa shrub. To meet the needs of timber, plywood and other wood-based industries large tracts at the foot of the ghats have been planted either with soft and hard woods especially *Haldina*, *Tectona* and *Terminalia*.

Some of the important trees and shrubs of this type are : *Alangium salvifolium*, *Anogeissus latifolia*, *Buchanania axillaris*, *Careya arborea*, *Cassia fistula*, *Crateva magna*, *Dalbergia paniculata*, *Grewia tiliifolia*, *Kydia calycina*, *Memecylo umbellatum*, *Miliusa tomentosa*, *Mitragyna parvifolia*, *Pterocarpus marsupium*, *Terminalia alata* and *Toona ciliata*.

Some of the chief climbers and twiners are: *Arbus precatorius*, *Ampelocissus tomentosa*, *Aristolochia indica*, *Asparagus racemosus*, *Aspidopterys canarensis*, *Cissampelos pareira*, *Cocculus hirsutus*, *Cryptolepis buchmanii*, *Dioscorea pentaphylla*, *Diplocisia glaucescens*, *Erythralium populifolium*, *Gouania microcarpa* and *Maerua oblongifolia*.

The undergrowth consists of *Abelmoschus angulosus*, *Abutilon indicum*, *Abutilon persicum*, *Cassia mimosoides*, *Crotalaria quinquefolia*, *Curculigo orchoides*, *Desmodium Spp.*, *Flamingia Spp.*, *Gomphostemma heyneanum*, *Hibiscus lobatus*, *Hybanthus enneaspermus*, *Hygrophila auriculata*, *Phaulopsis imbricata*, *Polygala persicarifolia*, *Spp of sida* and *Uraria lagopodioides*. Many ferns and orchids are found on tree trunks.

3. Evergreen and semi-evergreen types

The forests of this type could be observed at Irpu, Virajpet, Wotekolli, Sollekolli, Bhagamandala, Talakaveri, Madikeri, upper ghats of Sampaje, Kakkabbe, Tadiyandamol, Heggademane, Shantalli, Kundalli and some parts of Pushpagiri.

Excellent examples of tropical evergreen forest could be noticed at the lower slopes and valleys of the Western Ghats. The evergreen rain forest on the wind-ward side of the Western

Ghats is the richest type of vegetation that could be observed in Kodagu. Starting on the ridges of the Western Ghats, these formations reach their climax in the valleys opening out into the Western plains. When undisturbed they reach the status of climax vegetation. Giant trees with buttressed bases and trunks that are unbranched for over 20-30 metres, fan out to meet the contiguous tree tops high above the ground. The crowns of adjacent trees merge to form a verdant roof tampering the effect of the rain and standing upto the fury of the wind from June to September. During the rest of the year the canopy basks in the bright tropical sunshine filtering only a part of the daylight to the plants beneath.

The controlled levels of light intensity and relative humidity within the forest encourage stratification of trees, shrubs and herbs. Each stratum is by a long process of natural selection adapted to carry on metabolic activities, especially photosynthesis in this protected situation. There are variations in the composition of the canopy trees not only from north to south but also depending on soil, slope and altitude. In Kodagu district, the *Myristica*, *Bischofia*, and *Canarium* association is more frequent.

There are other plant forms in those forests supported by sturdy trees, woody lianas spiral to the sky in search of the light and wind near the canopy. Epiphytes carry on their entire life cycle perched on trees away from ground water and soil. The epiphytic orchids with special root and leaf adaptations can condense atmospheric moisture and conserve it over long period. Specialisation in floral structure helps in ensuring effective pollination. The minute, wind scattered seeds are aided in developing on their arboreal niches by nutrients supplied by symbiotic fungi harboured in the embryonic roots. The leaf litter and other plant debris that accumulates year after year on the forest floor are broken down by a host of macro and micro bio decomposers into simpler compounds that contribute to the formation of the rich humus layer of the forest soils. The recycling of nutrients from the humus layer is considered to be an essential requisite for the well being of the Western Ghat forests since the layer of the soil is thin and the water draining from its solid phase is reported to be deficient in the nutrients. The humus layer plays a further role in controlling run off, conserving moisture and gradually percolating it into the streams and rivulets that feed the rivers.

The ecological importance of the vegetational cover on the Ghats is considerable. The biological diversity and its spatial distribution within the forest apports solar energy as effectively as possible in the conversion of water and carbon dioxide into life sustaining organic compounds. The lethal carbon dioxide used up in the process and the vivifying oxygen liberated by it help in maintaining the quality of atmosphere.

The trees that attain a height of 25-40 metres are as follows:-

(Top layer or the emergent layer): *Artocarpus hirsutus* (*hebbalasu*), *Acrocarpus fraxinifolius* (*naruberu*), *Alstonia scholaris* (*saptavarna*), *Anthocephalus chinensis* (*kadval*), *Carallia brachiata* (*andipunarugida*) *Chukrasia tabularis* (*kelgarike*), *Chrysophyllum lanceolatum*, *Diospyros sylvatica* (*kuruvala*), *Dipterocarpus indicus* (*valimara*), *Dysoxylum binectariferum* (*kadagandlu*), *Elaeocarpus tuberculatus* (*dandla mara*), *Ficus nervosa* (*kadpara*), *Gordonia obtusa* (*nagathe*), *Hopea parviflora* (*Kiralbogi*), *Lophopetalum wightianum* (*boralupale*), *Mimusops elengi* (*pagade mara*), *Palaquium ellipticum* (*panchot mara*), *Tetrameles nudiflora* (*erimalu*) and *Vateria indica* (*saludhoopa*).

The trees that attain height of 15 to 20 metres are as follows: (Eco-dominant layer): *Aporosa lindleyana* (*saligida*), *Artocarpus heterophyllus* (*halasu*), *Baccaurea courtallensis* (*kolikukke*), *Bischofia javanica* (*neeli mara*), *Diospyros oocarpa*, *Cinnamomum* Spp. (*lavanga*), *Garcinia gummi-gutta*, *Garcinia xanthochymus* (*nerala mavu*), *Haldinia cordifolia* (*kedige*), *Harpullia arborea*, *Holigarna nigra* (*malageru*), *Macaranga peltata* (*upplige*), *Pajanelia longifolia* (*alongi*) and *Syzygium zeylanicum* (*gudda penneralu*).

The trees that attain height of 3 to 15 metres are as follows (Sub-canopy layer): *Agrostistachys indica* (*manchari*), *Allophylus cobbe* (*maraballi*), *Ardisia solanacea* (*bodhina gida*), *Callicarpa tomentosa*, *Diospyros crumenata* (*kantume*), *Euonymus indicus* (*kadu dasala*), *Goniothalamus wynaadensis*, *Homalium zeylanicum* (*kallamathiga*), *Leea indica*, *Pittosporum dasycaulon* (*bogari*) *Spondius pinnata* (*amte mara*), *Stereospermum colais* (*padali*), and *Vernonia arborea*.

Some of the important climbers and lianas are as follows: *Ancistrocladus heyneanus* (*kardula*), *Artistolochia tagala* (*Ishyariballi*), *Artabotrys zeylanicus* (*kadu kittale beru*), *Bauhinia phoenicea*, *Capparis cleghornii*, *Celastrus paniculatus* (*kangondi balli*), *Cosciniun fenestratum* (*maramunjil*), *Desmos lawii*, *Diploclesia glaucescens* (*Patoli*), *Entada pusaetha* (*hallakayi balli*), *Passiflora* Spp. (*kukki balli*), *Salacia* Spp. *Sarcostigma kleinii* and *Thunbergia mysorensis* (*kamanbillu balli*).

Some of the plants that live at ground level are as follows: (Ground layer) *Arisaema leschenaultii* (*kadu suwarna gadde*), *Asystasia crispata* (*madde soppu*) *Begonia* Spp. (*anekivihoo*), *Boesenbergia pulcherrima*, *Elatostema cuneatum*, *Jerdonia indica*, *Ixora nigricans* (*kisugara*), *Ophiorrhiza hirsutula* (*mungusi gida*), *Peliosanthes teta*, *Pellionia heyneana* and *Rhynchoglossum notonianum*.

4. Sholas and grassland types

The sholas are compact, low and non-stratified type of forests that are watered by mountain streams that run through them. The Shola type of vegetation comprises of both tropical and sub-temperate genera mixed together. The sholas may be considered to be a climax type. The sholas fit into a mountain depression and has a low profile that blend with the contours of the hills. The trees especially near the ridges tend to be stunted. Their branches are covered by lichens, mosses and epiphytes. Climbers are few. There is a good ground cover. There are extensive tracts of grassy mountain meadows in between sholas. This type of vegetation is seen at an altitude of 1,200 metres above sea level. They are located at mountains of Brahmagiri, Madikeri, Pushpagiri, Tadiyandamol and Talakaveri.

