CHAPTER – I

THE TRACT DEALT WITH

1.1. Introduction:

Present Mannarkkad Forest Division was constituted vide G.O (MS) 121/89/ F&WLD dated 28th December 1989 **(Appendix - I)**, consequent to re-organization of Forest Divisions in Palakkad District and started functioning from 1.4.1990 from Olavakkode. The Headquarters was shifted to Mannarkkad on 18.4.1991. The area under the newly formed Division comprises of Mannarkkad Range of erstwhile Palakkad Territorial Division, Agali Range and northern portion of Thenkara Range of former Palakkad Special Division.

The Present Mannarkkad Division comprises of three ranges viz., Mannarkkad, Attappady and Agali with headquarters at Mannarkkad, Mukkali and Kalkandy respectively.

Subsequent to nationalization of private Forests, the vested Forests of Palakkad District were brought under a newly created Palakkad Special Division with effect from 10.5.1971. The Working Plan prepared by Sri P. K. Zacharia (1980 to 89), was guiding the management of these vested Forests. With a view to have a compact area of administrative units with boundaries in consonance with the District and Taluk boundaries, for even distribution of the protection task and for better administrative convenience, three forest divisions in Palakkad District namely Palakkad, Palakkad Special and Nemmara were reorganized as per the Government Order quoted above. Accordingly, the present Mannarkkad Division came into being with all Reserve Forests and Vested Forests of Mannarkkad Taluk, Palakkad district. Earlier, the Working Plan was prepared separately for the RF and VF portions and even there was a period where no working plan covering the entire Mannarkkad Division till the first Working Plan was prepared. In the absence of a regular Working Plan, Management Plans were prepared during the period 1990 to 2000. The First Working Plan was prepared for the period 2001-02 to 2010-11 and this is the second Working Plan for the period 2011-12 to 2019-20.

1.2. The Tract Dealt With:

Mannarkkad Division comprises the forests within the Revenue Taluk of Mannarkkad excluding the area under Silent Valley National Park.

1.3. Name and Situation:

Mannarkkad Forest Division borders the south western part of the Western Ghats in middle portion of Kerala state on the northern side of Palakkad gap in Mannarkkad Taluk of Palakkad District. The tract dealt with lies within the north Longitude of 10^0 52' to 11^0 14' and east Latitude between 76^0 17' to 76^0 48'

The Forests in this Division, comprises of both Reserve Forests and Vested Forests, occurring along the Western Ghats. The notifications of Reserved Forests are given in **Appendix - II** and detailed list of Vested Forests notified with VFC item numbers is given as **Appendix - III**.

There may be variation in the total extent of Vested Forests, since some areas were restored in obedience to verdicts of Forest Tribunal and Hon'ble High Court of Kerala, in various OA, MFA, Writ Petition and OPs filed by the ex-owners.

1.4. Reserve Forests:

1.4.1. Panakkadan Reserve:

Panakkadan and its addition the Kottanikunnu form an isolated small block of forest in the foot hills of Western Ghats, Thiruvizhamkunnu valley and is 15 km away from Mannarkkad town, about 9.6 km away in the south west corner of Silent Valley Reserve. The land drains partly towards the east Ariyoorthodu and partly towards Maliariyanthodu in the west and both the streams joins Bharathapuzha. The lower areas are, at an elevation of about 75m above MSL on the western fringes of Panakkadan Reserve. The slopes support moist deciduous Forests with a barren precipitous rocky patch on the top. Panakkadan RF covers 447.58 ha, Kottanikunnu RF covers 50.91 ha and Mulakuvallam covers 111.6354 ha in extent (Reserved as per GO (Ms) 40472 Agri. dated 28.11.72 and Go (Ms) 204/75/AD/Agri. dated 30.6.1975).

1.4.2. The Attappady Block I to V:

These 5 blocks lie contiguous to one another. The eastern boundary of newly formed buffer area of Silent Valley RF forms the western boundary of these blocks. Bhavani river flows almost due south along the western boundary of Silent Valley through the middle of these blocks and takes sharp turn eastwards at the south-west corner of block V, where Panthenthodu joins Bhavani and flows to Coimbatore district and join Cauvery. The lowest point is 533 m above MSL where Bhavani leaves the RF and the elevation rapidly rises northwards to over 2225 m above MSL on Nilgiri border. Major portion from Block I has been transferred to form the buffer area of Silent Valley National Park, whereas Block II, III, IV and V remains as such. Eastern half of block V on the

south and Block II completely slope towards east. This portion supports poor type of sholas with grasslands and some deciduous teak forests.

Extent:

Block II & III and IV	1165.50 ha
Block V	5325.67 ha
Total	6491.17 ha

1.4.3. Attappady Block VI:

This is an isolated block of 6385.95 ha, generally undulating with hills and valleys well clothed with vegetation except for large grassy area around Muthikulam in the southeast and the mass of high hills in the south. This is a plateau with elevation varying from 610 m above MSL, at the exit of Siruvani River to 2,065 m above MSL, the highest peak, North West of Elival Malai. The river Siruvani, a tributary of Bhavani, is originating from these hills and flows northwards to Tamilnadu.

1.5. Boundaries of the Division:

North-Nilgiri District of Tamilnadu

East-Coimbatore District of Tamilnadu

South-Palakkad and Ottapalam Taluks

West-Malappuram District - Perinthalmanna Taluk

Extent:

The total forest area of this Division is 422.43 Km^2. The details of Reserved Forests and Vested Forests are listed below.

Table - 1 - Ranges in Mannarkkad Division

Sl. No	Range	HQ	Reserve Forest (km^2)	Vested Forest (km^2)	Total (km2)
1.	Mannarkkad	Mannarkkad	6.1013	117.8867	123.9880
2.	Agali	Kalkandy	63.8595	65.1507	129.0102
3.	Attappady	Mukkali	80.7714	88.6595	169.4309
Total			**150.7322**	**271.6969**	**422.4291**

The boundary description of the ranges is furnished below:

1.5.1. Mannarkkad Range:

North: Starting from the south western boundary of Silent Valley National Park at the south west boundary of VFC Item No. 92 and passes through the southern boundaries of VFC Item No. 92

Uppukulam Vested Forest, VFC Item No. 17 Kelaloor Malavaram Vested Forest, VFC Item No. 18 Pothoppadam Vested Forest, Northern Boundary of VFC Item No.19 Karappadam Vested Forest and Southern Boundary of VFC Item No.1 Thathengalam Malavaram Vested Forest till it crosses Mannarkkad-Anakkatty Road at Manthenpotty and from there the boundary runs towards east along the Southern boundary of Agali Range, till it meets the Tri-Junction of Kallamala, Palakkayam and Sholayur Village Boundary.

East: Starting from the point of northern boundary it runs towards south along the western and southern boundaries of Sholayur Village till it reaches the interstate boundary where the Taluk boundaries of Palakkad Taluk and Mannarkkad Taluk intersect and from there the boundary runs towards south along the Western boundary of Karimba II Village till it joins the point where boundaries of Palakkad and Mannarkkad Taluks meet.

South: Starting from the above point it runs towards west along the Taluk Boundaries of Palakkad Taluk and Mannarkkad Taluk till it reaches tri-junction of Palakkad, Mannarkkad and Perinthalmanna Taluk at south eastern boundary of Malappuram District.

West: From the above point it runs towards north along the Palakkad-Malappuram Districts boundaries till it ends at the starting point of south west boundary of Silent Valley National Park.

Boundary description of Forest Stations in Mannarkkad Range:

Palakkayam Forest Station: Headquarters: Palakkayam

North: Starting from the point where Nellipuzha crosses the southern boundary of Kallamala village, the boundary runs towards south east along the common boundary of Palakkayam and Kallamala Village till it touches the western boundary of Sholayur village and from there it runs along the common boundary of Palakkayam and Sholayur village till it touches the inter-state boundary of Tamil Nadu & Kerala.

East & South: From the above point it runs towards south along the inter-state boundary of Tamil Nadu & Kerala till it touches the Palakkad Taluk Boundary and then it runs towards west and then towards south along the common boundary of Mannarkkad and Palakkad Taluk till it touches the Palakkad-Mannarkkad road near Kalladikode.

West: From the above point, the boundary runs towards north-west direction along Palakkad-Mannarkkad road till it crosses Nellipuzha at Mannarkkad.

Mannarkkad Forest Station: Headquarters: Anamooly

North: Starting from the point where the Kunthipuzha crosses the southern boundary of the Silent Valley National Park, and the South West Corner of VFC Item No.1, Thathengalam Vested Forest it runs towards east of along the southern boundary of Silent Valley National Park till it reaches the North-West corner of the Kallamala Village and then towards south along the common boundary of Mannarkkad I and Kallamala village and then along the southern boundary of Kallamala village, till it crosses the Nellipuzha River at Manthampotti.

East: Starting from the end point of the northern boundary t runs towards South through the Nellipuzha River till it crosses NH 213 at Nellipuzha bridge near Mannarkkad and runs East along the NH 213 till it ends at boundaries of Palakkad and Mannarkkad Taluks near Kalladikkode and west till it crosses the Mannarkkad-Palakkad road and then along with Mannarkkad – Palakkad road till it crosses the Mannarkkad Taluk boundary near Kalladikode.

South: From the above point it runs west along the common boundary of Mannarkkad and Palakkad Taluks till it reaches the end point where Kunthi Puzha crosses Palakkad Taluk boundary

West: From the above point it runs North through the Kunthi Puzha till it ends at the Southern boundary of Silent Valley National Park.

Thiruvizhamkunnu Forest Station: Headquarters: Thiruvizhamkunnu

North: From the intersecting point of Southern boundary of Silent Valley National Park and North-West boundary of Mannarkkad Forest Division at the GPS Location N11 05 45.7 E76 21 39.5 and runs through the common boundary in eastern direction of Mannarkkad Division and Silent Valley National Park till it ends at the southern boundary of Silent Valley National Park where Kunthi Puzha crosses.

East: From the Southern boundary of Silent Valley National Park where the Kunthipuzha crosses it runs south along the Kunthipuzha till it reaches the end of intersection of Palakkad and Mannarkkad Taluks.

South: Starting from the above point it runs towards west along the Taluk Boundaries of Palakkad Taluk and Mannarkkad Taluk till it reaches tri-junction of Palakkad, Mannarkkad and Perinthalmanna Taluks at south eastern boundary of Malappuram District.

West: From the above point it runs towards North along the Palakkad Malappuram Districts boundaries till it ends at the starting point of South West boundary of Silent Valley National Park.

1.5.2. Agali Range: Headquarters: Kalkkandy

North: Starting from the point where Manthenpotty thodu crosses Mannarkkad - Anakatty Road, the boundary runs in the north-east direction along the Mannarkkad - Anakatty road till it reaches the interstate boundary at Anakatty.

East: From the above point where Mannarkkad - Anakatty road meet the interstate boundary at Anakatty, the boundary runs towards south along the interstate boundary of Kerala and Tamilnadu via Kodungarai Pallam ends at where Palakkad Taluk Boundary meet near Karimala. Till the southern boundary of Sholayur village meets the interstate boundary.

South and West: Starting from the above point, the southern boundary runs towards North West direction along the common boundaries of Palakkayam and Sholayur Villages end at trijunction of Kallamala, Sholayur and Palakkayam Villages thence continues towards North-Western direction till it reaches Mannarkkad - Anakatty road at Manthenpotty.

Boundary description of Forest Station in Agali Range:

Ommala Forest Station: Headquarters: Ommala

North: Starting from the point where the southern boundary of Kallamala village crosses the Mannarkkad - Anakatty road at Manthenpotty the northern boundary runs along the road till it reaches the starting point of Goolikadavu - Chittur road at Goolikadavu.

East: From the above point, it runs towards south of the Goolikadavu - Chittur road till it reaches at Chittur, then boundary runs towards south along the left bank of Siruvani River till it touches the Northern Boundary of Attappady Block VI RF.

South and West: From the above point, the southern boundary runs straight towards west along the northern boundary of Attappady Block VI RF meet at the common boundary of Kallamala Village and Palakkayam Village and continues towards west till it reaches Mannarkkad Range boundary at Panthanthodu.

Sholayur Forest Station: Headquarters: Sholayur

North: Starting from Goolikadavu, the boundary runs eastern direction along the Mannarkkad - Anakkatty road till it reaches the interstate boundary at Anakatty.

East: From the above point, where the Mannarkkad - Anakatty road meet the interstate boundary at Anakatty, the boundary runs towards south along the interstate boundary of Kerala and Tamilnadu till it ends at the north east corner of Attappady Block VI RF.

