CHAPTER – V

DEFORESTATION IN KERALA

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Forests are essential to support economic development and to maintain all forms of life on earth. They help to meet the social, economic, ecological, cultural and spiritual needs of the present and future generations. The Brundtland Commission (WCED/UN/1987)[1] found that the answer to meet future needs in the areas of food, energy, human settlement and income depends crucially on how the world's forests are managed. The inter-related and multiple roles of forests covering the whole spectrum of environmental conservation and rational utilization of forest resource are vital for human welfare and sustainable socio-economic development (C. Chandrasekharan, 1997)[2]. Therefore deforestation is likely to be a major catastrophe during the 21st century. In order to understand and evaluate the deforestation in Kerala, it will be useful to examine the forest resource situation at the global and national levels. The table 5.1 provides some interesting comparisons.

The area under natural forest in the world is 3,373,92 million hectares, in which India's share is only 0.015%. The growing stock of wood in natural forest in India constitutes around 47.0 M^3/ha. The area under forest plantations, in developing countries is estimated as 3.40 percent of the total forestland and for India it is 20.37 percent. Forest per capita in India is one of the lowest in the world (0.08 hectares) as compared to 0.50 hectares in the developing countries and 0.64 hectares in the world as a whole. About 91.4 percent at the total wood demands account for fuel wood in India – which is very high comparing to 79.63 percent in the developing countries and 56.3 percent all over the world.

TABLE - 5.1
FOREST RESOURCE SITUATION AT GLOBAL AND NATIONAL LEVELS

Sl. No	Details	World	Developing countries	India	India - World Ratio	India and developing countries ratio
1	Area of Natural Forest Land 1990 (Million hectares)	3,373.92	1941.47	51.73	0.015	0.026
2	Forest land as percentage of total land 1990	26.1	25.7	17.4	-	-
3	Growing stock of wood in Natural Forest (M^3/hectares) 1990	114.0	113.0	47.0	-	-
4	Biomass in Natural Forests (t/ha) 1990	131.0	169.0	93.0	-	-
5	Area of Forest Plantations 1990 (Million hectares)	N.A	68.44	13.25	N.A	19.36
6	Forest Plantation as percentage of total forest area	N.A	3.40	20.37	N.A	-
7	Total wood production 1993 (Million M^3)	3,334.03	2,087.97	287.45	8.62	0.13
8	Percentage of fuel wood to total wood 1993	56.3	79.63	91.4	-	-
9	Forest per capita (hectare)	0.64	0.50	0.08	-	-
10	Available forest biomass per capita (t)	82.37	81.73	0.60	-	-

Source: United Nations FAO, 1995, Govt. of India, F.S.I, 1996, C. Chandrasekharan, 1997.

The Forest Resource Assessment (FAO 1995), indicates that the growing stock per hectare increased steadily in almost all the developed countries. At the same time in the developing countries, in addition to the net loss of forest area and associated stock, there has been a reduction in the volume of growing stock and bio-mass per unit area of the remaining forest, where removals (legal and illegal) exceed growth. The extent of annual tropical deforestation which was estimated at 11.3 million hectares during 1970-80, increased to 15.4 million hectare during 1980-90. Along with an estimated deforestation in non-tropical developing countries (of 850,000 hectare), the annual forest loss in the developing world is 16.3 million hectare as indicated by the FAO.

The table – 5.2 shows deforestation in the twelve mega-diversity countries in the Eighties.

TABLE – 5.2
DEFORESTATION IN THE MEGADIVERSITY COUNTRIES IN THE EIGHTIES

Country	Share of World's land area (%)	Shares of world's flowering plant species (%)	Annual deforestation rate	
			Sq. km	%
Brazil	6.0	22	13820	0.4
Columbia	0.8	18	6000	1.3
China	7.0	11	N.A	N.A
Mexico	1.4	10	7000	1.5
Australia	5.7	9	N.A	N.A
Indonesia	1.4	8	10000	0.9
Peru	1.0	8	2700	0.4
Malaysia	0.2	6	3100	1.5
Ecuador	0.2	6	3400	2.4
India	2.2	6	10000	2.7
Zaire	1.7	4	4000	0.4
Madagascar	0.4	4	1500	1.5

Note: The Data refers only to the closed forests; 1990 is the reference year. Column 2 is based on a total of 2,50,000 known species overlapping across geographical boundaries.