The important tree species are as follows: *Acronychia pedunculata* (*bhootali*), *Allophylus cobbe* (*lavtepannu*), *Atalantia wightii* (*kadunimbe*), *Diospyros melanoxylon* (*tupre mara*), *Euonymus indicus* (*kadu dasala*), *Eurya nitida* (*hulini*), *Gordonia obtusa* (*adavi bikke*), *Grewia tilifolia* (*tadsalu*), *Hydnocarpus pentandra* (*enne mara*) *Maesa indica* (*ataki*), *Pittosporum dasycaulon* (*bogari*) *Premna coriacea* (*javangi balli*), *Schefflera venulosa* (*tengara balli*) and *Symplocos cochinchinensis* (*manjatte*)

At lower strata, *Nilgirianthus Spp.*, *Psychotria Spp.* large number of ferns and ground orchids could be observed. Insectivorous plants belonging to *Drosera* and *Utricularia* genera are also met with. Some hemi parasites like the members of Loranthacea, are common on the branches of the other trees. Some of the plants like, *Celastrus paniculatus (kangli balli)*, *Derris benthamii* and *Elaegnis conferta (hundese bilu)* are the frequently met stragglers.

Savannahs type of grass land could be observed on the last 300 metres of the mountains. They are termed as 'Savannahs' due to the dense growth of grasses. The grassy meadows afford a quick succession of herbs that appear in short-lived profusion. The slopes that have been burnt during the months of March-April revive with the first conventional showers. This makes plants to bloom. The tufts of grasses also produce new shoots so that in a few weeks the charred mountain slopes become green again. Most of the trees are dwarf and their leaves are narrow and small.

The important grass species observed are as follows: *Chionanthus malabarica*, *Gnidia glauca*, *Hypericum mysurense (chinnada avare gida)*, *Melastoma malabathricum (belavanaka)*, *Olea dioica (bili saraji)*, *Symplocos Spp. (balaloddugina gida)*, *Wendlandia thyrosoidea (kansur gida)*, *Phoenix humilis (kiri ichalu)*, *Euphorbia lacta*, *Exacum bicolor (dodde jirayat)*, *Heracleum rigens (kadu kotegeeri)*, *Knoxia sumatrensis*, *Platanthera susannae*, *Satyrium nepalense*, *Arundinella metzi (maragatattu lullu)*, *Chrysopogon fulvus (badihullu)*, *Chrysopogon hackelli (Gubbi lullu)*, *Dichanthium oliganthum (marvelhullu)*, *Eulalia phaeothrix*, *Ischaemum semisagittatum (kegadad hullu)*, *Oxytenanthera monadelphica (ote bidiru)*, and *Themeda tremula (podi lullu)*

Rheophytes and Hydrophytes

The vegetation along the streams and rivulets exhibits a specialised ecosystem. They control the rapid mountain streams. The important species are *Bambusa arundinacea (mullu bidiru)*, *Calophyllum apetalum (surahonne)*, *Hopea parviflora (kiralbhogi)*, *Lophopetalum wightianum (bili hebbalsu)*, *Madhuca nerifolia (sanna hippemara)*, *Salix tetrasperma (niravanji)*, *Vaccinium neilgherrense (sanna gida)*, *Cyperus corymbosus (bhadrehullu)*, *Homonoia retusa*, *Homonia riparia (nirganigalu)*, *Cinnamomum riparium*, *Boesenbergia pulcherrima*, *Colocasia esculenta (kashina gadde)*, *Crinum viviparum*, *Cryptocoryne retrospiralis*, *Zeylanidium johnsonii* and *Zeylanidium lichenoides*.

Very few tanks and lakes that exist in district are concentrated in Kushalnagar, Shanivarsanthe and in some parts of Virajpet. They abound in free floating and rooted forms of hydrophytes. Some of the important free floating and rooting aquatics are : *Pistia stratiotes (antargange)*, *Spirodela polyrhiza*, *Wolffia arrhiza*, *Aponogeton echinatus*, *Hydrilla verticillata (pachi)*, *Ipomoea acqatica*, *Limnophyton Obtusifolium*, *Najas indica*, *Nelumbo nucifera (tavare)*, *Nymphaea pubescens (kendavare)* and *Ottelia alismoides (hasiruniru patre)*.

Innumerable tiny plants live on the tank bunds and other marshy land. Some of the important ones are : *Ammannia baccifera (kallurive)*, *Bacopa monnieri (nirabhrahmi)*, *Eclipta prostrata (gurugalu)*, *Eriocaulon Spp. (beta gundu gida)*, *Hydrophila auriculata (nirugubbi gida)*, *Hydrolea Zeyanica (langlika)*, *Ludwigia Spp. (Kerebendu gida)*, *Polygonum glabrum (niru kanigalu)* and *Sphaeranthus indicus (adike kasa)*

Weeds

Two noxious weed species, *Chromolaena odorata* and *Balanophora fungosa* grow extensively in forests and coffee plantations and cause heavy losses. Some of the menacing weeds in the cultivating fields, waste lands and along roadsides are : *Acanthospermum hispidum* (kadle mullu) *Ageratum conyzoides* (nayi tulasi), *Almania nodiflora* (budde soppu), *Argemone mexicana* (arishina ummattu), *Bulbostylis barbata* (chauri hullu), *Cassia Spp.* (bettatangadi), *Celosia argentea* (koli gida), *Chenopodium album* (huchu chakota), *Chenopodium ambrosioides* (kadu oma), *Cleome monophylla* (kadu sasive), *Emilia sonchifolia* (ili kivi), and *Mallugo pentaphylla* (kedarasi). The Congress grass, *Parthenium hysterophorus* made its appearance in 1984 at Somvarpet and since then is spreading fast in the district.

Endemic plants

Some characteristic Endemic taxa of the Western Ghats that occur in the district are as follows:-

Adenoon indicum, *Aporosa lindleyana* (sadle), *Baccaurea courtallensis* (kolikukke), *Chionanthus malabarica*, *Cinnamomum riparium*, *Cynometra travancorica* (mukkanji), *Daphniphyllum neilgherrense* (nirukukke), *Erythropalum populifolium*, *Fahrenheitia zeylancia*, *Holigarna nigra*, *Jerdonia indica*, *Knema attenuata*, *Moullava spicata*, *Nothapodytes foetida* (durvasaneyama), *Otonephelium stipulaceum*, *Palaquium ellipticum* (panchota mara), *Pittosporum dasycaulon* (bogari) and *Vernonia Indica* (kare hindi), *Impatiens dendricola*. *Ligustrum decaisnei* and *Niligirianthus campanulatus* are extensively endemic to the Kodagu district.

Important crops of the District

Oryza sativa (rice), *Eleusine coracana* (ragi), *Zea mays* (musukina jola), *Sorghum bicolor* (jola), *Coffea arabica* (coffee), *Coffea robusta*, *Camellia sinensis* (tea, cha) *Hevea braziliensis* (rubber), *Areca catechu* (adike), *Piper betle* (veelyadele), *Elettaria cardamomum* (elakki), *Theobroma cacao* (coco), *Piper nigrum* (menasu), *Cocos nucifera* (tengu), *Curcuma longa* (arisina), *Ananas comosus* (anas), *Musa varieties* (bale), *Abelmoschus esculentus* (bendekayi), *Amaranthus tricolor* (dantina soppu), *Amaranthus viridis* (chilkire soppu), *Anacardium occidentale* (godambi), *Mangifera indica* (mavu), *Manihot esculenta* (tapioca), *Cucumis sativus* (southekeyi), *Cucurbita maxima* (silikumbla), *Luffa acutangula* (hirekayi), *Luffa cylindrica* (tupparey kayi) *Momordica charantia* (hagalakayi), *Citrulus lanatus* (kallangadi hannu), *Gossypium arboreum* (hatti), *Vigna mungo* (uddu), *Vigna radiata* (hesaru), *Vigna unguiculata* (alasanade), *Saccharum officinarum* (kabbu), *Annona reticulata* (seethaphala), *Annona squamosa* (ramphala) *Zingiber officinale* (shunti), *Brassica nigra* (sasive), *Murayya koenigii* (karibevu), *Citrus reticulata* (kittale), *Acacia sinuata* (sigekayi), *Coriandrum sativum* (kottambari) *Daucus carota* (carrot), *Jasminum multiflorum* (kasturi mallige), *Jasminum sambac* (yelusuttina mallige), *Capsicum annum* (mensinakayi), *Lycopersicon lycopersicum* (tomato). *Solanum melongena* (badane), *Solanum tuberosum* (alugadde), *Beta vulgaris* (beetroot), *Atriplex hortensis* (chakota soppu), *Crossandra infundibuliformis* (kanakambara), *Amarnathus caudatus* (chilkire soppu),

Artemisia vulgaris (davana), *Chrysanthemum indicum* (sevantige), *Guizotia abyssinica* (huchellu), *Helianthus annuus* (suryakanthi), *Basella alba* (basale soppu), *Brassica oleracea* var *capitata* (elekosu), *Raphanus sativus* (mulangi), *Carica papaya* (parangi hannu), *Ipomoea batata* (sihigenesu), *Cucurbita pepo* (boddugumbala), *Trichosanthes anguina* (padavalkayi), *Ricinus communis* (haralu), *Arachis hypogea* (nelagadale), *Cajanas cajan* (togari), *Cicer arietinum* (kadale), *Cyamopsis tetragonotola* (gorikayi), *Phaseolus vulgaris* (hurali), *Pisum sativum* (batani), *Moringa olifera* (nuggekayi), *Psidium guajava* (sibekayi), *Punica granatum* (dalimbe), *Citrus limon* (nimbe), *Manilkara zapota* (sapota), *Nicotiana tabacum* (hogesoppu), *Pennisetum typhoides* (sejje) and *Myristica fragrans* (jakayi).