South: Starting from the above point the boundary runs western direction along the northern boundary of Attappady Block VI RF till it reaches at the point where the Siruvani River crosses.

West: From the above point it runs north through the Siruvani River reach at Chittur and from there it runs northern direction along the Chittur Goolikkadavu road till ends at Goolikkadavu in Mannarkkad Anakkatty road.

Sinkampara Forest Station: Headquarters: Siruvani

North: The northern boundary of Attappady Block VI RF starts from the common boundary of Kallamala Village and Palakkayam Village and runs east till it reaches at Interstate boundary of Kerala and Tamil Nadu at Karimala

East: The eastern boundary of Attappady Block VI RF starts from above point, it runs south along the interstate boundary of Kerala and Tami Nadu till it crosses Palakkad Taluk boundary.

South and West: The west and south boundary of Attappady Block VI RF starts from the above point it runs in north-western direction along the boundary of RF and Eastern boundary of Palakkayam Village till it reaches the north west corner of RF meets at the common boundary of Kallamala and Palakkayam Villages.

1.5.3. Attappady Range: Headquarters- Mukkali

North: Starting from the tri-junction of interstate boundaries of Coimbatore, Nilgiri and Palakkad districts, it runs towards north-west direction along the inter-state boundary of Kerala and Tamilnadu via Kinnakarai, Srinivasa Malai (2192 m), Tundukkal malai (2268 m) till it crosses the Bhavani River.

West: Starting from the point where the inter-state boundary crosses Bhavani River and runs South along the right bank of Bhavani River till the point where river takes a eastward turn at Mukkali, then runs towards South up to the point where Manthenpotty thodu crosses Mannarkkad - Anakatty road.

South: Starting from the point where Manthenpotty thodu crosses Mannarkkad - Anakatty Road, the boundary runs in the north-east direction along the Mannarkkad - Anakatty road up to the end point of Kerala Tamil Nadu interstate boundary at Anakkatty.

East: The boundary starts from the above point it runs north in direction through the interstate boundary of Kerala Tamil Nadu along the river till it ends the tri-junction of Palakkad, Coimbatore and Nilgiri Districts.

Boundary description of Forest Station in Attapady Range:

Mukkali Forest Station: Headquarters: Mukkali

North: It starts from the Northern Interstate boundary of Mannarkkad Taluk where the Bhavani River crosses Kerala Tamil Nadu interstate boundary and runs east along the Kerala Tamil Nadu interstate boundary till it end at the north west boundary of Attappady Block V RF and north west boundary of VFC Item No.27, Aralikonam Vested Forest.

East: From the above point, the boundary runs towards south along the common boundary of the Attappady Block V Reserve Forest and VFC Item No. 27 Aralikkonam Vested Forest till it reaches Chenthamala and from there the boundary runs along Dhayam Stream till it crosses the Bommiyampadi-Thavalam road to Thekkuvatta and thence along the road towards south till it reaches Thavalam in Mannarkkad – Anakkatty road.

South: From the above point, the boundary runs towards west along Anakkatty -Mannarkkad road till it reaches Mukkali.

West: It starts from the Mukkali and runs north in Chindakki-Mukkali road till the Bhavani River turning perpendicularly towards east and thence it runs through the Bhavani River ends at the Starting of Bhavani in Kerala State.

Pudur Forest Station: Headquarters: Pudur

North: From the northern point where Attappady Block V RF and VFC Item No.27, Aralikonam Vested Forest joints it runs east along the interstate Boundary of Kerala and Tamil Nadu till it reaches the north-east boundary of Kerala State at the Tri-junction of Nilgiri, Coimbatore and Palakkad Districts.

East: From this point it runs south along the common boundary of Coinbatore Palkkad District boundary to reach at Mannarkkad – Anakkatty road which crosses the interstate boundary.

South: From the above point the boundary runs towards west along Anakatty -Mannarkkad road till it reaches Thavalam.

West: From Thavalam it runs north along the road Thavalam Mulli road ends near Thekkuvatta and runs along common boundary of Attappady Block V Reserve Forest and VFC Item No. 27 Aralikkonam Vested Forest.

1.6. Configuration of Ground:

Altitude: The altitude varies from 75 m to 2,237 m above MSL. The highest peak is Malladmala in Aralikkonam Block.

Topography: It is rugged and descending in a southwesterly direction.

Aspect: Owing to the undulating nature of the terrain all aspects are met with.

1.7. Drainage and Rivers:

Thathengalam:

Altitude varies from 200 m at Anamooli to 1,461 m at Poochamala. The prominent peaks are Varakkallu 808 m, Vasanapara 1,127 m and Madamudi 1,164 m. The rest of the area comprises of salient and re-entrants connecting the above peaks and the adjacent plains of Mannarkkad. The entire block forms the catchment of Kunthipuzha and its main tributaries viz. Nellipuzha, Ariyoorthodu and Palakkazhi puzha Outcrops of rocks strewn with large boulders are common in this block. Tree growth is confined to the re-entrants along the streamlets. This block is having southern aspect.

Karimala Mundanad*:*

Altitude varies from 152 m to 2,060 m. The prominent peaks are Chinnappara (1,039m), Puthiyamukham mala (1,693 m), Ayyappanmudi (1,922 m), Elivalmala (2,028 m), Anaimudi (1,179 m) and Periya Kunjiramala (1,998 m). Mundanad block forms the catchment of Kanjirapuzha. The block forms the face of hill range from Annanamudi to Periya Kunjiramala sloping mainly westwards to the plains. General slope is south- westerly.

Kallamala:

The elevation varies from 500 m to 570 m at Kallamala. All conceivable aspects are met with.

Aralikkonam Kinnakkara:

Altitude varies from 450 m on the riverbank between Elachivazhi and Indappatty to 2,237 m at Malladmala. The prominent peaks other than Malladmala are Taikkri 1,554 m, Thekkupanna 1,605 m, a peak near east Varahappalam dam 2,192 m, Oskallumala 1,139 m, Vellingiri mala 1,618 m, Kakkabettu 1,930 m etc. The block forms the catchment of Kundah River in the east and Bhavani River in the southeast. The general aspect is southern.

Thoova Block:

The general altitude varies from 600 m to 941 m. The general slope is northeast. A few tributary of Kodungarapallam take its origin from these forests. They are seasonal. The general aspect is northeast.

Panakkadan RF:

The terrain over the reserve forests exhibit a range of altitude and diversity in general configuration, Panakkadan and its addition Kottanikunnu forms an isolated small block of forests in the foot hills of Western Ghats in Thiruvizhamkunnu valley and about 10 km away in the south-western corner of the Silent Valley reserve. There is a small ridge running from south to north with elevation varying from 305 m to 455 m at Poramthalai peak, which is the highest point in the reserve. The land drains partly towards the east and partly towards the Malariyanthodu in the west and both the streams join Bharathapuzha. The lower areas of Panakkadan reserve in the western fringe are at an elevation of 75 m above MSL.

Attappady Reserve Block I to V:

The Ghat Forests of this Division lie in varying elevations between 455 m and 2,285 m above MSL. These 5 blocks are lying contiguous to one another and hence dealt with as a single unit for describing the configuration of the ground. An extent of 5925 ha has been demarcated from Attapady Block I to form the buffer area of Silent Valley National Park. The eastern side of Silent Valley and western side of these blocks have a common boundary. The Bhavani River flows almost southward along the middle of these blocks and parallel to Kunthipuzha River. Either banks of this river are hilly, supporting Forests with grasslands and unclothed rocks. The river takes a sharp turn eastwards at the southwest corner of Attappady Block V, where Panthenthodu joins Bhavani and flows to Coimbatore District joining Cauvery. The lowest point is 533 m from where Bhavani leaves the RF. The hills rapidly rise northwards going over 2,225 m on the Nilgiri border. To the east of Bhavani in Attappady Blocks IV and V, the ridges rise precipitously from the river and culminate in an unclothed needle shaped rocky mass, the highest point of which is 1,664 m called Malleswaram Malai, a place of worship of hill tribes from time immemorial. Eastern half of block V on the south and block II completely slope towards the east and drain their waters into Mailanthodu, Yaragur, Kudribakadvu pallam nallahs, which in turn drain their waters to Bhavani. This portion supports poor type of sholas with grasslands and some deciduous teak forests.

Attappady Block VI:

This is an isolated block generally undulating with hills and valleys well clothed with vegetation except for the large grassy area around Muthikulam to the south east and the mass of high hills to the south viz. Elival Range. It is a plateau with elevation varying from 610 m at the exit of Siruvani to 2,065 m, the highest peak northwest of Elival malai. This area forms almost a basin surrounded by the hills forming the outer boundaries of the reserve. The important hills starting from the north are Pulimalai 946 m, then towards the west Periyamandamudi 1,007 m, Amanthamudi 1,173 m, then Chinnappara malai 947m, Patiyamukkam malai 1,692 m, the Eleval malai 2,027 m at the south and Periyakunjirammudi 1,798 m, Parithi malai 975 m, Vellengirimudi 1,183 m, a place famous for Vellengiri temple and ending at Thambimudi 1,523 m in the north east corner. The slope is inward since the area is surrounded by the above hills. The river Siruvani, a tributary to Bhavani originates from these hills and flows northwards to Tamilnadu.

1.8. Geology Rock and Soil:

Soil survey organization, Kerala prepared a report on the soils of Vested Forests of Palakkad District. Relevant portions of this report are quoted below. The soil survey conducted in the following series has relevance to the areas dealt within this Plan.

Table - 2 - Soils of Mannarkkad Division

Series	Village	Status of land
1. Anakatty	Sholayur	Forest land
2. Kottamala	Agali	Forest land
3. Karuvara Chindakki	Agali	Forest land

Anakatty Series:

Anakatty series form deep to very deep and yellowish red to reddish brown loamy soils derived from gneissic parent material. These soils have a compact gravelly texture in the second layer, while in the third layer few gravels are seen. These soils are found in sloppy areas.

Characteristics of the Series: The texture of the surface layer varies from silty clay loam to clay loam while the colour ranges between yellowish red to reddish, hue 5/yr, value 4 to 5 and chroma 4 to 6. The texture of the B-horizon is usually gravelly clay loam to gravelly silty clay loam. The colour is reddish brown to dark reddish brown, hue 5/yr, value 3 to 4 and chroma 4.

Drainage and permeability: Moderate to low drainage with moderate permeability.

Kottamala Series:

This series consist of very deep, moderately fine textured loamy soils having reddish brown to dark reddish brown surface soil and clay loam to silty clay loam texture. The clay content increases with depth. Sand pockets are seen in the profile in most cases. The soils are developed over alluvium eroded from adjoining hill slopes. They occur in the low- lying regions of Attappady Valley.

Characteristics of the series: The texture of surface soil varies from clay loam to silty clay loam and the colour ranges from reddish brown to dark reddish brown, hue 5 yr, value 3 and chroma 4. The texture of B-horizon is usually silty clay loam ranging from clay loam to silty clay. Colour varies from dark reddish brown to yellowish, hue 5 yr, value 3 to 4 and chroma 3 to 8.

Drainage and Permeability: Moderately well drained with moderate permeability.

1.9. Mineral Resources:

Cankar: Small capping of grayish white cankar intimately admixed with soil noticed in the area between Kottathara and Gopinari in Attappady Valley. Local people use these in limekiln.

Iron Ore: Several magnetic quartzite fans containing less than 15% of magnetite have been mapped in the district. Bands ranging from 300 m to 10 km in strike length are seen north-east of Golachimala to Anakkallur in Aralikkonam Forests, Siruvani Estate to Mannarkkad covering Kallamala, Mukkali-venga, Urulankunnu, Thathengalam and Karimala in Mundanad Forests.

Gold: Sands of Siruvani River and its tributaries flowing along Attappady Valley near Agali and Kanjirapuzha near Palakkayam are sifted by local people for alluvial gold since ancient times.

Beryl: The pegmatite carrying green colored Beryl is seen one Km southwest of Vattalakki in Attappady valley.

Mica: Pegmatite veins between Agali and Kulukkur in Attappady valley carry thin blocks of muscovite Mica having a size of 0.25 cm to 0.5 cm across.

1.10. Ground Water:

The water table is at an average depth of 5 to 10 m in the plains. Geological survey of India carried out structural mapping in the district for studies on ground water potential. Shear zones, tending in NNE-SSE and NW-SE directions were delineated. Continuity of some of shear zones indicated possibility of their potentiality for ground water development. Resistivity traversing

and seismic refraction surroundings were carried out in the plains of Palakkad for exploration of ground water. A few low resistivity zones were traced. The depth of compact rock is found to be shallow.

