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State Forest Management and Biodiversity: A Case of Kerala, India

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1. Introduction

Republic of India is the seventh largest country in the world, covering an area of 3,287,263 km².has large and diverse forest resources in 633,397 km² of forest covers or 19.27% of land areas (ICFRE, 2003; FAO, 2003). Forest types in India vary from topical rainforest in northeastern India, to desert and thorn forests in Gujarat and Rajasthan; mangrove forests in West Bengal, Orissa and other coastal areas; and dry alpine forests in the western Himalaya. The most common forest types are tropical moist deciduous forest, tropical dry deciduous forests, and wet tropical evergreen forests. India has a large network of protected areas, including 89 national parks and around 497 wildlife sanctuaries (MoEF, 2005).

India has long history in forest management. The first formal government approach to forest management can be traced to the enactment of the National Forest Policy of 1894, revised in 1952 and once again revised in 1988, which envisaged community involvement in the protection and regeneration of forest (MoEF, 2003). Even having large and diverse forest resources, India's national goal is to have a minimum of one-third of the total land area of the country under forest or tree cover (MoEF, 1988). In management of state forests, the National Forest Policy, 1988 emphasizes schemes and projects, which interfere with forests that clothe slopes; catchments of rivers, lakes, and reservoirs, geologically unstable terrain and such other ecologically sensitive areas, should be severely restricted. Tropical rain/moist forests, particularly in areas like Arunachal Pradesh, Kerala, Andaman and Nicobar Islands, should be totally safeguarded (MoEF, 1988). Joint Forest Management (JFM), which was formally established in 1990, is a strong feedback for incorporation of the system in the National Forest Policy, 1988. So far, 27 State Governments have adopted resolutions for implementing the JFM program in their respective states, as on August 15, 2001, an area of 14,254,845 ha of forests lands are being managed through 62,890 committees under different names (MoEF, 2003).

One of the states mentioned in the National Forest Policy of 1988 is the State of Kerala. The forest cover in this state is 26.59% of the geographical area. Its forest type is tropical wet evergreen; it has 3 out of 80 national parks, and 12 out of 450 wildlife sanctuaries in India (India Forestry Statistics, 2000). The JFM in Kerala is called Participatory Forest Management (PFM).

There are many publications on JFM in India, but unfortunately not many about PFM in the State of Kerala. Moreover, information about the biodiversity in the forest itself and the utilization by local communities are rarely found. This research is aiming at resuming the restoration of biodiversity through Participatory Forest Management in Kerala State, with special attention to involvement of local communities into the management of protected areas.

2. Kerala Forests

State of Kerala is located on the South West of the Indian Peninsula, flanked by the Arabian Sea on the west and the mountains of the Western Ghats on the east. Total area of Kerala State is 38,863 sq. km with population density 819 persons per sq. km, and literacy rate is 90.9%, the highest in India. Forest covers in Kerala are 10,334 sq. km or 26.59% of the state geographical area (SFR, 1997; IFS, 2000).

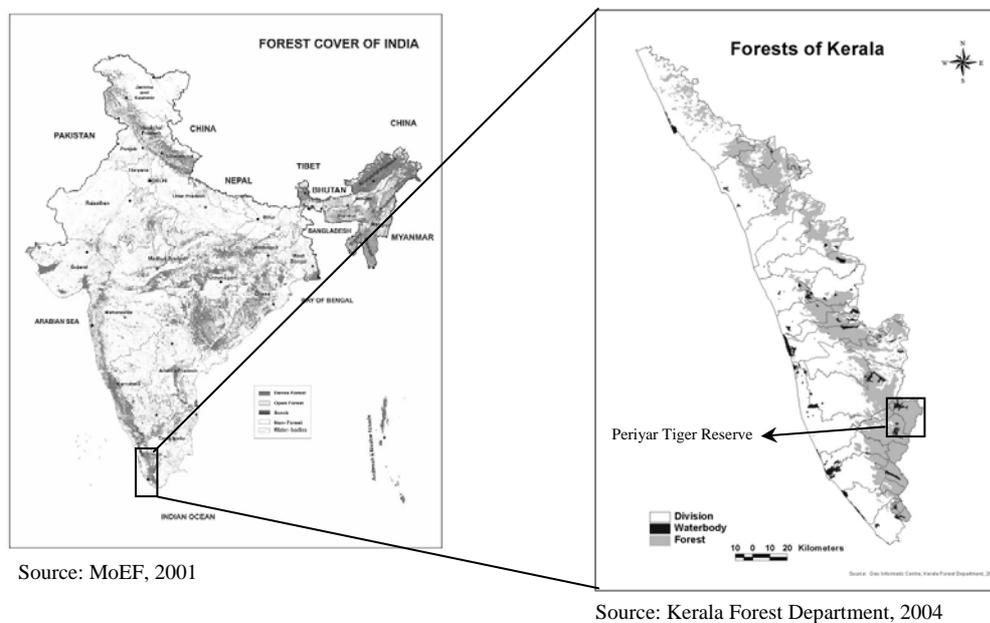


Figure 9.1. Forests of Kerala

The forests of Kerala are located mainly on the Western Ghats, the eastern part of Kerala State. Kerala Forests and Wildlife Department (KFD) classified the state forests by legal status, land utilization, vegetation types, and by management area. Classification of forests based on legal status are reserved and vested forests, while based on land utilization, it is classified into dense forests, plantations, and area given to other agencies. Based on vegetation types forests of Kerala is classified into: (1) southern tropical wet evergreen forests, (2) southern tropical semi evergreen forests, (3) southern tropical moist deciduous forests, (4) southern tropical dry deciduous forests, (5) grasslands, (6) montane sub-tropical forests, (7) southern montane wet temperate forests, and (8) plantations. Size of each forest types are shown in Table 9.1, as follow:

Table 9.1. Total forests area of Kerala State

No.	Classification	Area in km ²
Forest area by legal status		
1	Reserved forests	9,334
2	Vested forests	1,887
Total		11,221
Forest area by land utilization		
1	Dense forest/Natural forests	7,870
2	Plantations	1,530
3	Area given to other agencies	1,821
Total		11,221
Forest area by vegetation types		
1	Southern tropical wet evergreen	3,413
2	Southern tropical semi evergreen	
3	Southern tropical moist deciduous	4,100
4	Southern tropical dry deciduous	100
5	Grasslands	130
6	Montane sub-tropical	70
7	Southern montane wet temperate	
8	Plantations	1,587
Total		9,400
Forest area by management		
1	Selection felling area (protection forests)	1,000
2	Protection forests	6,870
3	Plantations	1,530
Total		9,400

Source: KFD, 2002a

There are 14 protected areas in Kerala established until 1984, namely 2 national parks and 12 wildlife sanctuaries. In the classification of forest by KFD, protected areas are not included in the classification, because they are included in reserved forest or protected forests. These protected areas are mentioned in Table 9.2.