Source: Lester R Brown, "State of the world," Horizon India Books, New Delhi, 1992, P.11.

Between 1850 and 1980 about 60 percent of forests and wood lands in North Africa and the Middle East were destroyed due to the pressure of human activity. During the same period, tropical Africa lost 20 percent, Southern Asia 43 percent and Latin America 19 percent of existing forest cover. In spite of efforts to rectify the problem, deforestation in the tropics has continued unabated and by some estimates may even be increasing. According to the FAO, Forest Resources Assessment 1990 project, which covered 97 percent of all tropical forests during the early 1980s, 60

percent of all deforestation is due to expansion of agricultural settlements. Open access forests have suffered most and even parks and protected areas are threatened.

TABLE – 5.3
DEFORESTATION: CONTRASTING RESULTS IN DEVELOPING AND THE DEVELOPED COUNTRIES

Developing Countries	Annual rate of deforestation (%)	Developed Countries	Annual rate of Deforestation (%)
(1)	(2)	(3)	(4)
Bangladesh	4.1	Australia	0.0
Bhutan	0.6	Canada	-1.1
Brazil	0.6	France	-0.1
Cameroon	0.6	Japan	0.0
Cuba	1.0	Netherlands	-0.3
India	0.6	South Africa	-0.8
Kenya	0.6	Switzerland	-0.6
Mexico	1.3	U.K.	-1.1
Myanmar	1.3	U.S.A	0.1
Pakistan	3.5	Morocco	-1.4
Philippines	3.4	Norway	-1.4
Sri Lanka	1.4	Syrian Arab Republic	-4.3
Thailand	3.5	Germany	-0.4
Uzbekistan	5.5	Ireland	-1.2
Vietnam	1.5	Finland	0.0
Tanzania	1.2	Israel	-0.3
Zambia	1.1		
Malaysia	2.1		

Source: Compiled from World Bank Atlas, The World Bank, Washington D.C, U.S.A, 1997.

The table – 5.3 reveals the contrasting results with respect to deforestation in the developing and the developed countries. Deforestation is widespread in the developing countries and the annual rates of deforestation are positive to impact adversely by degradation on human development and welfare. In contrast, intensive high yielding forest plantation and forestation programs for saving the natural forests have been successfully resorted to by the developed countries at the cost of relentless degradation of forest resources and deforestation in the developing world. It is highly

advantageous to the developed world to import wood and other forest resources from the third world, and as a result deforestation rate is negative in the advanced countries.

Deforestation in India

Per capita availability of forest in India is very low. At the time of independence the per head forest area in India was 0.112 hectare. It was steadily declining over the decades and reached 0.079 hectare in 1990-91, as revealed by the table 5.4. Because of their low productivity, these woodlands can support an annual harvest of no more than 39 million cubic meters. This amounts to only 0.046 cubic meters per person for both fuel wood and industrial wood, compared with U.S industrial wood consumption of 1.86 cubic meters per person which is 40 times higher (Dr. Ramaswamy and Pandimuruga, 1994)[3]. Government projections show India's demand for fuel wood climbing to 289 million cubic meters by A.D 2000, more than seven times the estimated annual growth, virtually assuring continued wood deficits (Lester R. Brown, 1991)[4].

TABLE – 5.4

PER CAPITA FOREST AREA IN INDIA (1950 – 51 to 1990 – 91)

Year	Forest Area per person in India (hectares)
1950-51	0.112
1960-61	0.123
1970-71	0.116
1980-81	0.099
1990-91	0.079

Source: Census of India 1991, Series – I, India, Paper – I, p. 21

The table 5.4 reveals the per capita forest area in India from 1950-51 to 1990-91. The decline in per capita forest area in the country is caused by the deforestation consequent on the pressures of her ever-increasing population.

Extent of Forests in Kerala

Kerala is situated between latitudes 8° 17'and 12° 47', north and longitude 74° 51' and 77° 24' east and stretches on a narrow strip on the South west coast of India, between the Arabian sea and the Western Ghats.

In the beginning of the 18th century forests clothed almost the entire land area of Kerala except settlement areas occupied by people. Cultivation of various crops increased and more settlements emerged in various parts at the expense of forests. By the beginning of the 19th century, the forest area was reduced to 3/4th of the land area. The present century witnessed large scale of cultivation of various crops in the lowlands, middle lands and high lands of the State.