1.10.1. Physical Features:

Relief: A relief analysis showed that Attappady area is dominated by medium elevation zones (60.6%). The low elevation part extends from the opening of the hills from Mannarkkad on the western side and through the river valleys of Bhavani and Siruvani towards the east. The high elevation areas are in the northern portion that is Nilgiri slopes and the Southern portion in the Siruvani hills.

Slopes: A study conducted by KFRI showed that the dominant slope category is medium covering an area of 523 km^2. Areas with steep slopes are few and are located mainly on the northern boundary of the region, which represent the southern face of the Nilgiri Range. Further, areas with steep slopes are met in the Southern Sector covering Siruvani hills. The valley located in the central portion has areas with undulating terrain.

Climate: In Mannarkkad Division, Attappady area is considered to be one among the driest parts of the Kerala Western Ghats. The Western part is humid and humidity decreases as one traverse from west to east. Rainfall varies from > 3000 mm in the Western half to > 900 mm in the eastern boundary. The hills on the western side are higher and steeper and the dryness in the eastern half has been attributed to the rain shadow effect of the mountains.

Attappady is of the two extensive east sloping plateaus on the Western Ghats of Kerala. It is situated north of the Palakkad gap and at the south western base of the Nilgiris. The watershed line of the Western Ghats forms the western boundary of Attappady. Descending from an elevation of 2300 m along the South Western corner of the Nilgiris, this line runs due south to an elevation of 550 m at Mukkali and later climbs to a height of 200 m at Muthikulam. The northern side of Attappady is demarcated by the Southern face of the Nilgiri. The southern and south or eastern boundaries are at a height of 150 m extending from Muthikulam. The eastern part is undulating to flat and merges with the plains of Coimbatore.

The average atmospheric temperature is always above 17^oC. March-May is the hottest period. From November to December, a cool dry winter is experienced. The eastern sector of Attappady is the low rainfall zone. This area receives the bulk of rainfall from the north-east monsoon. The biotype is dry deciduous forest with frequent individual trees of the moist

deciduous type. At present, the area has been thoroughly degraded and is dominated by pioneer euphorbiaceous scrub jungles. The dry season extends from 6 to 9 months and the annual rainfall is < 800 mm.

1.11. Winds:

Prevailing winds are from the west and southwest during April, September and from north and northeast from October to March. From November to March, strong east winds blowing from early morning till past noon cause drying of forest areas resulting in rapid spread of forest fires.

1.12. Rainfall:

The tract dealt with receives both south-west and north-east monsoon. The major precipitation is by southwest monsoon in almost all the areas with the exception of Aralikkonam, Kinnakkara and Thoova, which are in the rain shadow where the main source of rain is from northeast monsoon, the aspect being easterly. Based on the intensity of rainfall, this tract is divided into two zones.

1.12.1. Area receiving fairly heavy rainfall (>2000 mm):

The areas situated on the windward side of Attappady receive more than 2000 mm of rainfall annually.

1.12.2. Areas receiving poor rainfall:

The areas lying on the eastern slope of the Western Ghat (895 to 1,400 mm) are in rain shadow. Highest rainfall is received in the northern portion of Karappadam and Pothuppadam near Neelikkal of Silent Valley reserve where the average rainfall is around 5,000 mm. The lowest recorded rainfall at Pudur near Aralikkonam is 895 mm per annum.

1.13. Temperature:

Temperature varies widely between the plains and hills. The temperature in the plains fluctuates between 21ºC and 40ºC and in hills it varies from 10ºC to 32ºC.

1.14. Distribution of Area:

The total area of Forests under this Division consisting of both VF and RF is 53,907 ha Panakkadan Bit I and Bit II, Attappady Block I, II, III, IV, V and VI are the RF falling within the division. 546 ha of VF have been leased out to PCK Ltd for cashew planting in Mannarkkad Range at Anamooly. The details of the RF in the Division are furnished below.

Table - 3 - Legal Status of the land under Mannarkkad Division

Sl. No	Range	RF (ha)	VF (ha)	Leased from RF (ha)	EFL (ha)
1	Mannarkkad	610.13	11788.67	513.03	394.08
2	Attappady	8077.14	8865.95	-	80.08
3	Agali	6385.95	6515.07	-	245.88
Total		**15073.22**	**27169.69**	**513.03**	**720.04**

Table - 4 - Reserve Forest in Mannarkkad Division

Sl. No	Reserve	Area (ha)	Date of Reservation	Particulars of Notification	Remarks
1	Attappady Block I	1585.97	1.9.1900	No. 332 of 13.7.1900 on page 1085 of the gazette dt. 17.7.1900	An extent of 10,709 ha has been notified as Buffer Zone to Silent Valley National Park.
2	Attappady Block II,III & IV	1165.50	1.9.1900	"	-
3	Panakkadan	447.58	15.10.1906	No. 338 of 27.7.1906 on page 831 of the gazette dt. 7.8.1906	-
4	Attappady Block V	5325.67	1.9.1912	No. 314 of 22.6.1912 on page 696 of Part I of Gazette dt. 9.12.1912.	Acquired under L.A. Act for Rs. 11379.4
5	Attappady Block VI	6385.95	1.9.1912	No. 314 of 22.6.1912 on page 696 of Part I of Gazette dt. 9.12.1912.	Acquired under L.A. Act for Rs. 91571.12
6	Panakkadan Addition I	50.91	1.4.1916	No. 161 of 11.2.1918 approved in GO No. 568/ Revenue, dt. 11.2.1918	-
7	Panakkadan (Kanjiramkunnu and Mulakuvalla)	111.64	30.6.1975	GO (MS) 404/72 Agri. dt 28.11.72 and Go (MS) 204/75 AD Agri. dt. 30.6.75	-
Total		**15073.22**			

Besides the above-mentioned Reserve Forests, the division is having 27175.77 of Vested Forests distributed as 11791.11 ha, 6515.07 ha and 8869.59 ha, in Mannarkkad, Agali and Attappady Ranges respectively. The vested forest areas are the private forests vested with Government by virtue of Kerala Private Forest (Vesting and Assignment) Act, 1971. Ten OA cases, fifteen EFL-OA cases, six SLP cases, and ten MFA/RP are pending in Mannarkkad Division before the Forest Tribunal, Hon'ble Supreme Court and Hon'ble High Court of Kerala.

1.15. Division of Ranges into Stations:

The three Ranges are again divided into Forest Stations headed by Deputy Rangers. There are 3 Stations each in Agali and Mannarkkad and 2 in Attappady Range.

Table - 5 - Forest Stations and Headquarters

Sl. No.	Range	Forest Station	Headquarters
I	Mannarkkad	Palakkayam Thiruvizhamkunnu Mannarkkad	Kanjirapuzha Kacheripady Anamooly
II	Attappady	Mukkali Pudur	Mukkali Pudur
III	Agali	Sholayur Ommala Singappara	Sholayur Ommala Singappara

The Reserve Forests and Vested Forests dealt with are absolute property of the Government.

Table - 6 - Forest Areas leased out in the Division

Sl No	Type of Forest	Extent (ha)	Date of Lease	Government Order	Agency's Name & Purpose
1	Vested Forests	545.85 (32.82 ha resumed)	1.7.1981	GO (RT) 120/82 AD. Dt. 26.6.1982	Plantation Corporation of Kerala Ltd for Planting Cashew.
2	Vested Forests	1.295 ha	8.1.1997	GO(RT) No.12/97 F&WLD Dt. 08-01-1997 of Govt. of Kerala, F(c) A/11-2KER/61/TL dated 17-12-1996 of CCF Central	Laying 220 KV electric line from Panjal to Aruvacode
3	Vested Forests	1.15 ha	23-6-2009	GO(RT) No.202/09/F&WLD dt.25.4.2009	Palakkad District: Panchayat for construction of Meenvallam Mini Hydro Electric Project

1.16. Siruvani Dam:

Irrigation Department has lodged a claim of 370 ha of forest land, said to have been leased to them for construction of Siruvani Dam. But there is no lease agreement available either with them or with the Forest Department. The area falls in Attappady Block VI Reserve Forests (Muthikulam) of Singapara Forest Station in Agali Range.

1.17. Encroachment and joint verification:

The joint verification by Forest and Revenue officials revealed that 80 plots (34.39 ha) were encroachments prior to 01. 01.1977 and 1736 plots (557.9752 ha) after 01. 01. 1977. The encroachers included in the joint verification who occupied lands after 01. 01. 1977 are not evicted so far.

1.18. Boundary Consolidation:

The details of boundary consolidation are given in Part Two.

1.19. Rights and Concessions:

All the reserves are the absolute property of the state and none is encumbered with any rights of importance. Attappady Block I to VI are entirely free from all rights. In Panakkadan RF and its additions the following rights are allowed.

Public right of way admitted through the reserve, comprising of a path 9.1 m wide, open to men and cattle. Starting from the north west corner of the addition No (1) the path runs along its northern boundary to its northeast corner; then the path runs southwest through the addition for about 100 m till it meets the rock on the eastern boundary of the addition; then it runs along the eastern boundary crossing a thodu to the southern corner of the addition.

The following public right of way admitted through the reserve. (Kottanikunnu Reserve - Panakkadan Addition No. II) They are open to the public and cattle under control.

i. A path, of uniform width 9.1 link beginning at the tri-junction stone of survey No. 147, 150 and 167 and running around the edge of the reserve back to tri-junction stone.

ii. A path, of uniform width 9.1 m, from the northern tip of survey No. 166 to water channel beginning some 100m north of the tip and thence along the line of this channel to the southern extremity of survey No. 168.

The existing water channel running from the reserve to the adjoining lands and the channel, which feed it, shall not be disturbed.

1.20. Tribal Settlements:

There are 23 Tribal settlements in the reserve forests and 11 Tribal Settlements in the Vested Forests of this division as detailed below. The 'Record of Rights' to the tribes of the first eleven settlements in the aforesaid list was given on 9.10.1997. The tribes of Kurukkathikallu and Gottiyarkandi settlements objected to the measurements of the land in their possession, as they were protesting against the issuance of 'Record of Rights'. Hence details of the above two settlements could not be recorded. Tribes in these two settlements are demanding issue of Pattayams for the land in their possession in place of 'Record of Rights'.

CHAPTER – II (A)

FLORA

Kerala has a total recorded forest cover of 11,125.59 Km^2, which is 28.90 percent of the total land area of the state. This is greater than the national coverage of 19.50 percent. Forest cover of Kerala is largely spread over the Western Ghats which border the State. The 11,125.59 Km^2 of forest cover includes 9157.10 Km^2 Reserve Forests, 214.31 Km^2 proposed reserve and 1754.18 Km^2 vested forest. Of the recorded forest area, the effective (actual) forest area in Kerala is only 9400 Km^2.

Kerala boasts of 4600 flowering plants, of which 1272 are endemic and 159 species have been classified under different threat categories (Sasidharan, 2008). About three fourth of the flowering plants constitute a potential resource base with actual or potential value. It is estimated that 1000 species can be used as ornamental plants, besides there are 900 medicinal plants, 450 wild edibles, 175 gums, resins and dyes, 165 timber or wood, 150 spices, 14 bamboo and reeds and 11 canes(*Pushpangadan,* 1997).

Forests of Kerala are broadly classified into 5 major categories. They are Tropical Wet Evergreen Forest (3.48 lakh ha, Tropical Moist Deciduous Forests (4.1 lakh ha), Tropical Dry Deciduous Forests (0.094 lakh ha), Montane Sub-Tropical Forests (0.188 lakh ha) and Plantations (1.56 lakh ha).

2.1. Western Ghats:

The Western Ghats also known as the Sahyadri Mountains is a mountain range along the western side of India. It runs north to south along the western edge of the Deccan Plateau and separates the Plateau from narrow coastal plain along the Arabian Sea. The range starts near the border of Gujarat and Maharasthra, south of the river Tapti and runs approximately 1600 Km through the states of Maharashtra, Goa, Karnataka, Tamilnadu and Kerala ending at Kanyakumari at the southern tip of India. About sixty percent of Western Ghats are located in the state of Karnataka.

These hills cover 60000 Km^2 and form the catchment area for a complex of river systems that drain almost 40 percent of India. The average elevation is around 1200 meters. The Western Ghats is recognized as one of the major Biodiversity hotspots in the world. These forests harbour more than 4000 species of flowering plants and among them about 1500 are endemic.