Kodagu is a veritable 'Botanists Paradise' More than 1,300 species spread over 700 genera and 160 families, have been identified here. About 160 plant species are cultivated. Out of this, more than 700 species are used in Ayurveda and Siddha system of medicines.* The vegetation dynamics in the district indicates several changes in the natural vegetation due to human intervention. This is because of lumbering operations or by converting forest lands into plantations or commercial crops. This is done either by selective or clear felling or by clearing the undergrowth only. Road construction, electrical and telephone cable network has also contributed to degradation of plant life. Because of ever increasing population there is a great demand for fire wood, fodder and land for cultivation. There is also pressure on forest wealth from wood based industries. Judicious exploitation of forests will ensure sustained supply of timber, firewood and other natural products. It will also protect wild life and water resources. Destruction of forests will have disastrous effects on the environment.

FOREST WEALTH

Kodagu district stands fifth in the state in respect of forest area, and has 20 per cent of the total forest area of the State. Of the total geographical area of 4,102 sq.km. forest constitutes 1,259.52 sq.km. forming 30.43 per cent of the area of the district. This works out to 0.96 hectare of land area per person out of which 0.29 hectare is forest land. The reserved forests account for 1,136.46 sq.km; protected forest 27.14 sq.km., and 95.92 sq.km. unclassified forest. Kodagu is one of nine forest circles which has been further subdivided into four division for the purpose of administrative convenience. Of this the Madikeri division has 858.16 sq.km. of the districts forest and remaining falls in the Hunsur division.

Devara Kadu

The rulers of Kodagu used to grant forest land to a deity or a temple which was designated as 'Devara Kadu'. The temple authorities were allowed to use the produce of these forests for up-keep of the temple, for use during the annual car festival and special festivals and for the daily *pooja* of the deity. The neighbouring villagers were allowed to use water from these forests and use the area as passages. In 1969, such forest constituted 7,895 acres. There are about 346 such forests belonging to different communities and are known as, 'Basadi Kadu', 'Mathadakadu', 'Kaimadakadu', 'Devara Paisari Kadu', 'Holedevera Kadu', 'Suggidevara Kadu' and 'Palli Kadu'.

* Keshavamurthy and Yoganarasimhan, *Flora of Coorg District (Kodagu)*, 1990

Devara Kadu could be easily distinguished from the other forests on the basis of presence of symbols of the deity or the temple. Such representation may be in the form of an icon, statue, mask, pillar or trisula (trident). In 1863 - 70 the then Madras Government and later the Karnataka Governments have surveyed these forests. Today they are supervised jointly by the Revenue and Forest Departments. Sixty eight hectares of 'Pavitra Vana' is the best maintained Devara Kadu in district at the Palur. In 1367, the rulers of Kodagu had donated 150 hectares of forest to Shri Mahaligeshwara temple located at Palurbetta at a distance of 25 kilometres from Madikeri. Like all other Devara Kadus, the Pavitra Vana has also become a victim of encroachment by local influential people. However, in the interest of the district's ecology these forests should not be disturbed. Notable economical trees of Kodagu are discussed below.

Sandal Tree, *Santalum album* L. (*shrigandha*), is an ectoparasite and attains a height of 8-15 metres. It is grown from seeds and the tree is harvested commercially after 30 years. Its wood has very attractive grain and hence utilised by artisans like Gudigars for wood-carving. The sandal wood-oil has a very pleasant fragrance and hence there is a great demand in the country and abroad for it. The former rulers of the district had made it compulsory that all sandal wood and its products should be channelised through the government agencies only. This continued under the British and even later. Now, the owner of the tree (on whose land there is a tree) is paid 50% of its price.

Teak-Tree, *Tectona grandis* L. (*tegada mara*), is immune to insect attack and is water resistant. Hence it is in great demand the world over. It is tall, deciduous, magnificent tree with long and rough surfaced leaves. The teakwood, which darkens on exposure, is hard but easily worked; it is used for ship building, agricultural implements and for railway sleepers and coaches. The first teak plantation was grown at Karmadu in 1868. The trees are raised by broadcasting the seeds and the mature trees at the age of 90-100 years attain girth of 2-3 metres.

Rosewood Tree, *Dalbergia latifolia* (*bite mara*) is the valuable species of the district. Its ornamental heartwood having fragrance and purple-black colour has been used whole or in veneers or for boxes and furniture. Its seedlings are grown in the nurseries and transplanted in the forest.

Antiaris toxicaria (*ajjanpete*), is a tall tree and the trees are in abundance in Kodagu. Its seeds are toxic as it contains a bitter chemical, 'antaiaatin'. Jute is extracted from its soft and white stem and used in manufacture of mats, bags and ropes. *Lagerstroemia lanceolata* (*nandi mara*) is in great demand for building construction, as its wood is very strong and durable. In fact huge beams of this species are used in the construction of the palace at Madikeri. It is also used in boat construction. In 1988 one square foot of this wood and costing more than 360 rupees.

Match-wood and Plywood: A number of forest-based industries are allotted soft-wood to be harvested from the forest. Plywood, matches and packing industries are benefited by this new policy of the State Government. Fifty per cent of the lops and tops of the soft-wood extracted by the industries is permitted to be removed by them. The balance is brought to Department depots and disposed off to the registered small scale wood industries like slate frame, packing case industries, etc. by auction.

Rubber Plantations

Rubber is a hydrocarbon obtained from secretion (latex) of rubber plant, *Hevea brazillensis*. Its elasticity, toughness, impermeability, adhesiveness, and electrical resistance makes it useful as adhesive, coating, fibre, and insulator. In the year 1960-61 the Forest Department had raised rubber plantation in an area of 1,340 hectares as an experiment in degraded unreserved forests of Kodagu. Total yield of 360-400 tons of crude rubber was processed in seven factories located in the plantations but their head-quarters were at Kozhikode (Calicut) in Kerala. The details in plantations and factories are as follows:

S.No.	Name	Total Area in Hectares
1.	The Port-land Rubber Estate Co.Ltd. Makutta	500
2.	Kadamakal Rubber Estate Co. Ltd. Kadamakal.	300
3.	Cochin Malabar Estate Co. Ltd. Sampaje.	192
4.	Nilambur Rubber Co. Ltd. Devarakolly	141
5.	Ramapuram and Chikkanballi Estate Karadigod	100
6.	Padanjarakara Estate, Karadigod.	
7.	Chikkanaballi and Boovenhalli Estates, Karadigod.	

There were also smaller estates which had a total plantation of 100 hectares. Rubber is protected product and hence permission from the Rubber Board is required for its production and distribution.

Minor Forest Produce : The Forest Department disposes several minor forest products under three-year lease, taking taluk as a unit. The most important item is myrobalan (alale-kayee) which is used for tanning the leather. The other products are : tamarind, felonthis, ramphal, sitaphal, honey, wax, soapnut (*seegekai*), resin (*dhupa*), cinnamon bark, fruits of *Emblica officinalis* (*nellikayi*), nuts of *Sapindus laurifolius* (*antavalakayi*), seeds of *Azadirachta indica* (*bevinakayi*), nuts of *Madhuca longifolia* (*hippebija*) and leaves of *Butea monosperma* (*mutugada ele*). Several fruits used for colouring, and medicinal plants and horns are included in this category.

Pressure on the Forests

The forests are disappearing rapidly due to the pressure of increasing population. Shift cultivation, over grazing, converting forest into agricultural land, collection of fire wood and forest fires have contributed greatly in reducing the forest area. Prior to 1850, the British were interested in the protection of teakwood plantations only. This resulted in local people misusing the forest wealth. Frequent uncontrolled forest fires reduced ever-green forests into barren or grass lands. Only those forests reserved for hunting and the 'Pavitra Vanas', (*Devara kadu*) were well protected. In order to overcome this state of affairs, the 'Progressive Science Association' of England, introduced a legislation in 1850 intended to protect forest lands in India. This helped to pass 'Reserve Forest Act' of 1865 which resulted in reducing the pressure on the forest. At the end

of the nineteenth century, Kodagu Forest Division had 3,25,419 acres of reserved forest and another 4,72,309 acres were released for the benefit of the local populace.