Kerala state, though small, has 44 rivers. Large number of dams were constructed across the rivers in order to use the water for irrigation and hydropower. The dams being mostly in the forest areas, their catchments had to be protected. Keeping this objective in mind the forests around the reservoir of dams have been constituted as wild life sanctuaries. The protection afforded to these catchment areas led to the protection of wild animals and now these areas have really turned out to be refuge of many species of wild animals and plants. Other protected areas were also constituted taking into consideration the presence of large number of animals and unique plant life there

Protected forest areas in Kerala have been categorised as six, namely, Wild life sanctuary, Bird sanctuary, National park, Biosphere reserve, Mangroves (Mangalavanam) and Kavu (Sacred grove). The extend and the year of formation of the protected areas are given in table 5.5

There are ten wild life sanctuaries in the state in addition to one bird sanctuary (Thattekkad) and one tiger reserve, Periyar Reserve at Thekkady. Eravikulam and

Silent Valley are the two national parks. The Mangalavanam is a recently notified area at Kochi for the protection of a Mangrove patch. Sacred groves are private properties having varying extends and spread all over Kerala. In terms of percentage of protected area to forest area, and to land area, Idukki is in the foremost place (58.01 and 20.62 respectively) followed by Wayanad (36.4 and 16.6)

TABLE – 5.5
PROTECTED AREAS IN KERALA

No	Name of protected area	Extent Sq. K.M	Year of formation	Name of District
I	Wild Life Sanctuaries			
	1 Neyyar	128	1958	Trivandrum
	2 Peechi-Vazhani	125	1958	Thrissur
	3 Parambikulam	285	1962	Palakkad
	4 Wayanad	344.44	1973	Wayanad
	5 Idukki	70	1976	Idukki
	6 Peppara	53	1983	Trivandrum
	7 Shendurunni	100.32	1984	Kollam
	8 Chinnar	90.44	1984	Idukki
	9 Chinmoni	75	1984	Thrissur
	10 Aralam	55	1984	Kannur
II	Bird Sanctuary			
	1 Thattekkad	25.16	1983	Ernakulam
III	Tiger Reserve			
	1 Periyar Tiger Reserve	777	1978	Idukki
IV	National Parks			
	1 Eravikulam	97	1978	Idukki
	2 Silent Valley	89.52	1984	Palakkad
V	Mangrove			
	1 Mangalavanam	344	-	Ernakulam
VI	Sacred groves	-	-	All over the State

Source: S. Chandha Basha, 1997, The National Resources of Kerala, Worldwide Fund for Nature, India, Kerala, Thiruvananthapuram.

District-wise break up of forests

There was no proper attempt to survey the actual extent of forests in Kerala. Different agencies give different figures for the same period. The Land survey conducted in 1987 gives the extent of forest assessed by Forest Survey of India (FSI) as 10402 Sq. k.m. At the same time NRSA (National Remote Sensing Agency) assessed the forest area as 7376 Sq. k.m. The difference is mainly in the categorization of the forests. In 1993 the assessment given by the Forest Survey of India (FSI) was 10336 Sq. k.m which works out to 26.6 percent of the land area (FSI, 1993). By any estimate the forest per capita cover in Kerala is not more than 0.04 hectares.

As per the estimation of Kerala Forest Research Institute (1990), the total forest area in Kerala is 11,223 Sq. k.m of which 1,823 Sq. k.m have been given out for non-forestry purposes. The remaining area of 9400 Sq. k.m forms only 24.19 percent of the total land area. Of this 81 percent is dense-forest, 18 percent man made forest and 1 percent grass land. Out of the total forest land of 9400 Sq. k.m, 6900 Sq. k.m i.e. 73.4 percent is brought under protection forests, wild life sanctuaries and National parks. The balance 2500 Sq. k.m (26.1%) is categorised as production forests (KFRI, 1990)[5].

The Forest Survey of India (1993) gives district wise breaks up of Kerala forest as shown in table 5.6.