2.2. Composition and Condition of Crop:

The geographical area of the Division is 422.4291 km^2 of RF and VF area. It also has an additional area of 720.04 ha of EFL notified area under the administrative control. The tract dealt with in this Working Plan has a large heterogeneity in the environmental conditions. The complexity of physical features with corresponding variation in the Macro and Micro climatic conditions are expressed by a variety of plant formations. The composition of trees met with in the tract is different in different types of Forests, the details of which are furnished under Para given below. Trees of all age classes are met within the tract. The health and quality of the dominant trees are generally good, especially in the evergreen and semi-evergreen regions.

Based on the revised systems of classifications of the Forests of India by H.F. Champion and S.K. Seth (1963), following are the Forest types occurring in the Division.

i. West Coast Tropical Evergreen Forests (1A/C4)
ii. West Coast Semi evergreen Forests (2A/C2)
iii. Southern-Moist Mixed Deciduous Forest (3B/C2)
iv. Southern Tropical Dry Deciduous Forests (5A/C6)
v. Southern Montane wet Temperate Forest (II A/C1)
vi. Southern Euphorbic Scrub (6A/G2/Ds2)

2.2.1. West Coast Tropical Evergreen Forests (1A/C4):

West coast tropical evergreen forest is in its optimum form of development between 750 to 1100 m elevation, but under favorable conditions of aspect and humidity descends down to 600 m and below and gradually merges into Semi evergreen Forests. It occurs mostly in areas with over 2000 mm rainfall and a short dry period of three months or less. These Forests have more rainfall than in plains due to the relief against monsoon winds, reduction in the length of the dry season due to convection currents and night condensation almost throughout the year.

Floristic composition of this ecosystem is very much complex and the common characteristic species only have been listed. The dominant stratum invariably consists of species like *Mesua ferrea, Cullenia exarillata, Palaquium ellipticum, Vateria indica, Elaeocarpus tuberculatus, Artocarpus heterophyllus, Holigarna arnottiana, Persea macrantha, Calophyllum apetalum, Drypetes alata, Dipterocarpus indicus* and *Hopea glabra.* The lower strata were occupied mainly by *Euphoria longana, Olea dioica, Chrysophyllum roxburghii, Aglaia anamallayana, Gomphandra tetrandra, Hydnocarpus alpine, Polyalthia coffeoides,* and *Garcinia morella.*

These forests occupy humid areas and are found on hills and valleys between 300 and 1100 m elevation existing in Attappady Block I to V of Attappady Range and Attappady Block VI of Agali Range, covering an area of more than 10,000 ha Muthikulam natural forest is a typical west coast evergreen forest which is located at the Southern end of Attappady. Floristic analysis of this natural forest indicated the occurrence of a total of 42 trees species belonging to 25 families. *Euphorbiaceae* represented the maximum genera of 6 species; it is evident from the structural analysis that this forest is very dense as indicated by high-density values. Importance value recorded maximum for *Cullenia exarillata*, which is the most dominant species of this evergreen community. *Vateria macrocarpa* is a rare and endemic species, which is naturally present only in the Muthikulam forest in the whole world. It is an evergreen forest in which stratification showed 25 tree species arranged in four strata. The height ranged between 5 to 35 m.

Floristics:

The top canopy consists of *Cullenia exarillata, Calophyllum polyanthum, Toona ciliata, Canarium strictum, Hopea parviflora, Dysoxylum malabaricum, Dipterocarpus indicus, Mesua ferrea, Palaquium ellipticum, Bischofia javanica, Vateria indica, Dipterocarpus bourdillonii, Persea macrantha, Poeciloneuron indicum*.

Middle canopy consists of *Schleichera oleosa, Cinnamomum malabaricum, Myristica malabarica, Elaeocarpus serratus, Hydnocarpus pentandra Euodia lunu-ankenda, Holigarna arnottiana, Syzygium cumini, Garcinia gummi-gutta, Macaranga peltata, Mallotus philippensis, Ochlandra beddomei*, and Calamus species.

Herbs and shrubs: This flora consists of *Strobilanthes sp. Clerodendron viscosum, Olea dioica,* and *Glycosmis pentaphylla*.

2.2.2. West Coast Semi Evergreen Forests (2A/C2):

This forest is essentially a transitional forest, from the Wet Evergreen to Moist Deciduous and normally occurs between 400 to 900 m elevation. It is also a fairly dense forest but the characteristic tier formation is absent and the top canopy is uneven being a mixture of evergreen and deciduous species. It is often seen along the margin of the wet evergreen forest as eco-tones. Cauliflory is not common. Epiphytes and orchids are frequent. Liannas are more abundant.

These forests are originally evergreen forests but were disturbed by fire and human interference and are found in Attappady Block I & Block VI. These Forests are seen in Thudukki, Chindakki, Ummanarimala, Mukkali Venga Malavaram near Panthenthodu, Manthempotti of this Division within an elevation ranging from 250 m and 600 m above MSL.

The principal deciduous species identified from this forest were belonging to *Terminalia Paniculata, Lagerstroemia microcarpa, Chukrasia tabularis, Radermachera xylocarpa, Pterocarpus marsupium, Adina Cordifolia, Xylia xylocarpa, Bombax malabaricum and Vitex altissima.* The common evergreen species are *Mesua ferrea, Hopea glabra, Mangifera indica, Calophyllum apetalum, Euodia lulu-ankenda, Bischofia javanica and Hopea parviflora.*

Floristics:

The top canopy consists of *Dipterocarpus indicus, Bombax ceiba, Polyalthia fragrans, Terminalia bellerica, Ficus species, Stereospermum chelonoides, Tetrameles nudiflora, Alstonia scholaris, Lagerstroemia microcarpa, Spondias pinnata, Albizzia odoratissima, Vitex altissima, and Dysoxylum ficiforme.*

Middle canopy consists of *Mallotus phillippensis, Bauhinia malabarica, Miliusa tomentosa, Bridelia crenulata, Hydnocarpus pentandra, and Wrightia tinctoria.*

Herbs, shrubs and climbers consist of *Acacia intsia, Olea dioica, Dioscorea* species and *Calamus* species.

2.2.3. Southern Moist Mixed Deciduous Forest (3B/C2):

It is a fairly dense forest with trees attaining a height of about 20-30 m and most of the species are deciduous in the dominant and sub-dominant strata. The Forests are leafless during dry season. Number of species is low and the trees have a cylindrical bole, with a thick and fissured bark coming out in flakes. Buttresses are rare. The undergrowth is made up of many small evergreen shrubs. *Lianas quite* prevalent and are frequently represented by *Butea parviflora, Gnetum ula, Spatholobus roxburghii, Entada scandens* and a few others.

This type is seen in Attappady Valley, Kottanikunnu and Panakkadan Reserve Forests and below Evergreen Forests and in Vested Forests of Thathengalam, Paruthimala, Murukkanpara, Vettilachola, Kelaloor, Pothopadam and Karapadam. It also occurs in Aralikkonam Block on both banks of east varahapallam and west Varcha Pallam Rivers.

Floristics:

The component species are *Dillenia pentagyna, Xylia xylocarpa, Dalbergia latifolia, Syzygium cumini, Tectona grandis, Lagerstroemia microcarpa, Grewia tiliaefolia, Terminalia paniculata, Anogeissus latifolia, Bridelia crenulata, Albizzia lebbeck, Haldina cordifolia, Strychnos nux-vomica, Bamboosa bamboo, Ochlandra rheedii, Ochlandra travancorica* etc.

2.2.4. Southern Moist Deciduous Forest:

It occurs on poor soil with rocky outcrops and in steep slopes along the banks of Bhavani River. It occurs in area where rainfall is around 2000 m. Due to shifting cultivation and consequent extensive damage, it is reduced to a secondary stage. The remnant of the original composition of the forest is some large teak and rosewood trees, coppice growth of these species.

Predominant arborescent species identified from this forest are Lagerstroemia lanceolata, Dalbergia latifolia, *Spondias pinnata, Tectona grandis, Xylia xylocarpa, Kydia calycina, Emblica officinalis,* and Terminalia Spp. The shrubby stratum is made up of *Glycosmis cochinchinensis, Solanum torvum, Clerodendrum infortunatum, Leea indica* and pouzolzia spp. Bamboos are sometimes present in pure patches. Lianas and Cycas are commonly present.

2.2.5. Southern Tropical Dry deciduous Forest (5A/C6):

This Forest occurs in low elevations i.e. 300-600 m. The rainfall in this area ranges from 1000 to 1500 mm and the dry season lasts for about six months. It is an open forest of about 15 to 20 m height and the dominant trees are *Tectona grandis*, *Anogeissus latifolia*, and *Albizia amara*. The lower canopy is also deciduous and during February to May, the entire vegetation is devoid of foliage. The bark of most of the species is thick, dark and fissured. Thorny and *Microphyllous lianas* are frequent.

The topmost storey was made up of *Sapindus emarginatus, Albizia amara, Vitex altissima, Emblica officinalis, Gyrocarpus jacquini, Cochlospermum religiosum, Givotia rotterifomis, Anogeissus latifolia, Grewia tiliaefolia, Tectona grandis, Bridelia retusa, Buchnania lanzan, Cleisanthus collinus, Cassia fistula, Piliostigma racemosa, Cravateva nurvala* and *Hardwickia binata.*

The lower strata were predominantly occupied by *Butea monosperma Careya arborea, and Wrightia tinctoria.* The shrubs are *Limonia alata, Premna tomentosa, Lantana camera* and *Eupatorium odoratum*. Lianas are represented by *Zizyphus oenoplea, Pterolobium hexapetalum, Acacia spp, lchnocarpus frutescence, Dioscorea pentaphylla and Devis scandens*. This type of forests is confined to rain shadow regions like Aralikonam, Mulli and Thoova.

2.2.6. Southern Tropical dry deciduous Scrub:

It is found scattered throughout the vested Forests and most of them have been already assigned. This type of forest is a derived one from the dry deciduous forest due to intensive biotic influences. Only *xerophilous* species like *Euphorbia antiquorum* are left. It is subjected to intensive grazing and the best attains a

maximum height of about 4 m. While the periphery of the bush is covered by armed species, those in the centre are palatable and non spiny ones. Some scattered trees emerge here and there. Lianas are common and the grasses cover the denuded areas. This type of forest represents almost the final stage of degradation and the soil is much exposed to erosion.

It is poor with the following shrubs domination. *Euphorbia antiquorum, Euphorbia tirucalli, Dodonaea visocosa, Barleria buxifolia, Calotropis gigantea, Opentia dillenii, Cassia auriculata and Mundulea suberosa.* Occasionally, some of the infiltration species from the previous forest type also occur. They are *Sapindus emarginatus, Persea macrantha, Albizia amara, Vitex altissima, Emblica officinalis and Cochlospermum religiosum*. The ground floor consists of ephemerals like *Asystasia gangetica, Evolvutus alsinoides, Merrimea Spp, Cyperus Spp, Kyllinga monocephala, Tridax procumbens* etc. Grasses are represented mostly by *Perotis latifolia* and *chloris barabata*.

2.2.7. Southern Montane Wet Temperate Forest (Sholas):

It is a dense closed forest with a rounded crown, short boled and highly branched. On an average, they reach a height of about 15 to 20 m and at least two arborescent strata can be recognised. Lichens, mosses and ferns are more frequent. Their floristic composition is a mixture of species of temperate and tropical stock. This type of forest is found in Attapady Reserve Block I to V where rainfall is above 3000 mm per annum.

It consists of species like *Elaeocarpus munroii, Vernonia arborea, Meliosma arnottiana, Schefflera racemosa, Ternstroemia, japonica, Berberis tinctoria, Mahonia lesch enaultii, Syszgium Spp. Syplocos Spp. Litsea Spp. Cinnamomum Spp*. and a few other members of Lauraceae. The second storey comprises of *Rubus ellipticus, Rhodomyrtus tomentosa, Gaultheria fragrantissima* and Strobilanthes Spp. along the margins Hypericum *spp*. and Canes are commonly encountered.

2.2.8. Southern Euphorbia Scrub (6 A/G2/DS2):

This type of forest is found in the higher reaches of southern tropical dry deciduous forests in the Aralikkonam vested forests especially in the eastern portion around Mulli and Thoova forest.