Table 9.2. Protected areas in Kerala State

No.	Name of Protected Areas	Area in km ²	Year of formation
1	Periyar Wildlife Sanctuary	777.54	1950
2	Neyyar Wildlife Sanctuary	128	1958
3	Peechi-Vazhani Wildlife Sanctuary	125	1958
4	Parambikulam Wildlife Sanctuary	285	1973
5	Wayanad Wildlife Sanctuary	344.44	1973
6	Idukki Wildlife Sanctuary	70	1976
7	Eravikulam National Park	97	1978
8	Peppara Wildlife Sanctuary	53	1983
9	Thattekkad Birdlife Sanctuary	25	1983
10	Aralam Wildlife Sanctuary	55	1984
11	Silent Valley National Park	89.52	1984
12	Chenduruni Wildlife Sanctuary	100.32	1984
13	Chimmony Wildlife Sanctuary	85	1984
14	Chinnar Wildlife Sanctuary	90.44	1984
Total		2325.26	

Source: KFD, 2002a

In 2003, there are three more national parks established under first notification. Those national parks are located in Idukki District, and representing *shola* ecosystem.

Table 9.3. New National Parks in Kerala

No.	Name of Protected Areas	Area in km ²	Year of first notification
1	Mathikettan Shola National Park	12.8	2003
2	Anamudi Shola National Park	7.5	2003
3	Pambadum Shola National Park	1.3	2003

Source: KFD, 2004b

3. History of Forest Management in Kerala

Even from 3000 BC foreigners like Assyrians and Babylonians were drawn to Kerala for spices. In 5th century AD, Romans and Arabs were conducting a brisk trade with Kerala in pepper, cardamom, lavender, ginger, garlic, and other spices and condiments. The volume of foreign trade increased during 9th and 10th centuries AD. Commodities like pepper, lavender, teak, and ivory were exported and fishing nets, potteries, silk etc. were imported.

Three-fourth of the land area of Kerala was under thick forest even up to 18th century. History of forestry in Kerala can be dealt with three separate regions: Travancore, Cochin and Malabar areas, as these erstwhile geographical and political areas later merged to form the present Kerala State.

3.1. Travancore

In the beginning of 19th century Mr. Edyve visited South India to explore the possibility of exploiting the teak timber for shipbuilding. Later, in 1816, Lieutenants Ward and Coner came to survey Travancore and Cochin, "The Memoir of Travancore Survey" prepared by them gives valuable information on the forests of Travancore at that time.

In 1820, the government started exploiting timber directly and a timber depot was set up at Alapuzha. Captain Robert Gordon, the commercial agent was also holding charge as the Forest Conservator. His duty was to collect and make available timber and cardamom from forest areas for shipment to Great Britain.

Mr. U.V. Munroe was appointed as the first Forest Conservator. All the forests were considered as government property. During the period, timber extraction was confined to teak only, at the rate of 1500 logs/year. In 1844, rosewood and anjily were also deemed as royal trees. Collection of cardamom and wax was treated as the monopoly of the government.

In 1844, Mr. Vest succeeded Mr. Munroe. In 1864, Mr. Kunholf was appointed Conservator. Till 1853, teak had been supplied to temples, churches, illams and palaces free of cost.

In 1864, Dr. Brandis was appointed the Inspector General of Forests in India. The first Forest Act came into existence in 1865. Scientific forest management and forest protection in all provinces under the British Rule in India were codified. To train foresters, a Forest School was established at Dehra Dun during 1878. First National Forest Policy came into force during 1894.

Mr. J.S. Vemela was appointed as Asst. Conservator of Malayattoor in 1865. During this period Sir T. Madhava Rao, the Diwan of the king 'Ayilyam Thirunal' had taken the initiative to raise a teak plantation in Travancore. Accordingly, Vemburam Island near Malayattoor was selected and teak seeds were sowed. The exercise failed. Subsequently Sir Thomas who was looking after the teak plantation in Nilambur was appointed as Asst. Conservator in Konni. During 1866-67 teak planting was done on a small scale in Konni and Malayattoor and the practice continued.

The Travancore Forest Act came into force in 1887. As per this Act, Konni was declared as the first Reserve Forest in October 9, 1888. More areas were declared as Reserve forests in 1889.

Mr. Bourdillon was appointed as the Conservator in 1891. He is considered as the pioneer forester in Travancore. Mr. Bourdillon prepared the 'Report of the Forests of Travancore' in 1892. Large scale planting of teak was started during this period. Mr. Bourdillon developed a successful technique of stump planting to raise teak. His book "Forest Trees of Travancore" is considered even today as a very authoritative work on the tree flora of the State. It is indeed an authoritative list of trees to check how many trees have become extinct in this area.

In 1893 a detailed Forest Act was passed as a Regulation and in 1894, rules were framed based on the Act. In 1896, the Forest Department was totally re-organized on the lines of the British Forest Administration and the State was divided into Divisions and Ranges. More divisions were formed in 1913.

Agroforestry practices, combining agriculture with forestry, were started as early as in 1905. Forests areas were leased out for cardamom cultivation since 1905 and the rules were modified in 1935. Forests areas were also given to tribals free of cost at the rate of 1.2 hectares per family.

In 1906, Shri V.K. Govinda Menon was asked to prepare a report on the management of teak plantations, with special emphasis on thinning regime for the initial 10 years. The system of sale coupe was started in 1907 to prepare more area for teak planting. The extent of teak plantation was increased. The taungya system in teak plantation was introduced in Konni in 1910. Though the system failed, it was re-introduced in 1922. Studies in the Forest Research Institute revealed that the system was the main cause for soil erosion and degradation of forestland.

Mr. Rama Rao succeeded Mr. Bourdillon. He published a book, "Flowering Plants of Travancore" in 1911. Though he described 3535 plants in the book, only 1104 could be identified in Travancore area.

In 1923, wastelands were sold in bits of 200 ha to individuals and companies for cultivation of coffee and tea. Teak, rosewood, sandal and ebony were considered to be government property and only the government could cultivate these trees. The need for conserving the wildlife wealth was felt only during the 1930's. Mr. S.C.H. Robinson was appointed as the first Game Warden in 1933 for the protection of wildlife. The Periyar Lake Reserve was declared as Nellikampetty Game Sanctuary. This was later declared as the Periyar Wild Life Sanctuary. When scientific forestry practices were intensified, the Forest Department felt the need for more trained personnel. To meet this requirement, a Forest School was started in 1923 in Naduvathumoozhy to train forest guards. The school was later closed.

Forest administration also was streamlined by preparing a forest manual. The Forest Manual (1st Part) was published by Shri Narayana Iyengar in 1933. Shri L.A. Krishna Iyer published the second part in 1947. Part I dealt with forest laws and part II with administration. The Forest Manual guides the administrative procedures, selling of forest products, auctioning of trees and every other activity in the forest.

An extent of 9,600 ha of forest areas were leased out for paddy cultivation in 1942. Considerable damage was done to forestland due to this. However, the leasing process was allowed to continue. Later pressure began to mount from the leases for permanent ownership (Patta) of the land.

Plantation forestry was started in a systematic manner in 1940s on the basis of carefully prepared working plans. The first Working Plan for Quillon, for the period from 1944 to 1958 was prepared for planting Teak, Thembavu, Venteak, Anjily, Elavu, Bamboo and Cinchona and other economically useful trees. Even rubber plantation was tried out in some places.