Rural people were allowed to use *gomal* (pasture) land, district forest, minor forest, and barren land, for their household purposes. The erstwhile Rajas of Kodagu had granted two acres of *bane* land for each acre of wet land. The cultivator collected timber for his bonafide use and leaves for green manure as also top soil. In addition, they were given 'jammamalai', 'genimalai' etc., for the purpose of cardamom cultivation by collecting a nominal fee. This privilege has been extended to coffee cultivators also. Thus each cardamom and coffee farmer has been allotted five to three hundred acres of forest land for this purpose depending on the size of his plantation. Despite these concessions, trespassing and encroachment on reserved forest are on increase after Independence. Slogans like, 'tillers will be made the owners of the land' embolden the unscrupulous people to grab more and more forest land. Even public utility lands were converted into agricultural holdings. This resulted in, the rural people entering the reserved forests with their cattle for grazing. Thus by 1970 Reserved Forest depleted to such an extent that the State Assembly had to put a stop for releasing forest land for cultivation in the year 1973. As per Central Forest Conservation Act of 1980, no forest land can be released for non-forestry purpose in the State without specific approval of Government of India.

When firewood was in short supply, the Range Forest Officer is empowered to allow rural people to collect head-loads of wood from the reserved forest. They also collected dead and fallen small wood in cart-loads. This privilege affected the forest growth severely. Carts were taken all over the forest area and green and valuable trees were felled for firewood. People whose annual income is less than 12,000 rupees were allowed five cart-load of firewood per year free of cost. This facility was given to others for a fixed fee. People's greed resulted in complete disappearance of forest for 20-25 kilometres belt around the settlements. Hence in 1973 this facility was withdrawn. Following table 10, based on Forest Department's Working Plan Records, shows status of forests in 1960 and in 1980:

TABLE : 10 FOREST LAND IN KODAGU IN 1960 AND 1980

S.No.	Particulars	Forest Area in Sq.Km	
		1960	1980
1.	Geographical area	4,102	4,102
2.	Forest area with good forests	945	825
	Denuded forest area	125	245
3.	District forest or <i>paisary</i> or unreserved forest having good forest cover	120	40
	Denuded forest area	44	134
4.	Betta or Kan or Soppinabetta or Bena lands having good forest	470	70
	Denuded forest area	30	490

Source: *Karnataka State of Environment Report 1984-85*

KARNATAKA STATE REMOTE SENSING STATION

The Indian Space Research Organisation has launched Remote Sensing Satellites which collect excellent photographs and data of our agricultural and forest lands. The information received from the satellites about land utilisation of the district is as follows:

TABLE : 11 LAND UTILISATION FIGURES OF KODAGU (1986-88)

S.No.	Particulars	Area in Hectates	Percentage of Geographical Area
1.	a. Agricultural land (net sown area)	66,537.5	16.22
	b. Plantation area	1,80,110.0	43.91
2.	a. Ever-green, semi-ever green forest	98,287.5	23.96
	b. Moist deciduous forests	15,645.0	3.81
	c. Thorn-scrub forests	11,187.5	2.73
	d. Forest plantations	32,202.5	7.85
3.	a. Barren land with or without scrub	3,562.5	0.87
4.	a. Water sources, tanks and canals	2,062.5	0.50

(Source: Information supplied by Karnataka Remote Sensing Station)

On 14th March 1992 some miscreants set the Nagarahole National Park on fire. The Remote Sensing Satellites imagery data of the blaze collected on 26th March 1992 indicates that more than 717 sq.km. of reserved forest has been burnt down. However authentic data is awaited.

**TABLE : 12 FOREST LAND RELEASED FOR NON-FORESTRY
PURPOSE AS IN 1990**

S.No.	Purpose	Area in Hectares
1.	Area gone under submersion	562.00
2.	Area released for rehabilitation	640.00
3.	Area used for power lines	20.00
4.	Area given for other purposes	20.00
Total		1,224.00

(Source : Information supplied by Deputy Conservator of Forests, Madikeri)

Various development schemes are being implemented in the district and they can be classified under the following major categories:

Soil Conservation

This scheme is in operation in the drier tracts of the district where the areas are more prone to soil erosion on account of the barrenness of the land. The demand for teak wood is increasing year after year for construction and industrial purposes. Therefore, teak plantations are raised in the area

of clear-felled land and removal of the existing tree-growth. Softwood is in demand from the match and plywood industries. The existing demand is partially met from the natural forests. In order to meet the present and future demands, a scheme is in operation for softwood. Another scheme of rehabilitation of degraded forests is in operation for raising fuel wood, timber and other economic species like sandal, tamarind, *honge*, *hippe*, etc. For the year 1988-89, 36 hectares of plantations were maintained under soil conservation scheme by utilising Rs.90,000.

Social Forestry

Under the Social Forestry Scheme, extensive planting has been undertaken on the available open lands like the waste lands, gomal lands, barren forest area, fore-shores of tanks and reservoirs, either sides of roads and canals, fallow and marginal agricultural lands and open area in industrial estates. This programme is aimed at solving increasing demand for fire-wood and fodder. The objective is to finance individual farmers who are interested in planting trees where they can get benefit after fifteen to sixteen years. They have to take care of the trees which they planted and they have to refund the amount in instalments to the Government. In addition, compulsory planting has been enforced in the district under the Tree Preservation Act. The standards for planting in the urban and rural areas have been fixed. In rural areas, the standard is a minimum of ten trees per hectare in agricultural lands and twenty five trees per hectare in non-agricultural vacant lands. With an aid of 8.54 lakh rupees from the World Bank, afforestation programme in 22 hectares was undertaken in the year 1988-89. Another 87 hectares of afforested land was maintained. Forest nurseries have been maintained at Galibeedu in Madikeri taluk, Kadanur in Virajpet taluk and Hudgur in Somvarpet taluk. A total of 3.4 lakh seedlings were grown.

Special Component Plan

The Special Component Plan is being implemented for providing benefit to each family around a cluster of villages with predominantly Scheduled Caste population in the district in an intensive manner to enable this community to cross the poverty line in the shortest possible time. The programmes included are : 1. Raising plantations for silk cultivation, 2. Free supply of bee-hive boxes, 3. Supply of seedlings for planting in homesteads and farm-lands, 4. Silviculture, 5. Free houses for forest plantation labourers and 6. Free supply of forest produce to artisans.

Tribal Sub-plan

The tribals have been forest dwellers since time immemorial, having a free life in the forests. They had their traditional vocations like shift cultivation, hunting, fishing, catching birds, and collection of minor forest products. They are also engaged in the forestry operation on daily wage basis and on monthly basis. The programmes undertaken in this scheme are 1. Raising of minor forest products yielding plantations, 2. Maintenance of fruit orchards, 3. Training in improved method of logging and supply of logging equipments, 4. Organisation and promotion of forest labour co-operative societies, 5. Construction of houses for Scheduled Tribe forest workers, 6. Raising plantations for silk cultivation, 7. Raising of fruit-yielding trees, and 8. Maintenance of established plantations. Total expenditure incurred under this scheme was 7.9 lakh rupees in the year 1988-89. This amount helped, to plant seedlings in 54.5 hectares, to distribute house

construction materials to 94 workers, to construct 25 houses, to distribute bamboos to another 100 people, to raise 66,000 seedlings, to maintain 58.5 hectares of forest land, to dig one tube well, and to provide *challas* to 56 beneficiaries.

Integrated Development of the Western Ghats

The ever-green forests of the Western Ghats are subjected to great exploitation which has caused a serious ecological imbalance. The scheme includes bamboo plantation, matchwood and plywood plantation and cultivation of medicinal plants. Total expenditure incurred under this scheme was 28.76 lakh rupees in the year 1988-89. This amount helped to undertake, afforestation of 303 hectares of land, construction of a tank, initiation of forestry operation in 61 hectares, raising of two lakh seedlings and sixty bamboo nursery beds, maintenance of 12.72 lakh seedlings, protection of 601 hectares of old plantation and care of another 300 seed beds.

Prior to the enactment of Karnataka Preservation of Trees Act 1976, there were other laws which were applicable to Kodagu. They were: 1. Madras Province Act of 1873, protecting wild elephants from indiscriminate killing was made applicable to Mysore State after some modifications in 1933. 2. Mysore State Forest Protection Law of 1900 and 3. Mysore State Act for Protecting Wild Life and Fish of 1901.