2.3. Plantations:

2.3.1. Teak Plantations:

Teak Plantations were raised in Panakkadan and Attappadi Block I to V Reserves starting from 1934 onwards. During the eighties, plantations were also raised in

Gottiyarkandy, Karapadam and Kandamangalam, but they are poorly stocked. The extent of teak plantation has reduced to 629.25 ha from the extent of 1093.72 ha during the plan period 2001-2010. Some of the areas near Chindakki, Manthanpotti, Karapadam, Kandamangalam etc had been diverted to Silent Valley National Park for the creation of Buffer Zone. Teak plantations raised in Pottikkal and Chindakki are comparatively good, when compared to Panakkadan and Gottiyarkandy.

In the previous Working Plan, teak plantations raised in the Division has been divided into two felling series viz. Mannarkkad teak felling series including Panakkadan and Thathengalam areas, Gottiyarkandy teak felling series including Pottikkal, Mukkalivenga, Chindakki, Panthenthodu, Thadikundu and Gottiyarkandy areas. Since the major portion of the area has been diverted, felling series is removed and plantations maintained at Panakkadan and Pottikkal are maintained as such.

2.3.2. Cashew Plantations:

The cashew plantations raised in Mannarkkad Range are more than 40 years of age and most of the plants are dead due to trunk borer. The total area of the plantations is 213.69 ha plantations raised during 1956, 1957, 1958 at Kanjiramkunnu were planted with Miscellaneous species such as *Swietenia Mahagony, Phyllanthus emblica, Terminalia bellerica* and *Mangifera Indica.* Besides Kanjiramkunnu, Mulakuvellam and Thiruvizhamkunnu are the other areas where cashew plantations are being raised extensively.

2.3.3. Miscellaneous Plantations:

Miscellaneous Plantations have been raised in a large scale in Mannarkkad Division. The number of plantations comes to around 92 with varying extents from less than one hectare to 2781.787 ha The major portions of the plantation were raised in Agali Range. A variety of species have been tried including *Acacia nilotica, Ailanthus triphysa, Anacardium occidentale, Dalbergia latifolia, Swietenia mahagony, Pterocarpus marsupium, Syzygium cumini, Tamarindus indica, Phyllanthus emblica, Grevillea robusta,* etc. Poor site selection, Vagaries of weather, uncontrolled grazing and collection of firewood coupled with untimely planting, poor quality planting stock have all contributed to the failure of miscellaneous plantations.

2.4. Bamboo:

Bamboo is a promising renewable natural resource requiring immediate attention. The benefits of bamboo are employment provision, income generation and environment protection, mainly by its soil binding capacity. It is a well-known

plant resource for faster growth, multiple uses and aesthetic beauty. In Kerala, major share of bamboo resources are utilized by the pulp and paper industry. Yet entry of cash crops into the agricultural sector has paved the way for the disappearance of bamboo as a crop. There was over exploitation of bamboo for industrial requirements resulting in the depletion of the resources. *Dendrocalamus strictus* and *Bamboosa arundinaceae* are the bamboo species available in Mannarkkad Division. *Bamboosa arundinaceae* occur in drier tracts and *Dendrocalamus* is confined to moist areas. The main bamboo bearing areas in the Division are Panthenthodu, Gottiyarkandy in Attappady Range, Vakkodan, Kelalloor, Karimba, Thiruvizhamkunnu areas of Mannarkkad Range.

2.5. Reeds:

Reed bearing areas are confined mainly to the stream banks. The common species occurring in this division are *Ochlandra rheedi* and *Ochlandra travancorica*. Extensive patches of reed occur in silent valley Attappady Block VI, Anavayi, Sholayur, etc. banks of Kunthipuzha and Siruvani rivers and their tributaries support fairly good quality reeds. Major viable reed bearing area is in Muthikulam in Attappady Block VI of Agali Range. The area under reed forest is about 500 ha.

2.6. Rattans:

Rattan is a forest product traditionally depended upon by rural people for subsistence and for additional cash income. Rattan is a strong and medium-density wood, yet much lighter than wood and extremely reliable. Because of these desirable characters, it is extensively used in the manufacture of a wide range of furniture and handicraft items. Canes occur in the evergreen forest of this Division. The major species observed are *Calamus rheedii, Calamus tennis, Calamus rotang, Calamus travancorica, and Calamus vimindis*. The main cane bearing areas are Muthikulam in Attappady Block VI, Sholayur, Karimala, Mundanadu, Meenvallam and Vettilachola areas.

2.7. Status of Natural Regeneration:

The status of natural regeneration is not promising in Semi evergreen and moist deciduous type of forests in Mannarkkad Division, especially in the degraded patches. The threat factors for the natural regeneration are fire, weed growth consequent to the opening in canopy, grazing, drought etc.

Grasses and weeds severely deprive young regeneration of moisture, light and heat. The climbers smother and constrict plants, especially young ones, by climbing upon them resulting in gradual decrease in mean annual increments. The course grass

may prevent light showers reaching the soil, transpire large quantities of water and hence increase the danger of drought. Further, grasses and weeds prevent fallen seeds of trees reaching the soil and suppress the growth of younger plants. In Mannarkkad Division, damage to the natural regeneration by weeds, climbers etc are seen in younger plantations and also in natural forests.

2.8. Prominent Weed:

Prominent weeds are *Mikania, Lantana camera* and *Eupatorium*, *Lantana camera* is well adapted to tropical humid conditions prevalent in parts of Attappady reserves. Infestation of *Mikania macrantha* in natural forests is severe. It covers vast area within a short time, cuts sunlight, suppresses the host plants and eventually kills them. Various control measures have been recommended for controlling these alien weeds including manual/mechanical uprooting, herbicides and classical biological control with insect agents.

2.9. Fire:

Fire is another factor detrimental to the natural regeneration by exposing the soil which in turn leads to soil erosion. Drought alters the water balance in the plants. Increase in the evaporation and resultant loss of water is caused by prolonged dry spell. High temperature and drought prevent germination of seeds and may even kill seeds, seedlings, older plants and at times even older trees.

2.10. Grazing:

Grazing is severe in forest areas adjoining the habitations. Cattle are often set free in groups to the forest areas, which usually cause considerable damage to the regeneration by way of trampling seedlings and by hardening the soil. Grazing pressure is mostly felt in Attappady, Agali areas. A regeneration survey has been conducted in the natural forests of this Division.

2.11. Injuries to which the crop are liable:

2.11.1. Anthropogenic Injuries:

Man: Man is one of the important factors responsible for the degeneration and degradation of forests by way of encroachment, illicit felling, illicit brewing, setting of fire, poaching etc. clear felling and unscientific felling are sure to degrade forests. Failure to provide suitable environment for natural regeneration and defective cultural operations results in various setbacks both in natural forests and in manmade forests.

Fire: The deciduous forests are particularly subjected to annual fire during the dry months of the year. It causes considerable damages to the regeneration and exposes soil resulting in soil erosion and high wash-off. The largest single factor, which causes damage to the forest, is fire. The grazers who set fire to the grass for promoting fresh shooting cause deliberate fires. People engaged in collection of non-wood forest produce also set fire to the vegetation as a whole, or to the individual trees to facilitate collection of the produce. Agriculturists set fire to the vegetation during the months before rains with a view to generate ash, which subsequently during the rains is washed down to their fields. Ground fire is common annually which depletes the dry organic materials. Statistics of fire occurrence in any forest division do not always denote the true extent of damage and more often taken for granted in most areas. Details of fire occurrence in the division are furnished in **Appendix - IV.**

2.11.2. Illicit felling:

Illicit felling in natural Forests and plantations is another factor, which is injurious to the crops. Illicit felling are often related to timber smuggling, illicit brewing in the forests etc. standing trees are also felled for collection of firewood. A statement showing the details of forest offences booked in the Division for the last 10 years indicates that, there is a steady increase in the occurrence of offences especially since the year 2005. The increased number of offences could be attributed to the decreased labour opportunities available to the local people.

2.11.3. Illicit brewing in the Forests and Ganja Cultivation:

Forest areas provide more suitable conditions than the non-forest areas for the unauthorized brewing of liquor, mainly because it is easier to escape notice of the Police and Excise authorities and also in view of the easy availability of firewood in large quantities required for the distillation. Since lot of water is required for distillation, this process often takes place besides the streams and streamlets. Firewood required for the distillation is collected by cutting down the valuable trees often from the nearest areas.

Similarly, Ganja had been extensively cultivated in Attappady Range of Mannarkkad Division during 2000 to 2006 and continuous raid for the eradication of Ganja had resulted in sharp decline in its cultivation. Tribal hamlets and its adjacent areas are highly prone to Ganja cultivation. Tribes are generally exploited by outsiders for raising Ganja. Protection has to be strengthened by participation of the people to curb this menace. More Vana Samrakshana Samithies have to be constituted in such sensitive areas and the activities of the existing VSS should be re-oriented to deal with such issues.

2.12. Injuries due to Natural Causes:

2.12.1. Drought: Increase in evaporation and resultant loss of water is caused by prolonged dry spell. Drought alters the water balance in the plants. High temperature and drought prevent germination of seeds and may even kill seeds, seedlings, older plants and at times even older trees. In general, it reduces the increment, induces premature leaf fall and increases fire hazard. Drought in the form of delayed monsoons may be harmful for artificial regeneration operations.

2.12.2. Wind: Wind generally causes physical injury to the Forests, where soil is shallow. Severe wind also alters the fine characteristics of timber. It enhances transpiration drying out of the soil as well as uprooting and breaking of the trees at times. However, damage caused by wind is not of much significance in this Division.

2.12.3. Flood: The floods during the Southwest and the North East monsoons erode the banks of the rivers and uproot the trees along the river banks.

2.12.4. Grazing: This is severe in forest areas adjoining the habitations, cattle are often set free in groups to the forest areas, which usually cause considerable damage to the regeneration by way of trampling seedlings and by hardening the soil. Goats and sheep browse the seedlings and tender leaves and buds of many species.

2.12.5. Wildlife: Wildlife cause occasional damage to the seedlings and poles both in natural Forests and in plantations. Elephant, wild boar, rodents, deer, and porcupines are the ones causing damage to the plantations. Elephant damages teak plantations by uprooting trees, trampling the seedlings, peeling the bark of poles etc. Sambar deer also cause injuries to the trees by rubbing their horns against the bark and browsing seedlings of certain species.

2.12.6. Grass, weeds and climbers: Grasses and weeds severely deprive young regeneration of moisture, light and heat. The climbers smother and constrict plants, especially young ones, by climbing upon them resulting in gradual decrease in annual increment. Further, grass and weeds prevent tree seeds reaching the soil cover and suppresses the growth of the younger plants.

Prominent weeds are *Mikania, Lantana camera,* C*alycopteris floribunda* and *Eupatorium*. *Loranthus longifolius* also affect teak and softwood plantations. Removal of the same is necessary to prevent retardation of growth and loss of increment resulting from these parasites. Infestation by climber *Mikania macrantha* in younger plantations and in natural forests is rampant, it covers vast areas within a short time and eventually kills them by the tent house effect.

CHAPTER - II (B)

FAUNA

The existence of wildlife is an indication of the biological wealth of a Nation. Wildlife management is a vast expanding field, encompassing several disciplines and covering vital areas like habitat management, preservation of endangered species, protection of species diversity, appraisal of socio-economic relations etc. The constant shrinkage of wilderness, ever-increasing community pressure on wildlife habitats, problem of eliciting public support for conservation, forestry operations in wildlife areas etc have further enlarged the dimensions of wildlife management in our Country.

2A.1. Proximity to protected area:

Mannarkkad Division has abundant number and variety of wildlife since it is adjacent to Silent Valley National Park. Areas outside the protected area network are often vital ecological corridor links and must be protected. Thus, conservation efforts in Mannarkkad Division by virtue of its proximity to Silent Valley National Park assume immense significance. There is frequent seasonal migration of animals in large herds from the National Park to these areas and vice versa.

2A.2. Mammals:

2A.2.1.Elephant: Among the mammals, Elephant (*Elephas maximus*) is a familiar sight as a domesticated animal throughout the Forests. Like many other counterparts, being a forest animal, they have suffered from the relentless erosion of their habitat. Elephants do not appear to have become reduced in number to any perceptible extent; they still roam about in the dense Forests and descent to the cultivated slopes and valleys in herds, especially during summer, creating considerable havoc in the fringes.

2A.2.2. Nilgiri Langur (*Presbytis johnii*): The langurs or monkeys represent the primates. Nilgiri Langur (*Presbytis johni*) which once was abundant in the higher elevations has become rare and urgently needs protection. It is a langur with glossy black coat and yellowish brown head. The favourite haunts of these animals are the dense evergreen forest stretches' with perennial water courses. These are generally sighted in the high reaches of this tract.