The Government took active interest in starting forest-based industries. Punalur Paper Mill (formerly Meenakshy Paper Mill) was established during 1940 with the government holding one-third of the shares. The government had assured supply of raw material, mainly bamboo and reeds, to the mill at reduced rate.

3.2. Cochin

As a practice, forestlands were leased out to private individuals for collection of timber. There was no limit for the exploitation and the result was depletion of the forest areas. The system was stopped by Col. Munroe in 1812. In 1813, a head of Forests by name 'Malamel Vicharippu' was appointed with supporting staff to collect timber from forests. During the period, the Forest Department collected only teak trees directly and private individuals were allowed to take the other trees after remitting the prescribed cost.

Lt. Leth Bridge took charge of the Forest Department 1880. He exploited the forest ruthlessly to improve the financial position of the state. However he tried to grow more trees particularly teak by sowing tones of teak seeds. In 1835, Mr. J.A. Kolhoff was appointed the first conservator of Cochin. He framed rules for the collection of forest produces. Accordingly royal trees were collected departmentally, miscellaneous trees by permit system and Minor Forest Produce by contract. Rosewood and Ebony were declared as royal trees in 1837.

Over exploitation of trees resulted in the destruction of vast forest tracks during the period. Moreover large areas were cleared and converted to agricultural lands during 1855- 1875. Raising teak plantation in Cochin on the banks of Parakkadavu Puzha started in 1873 and continued till 1891. Over 200 ha of plantations

were raised during this period. Due to various reasons, these plantations failed. An attempt was made in 1893 to raise sandal plantations.

Shri Alvar Chetty of Madras became the Advisor of the Maharaja in 1897. He imposed restrictions on the collection of timber from forest. Cochin Forest Act based on the Madras Forest Act of 1882, came into effect in 1905. Rules were framed to protect and exploit forest. For collecting firewood a system called 'Coppice with standards' was introduced. Construction of a Forest tramway was started in 1901 and completed in 1908 at a total cost of Rupees 18.47 lakhs to transport timber from Orukomban areas to Chalakkudy. The tramway helped to transport about 10,000 cu. m in a year and exploit about 32,000 ha of forest areas. The total extent of forest areas in Cochin during this period was about 50,000 ha.

In 1908, the department was brought under the range system. Forests were divided into Ranges and Sub Ranges. Division system came into being in 1944. Regular Teak plantations were started from 1915. Artificial regenerations of other species were also started during the period. The monopoly on royal trees was ended in 1923. In 1944 Machad Range and Trichur Range were converted as Divisions. Shri S. Venkiteswaran was the Conservator during this period. A Forest Development Division under the charge of an ACF was formed to construct roads for colonization of Ex-Service men. Extensive forest areas were given on lease for cultivation of varieties of crops.

3.3. Malabar

As per the agreement of 1792-Sriranga Pattanam, complete Malabar Area, except Wayanad, came under the British rule. Later, Wayanad was also brought under their control. In contrast to the practices followed in Travancore and Cochin, the forests in Malabar Area were considered as private property under the British rule. But some areas for which, there were no claimants were kept under the control of government.

The teakwood, required for Naval Dockyard, Bombay were collected from Kanara, and Malabar areas during those days. To meet this requirement, even immature trees were felled. Though the Principal Collector Mr. Sheffield pointed out the necessity to ban the felling of immature trees, no steps were taken till Mr. Canolly became the Collector in 1880.

Considering the extent of forest under government ownership and its potential to grow more trees, he had prepared a note and brought to the notice of the government the immediate need for raising plantations considering the projected needs. He assessed the timber requirements as 2230 cu. m/year for the construction of one ship each year. According to him 2000 teak trees were to be felled annually to meet the projected need. Considering 60 years as the minimum rotation for teak, he anticipated to plant 1,20,000

trees in a phased manner. For this, 670 sq. km of forestland from private owners had to be purchased. The Government promptly accepted his suggestions, and Canolly made forestry history by raising the first ever-teak plantation in the world. Accordingly the forestland under Thrikalayur Devasom was taken on lease. Later forest area of Nilambur, Thirumulpad, and Zamorin of Kozhikode were also taken on lease in 1841 and 1843. When large teak areas were identified in Kanara, further leasing of forestland was stopped in 1843.

Collector Canolly increased the extent of forestland for regenerating teak artificially. Mr. Smith was entrusted with this work during 1841. The over exploited area in the western side of Nilambur was selected for the work. In 1842, teak seeds were broadcasted and natural seedlings were transplanted in the degraded areas. Since the attempt of Mr. Smith had failed, Mr. Graham was appointed in October 1842 in his place to continue the artificial regeneration. Various trials were conducted for germinating teak seeds. Then, Collector Canolly entrusted the work to Sub-Conservator Shri Chathu Menon, who was able to raise many seedlings in nursery by germinating pre-treated seeds. The Silviculture technique developed by Chathu Menon involves pre burning of seeds. These seedlings were planted in 1844. The 10-20 cm height seedlings were planted in June. The planting was done in a spacing of 1.8 m x 1.8 m quincunx and in pit of 30 cm cube. The plantations were well maintained by Chathu Menon. Thinning was practiced from 1854 and was continued.

A sample plot of 100 teak trees belonging to the 1844 plantation is still preserved as an experimental plot. The KFRI with the help of the Kerala Forest Department has set up a teak museum at Nilambur in recognition of the fact that the first ever teak plantation in the world was raised in Nilambur.

Madras Forest Act came into force in 1882. The forests of Karimpuzha, New Amarambalam, Silent Valley, Valayar and Chennath Nair Reserve were declared as Reserved Forests during 1883-87. More areas became Reserved Forests later. Maj. Campbell, the Conservator, suggested to continue teak planting in 1886, which stood suspended from 1877 to 1885. The plantations were not successful due to poor site quality.

One of the commercial important exotic trees planted in Nilambur was Mahogany. Mahogany is one of the few tree species suitably adapted to the natural condition of Kerala. Planting of Jack and Anjily along with teak was also practiced. The first working plan for Nilambur division (1896 – 1905) was prepared in 1894. This indicates that management of forests guided by Working Plans started in Malabar area much before the practice started in Travancore. Mr. Ribbon Troup, the Inspector General of Forests visited the Teak plantations of Nilambur in 1898. Mr. Rodez Morgan, District Forest Officer had made a study of Flora & Fauna of Malabar and included in the book of Mr. Willian Logan in 1887.

During 'Mappila Lahala', Forest officials were harassed and many of the forest buildings were burned and destroyed in 1921–22. One of the oldest collection of books and other authoritative records of forestry in Malabar kept in the Divisional Forest Office in Nilambur, were also destroyed during the 'Mappila Lahala'. Many of the teak plantations were affected by flood in 1924. For economic and swift transportation of wood from Nilambur, a Nilambur – Shoranur railway line was laid in 1927.

The private forests were over exploited and mismanaged during early 1900. Lot of people from Central Travancore colonized Malabar and large areas were brought under cultivation destroying the forest cover. The Madras Preservation of Private Forest Act, 1949 came into force and all private holdings of forests exceeding 40 ha came under the purview of the Act. Nevertheless, the Act could not fully control the destruction of forests.