Karnataka Preservation of Trees Act 1976

The large extent of private forests and tree crops are grown mainly as shade crops for coffee and cardamom and also trees are being grown in the private holding which are granted as privileges for cultivators. The land owners are entitled to use these trees for their *bona fide* purpose. Because of high value of timber, the farmers started exploiting indiscriminately, particularly *bane* lands, *kumri* lands, and *kan* lands. This act has prevented the indiscriminate felling in private holdings. They will be permitted to fell only when some trees are found scientifically unsuitable. Whenever permitted, they have to plant five saplings in the place of each tree felled; if they fail to plant, their security deposit will be used by the Forest Department to plant required number of plants in their holdings.

Forest Protection

In order to protect the forest wealth, mobile squads have been organised by the Forest Department. The main functions of the squad are to achieve prevention of smuggling of forest produce from Government lands and reserved forests in particular by intensive and extensive patrolling in the forest during night and also organising surprise raids. There is forest mobile squad at Madikeri under the control of the Assistant Conservator of Forests. The officer is entrusted with investigation and vigilance work. The staff has been supplied with arms and ammunition, especially in border areas prone to organised smuggling. The offences detected and the forest produce attached in these cases are handed over to the respective territorial divisions for final disposal and the revenue collected by way of compensation and sale of attached materials are accounted for. Karnataka is the first State in introducing wireless network for prevention of smuggling forest produce.

Forestry Training Institutes

Officers of the Department are being trained at Dehradun (Uttar Pradesh) as probationers. Simultaneously the State Public Service Commission also recruits candidates who are trained at Coimbatore (Tamilnadu) and Barnihat (Uttar Pradesh) for two years. During the training period they undergo rigid training and get acquainted with the knowledge of the forests of the country. For Range Forest Officers, training is imparted at Coimbatore. In Karnataka there is one Foresters' Training School at Dandeli (Uttara Kannada district). Here training period is fifteen months. At Kushalnagar (Kodagu) Forest Guards are trained for six months, in different subjects related to forestry. In addition there are provisions in different agricultural universities for educational programmes which will lead to degrees in forestry.

Vanamahotsava

In the year 1952, a national programme of tree planting, 'Vanamahotsava' was launched, with an object to impart tree consciousness and planting trees all over the district involving general public. Tree-population in urban localities had dwindled due to industrialisation, resulting in, air pollution, water pollution, sound pollution and light pollution experienced in almost all cities. Though several crores of seedlings are planted every year, only ten per cent of them survive due to lack of protection.

CLIMATE

Two centuries ago the district was teeming with forests and as a result Kodagu was like a cold storage, during major part of the year. An official of Tipu Sultan's regime writes:- " A description of the cold here makes the pen, before it begins to write, stiff as if it were plunged into the frozen sea, and the tongue of truth at describing the temperature is with fear and astonishment congealed like rice, notwithstanding it is covered with the *Posteen* (fur cloak) of the lips, what can it say therefore?... This, however, is the description of the summer. God protect us from the winter and rainy seasons". Kodagu district has very moist rainy monsoon climate. Of the 14 heavy rainfall stations in India, with annual rainfall of more than 5,000 mm, four are in Karnataka. Of these, except Agumbe in Shimoga district, the remaining three places viz., Bhagamandala (6,032 mm), Pullingoth (5,941 mm) and Makutta (5,054 mm) are in the district. The climate in the district is determined largely by its geographical location with respect to the sea and monsoon winds and physiography. The Western Ghats, which run almost north-south at right angles to the path of the south-west monsoon current, cause heavy rainfall in the district. The major portion of the district lies in the Western Ghats and the Malnad climatic region of the State. In this region, the annual rainfall ranges from 4,000 to 8,000 mm over the Western Ghats, decreasing eastwards to about 2,000 mm in the eastern edge of the region.

It is very evident that man's interference in environment has brought about drastic climatic changes in Kodagu. The present climate could be described as cool, equable and pleasant. The year may be divided into four seasons. Winter lasts from January to February and characterised by clear

skies, low humidity and agreeable temperature. Summer lasts from March to May and rising temperature is its speciality. Kodagu experiences South-West monsoon rains from June to September and North-East monsoon rains from October to December.

Rainfall

Kodagu district receives major part of rainfall from South-West and North-East monsoons. There is some amount of rainfall in other two seasons (winter and summer) also. The western half of the Kodagu district (Bhagamandala-Pullingoth-Makutta-Karika area) receives the annual rainfall of more than 5,000 mm, the highest rainfall in the area being 6,032 mm at Bhagamandala, which is very near the location where the Cauvery river originates. Rainfall in Kodagu also decreases rapidly as one passes from the hilly region to the plains; for example while Bhagamandala has 6,032 mm Kushalnagar, about 48 km east of it, has 1,120 mm, which works out to a rainfall gradient of 102 mm per km of horizontal distance. The highest rainfall recorded in a day was 523 mm at Ponnampet on 16th July 1965. The second highest was 414 mm at Bhagamandala on 5th July 1961. The annual normal rainfall (Based on 1901 to 1970 data) is, 2,718 mm ; Madikeri taluk: 3,287 mm, Somvarpet taluk: 2,306 mm; and Virajpet taluk: 2,661 mm.

South-West Monsoon

By the end of May, the south-east trade winds from south of the equator extend northwards into the Arabian sea and Bay of Bengal as a moist south-westerly stream which is the south-west monsoon. These winds gather much moisture while passing over sea and condensation takes place when the clouds strike against the Western Ghats, resulting in heavy rains. The rainy periods are pulsatory in nature with bursts of general rain for a period followed by breaks of a few days to a week or two weeks. The seasons's rainfall is about 80 per cent of the annual rainfall in the Ghat region. The rainfall in this season is 2,172 mm; Madikeri taluk : 2,730 mm; Somvarpet taluk 1,716 mm, and Virajpet taluk : 2,072 mm. The number of rainy days (a rainy day being one with 2.5 mm. or more in 24 hours) in the season varies from 95 to 105 in the Western Ghats and is about 25 to 30 in the *maidan* areas. This season has recorded 2,084 mm of rainfall during 1988.

North-East Monsoon

The north-east monsoon commences in October when the south-west monsoon begins retreating. These winds, being of land origin, are mainly dry, but with their travel over the Bay of Bengal, they pick up moisture. Under its influence the western border of Kodagu receives 400 to 500 mm. of rain. Madikeri gets 403 mm., Makutta 440 mm., Karika 471 mm., and Pullingoth has as much as 654 mm. This rain accounts for less than ten per cent of annual rainfall in Ghats area, and one half of it is received in the month of October, and then it tapers off. The district's average annual rainfall in this reason is 300 mm but in 1988 it accounted for only 10mm.

Winter is a dry season with very little rain. Kodagu receives on an average of 10 mm. of rain in winter. However, in 1988 it went to 25 mm. Summer is also very dry with very little rain. However in May rainfall increases and accounts for 150 mm. Average rainfall in summer is 235 mm, however in 1988 it got reduced to 148 mm only.

The Meteorological Department of India has maintained records for 22 rain gauge stations of Kodagu for periods ranging from 46 to 100 years. The average annual rainfall in the district (1901-1950) is 2,725 mm. (Madikeri and Ammathi stations are not included as they are at the top of the ghats). Heavy rainfall occurs during the three months, June to August and July is the rainiest month. On an average, there are 118 rainy days in a year in the district. This number decreases from 152 at Pullingoth to 85 at Kushalnagar. The heaviest rainfall in 24 hours recorded at any station in the district was 842 mm. at Bhagamandala on 25th July 1924. In a given year rainfall reaches peak twice, in July and October. Rainfall is on increase from May to July and then it tapers off.

Average monthly rainfall of Madikeri, from 1863 to 1870 is as follows: January - 5.5. mm, February - 0 mm, March - 36.6mm, April - 39.6 mm, May - 111.5 mm, June - 624.3 mm, July - 1,073.7 mm, August - 611.4 mm, September - 299.5 mm, October - 183.6 mm, November - 62.2 mm, December - 16.8 mm, and Annual - 3064.5 mm. Average monthly rainfall recorded at different stations, based on 1901 to 1950, is shown in table : 13. Taluk wise normal rainfall (1951 to 1988) is given in Table 14. Monthly normal rainfall of the year 1990 is depicted in Table 15. Kodagu's annual average rainfall frequency, based on data of 1901 to 1950, is shown in Table 16.