2A.2.3. Lion-tailed Macaque (*Macaca silenus*): This species is endemic to Western Ghats. The animal is with a glossy black for coat, a beard and a tuft of hairs at the end of the tail. They live in

groups headed by old strong male. They are sighted in thick Forests of evergreen nature and also in the riparian fringe Forests. With its dark colour sand shy and seclusive habits, there is little wonder that it seldom in this tract as it is confined to Silent Valley National Park.

2A.2.4. Bonnet Macaque (*Macaca radiata*): It is a medium sized long tailed monkey species is endemic to Peninsular India. A bonnet of long dark hairs radiates in all direction from a whorl on its crown. These social animals live in small groups led by old strong males. They are found in plain forest stretches and seldom venture into the populated areas.

2A.2.5. Leopard (*Panthera pardus):* This carnivore with a fulvous coat marked with black spots arranged in rosettes in tawny yellow background can thrive in almost all habitats. Usually, except in breeding season they are solitary animals. The animal is a good climber and a powerful leaper. They prefer rocky slopes with abundant bushes for cover. They hunt any animal that can be overpowered like Sambar, Gaur, Wild boar, and other small games. Leopards are often met with in this tract.

2A.2.6. Sambar (*Cervus unicolor*): It is the largest Indian deer. The stags carry the grandest bony, stout and rugged antlers, which are shed annually. The coat is coarse and shaggy with yellowish or grayish tinge. Usually, they graze at night in open glades and seek shelter in the Forests during the day time to avoid the high temperature and predators. The senses of smell and hearing are acute while the eyesight is moderate. Its alarm call is often the surest sign of presence of tiger or leopard in the vicinity. They form the main food base of the carnivore in this tract.

2A.2.7. Spotted deer (*Axis axis*): Spotted deer or chital is most familiar with its closely spotted rufous coat and this species is considered as the most beautiful of World's many deer.

2A.2.8. Barking deer (*Muntacus muntjak*): It is a small, shy deer with reddish coat and short two-tined stubby antlers. The antlers are set on pedicles that extend down each side of the face as bony ridges and hence the name rib-faced deer. Their dog-like barking call is easily imitated by the experienced hunters and these animals fall easy prey to their guns. They are often found in pairs or singly in valleys at dawn and dusk.

2A.2.8. Mouse Deer *(Moschiola meminna)*: This is a small ruminant with white coat spotted brown and white, is not easy to meet with, as it is very adept at hiding in the bushes, its small size, shy habits and protective coloring help to escape observation. They inhabit the lower reaches of the foot hills with grass covered rocky out crops. They form an easy prey to other carnivores, python etc.

2A.2.9. Indian Bison (*Bos gaurus*): This majestic ungulate with huge head, massive body, sturdy limbs and strong horns curved inwards over the head. The horns are broad and flattened at base and pointed at tip. It is heavily built animal, with a pronounced hump or dorsal muscular ridge abruptly ending behind the shoulders. They usually graze in open glades in small family groups led by the old bull early in the mornings and in the afternoons and retire to the shelter and seclusion of forest during hot hours. Their defence is their massive size and acute sense of smell.

2A.2.10. Wild Boar (*Sus scrofa*): This is abundant in the hilly tracts and in the vicinity of plantations. They form major food base for the beasts of prey of this tract. With the protection they are getting the population of this highly prolific breeder has gone up and become almost a menace to the people residing in fringes. They often raid the agricultural crops raised by the residents and damage them. They also cause damage to nurseries and younger plantations by digging up in search of tubers.

2A.2.11. Jungle Cat (*Felis chaus*): This common wild cat resembles the house cat in many respects but has a distinct appearance with the heavy built, long legs and comparatively small tail. Fur is also richer than the domesticated cat. Usually it is a solitary animal and pairing is observed only during the breeding season. They reside in wooded areas with a safe retreat among rocks. It hunts on small mammals, birds, reptiles etc.

2A.2.12. Indian Wild dog-Dhole *(Cuon alpinus):* It is similar to domestic dog, but shorter in limbs and muzzle. These red coated animals prefer forest areas with ample food, shade and water. They are social animals going about in packs. These powerfully built animals have great stamina and they go on tracking the prey with acute sense of smell, scouring Forests and meadows for miles around, during day time.

2A.2.13. Sloth Bear *(Melursus ursinus):* These heavily built animals are having black shaggy fur coat with brownish tinge. The elongated muzzle and lower lip, the long un-kept hair, the short hind limbs, the long claws and the whitish V-shaped breast patch are the characteristics features of these animals. They are capable of standing on the hind legs for surveillance of the surroundings. The sight is poor but the sense of smell and hearing are acute. They prefer areas with rocky outcrops to offer them shelter from scorching sun and rains.

2A.2.14. Indian Fox *(Vulpes bengalensis):* They resemble the domestic dog, but the tail is with more tufts of hairs. They are found close to human habitation. They live in burrows dug by them. They will be in packs of various sizes they hunt on small games, reptiles, insects etc.

2A.2.15. Indian Jackal *(Canis aurcus):* These animals are little larger than the common fox. They live in any environment. They are found in pair or in small packs. They come out in dusk, hunt and retire at dawn. They hunt small animals which they can overpower. They also raid the poultry, try to lift lambs etc.

2A.2.16. Indian Grey Mangoose *(Herpestes edwardsi):* They are uniformly grey or rufous in colour. They are usually found in pairs or small family groups. They prefer areas with thick undergrowth and shun dense forest areas. They are diurnal in habit and feed on rats, mice, lizards, birds, insects snakes, eggs and fruits.

2A.2.17. Small Indian civet *(Vivericula indica):* They are smaller when compared to other civets. Its fur coat is grey in colour, marked with spots and bands. They prefer open scrub jungles near to human habitations. It shelters in holes or under rocks or abolished buildings. These nocturnal animals hunt on small animals like rats, squirrel, birds, lizards etc. they also feed on fruits, roots and such vegetable matter.

2A.2.18. Indian Pangolin / Scaly ant-eater *(Manis Crassi caudata)*: The most distinctive feature of this species is the armour it is provided with. The upper surface and body and tail are covered with horny overlapping scales. When disturbed, they roll into a ball and the scales protect them from the external attacks. They live in burrows made by them. These curious terrestrial animals are toothless and hence use the long tongue that can be ejected out to suck in the ants that comprise their main food.

2A.2.19. Slender loris *(Loris tardigradus)*: These weird animals usually found in the dense forest tracts. The body and the limbs are very slender. The face is almost rounded and the muzzle is short. The ears are very small but their eyes are very large. They have no tails. These arboreal creatures are nocturnal in habit. They feed on fruits, leaves, insects and small animals they can capture.

2A.2.20. Indian Giant Squirrel *(Ratufa indica)*: These animals are generally found in Forests. They often stay at the top of lofty trees and they usually move from tree top to tree top by remarkably giant leaps. The black fur coat has characteristics reddish brown stripes and marks with a long bushy tail. They are shy animals that stay motionless when intruders are sighted. They are found in large numbers in the dense forest of this tract.

2A.2.21. Indian crested Porcupine *(Hysterix indica)*: This is a peculiar animal with profuse armature of black and white quills of 15 to 30 cm long on the back. These quills are the modified hairs used for defence. They prefer rocky hillside with good vegetative cover. They feed on fruits, grains and all types of vegetables. They cause much damage to the nurseries and agricultural crops.

2A.2.22. Black Naped Hare (*Lepus nigricollis*): This hare has got a black patch on the back of its neck and hence the name. They are often sighted in open areas with thickets of bushes. Though they are usually nocturnal, they seek food during day time. It relies on grass, leaves etc. causing damage to seedlings by nipping off the apical portion.

2A.3. Birds:

Birds are abundant but no bird can be mentioned as special to this division. The tract is very rich in avifauna and totally 170 species were identified from the area. All the birds common to Western Ghats can be met with in the tract. A total of 42 families of birds were represented in the Attappady hills and adjoining to silent valley area, of which *Muscicapidae* was the dominant family with 33 species followed by *Columbidae* with 9 species and Picidae with 8 species. Ten species of raptors were recorded during the survey. During the survey of birds conducted in 2007, the tract is classified into Dry Deciduous, Most Deciduous, Evergreen, shola and grassland habitat. In moist deciduous area, 101 species were recorded, 100 species were identified in evergreen sites and of which, 10 species were endemic. In dry deciduous belt, totally 75 species were identified of which 2 species were endemic. The abundance of ground dwelling species such as thrushes was remarkably high in the evergreen forest and its variety indicates a very productive and protected evergreen habitat with the least amount of disturbance.

2A.4. Endemic birds:

About 15 Western Ghats endemic birds were identified by the experts during their survey. Most of the endemic birds were mainly confined to shola, evergreen and deciduous forests. Five Indian endemic species namely Grey Jungle Fowl, Indian scimitar, Babbler, Malabar whistling thrush, Painted Bush Quail and Red Spur Fowl were recorded during the survey. Grey jungle fowl was recorded in deciduous evergreen and shola forests where as Red spur fowl was recorded in moist deciduous forest alone. A total of 26 South Asian main land endemics were recorded during the survey in various habitats and most of them were mainly confined to moist deciduous and evergreen forests. Endemic birds observed in the tract is furnished

2A.5. Threatened Birds:

Conservation status of the birds is based on the threat status, variety and distribution range. Species which are threatened and endemic got the first priority for conservation. The Globally threatened Niligiri Wood Pigeon, White Bellied short wing, Nilgiri Laughing thrush and Near Threatened Nilgiri Fly catcher, Blacked Orange Fly catcher, Grey Jungle Fowl, Nilgiri

Pipit, Malabar Grey Hornbill were recorded during the study. Nilgiri Laughinthrush and the white bellied short wing were recorded from the Shola Forests of Thudukki region. Nilgiri Pipit was recorded in the grasslands of the Thudukki area. Nilgiri wood Pigeon was recorded in the evergreen and Shola Forests of the Attappady area. Threatened and near threatened birds observed in the tract are given **Appendix – V.**

2A.6. Butterflies:

Totally 133 species of butterflies were recorded including eight species endemic to the region, of which four species are endemic to south India, one to peninsular India and three to Western Ghats. Fourteen species observed are included in the protected list, six belonging to schedule –I and nineteen to Schedule-II of the Wildlife Protection Act and Danaid Egg Fly include both Schedule I & II. The most common species was common four Rings. The rare species are Malabar Banded Peacock, Southern Bird wing, Malabar Raven, Plains cupid and Yam fly. Crimson Rose, Common mime and Danaid Egg Fly are the endangered species of India recorded during the study. Butterflies recorded in the tract are shown in **Appendix –VI.**

2A.7. Reptiles:

Snakes, lizards, turtles and tortoises represent reptiles. The most striking of the reptilian population in this area, however are the snakes, which are abundant, practically, all the poisonous snakes belong to South India are present here. The best known of these is the much dreaded Cobra (*Naja naja*) which is quite common both on hills and in the low country. It is early recognized by its hood and by its way of raising the head and spreading out the hood when alarmed. Its bite is fatal.

2A.7.1. King Cobra (*Ophiophyagus hannah*): A large cobra confined to the hilly tracts is known as King Cobra. It is the most dreadful poisonous snake. They are found in dense Forests at higher altitudes. It may attain a length of about 6 m. The hood is not wide as in cobra. It feeds on other snakes and rodents.

2A.7.2. Python (*Python molurus*): It is the largest snake found in this tract. It is a non-poisonous snake nonetheless dangerous as it coils rounds its victim and kills by strangulation. They prefer usually moist areas. It feels on small animals, birds, frogs etc.

2A.7.3. Viper *(Vipera ruselli):* It is a common poisonous snake found in the area. It is dark brown in colour with elliptical patches that run in three rows. The head is distinctively triangular in shape. They inhabit rocky and bushy areas. They feed on small animals, birds, lizards etc.

2A.7.4. Krait *(Bangarus caeruleus)*: This poisonous snake is stud blue in colour with white bands around the body. This snake is nocturnal inhabit and feeds on other snakes, birds, rodent, lizards etc.

2A.7.5. Rat Snake (Ptyas mucosus): It is a common non-poisonous snake that is considered as the true friend of farmers as it helps by preying upon rats and mice. It is very agile and a good climber.

2A.7.6. Common Green-Whip Snake (***Dryophis nasutus***): It is a slender snake, almost green in colour. The dorsal part is full of black and white oblique lines, which are well defined in the anterior region. The head is elongated with a pointed tip. It can be found in foliage of small trees and bushes. It feeds on insects, lizards, small birds etc.