3.4. Kerala

The new state of Kerala was formed by merging Travancore, Cochin and Malabar areas on November 1, 1956. Mr. E.A. Lazredo (Madras) was the first Chief Conservator of Forests of Kerala. The Forest Department was re-organized into three circles (Quillon, Chalakkudy & Kozhikode) and 14 divisions (Trivandrum, Thenmala, Punalur, Konni, Ranni, Kottayam, Malayattoor, Chalakkudy, Thrissur, Nenmara, Palghat, Nilambur, Kozhikode & Wayanad) for administrative convenience. The forest boundaries of divisions and ranges were prescribed by government notifications. The administration of each of the division was put under the charge of a Divisional Forest Officer and the management of these divisions was on the basis of working plans. Working plans were prepared for all the divisions.

The extent of virgin forests at the time of re-organization was 8635.11 sq. km. excluding forest plantations. A number of forest divisions and circles were created to make forest management very effective. Munnar division was started in 1963.

A number of administrative reforms have been brought for the sustainable utilization of the forests. The important ones formulated include the Kerala Forest Act 1961. Under the Private Forest Vesting and Assignment Act, the government took over all the private forests of the Malabar area.

In spite of the best efforts of the department to maintain maximum land under forest cover and exploit the tangible and intangible benefits out of it, the area under forest cover has been shrinking due to a multitude of reasons.

3.5. Canolly's Plot

The Canolly's Plot is the living monument that illustrates the integrity, zeal and honesty of late Shri. Chathu Menon, a Sub Conservator of Malabar who played the pivotal role in raising the first ever-teak plantation in the world. It is located in the right bank of Chaliyar River in Nilambur. An extent of 5.75 acres from 1844 teak plantation is retained as a permanent preservation plot. The total number of trees in the plot are at present is 123. The biggest tree is tree number 23 with 24 meters clear bole and 416 cm GBH. The volume of the tree is estimated as 26 cu. m. The average volume per tree in the plot is 8.8 cu. m and the total volume is 1082 cu. m. This is one of the most famous forestry plot of the world, attracting foresters from all over the world to pay homage to those stalwarts, responsible for teak planting in India.

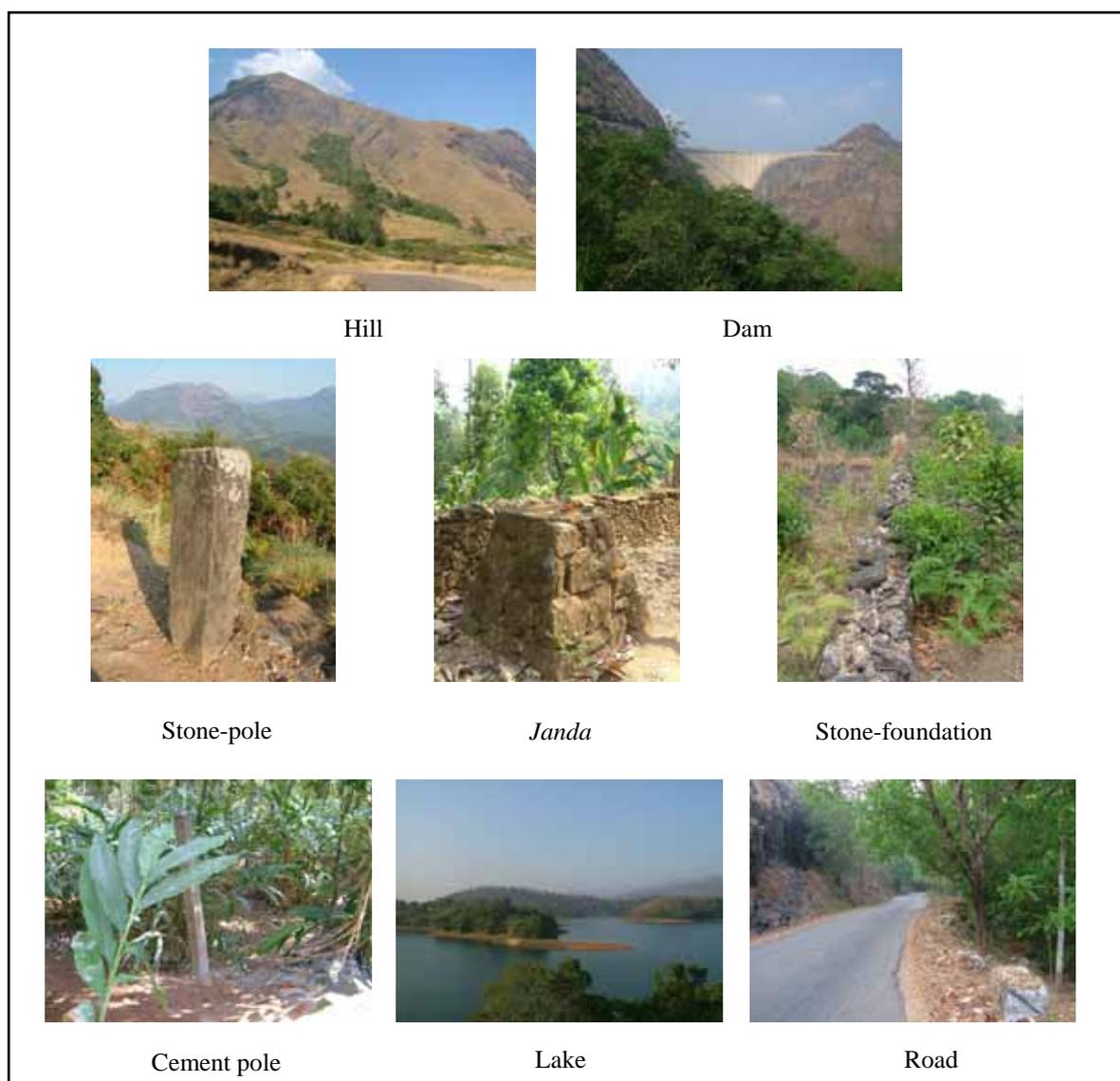
Teak had been over exploited even at the time of British Colonial rule to meet British shipbuilding requirements. Therefore they started raising teak in plantations in Nilambur as early as 1844. The experimental plot preserved from the 1844 plantation is named after Canolly who conceived the idea.

To highlight the glory of teak and its diversified use, a teak museum has also been setup in Nilambur jointly by the Kerala Forest Research institute with the help of Kerala Forest Department (KFD, 2004a).

4. Forest Settlement

The basic law for forest management in India is the Indian Forest Act, 1927. This act contains forest settlement (reserved forests, section 2-27; village forests, section 28; and protected forests, section 29-34), control over forests and lands not being the property of government (section 35-28), the duty on timber and other forest produce (section 39-40), the duty of timber and other forest produce in transit (section 41-44), the collection of drift and stranded timber (section 45-51), penalties and procedure (section 52-69), cattle trespass (section 70-71), forest officers (section 72-75), subsidiary rules (section 76-78), and miscellaneous (section 79-86). The act is applied to the whole of India, except the territories, which immediately before the 1st November 1956, were comprised in the States of Bihar, Bombay, Coorg, Delhi, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, and West Bengal; but the Government of any State may by notification in Official Gazette bring the act into force in the whole or any specified part. Forests in Kerala were settled as Reserved Forests based on the Kerala Forest Act (1961) section 3 to 29, and its amendments in 1980, 1986, 1989 and 1993. Section 3 of this act stated that the Government might constitute any land at the disposal of the Government as Reserved Forests in the manner hereinafter provided. Under this act, there are the Forest Settlement Rules (1965) and Rules Regarding the Publication of Revised Boundary Description of Reserved Forests, which arranged detailed procedures of the settlement of the reserved forest.