TABLE 5.6
DISTRICT-WISE FOREST AREA

Sl.No	District	Geographical area	Forest cover Sq. K.M			% of forest area to Geographical area of District
			Dense	Open	Total	
1	Kasargod	9398	1332	369	1701	18.10
2	Kannur					
3	Wayanad					
4	Kozhikode					
5	Malappuram	3674	724	103	827	22.51
6	Palakkad	4392	945	428	1373	31.26
7	Thrissur	3031	807	73	880	29.03
8	Ernakulam	24108	251	21	272	11.29
9	Alappuzha	1883	7	-	7	0.37
10	Kottayam	2204	57	24	81	3.67
11	Idukki	5061	2226	310	2536	50.11
12	Pathanamthitta	4620	1755	510	2265	49.02
13	Kollam					
14	Thrivunanthapuram	2192	317	77	394	17.97
	Total	38863	8421	1915	10336	26.59

Source: Forest Survey of India, 1993

Accordingly, total forest area in the state is 10336 Sq. k.m. constituting 26.59 percent of the geographical area of the state.

Forest Types

The forests of Kerala have been divided into seven major types, which are subdivided in to twenty sub types and many further subdivisions depending upon the floristic composition and other minor factors (Chandrasekharan, 1997)[6]. The seven major forest types are tropical evergreen forests, most deciduous forests, dry deciduous forests, Shola-grass land complex, plantations, Wetlands and Sacred groves (Kavus).

The tropical evergreen forests occur in areas of 200-1500 m above msl with the annual rainfall range of 250-500 c.m. According to Chandrasekharan (1962)[7], the

evergreen forest formations can be divided into 3 climatic types on the basis of floristic composition and habitat conditions.

The most deciduous forests which occur between 500-900 meters above msl, within a rain fall range of 250-350 c.m have been intensively managed for commercial forestry due to dominance of species like teak and rose wood.

The tropical dry deciduous forests extend to about 100 Sq. k.m leeward side of the Western Ghats in the rain fall zone of about 100-150 cm in an elevation range of 300-1,000 meters. This type of forests are limited in Kerala. The Shola-grassland region occurs above 1,500 in elevation in the high ranges and Nilagiri Hills. Their catchment value for Kerala is well recognised.

The plantations of various species occupy 1,550 Sq. k.m area and constitute habitation for many Mammals, birds, reptiles and amphibians. About 750 Sq. k.m area is under teak, about 300 Sq. k.m under Eucalyptus and the rest mostly under mixed plantations.

Six percent of the world's surface area is covered by wet lands, yet there is inadequate information about wild life values of the wetlands, especially in Kerala. By virtue of its geographical position along the coast and mountainous topography Kerala supports rich wetlands. Most of the wet lands in Kerala are either community properties or private holdings, but some of them belong to Revenue Department.

Sacred groves represent unique examples of 'instu' conservation of bio diversity (V.K. Uniyal, 1997)[8]. Many vanishing plants on the low elevation tropical evergreen forests can still be found in the sacred groves of Kerala. Table 5.7 shows the forest resource situation in India and Kerala.

TABLE - 5.7
FOREST RESOURCE:
SITUATION IN INDIA AND KERALA

Sl. No	Details	India	Kerala	State ratio % (Kerala/India)
1	Area of Natural forest land, 1990 (Million hectares)	51.73	0.94	1.81
2	Forest land as percentage of total land – 1990	14.70	27.80	-
3	Area of forest plantations – 1990 (M Hectare)	13.25	0.15	1.13
4	Forest Plantation as percentage of total forest area	20.37	23.60	-
5	Total wood production from forest sources 1993 (Million M^3)	287.45	1.13	0.39
6	Percentage of fuel wood to total wood 1993	91.40	79.60	-
7	Forest area per capita (hectares)	0.08	0.03	-

Source: Adapted from Govt. of India F.S.I, 1996, Govt. of Kerala 1994 and Chandrasekharan, 1997.

The natural forest in India is 51.73 million hectares, in which Kerala's share is 1.81 percent. The forest land as percentage of total land area in India comes around 17.4 percent, but it is around 27.8 percent in Kerala. Forest area per capita is lower in Kerala (0.03 ha), than in the national average of 0.08 hectares. The area under forest plantations is 13.25 percent in India, while it is 0.15 percent in Kerala.