Temperature

The records of Madikeri meteorological observatory may be taken as broadly representative of the conditions in the district in general, except that the temperature in the east of ghat region a few degrees higher. Low temperature of January begin to increase from mid-February and reach climax in April and May. The mean daily maximum temperature of March is 28.5° C. while minimum is 16.6° C. The mean daily maximum temperature in April and May may be as high as 34° - 35° C. With the onset of the south-west monsoon by the beginning of June, temperatures decrease and weather becomes pleasant. However, decrease in night temperature is only marginal. By about September last week, when the south-west monsoon withdraws, there is a gradual increase in the temperature. In the next four months there is not much change in the day temperature but fall in night temperature is noticeable. The mean daily minimum temperature in January is 14.2° C. The lowest daily temperature, from December to February, is 6° C. The highest maximum temperature recorded at Madikeri was 35° C on 11th may 1902, while the lowest minimum was 5.4° C. recorded on 4th February 1968. The mean annual range of temperature (i.e. the difference between highest mean daily maximum temperature and lowest mean daily minimum temperature) is 7° to 8° C. in Ghats and maidan area. Table 17 shows the monthly mean daily maximum and minimum temperatures and the extreme highest and lowest temperatures recorded at Madikeri station.

Humidity

The relative humidity is generally high throughout the year. Relative humidity depends not only on the amount of water vapour in the atmosphere but also on temperature. In general, Ghats and Malnad areas are more humid than the *Maidan* areas. Average relative humidity from January to April is about 68%. From June to September it reaches the peak of 94.5%. In October to November it decreases to 80%. It decreases gradually from September to November and more rapidly till March. Table 17 shows monthly relative humidity also.

Cloudiness

Cloudiness is recorded in oktas. One oktas is equal to one-eights of the sky covered with cloud. An overcast sky is said to be covered by eight oktas of cloud and half covered sky by four oktas of cloud. Cloudiness is maximum in the south-west monsoon and minimum in January-March when skies are mostly clear with occasional high or medium clouds. In Ghats and *Malnad* areas, skies are generally overcast with low clouds in July and August, when there is rainfall of more than twenty days in a month and sun is not seen for days together.

Pressure and Winds

In general, surface wind flow over the district is from west or south-west in the south-west monsoon season. During the north-east monsoon season it blows from east or north-east direction. On some after-noons it may blow from north-west direction. Generally, on other days of the year it blows in between north and east direction. At times it may also blow in between south-west and north-west direction. Winds are generally weak or medium but becomes strong under the influence of north-east winds. In July-August wind blow with a velocity of 12 kilometres. Annual average wind velocity is 7.8 kilometres. Table 18 shows average velocity of the wind.

Other Weather Phenomena

Thunderstorms, hailstorms, duststorms, squall and fog are the other weather phenomena of importance. Thunderstorms occur mainly in the summer months of March, 2-3 days, April : 6-7 days and May : 7 days. Once again it strikes during north-east monsoon in the months of October : 6 days, November : 3 days. It is very rare in December to March period. Rarely it may strike in June-August period also. Soon after north-east monsoon a depression in northern end of Bay of Bengal is formed which moves either westwardly or north-westwardly direction. As the season advances the depression is formed at the southern part of the Bay. Hence storms appear in the months of October, November and to some extent in December, in the Bay region. At times these storms move westwards and bring heavy rains to Kodagu and surrounding area. Hailstorms are rare. However, in the months of March-April, thunder storms and heavy rain may be accompanied by hailstorm. Fog generally occur in early morning hours in the months of March, April and September. Squalls and dust-storms are very rare in the district. Table 19 shows other weather phenomena of Kodagu district.

ECOLOGY AND ENVIRONMENT

Rain water, springs and streams flowing from the Western Ghats bring with it fertile soil and minerals and deposits in the valleys, where paddy, maize, and other food crops are grown. Agriculture is the major source of income for majority of the people. The Britishers tried to change this pattern by acquiring these lands and attempted to put the land under forest cover. After independence, there is great pressure on agricultural land for cultivation and the fertile forest land has become the victim of the peoples greed. The mountain slopes are being utilised to grow under-ground tuber crops like sweet potatoes, tapioca and yam, in addition to traditional millets. This led to fast soil-erosion and depletions of soil fertility. Thus, this land has been grouped under

IV to VII grade (most of the Western Ghats slopes belong to this group) and it is strongly advised to discourage agriculture in this area. Cattle fodder could be profitably grown here.

Traditionally, growing plantations is the main occupation in the western side of the Western Ghats. Though, pepper and cardamom crops are grown to some extent, the major part is collected from the forests. Cultivation of tea, coffee, cardamom, rubber, cashew, and recently cocoa, is on increase. Growing plantations is a better proposition than cultivation of annual crops. However, in some places where plantations were grown by clear felling of the existing forests the results were disastrous. In such areas the Eupatorium weed has become a dominant species. In order to attain success in growing any plantation, good forest cover and perennial water sources are prerequisites. In the absence of these two important requirements, raising of plantations will not be a profitable proposition in the years to come. In certain areas the cardamom plantations are abandoned and the shade trees are sold as logs. Such unfertile lands used to grow tuber crops. Studies are yet to be undertaken to know the long range effects of extensive use of fertilizers and pesticides that are in vogue.

The *flora* and *fauna* of Kodagu is very varied, next to that of Himalayan region. There are innumerable plants and animals which are specific to the district. The wild forms of many cultivated plants are also located here. Similarly, the ancestral stock of domesticated animals and agricultural crops still exist in the wilderness. However, uncontrolled destruction of their natural habitat will lead to disastrous consequences. The religious practices of the district have helped, to curtail to some extent, in preserving the natural wealth. Following steps are recommended to preserve soil, water and forest wealth:

1. The steep slopes of the Western Ghats should be utilised for growing fodder plants and perennial trees.
2. The community forest land and grazing land should be put to good management.
3. Clear felling of the reserved forests should be discontinued. Afforestation should be carried on large scale in degraded tracks of reserved forests.
4. The forest based industries should not be given raw material on a concessional rate. The cost of afforestation should be recovered from the forest-based industries.
5. The forest-based industries should collaborate with the farmers to produce the industrial raw materials on their own land.
6. The Government should not enter into any agreement with forest based industries to supply the raw material from the reserved forest areas.
7. The Forest labourers co-operatives or the Land Army should be assigned the work of collecting the forest products.
8. The river beds and valleys should be used for growing trees and fodder. Reserved forests in sensitive areas of river catchments should be strictly maintained as protected forests.
9. Prior to granting permission to grow cashew, rubber and other plantations, the authorities should get convinced that provision is made for sufficient natural forest among the plantations.

10. Nature reserves should be developed to protect the entire spectrum of biological communities of the Western Ghats. The traditional 'Pavitra Vana' should be taken as a model for this purpose. Services of schools, colleges, universities, scientific institutions and voluntary agencies should be actively utilised in the development of the region.*

Karnataka Pollution Control Board

Karnataka State Pollution Control Board is in existence since 21.9.1974. It is responsible for implementation of, the Water (Prevention and Control of Pollution) Act of 1974 and the Air (Prevention and Control of Pollution) Act of 1981. Since 23.5.1986, the Environment Protection Act 1986 is in force. Government of India has formulated rules and regulations under this Act and has insisted that all the State Governments should abide by them. In Karnataka it is the duty of the Pollution Control Board to implement all rules and regulations. Regular survey work is carried on to find out the level of water pollution in the industrial discharge and the steps taken by the concerned industry to keep the pollution within the permissible limits. The Board also participates in Global Water Quality Monitoring Programme and Monitoring of Indian National Aquatic Resources Programme of the Central Board. As per the latter programme, every month Cauvery river water sample is collected at Baichanhalli near Kushalnagar and beyond Napoklu bridge, and analysed. With the aid of the Central Pollution Control Board, survey work in the Cauvery basin is undertaken. The water is subjected to 21 types of tests. The detailed report sent to the Central Board includes observation on weather conditions, land utilisation, population, cattle, public employment, agriculture, irrigation, use of fertilisers and pesticides, industrial pollution, domestic drainage and disposal arrangements.

Rules and regulations are formed to regulate and control air pollution in the district and are strictly implemented. In consultation with the Central Pollution Control Board, permissible level of pollutants like dust particles, sulphur dioxide and carbon dioxide, have been fixed as per Act 17(1)(9). Since 1.4.1988, modified act of 87 regarding air pollution (regulation and control) is in force. Similarly the Board has laid down the tolerance limit for vehicular emissions, and the Road Transport Officer is authorised to implement these rules and regulations. The Board also regulates discharge of liquid and gases and those industries which do not abide by these rules are prosecuted. However, the air and water pollution problems are not of a magnitude in the district as noticed in other districts of the State. This may be due to lack of industries, scant population and large forest area.