In case of settlement of Vested Forests from private forests, the Government of Kerala established the Kerala Private Forests (Vesting and Management) Act, 1971 and amendments in 1978, 1981, and 1986. Under this act, the Kerala Private Forests (Vesting and assignment) Rules (1974) section 2 and 3 arranged detailed procedures of the settlement of vested forests. While settlement of protected areas from reserved forests was regulate by the Wildlife Protection Act, (1972) section 18 – 38. One of the procedures of setting a forest area is demarcation of boundaries. The boundaries of a forest area are prioritized to natural landmark, such as river, hill, lake, road, dam, etc. but if there is no such landmark, artificial demarcation is made, such as “Janda”, stone-pole, and stone-foundation. The samples of demarcation of boundaries are shown in Figure 9.2.



Source: Field research, 2004

Figure 9.2. Demarcation of forests boundaries

The results of settlements of reserved forests and vested forests in Kerala can be observed in Table. 9.4. Idukki District has the largest forests areas among all districts in Kerala, which represented by the largest reserved forests area. The next largest reserved forests areas are in Pathanamthitta and Thrissur Districts. While, the largest vested forests area is in Palakkad District.

Table 9.4. District-wise forest area in km²

No.	District	Reserved forests	Vested forests	Total
1	Thiruvananthapuram	495.145	3.534	498.679
2	Kollam	695.824	12.978	708.802
3	Pathanamthitta	1,719.34	1.611	1,720.96
4	Kottayam	100.845	--	100.845
5	Idukki	2,953.71	37.396	2,991.11
6	Ernakulam	310.917	--	310.917
7	Thrissur	1,006.72	6.343	1,013.07
8	Palakkad	852.565	757.584	1,610.15
9	Malappuram	325.448	434.195	759.643
10	Kozhikode	86.139	205.085	291.223
11	Wayanad	564.421	319.412	885.833
12	Kannur	142.848	87.799	230.647
13	Kasargod	86.022	24.933	110.955
Total		9339.954	1890.87	11232.82

Source: KFD, 2002a

5. Forest Biodiversity

Biodiversity can be measured at three levels, namely ecosystem, species and gene. Biodiversity of Kerala Forests in this study focuses only on ecosystem and species levels. In the ecosystem level, there are many types of forests based on the legal status, management, land utilization, or vegetation types as mentioned in section 2. Kerala Forests. In each ecosystem level, there are many species, for both plant and animal.

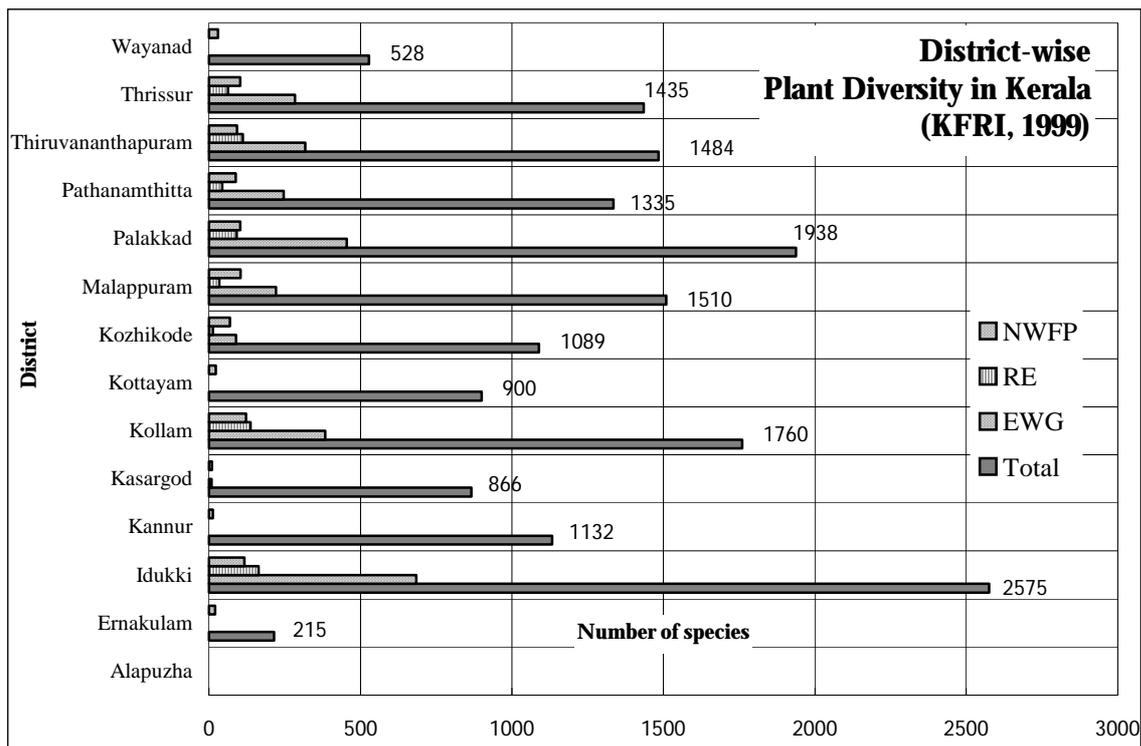
5.1. Ecosystem Diversity

Forest or vegetation types represent some of ecosystem diversity in Kerala Forests. Data and information on forest areas were collected from some institutions, such as Department of Forest and Wildlife, Government of Kerala (KFD, 2002a), Land Use Board (LUB, 1995), Kerala Forest Research Institute (KFRI, 1999), and World Wide Fund for Nature-India. Information on forest in protected areas, including forest types, biodiversity, etc. are available in each protected areas' Management Plans.

Kerala has at least 8 forest types as shown in Table 9.1, namely: (1) Southern tropical wet evergreen forest, (2) Southern tropical semi evergreen forest, (3) Southern tropical moist deciduous forest, (4) Southern tropical dry deciduous forest, (5) Grasslands, (6) Montane sub-tropical forest, (7) Southern montane wet temperate forest, and (8) plantations. Most of these forests are in the high ranges of Western Ghats, bordering Kerala and Tamil Nadu, the neighbor-state. Each forest types must have various and unique ecosystems, which formed by abiotic and biotic factors, including human.