Deforestation in Kerala

The sharp reduction in forest area in Kerala is generally attributed to the low land-man ratio, population growth and the consequent increase in demand for agricultural land, fuel wood, fodder and timber. This in turn led to encroachments of

forest land and illegal fellings in forest areas. The forest areas under encroachment in Kerala on 31st March 1994 is 49,917.56 hectors (FSI, 1995)[9]. The various developmental programmes (like river valley projects, roads, transmissions, industrial and other developmental projects) started by State governments have thus caused a great extent of deforestation. From 1984 to 1994, an area of 1,183.38 hectares of land has been diverted from forests for such purposes (Murali Vallabh, 1996)[10].

Since the formation of the state of Kerala in 1956, various development projects and welfare schemes launched by the state and her policy of continuing support to plantations and cash crops led to large scale delineation of forest land. Moreover, since 1950, especially after 1956, and until early 1980s due to political support, the phenomenon of encroachment became more widespread and resulted in large scale deforestation. It is estimated that between 1956 and 1973, i.e. within 17 years of the formation of the state 4187.37 Sq. K.Ms of forest area were delineated for various purposes (Joshi, 1989)[11]. The process of deforestation continued at a rapid rate of one percent per annum between 1973-84. Therefore, even if the rate of deforestation for the above period is presumed as 0.5 percent per annum, the total natural forest area of the state would be only about 9-10 percent of the total geographical area of the state by 1984 as suggested by Joshy, 1987. The critical condition of the Kerala forests is very clear from the data given in table 5.8

TABLE – 5.8
THE FOREST AREA LOST FOR VARIOUS PURPOSES IN THE TWO DECADES BEFORE 1980

Sl.No	Purpose	Area lost (hectares)
1	Irrigation projects	4000
2	Hydro electric projects	28500
3	Arable land scheme	15000
4	Kerala Forest Development corporations	11801
5	Plantation corporation	11709
6	Oil palm India Ltd	3705
7	State farming corporation	2528
8	Rehabilitation plantation	2565
9	Resettlement project	6000
10	Vested forest gives back to owners	5000
11	Encroachment	35000
	Total	125808

Source: Kerala Forest Department, Aranyam, October – December 1999, Vol-III, No.4, P.3

The table reveals the reality that from 1960 onwards up to 1980, Kerala has been annually losing an average forest area of about 6290 hectares (125808/20)