2A.7.7. Water Snake *(Enhydris enhydris):* It is an aquatic snake that seldom leaves the water. It is non-poisonous and harmless. It feeds on frogs, warms etc.

2A.7.8. Sand Boa *(Eryx coppicus):* This non-poisonous snake is pinkish grey in colour with deep brown irregular patches all over the body. The head is not distinct. They always remain hidden in sandy soils. It feeds on frogs mice, lizard. The tail is blunt and resembles the head portion. It can also crawl back. Due to these peculiarities, it is often described as two-headed snake by the common folk.

2A.8. Amphibians:

Amphibians are represented by frogs, toads and caecilians in this tract. The common frogs belonging to the Genus Rana are found in then waterholes and damp places. The common frogs found here are *Rana hexadactyla, Rana tigrina, Rana Semipalmata and Rana auventiaca.*

Toads belonging to the genera Bufo are common in this tract. The prominent toads that can be met with in this tract are the following. *Bufo melanostictitus*, *Bufo Parietallis* and *Bufo microtympanum*. Tree frogs belonging to the genera *Rhacophorus* are also seen in the tract and many of them are poisonous.

2A.8. Fishes:

Kanjira Puzha, Nellipuzha, Kunthipuzha, Bhavani and Siruvani are the prominent rivers of this tract. The deeper gouges in the river got silted and it cannot hold water throughout the year. As such, the water course cannot form a good abode for the Piscean fauna. During the monsoon period when the water flow is steady, some fishes from the lower parts migrate to the upper

reaches of the river. As the water-level recedes most of them will return and the remaining ones will be trapped in the musky water left in small ditches in the water courses. The prominent fish species found growing in the streams are given in the table below.

Table - 7 - Prominent Fishes of the Region

Sl.No.	Local Name	Scientific Name
1	Magur (Mushu)	*Clarias batrachus*
2	Poovaliparal	*Puntius filamentoses*
3	Kuruvaparal	*Puntius swrana*
4	Varal	*Musta cembelu armatus*
5	Cat fish	*Mystus malabaricus*
6	Murrel	*Channa striatus*
7	Pearl Spot	*Etroplus suratensis*

2A.9. Injuries to which Fauna is liable:

2A.9.1. Habitat Destruction: The extension of many species is often associated with the denudation of their natural habitats, owing to ever increasing biotic pressure forestry operations, and development activities like construction of roads and buildings etc. taking place in the natural habitats of wildlife. Roads restrict the movement of fauna. Corridors connecting two vegetation zones gradually vanish due to various developmental activities, which again restrict the movement of Wildlife especially elephants. The shrinkage of corridors has resulted in the confinement of elephants in a particular territory, which was not so in the past. The fragmentation of the Forests has also been causing problems to the elephants. Crop raiding and human causalities due to the attack of Wild elephants are the main consequences which villages are experiencing.

2A.9.2. Environmental and Ecological Factors: Environmental factors are food, water and shelter, which are most important components in a habitat. The shortage of the above components is often associated with the habitat destruction. Plant life, upon which animal subsist has an important role in the well being of the animals. Where grazing has been a real problem, the available food has to be shared by the wild fauna and cattle population.

Water is another component which determines the existence of fauna. Water source in the Wildness dry up followed by prolonged drought. Big animals like elephants are often forced to change their traditional routes in search of water and food. Water holes without vegetation cover do not attract wildlife.

Ecological factors like temperature, humidity etc also affects animal life. Seasonal variations of weather such as severe drought can have marked effect of wildlife. Humidity also has an effect on the loss of moisture from the body of certain animals.

2A.9.3. Fire: Wild fire occurring in the Forests cause considerable damages to the wildlife. Apart from destruction of various micro organisms in the soil it is also affects various small mammals like snakes and birds. Annual forest fire covers a vast area, which deplete the biodiversity of the region along with preferred food of elephants.

2A.9.4. Hunting and Wildlife Trade: Hunting and wildlife trade are threat factors for wild fauna. Hunting includes, shooting trapping, poisoning etc. Hunting can be for meat, for trophies, medicinal purposes, crop protection etc. Wildlife trade includes trade on animal articles and also live trade. Live trade in reptiles, monkeys, birds, butterflies, frogs, tortoises etc has been accelerating the process of depletion of species rapidly.

2A.9.5. Disease Transmission: Epidemics constitute one of the main factors for the depletion of our fauna. Very little work has been done on the detection and treatment of wildlife diseases in Kerala. The diagnosis of free wild animals is very difficult but nevertheless, extremely important. Several communicable diseases of bacterial, viral and protozoan origins occur among wildlife, Wildlife and domestic cattle suffer from almost similar diseases and the chance of transmission is extremely high.

CHAPTER – III

UTILIZATION OF FOREST PRODUCE

3.1. Agricultural Customs and Wants of Local Population:

3.1.1. Agricultural Customs:

The administrative jurisdiction of the Forest Division spreads over 2 development blocks of Mannarkkad Taluk having 24 villages in 12 Panchayats. The total population of Mannarkkad Taluk i.e. the division is 3,08,910 of which 1,51,656 are male and 1,57,254 female. Out of these 6.25% of the population are cultivators and 16.186% agricultural labourers. They grow crops like Groundnut, Sugarcane, Sorghum, Ragi, Maize, Tobacco, Gingelly, Cotton, Tapioca, Plantain and Vegetables in addition to paddy. They mostly depend on monsoons; paddy is grown wherever irrigation facilities are available. The hill tribes follow primitive type of cultivation without any of the inputs like fertilizers, pesticides or intercultural operations.

Hill Tribes:

The main hill tribes are Irulas, Muduvas and Kurumbas. The hill men are engaged in collection of NTFPs and forestry works.

3.1.2. Demands of the populations:

Paddy cultivation requires copious water on a regular basis. Since irrigation facilities are absent in most of the areas, paddy is cultivated in rain-fed areas. Due to the peculiar character of the soil, the paddy fields get dried up immediately after the rains. They depend on artificial ponds and natural streams for irrigation and drinking. Therefore, the most important demand of the people is water.

There has been steady change in cropping pattern consequently the requirement of wood and other forest produce has also increased in addition to the main demand for water. The major requirements of the population from the forests are:

- Small timber for agricultural implements and house construction
- Firewood and charcoal for domestic consumption, hotels and cottage industries
- Timber for buildings, bridges, furniture, veneers etc.
- Pasture for cattle
- Grass for thatching and fodder
- Green manure for cultivation
- Pole and thorn for fencing
- Non-wood forest products like bamboo, reeds, medicinal plants etc.
- Sand, broken stone and granite for construction

3.2. Markets and Marketable Produce:

The main marketing centers of forest produce are Palakkad, Thrissur, Kozhikode, Kochi, Ottapalam, Shoranur, etc within the State and Coimbatore, Pollachi, Salem, Mysore, etc outside the State. Seven numbers of registered units are engaged at present in the sale of forest produce. Besides, there are many unregistered units trading in forest produce.

3.3. Marketable Products:

The marketable products can be classified as timber, teak poles, firewood, bamboos and reeds, cashew nuts and non-timber forest produce.

3.3.1. Timber: Timber is an important forest produce collected and marketed as round or sawn material. The main hardwood species are teak (*Tectona grandis*) Rosewood *(Dalbergia latifolia*), Venga *(Pterocarpus marsupium*) Nangu (*Mesua ferrea*), Chadachi (*Grewia tiliifolia*), Maruthi (*Terminalia paniculata*), Karimaruthu (*Terminalia tomentosa*) Venteak (*Lagerstroemia microcarpa*), Irul (*Xylia xylocarpa*), Vaka (*Albizzia odoratissima*), Plavu (*Artocarpus heterophyllus*), Manjakadambu (*Haldina cordifolia*), Aini (*Artocarpus hirsutus*) etc. Softwood species are Mullanchakka (*Cullenia exarillata*), Vallappayin (*Vateria indica*), Narivenga (*Acrocarpus fraxinifolius*), Thellippayin (*Canarium strictum*) Pali (*Palaquim ellipticum*) Poola (*Bambax ceiba*) etc. The timber finds ready market at Palakkad, Coimbatore, Pollachi, Shoranur, Pattambi, Ottapalam etc. Teak and Rosewood are the most sought after species in these markets for furniture and export. Other hard wood species are also in demand for construction purposes. Softwood is mostly used in industries like matchwood, packing case, plywood, etc. The Western India Plywood, Valapattanam is a major consumer of plywood species.

3.3.2. Teak Poles: Teak poles from thinning of plantations are sold in public auction. The local consumption of teak poles is meager, major portion is exported to other districts and outside the state. About 28 registered units are involved in marketing of teak poles in Palakkad Revenue District.

3.3.3. Firewood: Villages and small towns consume maximum quantity of firewood. The tile, brick and kiln industries also consume an equal quantity. The brick-manufacturing units, a cottage industry, are mostly located in the villages. There are about 3000 big and small units within Palakkad District and each unit is capable of manufacturing about 1,00,000 bricks, consume an average of 15 tones of firewood per annum, the total requirement is 45,000 MT/annum. Major quantity of which comes from private holdings. Demand for firewood has increased its cost, prevailing price is about Rs. 750/- per ton. The hike in the price is due to the short supply. Besides, manufacture of charcoal and Ayurvedic medicines require appreciable quantities of firewood.

Teak and rosewood billets are mainly used by the manufacturers of household articles, furniture and wood- crafts.

3.3.4. Bamboos and Reeds: There is heavy demand for bamboo and reeds from Kerala State Bamboo Corporation, Angamaly; Hindustan News Print Ltd, Velloor. Villagers and other poor people also utilize these materials in cottage industry. These are supplied to hill tribes for bonafide use at concessional rates.

3.3.5. Cashew nuts: The division has 249.0830 ha of cashew plantations and the right of collection of nuts is sold in public auction, annually. Processed cashew nut is exported and earning foreign exchange. The processing factories are located at Kollam, Kottarakkara, Kunnamkulam, Irinjalakuda and Thalassery. Cashew nut also yield bi-products like shell oil, an important industrial raw material for manufacturing anti corrosive paint for ships and boats and cashew apple is used for making liquor (fenny), pickles, jams, candy and beverages. Cashew testa contains tannin and used in leather industry.

3.3.6. Non-Timber forest produce: Honey, cardamom, soap nut, shikakai, walnut, gooseberry, pepper, canes, black dammer etc are important NTFPs in great demand. Subsequent to the increased popularity of Ayurvedic medicine, the demand for medicinal plants, fruits and oil-seeds, has increased considerably. Reeds and canes occurring in the evergreen patches along the stream banks and other sheltered pockets find easy market for production of baskets, mats, furniture and other household articles. Coimbatore and Pollachi are the two important marketing centers for reeds and bamboos. The following are the Harijan Girijan Co-operative Societies engaged in collection of NTFPs from Mannarkkad Division.

1. Sholayur Girijan Co-operative Society – Agali
2. Malampuzha Girijan Co-operative Society – Malampuzha
3. Kurumba Girijan Co-operative Society – Attappady

There is high demand for medicinal plants from institutions like Kottakkal Aryavaidyashala, Coimbatore Aryavaidyashala, Nagarjuna Ayurvedics, and Oushadhi.

3.4. Paper and Rayon Pulp Industry:

The first paper factory was established in India in the year 1832 in West Bengal. Till 1960 the growth of paper industry was dull and very slow. By 1970, about 60 paper mills were functioning in different parts of India with a rated capacity of 8,50,000 tons. At present Kerala Government is supplying raw materials to HNL, Velloor. While that of HNL is 1,00,000 tons per annum.

3.5. Hard Board, Chip Board, Fiber Board:

The fiberboard and chips board industry was started in Bombay in 1958 and this industry has found its market everywhere and flourishing successfully.

3.6. Match Industry:

The raw material needed is soft woods of specific qualities with regard to colour, hardness, smell, weight etc. The first unit of match industry in India was started in Ahmedabad during 1894-95. The industry has developed as a cottage industry throughout India. There are about 34 match wood factories in Palakkad revenue district and they can be classified into 3 categories.

1. Manufacture of splints and veneers and export of such products.

2. Manufacture of end products viz. matchbox and matchsticks.

3. Dipping factories.

The manufactured splints and veneers are exported mainly to Tamilnadu, Mumbai, Gujarat, Bihar etc. Few factories are manufacturing the finished products viz. safety matches (both manufacturing and dipping are done in the same factory). There are 18 dipping factories around Ottapalam, Pattambi and Lakkidi. The total consumption is about 65,000 m^3 of soft wood/annum.