5.2. Species Diversity

The latest available data on biodiversity (plant and animal) was issued by Kerala Forest Research Institute (KFRI, 1999). There are 14 series of books of district-wise forest and biodiversity of Kerala State as the product of the project “People’s Campaign for Ninth Plan: District Level Planning”. The data is resumed as follow:



Source: KFRI (1999)

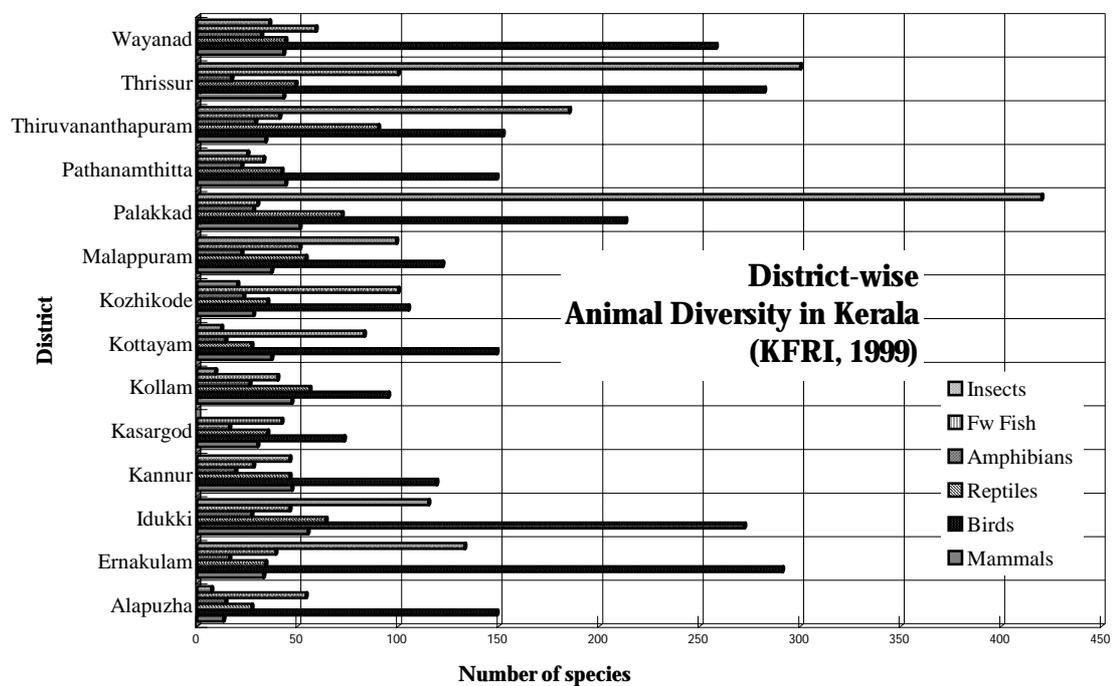
Figure 9.3. District-wise plant diversity in Kerala

5.2.1. Plant Diversity

Figure 9.3 shows that Idukki District has the highest plant diversity, represented by the highest number of species in non-wood forest products (NWFP), in rare and endangered species (RE), in species endemic to Western Ghats (EWG), and finally the highest in total number of species. This due to the largest forest areas among the districts and also to the existence of 5 protected areas in Idukki. Idukki District consists of two natural physiographic zones, namely the high land (75-750 m above msl) and high ranges (> 750 m above msl). About 96% of total geographic area of the district is in the high range region. The total geographic area of the district is 5,019 km² and the actual forest area of the within the district is about 2,678 km² forming 53.38% of the total area (KFRI, 1999).

5.2.2. Animal Diversity

Regarding of the animal diversity, the highest diversity of insects is in Palakkad District, freshwater fish is in Kozhikode District, amphibians is in Wayanad District, and reptiles is in Thiruvananthapuram District. Ernakulam District is abundant with bird diversity, while Idukki District is the home of mammals. This information is shown in the figure 9.4.



Source: KFRI (1999)

Figure 9.4. District-wise animal diversity in Kerala

5.3. Protected Areas

There are 14 protected areas (PAs) in Kerala State (see Table 2). Each PA has its uniqueness and represents forest biodiversity of Kerala. Along with this, each PA also has problems, which challenge the PA managers. The main problems of most PAs are PA-people conflict, which now begin to be reduced by Participatory Forest Management or in PAs it is called Eco-Development Programs.

Visits to protected areas were conducted in Idukki District, where 5 out of 14 protected areas are located. In each PA, discussion with forest officers and local people engage in Eco-Development Program (EDC) were conducted. Discussions with forest officers were mainly on PA condition, biodiversity, problems and Eco-Development Program, which also included in Management Plans. Summary on PAs' species diversity is shown in Table 9.5.

Table 9.5. Species diversity of each protected area in Idukki District

No	Biodiversity	Number of Species				
		Chinnar WS	Eravikulam NP	Idukki WS	Periyar TR	Thattekkad BS
1	Flowering plants	965	297	197	1965	307
2	Mammals	28	29	27	62	34
3	Birds	225	132	201	315	270
4	Fish	14	na	na	55	12
5	Amphibians	15	20	na	16	57
6	Butterflies	156	101	na	160	76
7	Reptiles	52	na	9	30	30

Note: na = data not available

Source: KFD, 2001; KFD, 2002b; KFD, 2002c; KFD, 2002d; KFD, 2002e

The significance of the enactment of these protected areas was mentioned in each management plan. Chinnar Wildlife Sanctuary was settled because rich in reptilian fauna, *Albizia lathamii* is critically endangered species which found here, well-known repository of medicinal plants, there are settlements of Hill Pulaya and Muthuvan Tribes, there are megalithic burial sites consist of dolmen and cysts, to protect the Great Giant Squirrel and as protected area next to Eravikulam National Park, Chinnar WS also included in the home range of Nilgiri Tahr (KFD, 2002b). Eravikulam National Park was settled in order to protect the wild goat "Nilgiri Tahr" (*Hemitragus hylocrius* Ogilby, 1938), which is in the world, could only be found here, also many kinds of animal species, which are endemic to Western Ghats. There are also 10 endangered species included in the Red Data Book of Indian plants (KFD, 2002c). Idukki Wildlife Sanctuary consists of varied flora and fauna. The entire sanctuary is the catchments of Idukki Hydro Electric Project. The Arch Dam is first of its kind in India and biggest in Asia. The forest surrounding the

reservoir forms a conducive habitat for wildlife. The sanctuary is the part of High Range Forest, which represents fragmentation and isolation from the main tract of vegetation extending between Munnar Hills and Periyar Tiger Reserve due to development of dams and associated human settlements (KFD, 2002d). Periyar Tiger Reserve was settled to protect tiger and other wildlife. There are 516 species of plants endemic to Western Ghats and 3 species of plants endemic to Periyar, 36 species of animal endemic to Western Ghats and 2 fishes endemic to Periyar. Thattekad Bird Sanctuary was settled to protect 270 species of birds and other plants and animal (KFD, 2002e).

6. Forest Management

6.1. Kerala Forest and Wildlife Department

Kerala Forest Department (KFD) is the single largest landowner in the state. All reserved forests, vested forests, wildlife sanctuaries and national parks come under the jurisdiction of the department. Forest management in Kerala has undergone a sequential shift on the basis of dominant paradigms of forestry at national and international levels. Currently thrust areas of forest management are biodiversity conservation, social forestry, ecotourism and participatory management. There are about 8,500 employees in the Kerala forest department, which include Principal Chief Conservators, Conservators, Divisional Forest Officers, etc. (KFD, 2002a).