* Madhav Gadgil : *Eco Development of Western Ghats in Karnataka*, Karnataka State of Environment Report, 1983-84, p. 163

TABLE - 13

Normal and Extreme Rainfall

Station	No. of Years of data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Highest annual rainfall as % of normal & year **	Lowest annual rainfall as % of normal & year **	Heaviest rain fall in 24 hours * Amount (mm)			
Virajpet	50	a	4.6	7.1	17.5	67.8	154.4	572.8	892.6	435.6	203.2	212.3	84.8	19.1	2671.8	161 (1923)	73 (1928)	366.5	1926	July 7
Fraserpet	50	b	0.5	0.5	1.5	4.9	8.6	21.5	26.4	22.3	15.4	12.8	5.8	1.4	121.6					
		a	5.8	5.6	14.7	67.3	139.9	143.5	248.7	142.2	89.4	165.9	78.2	18.8	1120.0	140 (1946)	63 (1936)	160.5	1948	July 9
Somwarpet	50	b	0.4	0.5	1.1	5.1	8.6	12.5	19.1	13.2	8.3	9.9	5.1	1.1	84.9					
		a	5.6	5.6	12.9	62.0	110.7	323.9	774.9	436.1	170.9	168.4	83.1	21.1	2175.2	145 (1923)	69 (1918)	237.4	1924	July 18
Napoklu	50	b	0.6	0.4	1.0	4.9	7.6	18.3	24.9	21.7	12.6	11.0	5.5	1.4	109.9					
		a	10.7	10.9	47.7	135.4	168.7	561.6	1058.4	545.1	210.3	237.2	98.0	21.3	3105.3	156 (1923)	72 (1918)	323.3	1924	July 17
Sanivarasante	50	b	0.8	0.8	3.2	8.4	10.0	21.7	26.6	22.6	15.4	14.0	6.3	1.4	131.2					
		a	4.3	4.6	15.7	55.4	107.4	271.8	620.4	366.1	147.8	166.4	78.5	18.3	1883.7	142 (1923)	76 (1918)	264.4	1924	July 15
Pannampet	44	b	0.4	0.4	1.0	4.1	6.9	16.8	25.3	21.8	12.1	10.2	5.2	1.0	105.2					
		a	4.1	3.1	15.0	72.1	138.7	497.8	822.7	412.7	195.1	170.9	74.9	14.7	2421.8	151 (1924)	72 (1918)	303.5	1924	July 25
Bhagamandala	44	b	0.4	0.3	1.2	5.3	8.3	20.3	25.4	21.7	15.3	11.1	5.5	1.1	115.9					
		a	6.3	6.1	26.7	94.7	241.5	1287.2	2140.5	1237.2	497.3	339.3	135.4	20.3	6032.3	163 (1924)	72 (1944)	842.0	1924	July 25
Suntikoppa	44	b	0.7	0.3	1.7	6.7	10.8	26.1	29.3	28.3	21.4	17.0	7.7	1.6	151.6					
		a	5.6	6.1	18.5	64.8	118.4	293.1	542.8	321.6	144.8	160.3	74.9	12.9	1763.8	132 (1946)	70 (1944)	222.5	1924	July 16
Srimangala	16	b	0.6	0.5	1.1	5.1	8.4	18.6	24.8	21.9	12.9	11.0	5.6	1.1	111.6					
		a	3.8	4.8	12.9	82.3	100.6	498.9	1091.9	633.5	217.7	134.4	82.5	15.5	2878.8	130 (1936)	74 (1945)	272.0	1941	June 9
Karike	18	b	0.3	0.3	0.9	5.7	8.1	20.7	27.3	22.2	14.6	9.3	6.1	1.3	117.1					
		a	7.4	3.8	21.6	97.0	180.9	1015.2	1586.2	991.9	481.3	322.3	124.7	23.6	4855.9	126 (1943)	79 (1939)	299.7	1953	July 6
Pulingoth	18	b	0.6	0.3	1.5	5.4	9.3	26.0	30.0	27.6	20.9	16.1	8.1	1.7	147.5					
		a	13.5	3.6	32.8	172.5	248.4	1277.9	1905.0	1125.0	502.9	453.1	178.6	27.4	5940.7	119 (1938)	74 (1944)	330.2	1943	July 13
		b	0.6	0.2	1.6	8.2	10.5	26.7	29.9	27.9	19.3	17.9	8.7	1.6	153.1					

Station	No. of Years of data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual as % of normal & year **	Highest annual rainfall as % of normal & year **	Lowest annual rainfall as % of normal & year **	Heaviest rain fall in 24 hours * Amount (mm)			
Makut	18	a	5.3	2.8	20.6	93.2	192.5	1094.7	1699.8	1028.5	476.5	279.4	129.0	32.0	5054.3	120	80	415.5	1958	July 14
Balekove	18	b	0.4	0.3	1.1	5.9	10.1	26.0	29.7	26.6	20.4	14.3	6.8	1.6	143.2	(1946)	(1934)			
		a	5.8	4.1	21.3	94.5	123.9	284.0	585.5	347.0	155.2	153.9	79.5	13.7	1868.4	135	75	265.2	1953	July 6
Nagerhole	18	b	0.4	0.4	1.1	6.4	8.6	17.7	25.6	20.2	12.5	11.3	5.7	1.4	111.3	(1946)	(1934)			
		a	6.9	3.8	20.3	95.3	123.4	242.1	471.4	274.8	122.9	155.5	79.3	14.7	1610.4	128	72	307.3	1953	July 6
Karmad	18	b	0.5	0.2	1.3	6.4	9.2	17.3	24.6	19.4	11.0	10.9	6.0	1.4	108.3	(1940)	(1934)			
		a	6.3	4.3	24.1	75.7	104.4	256.0	526.3	282.2	153.2	148.3	70.4	16.3	1667.5	143	77	291.1	1953	July 6
Murkhal	18	b	0.5	0.4	1.4	5.6	8.3	17.2	24.1	19.7	13.4	10.9	4.8	1.6	107.9	(1946)	(1934)			
		a	6.3	9.1	20.8	97.8	138.7	190.7	348.2	220.2	126.0	174.2	77.0	18.5	1427.3	153	68	192.3	1958	July 6
Thittimatti	18	b	0.5	0.6	1.2	8.2	9.2	14.8	21.9	17.5	10.6	9.9	5.0	1.4	99.0	(1940)	(1934)			
		a	6.9	5.3	23.9	80.3	117.6	229.4	320.8	177.3	121.4	181.3	63.0	13.7	1320.9	126	78	190.5	1943	July 10
Dubari	18	b	0.5	0.6	1.5	6.0	8.4	16.3	22.2	15.4	11.2	11.4	4.6	1.3	99.4	(1943)	(1945)			
		a	4.3	8.1	23.4	98.3	117.8	182.4	325.1	184.1	102.1	155.2	70.1	16.5	1287.2	128	74	147.3	1948	July 9
Hudugur	18	b	0.6	0.5	1.5	6.2	8.4	15.3	22.2	18.0	9.6	10.6	4.4	1.3	96.6	(1940)	(1938)			
		a	6.9	7.4	18.3	74.9	92.2	135.9	302.0	198.4	92.5	151.6	57.7	16.3	1154.1	145	65	102.4	1953	July 6
Sampaje	18	b	0.5	0.5	1.1	5.5	7.9	13.2	23.2	17.9	9.5	11.0	4.3	1.1	95.7	(1946)	(1939)			
		a	7.1	6.3	28.7	120.4	196.3	692.7	1291.3	936.0	487.9	341.4	156.5	23.6	4268.2	129	80	247.9	1948	July 10
Kodagu (District)		b	0.4	0.5	2.0	6.8	10.2	25.4	29.3	27.1	21.7	18.3	8.5	1.8	152.0	(1924)	(1905)			
		a	6.4	5.6	21.9	90.1	145.8	502.6	878.2	515.8	233.9	212.6	93.7	18.9	2725.5	142	62			
Madikeri	50	b	0.5	0.4	1.4	5.9	8.9	19.6	25.6	21.5	14.4	12.4	6.0	1.4	118.0	(1923)	(1918)			
		a	6.1	7.6	18.8	67.8	135.9	606.3	1129.3	682.7	307.6	199.9	81.3	22.1	3265.4	127	66	364.5	1924	July 17
Ammathi	44	b	0.6	0.6	1.4	5.0	8.3	23.0	28.4	26.6	18.9	12.7	5.5	1.4	132.4	(1924)	(1918)			
		a	5.3	6.3	22.3	76.5	141.5	402.1	722.1	389.1	178.1	194.8	86.4	15.7	2240.2	237	68	410.7	1924	July 25
		b	0.4	0.5	1.7	6.2	8.9	19.7	25.1	21.0	13.9	12.0	5.7	1.0	116.1	(1924)	(1918)			

(a) Normal rainfall in mm (b) Average number of rainy days (days with rain of 2.5 mm or more) (c) Madikeri and Ammathi are hill stations
 * Based on all available data upto 1970. ** Years given in brackets