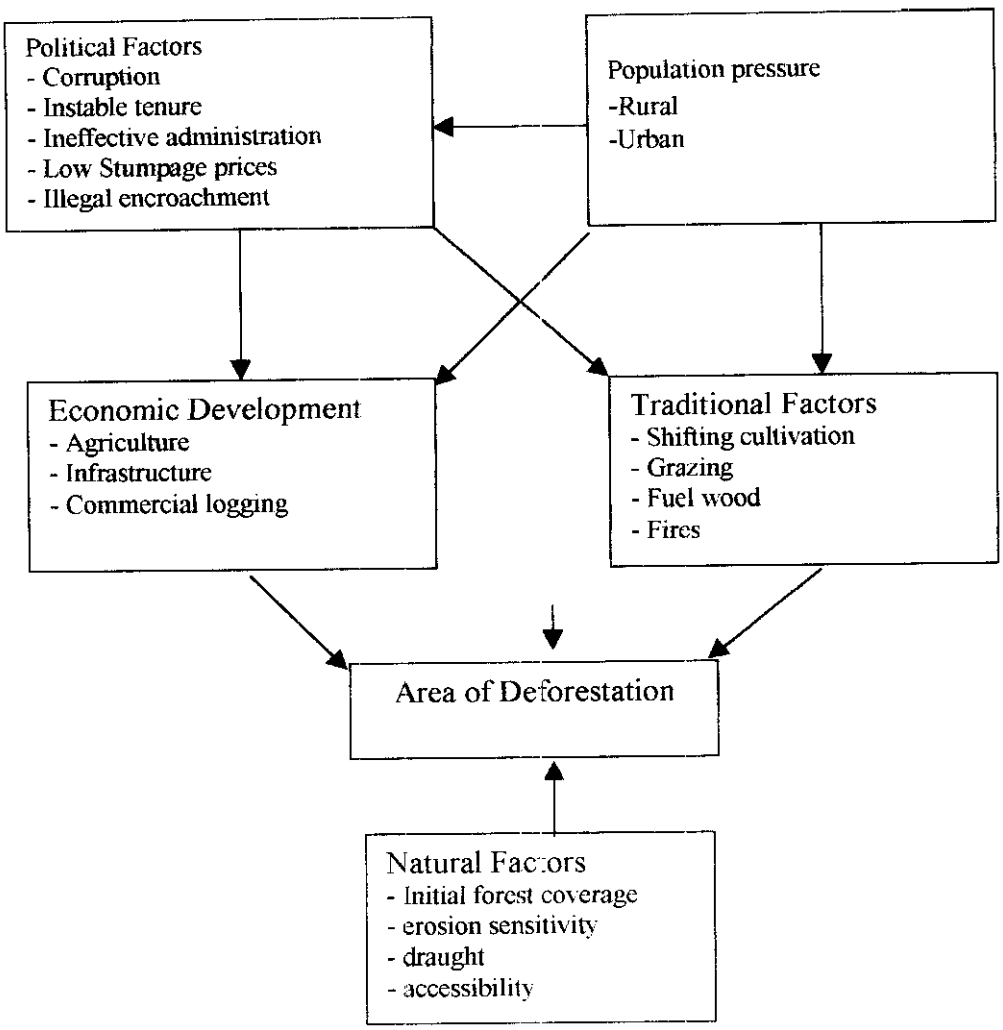
The Frame Model of Deforestation

Unless the causes are identified and addressed appropriately, reforestation and forestation would be just palliatives only. Just, how much ecological disruption forest clearing causes, depends on a number of factors, including topography, rainfall, cropping pattern, soil characteristics, geological conditions and how the land is used and treated etc. Several causes are put forth for the large-scale deforestation in the state. Some of them are identified in the frame model.

DIAGRAM - 5.1

A FRAME MODEL OF CAUSES OF DEFORESTATION

Duration of human impact



Deforestation: Mathematical process

Deforestation as a Mathematical process is described by the reduction of an initial forest area of a certain class (FA i,t) into a final forest area of the some class (FA i,t $^{-}$n) during number of years (n). If the annual relative rate of deforestation (P) is assumed constant during a certain period, the final forest area of that period can be estimated by discounting the initial forest into the final date as follows.

$FA\ i, t\ ^{-}n = FA\ i, t\ (1+p/100)^{-n}$

And then the Area of Deforestation (AD) is found by subtraction

$$\sum_{t}^{T+n} Adi = F\ a\ i, t - F\ a\ i, t+n$$

If a constant annual percentage of doforestation is applied in the same area for successive years (cetris paribus) this leads to successively decreasing annual area of absolute deforestation. On the other hand, if a constant annual rate of deforestation is applied for successive years (cetris paribus), this leads in turn to successively increasing annual percentage of relative deforestation. In the latter case, the annual percentage of deforestation equals 100 during the last year of the total process and then deforestation can take place only if new forestation occurs.

To sum up, the forests of the state are shrinking under acute socio-economic pressures. Deforestation is marching ahead in the state unhintered due to demand pressures in the form of pasture, mechanized agriculture and infrastructure development. Increasing demand for agricultural land, fuel wood, fodder and timber, plantations and cash crops, encroachments and illegal felling, river valley projects, power transmissions and industrial development have caused a great extent of deforestation. Uncontrolled profiteering and corruption motives of politicians, forestry officials, timber merchants and rich land owners in the exploitation of the

forest resources too add to causes of deforestation. At the Earth Summit (United Nations Conference on Environment and Development) in Rio de Janeiro in June 1992[12], the world leaders made a commitment to work towards sustainable management and conservation of all types of forests. Eight years in to the march towards sustainable forest management and having reached the target year of 2000 AD, progress in achieving that goal is slow at the global, national and regional levels.

In Idukki there was roughly 12,850 $k.m^2$ of forest in 1940, including the area under cardamom cultivation (Chandrasekharan, 1973)[13]. Kottayam district, which was at that time included the High Range area, lost 897 $k.m^2$. This was the largest loss of forest compared with the other districts in Kerala. Of the 897 $k.m^2$ lost, 768 $k.m^2$ went to reservoirs and 43 $k.m^2$ to official settlements (Chandrasekharan, 1973)[14]. The above figures represent the legal loss of forest cover (i.e. areas no longer officially under forest department control). Actual losses were probably higher. Based on map and satellite image analysis. Chattopadhyay (1984)[15] estimates that Idukki district lost 22 percent of its forest area between 1905 and 1965 and a further 32 percent between 1965 and 1973. Deforestation in Idukki district is the topic of discussion in the following chapter.

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