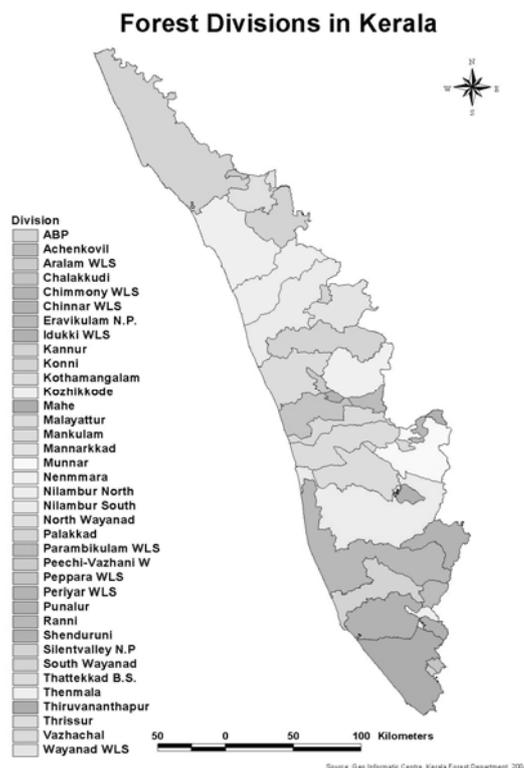


Figure 9.5. Forest divisions in Kerala

Source: Geo Informatic Center-KFD (2004)

The Kerala Forest and Wildlife Department is headed by Principal Chief Conservator of Forests, whom also Chief Wildlife Warden. The Principal Chief Conservator of Forests is assisted by Additional Principal Chief Conservator of Forests, Chief Conservator of Forests (Wildlife), Chief Conservator of Forests (FMIS), Chief Conservator of Forests (Vigilance), Chief Conservator of Forests (Administration), Chief Conservator of Forests (Eco-Development & Tribal Welfare), Chief Conservator of Forests (World Bank Project), Chief Conservator of Forests (Planning), Chief Conservator of Forests (Development), Chief Conservator of Forests (Social Forestry), Chief Conservator of Forests (IHRD), Chief Conservator of Forests (Protection) and two Regional Chief Conservators one at Kollam and one at Kozhikode.

For general administration there are 5 forest circles headed by Conservators, under their jurisdiction forest Divisions controlled by Divisional Forest Officers. Each Division further sub divided into basic units – Forest Ranges, which are managed by Forest Rangers who reporting to the Divisional Forest Officers (Government of Kerala, 2004). For wildlife divisions there are wildlife division headed by Wildlife Warden. Under wildlife division, there are protected areas, which are headed by Assistant Wildlife Warden. There are 23 forest divisions and 12 wildlife divisions in Kerala, as shown in Figure 9.5.

6.2. Participatory Forest Management

As mentioned in the introduction, that the first formal government approach to forest management in India can be traced to the enactment of the National Forest Policy of 1894, revised in 1952 and once again revised in 1988, which envisaged community involvement in the protection and regeneration of forest (MoEF, 2003). Joint Forest Management (JFM), which was formally established in India in 1990, is an important mechanism of this policy that ensures local community participation in afforestation programs. In 1992, National Afforestation and Eco-Development Board was established, which responsible for the National Afforestation Program through community participation.

In Kerala, JFM is initiated in 1998 and implemented since 2000 under the name of Participatory Forest Management (PFM). Since immemorial time, Indian people live in rural village, utilized surrounding natural resources traditionally for their livelihood. During the colonial period, the Government of India drew up a regulation that all forests are national forest. According to National Forest Policy (1988), the right and concessions enjoyed by tribal and other poor living within and near forests should be fully protected, and forest management should associate to them in the protection, regeneration and development of forest as well as to provide gainful employment to people living in and around the forest. At the same time, the Government of India have intention to minimize degradation of forest by local people through National Afforestation Program by establishing JFM in 1990 or PFM in Kerala since 1998.

Study on PFM was conducted through discussions with forest officers in Department of Forest and Wildlife (KFD), both in the KFD Headquarter in Thiruvananthapuram, and in each forest areas visited (5 protected areas and 2 territorial forest areas). Discussion on PFM also conducted with some professors in Kerala Agricultural University, researchers in Kerala Forest Research Institute (KFRI), Cardamom Research Station-KAU (CRS), Indian Cardamom Research Institute (ICRI), WWF-India Kerala State staffs, Executive Secretary of Cardamom Grower's Association, and local people engage in PFM (presidents of EDCs and VSS). As a result of the discussions, understanding about the term PFM was built.

Based on legal status of forests and location of local people involved, different nomenclatures have been used to describe the organizational set up which ensures community participation in afforestation program. Based on the legal status of the forest, the local people in the Reserved Forest including Vested Forest are represented by the Van Samrakshana Samithies (VSS) or Forest Protection Committee, whereas local people in Cardamom Hills Reserves are engage in Unit Level Organization (ULO) of Cardamom for Rainforest Conservation Committees (CRC) and local people in protected areas constitute what is known as the Eco Development Committees (EDC). Based on location of local people involved, there are two classifications, namely tribal and fringe. "Tribal" refers to tribal people who live inside the forest areas, and depend on the forest for their livelihood. "Fringe" refers to local people, both tribal and non-tribal, who live adjacent to the forest areas. Finally, there are 5 types of PFM based on the combination of legal status forest and type of local people involved in PFM, resume as follow:

Table 9.6. Five Types of local people's participation in Participatory Forest Management

Reserved Forest → Van Samrakshana Samithi (VSS)/ Forest Protection Committee

1. Fringe VSS

2. Tribal VSS

Special Case in the Reserved Forest: Cardamom Hills Reserve →

Cardamom for Rainforest Conservation Committee/CRC

3. Unit Level Organization (ULO)

Protected Areas → Eco-Development Committee (EDC)

4. Fringe EDC

5. Tribal EDC

Source: Field research, 2004

6.3. Joint Forest Management as an Example of Decentralization without Devolution

Fisher, et al (2000) mentioned three types of approaches of decentralization and devolution, namely (1) decentralization without devolution, where government seek public participation in (generally) large-scale

programs, with centrally set objectives, (2) decentralization with a degree of devolution in some instances, where decentralization of forest management roles from central government to local government, but not to local communities, and (3) decentralization and devolution (not always complementary), where decentralization acts gives local government units control over all natural resources within their administrative area, which at the end caused a confusion and conflict at the local level regarding rights to benefits, access, and responsibilities.

JFM in India has long history of trials and errors and involving many parties, including researchers, academic people, NGO, local people, and the Government of India itself. JFM program in the present form can be traced to the Arabari experiment initiated by foresters in the State of West Bengal. This experiment provided a strong feedback for incorporation of the system in the National Forest Policy of 1988. In many locations people's voluntary groups were engaged in protection of forests without any initiative from the government. Subsequently, based on the experiences, the process of institutionalizing people's participation in forest protection and regeneration began. This type of collective endeavor in protection and management of forests through people's involvement was later termed as Joint Forest Management, which indicates the bottom-up approach in forest management.