Table 14 : Percent Increase and Decrease in Rainfall over normal Rainfall

Year	Madikeri		Somvarpet		Virajpet		Kodagu District	
Normal Rainfall (1901-1970)	3,287.2	-	2,206.1	-	2,661.2	-	2,718.2	-
1951	3,086.7	-6.1	2,197.1	-0.4	1,992.4	-27.8	2,402.0	-11.6
52	2,380.9	-27.6	1,818.4	-17.6	2,054.8	-22.8	2,084.7	-23.3
53	3,223.7	-1.9	2,759.8	+25.1	3,262.5	+22.6	3,082.0	+13.4
54								
55	Figures Not Available							
56								
57	3,033.0	-7.7	2,023.6	-8.3	2,639.3	-0.8	2,565.3	-5.6
58	3,793.4	+15.4	2,788.3	+26.4	2,895.0	+8.8	3,158.9	+16.2
59	3,604.2	+9.6	3,022.4	+37.0	3,402.9	+27.9	3,343.2	+22.9
1960	3,510.0	+6.8	2,225.2	+0.9	2,585.1	-2.9	2,773.4	+2.0
61	5,941.2	+80.7	3,152.2	+42.9	5,170.5	+94.3	4,754.6	+74.9
62	3,656.1	+11.2	2,479.1	+12.4	3,149.5	+18.3	3,094.9	+13.8
63	3,133.6	-4.7	1,772.9	-19.6	2,137.9	-19.7	2,348.1	-13.6
64	3,423.3	+4.1	2,459.4	-11.5	2,478.3	-6.9	2,787.0	+2.5
65	2,056.9	-37.4	1,444.6	-34.5	1,683.8	-36.7	1,728.4	-36.4
66	2,452.4	-25.4	1,744.9	-20.9	1,931.4	-27.4	2,042.9	-24.8
67	2,766.6	-15.8	2,305.5	+4.5	1,931.4	-27.4	2,334.5	-14.1
68	2,830.7	-13.9	2,134.2	+3.3	2,524.6	-5.1	2,496.5	-8.2
69	3,188.7	-3.0	2,274.7	+3.1	2,188.9	-17.7	2,550.8	-6.2
1970	3,137.3	-4.6	2,177.8	-1.3	2,733.0	+2.7	2,682.7	-1.3
71	2,922.4	-11.1	1,708.9	-22.5	2,478.5	-6.9	2,369.9	-12.8
72	2,693.0	-18.1	1,874.4	-15.0	2,189.0	-17.7	2,252.1	-17.1
73	3,314.2	+0.8	2,503.4	+13.5	2,159.0	-18.9	2,658.8	-2.2

General

Year	Madikeri		Somvarpet		Virajpet		Kodagu District	
74	3,139.6	- 4.5	1,923.5	- 12.8	2,647.5	- 0.5	2,570.2	- 5.4
75	3,553.9	+ 8.1	3,034.6	+ 37.6	3,182.0	+ 19.6	3,256.8	+ 19.8
76	2,192.2	- 33.3	1,342.8	- 39.1	2,178.0	- 18.2	1,904.3	- 29.9
77	3,418.3	+ 4.0	2,446.2	+ 10.9	2,730.0	+ 2.6	2,864.8	+ 5.4
78	4,135.6	+ 25.8	2,494.2	+ 13.1	2,951.2	+ 10.9	3,193.7	+ 17.5
79	3,407.9	+ 3.7	1,852.9	- 16.0	2,847.5	+ 7.0	2,702.8	- 0.6
1980	4,152.2	+ 26.3	2,606.2	+ 18.1	3,076.1	+ 15.6	3,278.2	+ 20.6
81	3,065.4	- 6.7	2,945.0	+ 33.5	3,491.9	+ 31.2	3,167.4	+ 16.5
82	2,352.3	- 28.4	1,699.8	- 22.9	2,300.0	- 13.6	2,117.3	- 22.1
83	2,715.1	- 17.4	1,557.9	- 29.4	2,552.3	- 4.1	2,275.0	- 16.3
84	4,412.7	+ 34.2	2,041.7	- 7.5	3,059.1	+ 14.9	3,076.0	13.2
85	2,590.2	- 21.2	1,664.1	- 24.6	2,027.7	- 23.8	2,094.0	- 22.9
86	2,925.7	- 10.9	2,486.7	+ 12.7	1,686.8	- 36.6	2,433.0	- 10.5
87	2,828.9	- 13.9	1,110.2	- 49.7	1,402.2	- 47.3	1,780.4	- 34.5
88	3,385.0	+ 2.9	1,292.0	- 41.4	2,412.4	- 9.3	2,363.1	- 13.1

Table 15 : Rainfall in 1990 compared with Annual Rainfall

S.No.	Month	Average Rainfall in 1901-1970 (mm)				Rainfall in 1990 (mm)			
		Madikeri	Somvarpet	Virajpet	District	Madikeri	Somvarpet	Virajpet	District
1	2	3	4	5	6	7	8	9	10
1.	January	5.0	5.2	4.7	5.0	0	0	45	15
2.	February	6.2	4.8	5.9	5.6	0	0	0	0
3.	March	17.0	12.5	14.6	14.7	0	0	0	0
4.	April	75.9	69.5	75.1	73.5	2	15	11	9
5.	May	149.5	119.3	171.3	146.7	252	93	207	184
6.	Total Premonsoon Rain	253.6	211.3	271.6	245.5	254	108	263	208

1	2	3	4	5	6	7	8	9	10
7.	June	588.8	322.6	546.7	486.0	777	319	354	483
8.	July	1,149.9	760.1	905.0	938.3	718	306	507	510
9.	August	696.1	462.9	429.0	529.3	989	627	460	692
10.	September	295.3	170.0	191.5	218.9	203	79	64	115
11.	Total S.W. Monsoon	2,730.1	1,715.6	2,072.2	2,172.6	2,687	1,331	1,385	1,801
12.	October	205.5	182.3	217.2	201.7	260	416	310	329
13.	November	78.7	77.4	83.0	79.7	20	19	28	22
14.	December	19.3	19.5	17.2	18.7	0	1	0	0
15.	Total N.E. Monsoon	303.5	279.2	317.4	300.0	280	436	338	351
16.	Total Annual Rainfall	3,287.2	2,206.1	2,661.2	2,718.2	3,221	1,875	1,986	2,361

Source : Drought Monitoring Cell, Science and Technology Department

Table 16 : Frequency of Annual Rainfall in the District (Data 1901-1950)

Range in mm	No. of Years	Range in mm	No of years
1601-1800	1	2801-3000	5
1801-2000	0	3001-3200	7
2001-2200	5	3201-3400	2
2201-2400	9	3401-3600	1
2401-2600	8	3601-3800	0
2601-2800	11	3801-4000	1

TABLE 17

Maximum and Minimum Temperature and Relative Humidity (Madikeri)

Month	Mean Daily Temp		Highest max. ever Recorded		Lowest min. ever Recorded		R.H.	
	Max	Min	°C	date	°C	date	0830*	1730*
	°C	°C					%	%
January	24.9	14.0	31.7	4th Jan. 1954	9.4	16th Jan. 1946	78	56
February	27.0	14.9	31.7	22nd Feb. 1911	8.9	20th Feb. 1936	74	55
March	28.9	16.4	33.3	30th Mar. 1921	10.6	21st Mar. 1955	70	56
April	28.6	17.8	33.9	26th Apr. 1896	10.6	16th Apr. 1955	78	70
May	26.7	18.2	35.0	11th May 1902	9.4	21st May 1955	85	78
June	22.2	17.4	30.0	2nd Jun. 1939	10.0	29th Jun 1955	93	95
July	20.3	16.8	28.9	6th Jul. 1955	11.2	1st Jul. 1958	95	98
August	20.7	16.8	26.7	16th Aug. 1951	12.2	1st Aug. 1920	95	97
September	22.0	16.6	27.2	23rd Sep. 1951	12.2	24th Sep. 1935	92	92
October	24.0	16.9	28.3	7th Oct. 1899	10.6	30th Oct. 1948	87	84
November	23.9	15.8	27.8	14th Nov. 1918	10.6	3rd Nov. 1947	83	73
December	23.8	14.3	28.9	23rd Dec. 1903	9.4	8th Dec. 1937	82	80
Annual	24.4	16.3	30.2		10.4		84	76

* Hours in Indian Standard Time.

TABLE 18

Table 18 : Mean Wind speed in Madikeri in kilometre per hour

JAN.	FEB.	MARCH	APR.	MAY	JUNE	JULY	AUG	SEP.	OCT.	NOV.	DEC.	ANNUAL
6.9	5.8	5.3	5.6	6.8	9.8	12.4	11.1	8.9	5.8	7.1	7.9	7.8

Table 19

Special Weather Phenomena in Days*

Details	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Thunder	0.1	0.1	2.5	6.5	6.1	0.7	0.1	0.1	1.6	5.9	2.4	0.2	26.3
Hail	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Dust storm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Squall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fog	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3

General

* No. of days 2 and above are given in whole number