Through letter No. 6.21/89-PP dated June 1st, 1990, the Government of India outlined and conveyed to the State Governments a framework for creating massive people's movement through involvement of village committees for the protection, regeneration and development of degraded forest lands. This gave impetus to the participation of stakeholders in the management of degraded forests situated in the vicinity of villages. The JFM program is structured on the broad framework provided by the guidelines issued by the Ministry (MoEF, 2003). The JFM consists of items necessary in JFM program, such as micro plans, fund, formation of JFM committees, etc. including participation of women in JFM. This indicates the top-down approach in forest management.

JFM is an example of decentralization without devolution. This could be recognized from the involvement of local people in protection and management of forest without initiative from government (bottom-up), then formally enacted by the Government of India and conveyed to all states government (top-down), and again needs local people's participation to conduct the activities and to obtain financial support.

Currently, JFM activities in different states are being funded from existing programs of the Forest Departments, inter-departmental linkages, and donor/externally aided project and from substantial village/community fund, which have been generated from voluntarily contributions. This also indicates the combination of top-down and bottom-up approach in forest management.

Many international organizations are willing to give donation for programs/projects, which involving local people's participations. This fact is well utilized by the Forest Department and also by NGOs to earn fund from international donor. Mostly, this fund will be used to support some projects or programs, including JFM. Here, the top-down approach in forest management was strongly visible. Local people who engaged in PFM were asked why they were willing to join this program. Some of them responded in very high-sounding, that it is for the next generation, and it seemed that they have high awareness in forest conservation, while others who have just begun to join in the PFM, responded in very innocence way, that because the Forest Officers said that it is good for their livelihood. On the other hand, bottom-up approach seemed to increase rapidly. The formation of JFM committees throughout the country reflects the awareness of local people on forest conservation and participation in forest management. The successful of JFM in one place became a trigger for local people in other place to join the program. Furthermore, signatures of local people engage in PFM are necessary to obtain the fund for protection or regeneration of forest. These also indicate the bottom-up approach in forest management; although the formation of a committee might be top-down one.

7. Conclusion

Kerala, the most populated state in India, not only high in literacy rate and rich with culture, but also rich in forests and forest resources. People live in harmony with the forest and wildlife happily inhabits the forests, which are now surrounded by human population. How could this happens became inquiry. Of course, the Kerala Forests and Wildlife Department (KFD) is facing some problems and challenges in managing the forests throughout the state. But there are also success stories about Participatory Forest Management. Again, this became inquiry. Some possible reasons behind the successful of PFM are as follow:

- High literacy rate of people enable people to read more and increase the awareness on the importance of forest and forests conservation
- There are fund available for people who engage in PFM activities
- People who live in the forests or adjacent to the forests have no choice other than join the PFM activities, in order to keep their existence in the forests and subsistence from the forests areas.
- The Government has no place to resettle the people who live in the forests.

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References

- FAO, 2003. *Country Information: INDIA*. Food and Agriculture Organization. (<http://www.fao.org/forestry/foris/webview/forestry2/index.jsp?siteId=5081&langId=1>). Browsed on Dec. 18th, 2003.
- Fisher, F. J., P. B. Durst, T. Enters, and M. Victor, 2000. Overview of Themes and Issues in Devolution and Decentralization of Forest Management in Asia and the Pacific. Enters, T., P. B. Durst, and M. Victor (eds.), *Decentralization and Devolution of Forest Management in Asia and the Pacific*, RECOFTC Report No. 18 and RAP Publication 2000/1, Bangkok.
- Government of Kerala, 2004. The Official Website of Government of Kerala. (http://www.kerala.gov.in/dept_forest/forest.htm). Browsed on June 24th, 2004.
- ICFRE, 2003. *India Forestry Statistics 2000*. Indian Council of Forestry Research and Education. (http://www.icfre.org/forestry_stats/2000/). Browsed on Nov. 4th, 2003.
- KFD-HRC, 2002. *Western Ghat Development Programme in PFM: Cardamom for Rain Forest Conservation Programme for Augmentation. Period of the Project: 2002-2007*. Kerala Forest Department-High Range Circle, Kottayam.
- KFD, 2001. *Management Plan Periyar Tiger Reserve 2001-2002 to 2010-2011 (Final Draft)*. Forest and Wildlife Department, Government of Kerala, Thekkady.
- KFD, 2002a. *Green Citadel: An Interactive CD ROM on Forests of Kerala*. Department of Forests and Wildlife, Government of Kerala, Thiruvananthapuram.
- KFD, 2002b. *Management Plan of Chinnar Wildlife Sanctuary 2002-2011*. Department of Forest and Wildlife, Government of Kerala, Munnar.
- KFD, 2002c. *Management Plan of Eravikulam National Park 2002-2011*. Department of Forest and Wildlife, Government of Kerala, Munnar.
- KFD, 2002d. *The Second Management Plan for Idukki Wildlife Sanctuary 2002-2003 to 2011-2012*. Rajan, P. K., V. Gopinathan, and V. K. Uniyal (eds.). Government of Kerala Forest & Wildlife Department, Idduki.
- KFD, 2002e. *The Second Management Plan for Thattekad Bird Sanctuary 2002-2003 to 2011-2012*. Rajan, P. K., V. Gopinathan, and V. K. Uniyal (eds.). Government of Kerala Forest & Wildlife Department, Idduki.
- KFD, 2004a. *History*. (<http://www.keralaforest.org/html/general/index.htm>). Browsed on December 2nd, 2004.
- KFD, 2004b. New National Parks for the Nation. *Kerala Forests and Wildlife Department News Letter*, Issue no. 18, June, 2004, Thiruvananthapuram.
- KFRI, 1999. *Forest and Biodiversity. People's Campaign for Ninth Plan: District Level Planning*. 14 Districts Series. Kerala Forest Research Institute, Peechi.
- LUB, 1995. *Land Resources of Kerala State*. Kerala State Land Use Board, Thiruvananthapuram.
- MoEF, 1988. *National Forest Policy 1988*. Ministry of Environment and Forests, New Delhi (<http://envfor.nic.in>). Browsed on Nov. 4th, 2003

- MoEF, 2001. *State of Forest Report 2001*. Forest Survey of India, Ministry of Environment and Forest, Dehra Dun. (<http://envfor.nic.in/nfc/fc-stat.htm>). Browsed on October 18th, 2004.
- MoEF, 2003. *Joint Forest Management*. Ministry of Environment and Forests. (<http://envfor.nic.in/divisions/forprt/jfm/html>). Browsed on November 4, 2003.
- MoEF, 2005. Wildlife Division. Ministry of Environment and Forest, New Delhi (<http://www.envfor.nic.in>). Browsed on June 23, 2005
- Tampi, K. B., N. M. Nayar and C.S. Nair (eds.), 1997. *The Natural Resources of Kerala*. WWF for Nature-India, Kerala State Office, Thiruvananthapuram.
- Unnikrishnan, P.N., 2002. *Cardamom and Rain Forest Conservation*. Paper presented in Seminar on October 3, 2002. Chief Conservator of Forest (E&TW). Department of Forest and Wildlife, Government of Kerala, Thiruvananthapuram