3.7. Boat Building:

Species like *Artocarpus hirsutus* (Anjily), *Artocarpus hetrophyllus* (Plavu) are used by boat building yards. These boats are mainly used for fishing and transport. The main boat building yards in Kerala are Vizhinjam in Thiruvananthapuram district and Neendakara in Kollam district. Ordinary fishing boats and country crafts are made all along the coastal areas.

3.8. Ship building:

The Shipyard at Kochi requires large quantity of timber.

3.9. Railway coach building:

Timber species like *Tectona grandis, Terminalia paniculata, Lagerstroemia microcarpa, Pterocarpus marsupium* etc are selected by the Railways for coach building and the timber are mostly exported to other states like Tamilnadu, Maharashtra etc, where these factories are located.

3.10. Transport equipments:

Body building of buses, lorries, trailers, hand carts, bullock carts etc require a lot of timber and these are manufactured on small scale in various parts of this division. The important species used are *Xylia xylocarpa, Grewia tiliifolia, Tectona grandis, Pterocarpus marsupium, Artocarpus hirsutus* etc.

3.11. Agricultural implements:

The introduction of iron ploughs and tractors reduced the use of native agricultural implements. But these conventional implements are still used in the villages throughout the division limits. The important species are *Xylia xylocarpa, Tectona grandis, Pterocarpus marsupium* etc.

3.12. Packing case industry:

Many of the softwoods, without considering their limitation in quality of wood (nailing property, smell, weight etc), are used for making packing cases. There are about 13 industries within the district utilizing about 20,000 m^3 of softwood timber like *Mangifera indica, Persea macrantha, Lannea coromandelica, Spondias mangifera* etc.

3.13. Lines of Export:

3.13.1. Roads: This Division is well connected with network of roads and railway line. The existing network of roads and railways are sufficient to transport forest produce. Kozhikode - Palakkad road (NH-24) and Mannarkkad to Coimbatore are passing through this division. Besides, there are several link roads diverging from these main roads and are interconnected. These roads are adequate for the transportation of forest produces.

3.13.2. Railways: Olavakkode (Palakkad Junction) and Shoranur are the two important railway heads close to this division. The broad gauge lines connecting Thiruvananthapuram-Chennai, Thiruvananthapuram-Bangalore, Thiruvananthapuram-Mumbai and Mangalore-Chennai pass through these stations.

3.14. Method of Harvesting:

Plantations are harvested by way of thinning and final felling. Felling in any form is not resorted to in natural Forests.

3.15. Execution of Departmental Works:

Convener System was introduced vide Order No. G.O. (Rt.) 118/89/Forest dt. 22.12.89. In this system an able person among the workers is selected to be the convener and with his help the labourers are engaged to carry out the works to the satisfaction of

the department and payment is made to the labourers through the convener for completed works by a crossed cheque issued in favor of the convener.

3.16. Classification of Timber and Poles:

After converting the felled trees, the logs obtained are classified into girth classes based on under bark girth at mid-point. In case of softwoods, mid-girth is taken after removing a small strip of bark around the log. Logs requiring de-sapping are measured at mid-point after de-sapping. The volume is calculated by quarter girth formula. In addition to girth classification, classification and grading of timber is also done with reference to length, soundness etc.

3.17. Harvesting of bamboos and reeds:

Bamboos are allotted to M/s. HNL, Velloor at pre-determined rates. The bamboos in the vested Forests were sold in public auction. Local people are allowed to collect bamboos and reeds for bonafide use on permit basis. The present policy of the Government is to allot bamboos and reeds to industrial concerns like Mavoor, Kozhikkode; Hindustan News Print Ltd., Velloor; Kerala State Bamboo Corporation, Angamali etc.

3.18. Cost of extraction of timber:

A comparative statement showing the cost of extraction of timber, firewood and poles in the year 1994, 2006 and 2011 is furnished below.

Table - 8 - Cost of Extraction of Forest Produce (ordinary area)

Sl No	Description	Unit	Rate in 1994	Rate in 2006	Rate in 2011
Timber Extraction					
i	Felling and Preparation of logs (Hard Wood) ½ m^3 and below 1m^3	1 m^3	12.00	20.00	403.00
ii	Felling and preparation of Logs (wood to be de-sapped) ½ m^3 & below	1m^3	36.00	60.00	201.50
iii	Felling and preparation of Logs (Softwoods) ½ m3 and below	1m^3	9.00	15.00	302.25
iv	Haulage for a distance of initial 400 m. Hand dragging	1m^3	31.78	44.14	1280.06
vi	Haulage for every additional 200m	m^3	7.94	11.00	319.00
vii	Haulage in difficult area over initial 400m	1m^3	35.75	55.17	1474.27
Transportation Charges					
i	By Lorry Main road 1st 10 km	m^3	22.5	33.75	132.90
	Next 15 km	m^3/Km	1.5	2.25	131.70

Sl No	Description	Unit	Rate in 1994	Rate in 2006	Rate in 2011
	Beyond 25 km	m^3/Km	1.2	1.8	106.50
ii	By Coupe roads for 1st 10 km	m^3	33.75	50.62	199.30
	Next 15 Km	m^3/Km	2.25	3.37	13.17
iii	Loading Charges	m^3	8.47	14.12	570.00
iv	Unloading Charges	m^3	2.54	3.53	123.55
Firewood Extraction					
i	Felling and Billeting, Stacking	MT	10.46	17.44	269.15
ii	Transportation by head load (200m)	MT	6.28	8.72	291.24
iii	Loading Charges	MT	14.62	18.00	517.50
iv	Unloading and stacking	MT	8.50	10.46	300.84
Bamboo Extraction					
i	Felling and collection of full Bamboos	100 Nos	243.75	300.00	305.20
ii	Felling and collection of Top Bamboos	100 Nos	117.00	144.00	305.20
iii	Felling and collection of Bottom Bamboos	100 Nos	146.25	180.00	305.20
iv	Collection of Reeds	100 Nos	9.75	12.00	300.00

3.19. Past and Present Prices:

In the past supply was more than demand and hence the prices of forest produce were low. The supply was abundant due to clear felling of vast extents of forest tracts for raising industrial plantations, construction of hydroelectric projects, raising of commercial plantations etc. Subsequently, with the promulgation of Forest Conservation Act 1980, clear felling was abandoned, resulting in shortage of timber and firewood. The low supply and high demand combined with other factors governing fluctuations in the market has escalated the prices of forest produce. Thereafter the upward trend of prices continued for years and at present the price is increasing by leaps and bounds. A comparative statement of price of important timber species for the year 2001 to 2010 is given in **Appendix - VII.**

CHAPTER - IV

PLANTATION CORPORATION OF KERALA LIMITED (PCK)

4.1. Activities of PCK in Harvesting and Marketing of Forest Produce:

Plantation Corporation of Kerala (PCK) was established in the year 1982 vide G.O(Rt) No.1068/82/AD dated 15-04-1982 under Agriculture (Forest Special Act) Department with a view to raise cashew under Multi-State Cashew Project. The areas under vested forests of Paruthimala and Thathengalam were proposed to be lease to PCK in June 1982, for planting cashew. Initially, an extent of 498.87 ha was transferred to the Corporation for raising cashew. Besides the above, Mezhukumpara and Anamooly areas were also handed over to PCK subject to certain conditions laid under the lease deed and the extent has increased to 545.85 ha The lease deed was executed between the government on one part and M/S. Plantation Corporation of Kerala on the other part in the year 1986. The conditions are as follows.

i. The plantations of rubber given in the schedule I appended hereto will stand transferred to the Corporation together with all assets and liabilities specifically provided in Schedule II attached hereto, from the date of the lease deed. The watchers mentioned at Schedule II will be absorbed as field workers by the plantation corporation, according to its actual requirements and according to the norms followed by in other plantations. The corporation will be responsible for its management, improvement harvest and they are at liberty to deal with the plantation subject to this lease deed.

ii. The lease shall be for a period of 50 years renewable at the option of the government on terms and conditions to be fixed by them for another term of 30 years more at a time.

iii. The corporation shall pay to Government, lease rent at the rate as per the schedule attached of date of transfer. Payment for each financial year shall be made before the 31st day of March of the previous year through remittance into Government on counter signed chalans issued by the Forest Department; belated remittance shall bear 12% penal interest per annum.

iv. Provided that the Government shall if they deem fit revise the lease rent rate from time to time and the corporation shall pay such revised lease rent for the subsequent years.

v. Trees standing in the plantation, a list of which is appended as Schedule III hereto belong to Government and the corporation shall protect them from damage, lopping or cutting branches shall not be done without specific sanction from the Custodian of Vested Forests. Their uprooting due to wind or damage due to other natural causes, should be brought to the notice of the Custodian in time by the corporation. Provided that the Forest Department is at liberty to extract any such tree or trees from the plantation at any time without causing any damage to the Rubber Trees or any other property of the Corporation as far as possible.

vi. Provided further that in the event of any damage caused to the rubber trees or other properties of the corporation. During such extraction in spite of extreme care, the corporation shall not be entitled for claim for compensation.

vii. The corporation shall not sub-lease the plantation or part thereof for any purpose without prior sanction of the Government.

viii. The present value of the plantation shall be valued by an agency like the Rubber Board and the same shall be treated as the share capital of Government. Any additional sum found not incorporated in the above amount subsequently, will also be added on to the above amount which, then, will represent the Governments new share capital.

ix. The Corporation shall be bound to pay all taxes in force from time to time.

x. Officers of the Government will be at liberty to enter upon any land under lease including any structures, roads of building etc constructed by the corporation within the lease hold at any time for discharge of their official duty and the corporation shall render them all assistance and help in carrying out such official duty.

xi. Government shall permit the Corporation to use the forest roads leading to the plantation with due regard to forest protection and shall not levy any tax or charge for plying its vehicles through these roads.

xii. The Corporation shall be liable to refund the amount incurred by the Forest Department by raising and maintaining the cashew plantation.

xiii. Conditions of this lease deed shall be modified with the mutual consent of the both parties.

At present, PCK has a total extent of 513.03 ha raised with cashew as the main crop after resuming back 32.82 ha area by the Department. They have one officer, 7 staffs and 38 workers for execution of works in the field. Weeding is the maintenance work for betterment of the crop.

Prescription: Even though the area was handed over to PCK and the lease deed executed on 15.04.1982, it is seen that no clearance was obtained from the GOI under the FC Act. It is prescribed that the DFO shall call for the proposal from PCK and initiate steps to obtain the mandatory clearance required under the Act within a year in the Plan period.

CHAPTER - V

FIVE YEAR PLANS

5.1. Introduction:

The Eleventh Plan began in a favorable circumstance with the economy having grown at the rate of 7.7% per year in the Tenth Plan Period. However, people still lack the basic requirements for a decent living in terms of nutrition, access to education and basic health, and also to other public services such as water supply and sewerage. The Eleventh Plan aim to accelerate the pace of growth while also making it more inclusive. The growth objective is to achieve an average growth rate of 9% per annum for the plan period. The objective of inclusiveness is reflected in the adoption of 26 other monitorable targets at the National level relating to

1. Income and poverty
2. Education
3. Health
4. Women and Children
5. Infrastructure and
6. Environment

5.2. Environment:

Protection of the environment has to be a central part of any sustainable inclusive growth strategy. This aspect of development is especially important in the Eleventh Plan when consciousness of the dangers of environmental degradation has increased greatly. Population growth, urbanization and anthropogenic development employing energy-intensive technologies have resulted in injecting a heavy load of pollutants into the environment. More recently, the issue assumed special importance because of the accumulation of evidence of global warming and the associated climate change that it is likely to bring. An important feature of any environmental strategy is that environmental objectives require action in several areas, which typically lie in the purview of different ministries. The Ministry of Environment and Forests (MoEF) has the important role of monitoring the development process and its environmental impact in a perspective of sustainable development and to devise suitable regulatory structures to achieve the desired results. While this role is crucial, environmental objectives can only be achieved if environmental concerns are internalized in policy making in a large number of sectors. This would require sharing of

responsibility at all levels of government and across sectors with respect to monitoring of pollution, enforcement of regulations, and development of programmes for mitigation and abatement. Regulatory enforcement must also be combined with incentives, including market and fiscal mechanisms to encourage both industry and people in their day-to-day working to act in a manner responsive to environmental concerns, sustainable use of natural resources also requires community participation with a responsible role assigned to the communities for conservation.

5.3. Management of Forests under Five Year Plans:

Forest is a dynamic living entity that is to be managed with a view to conserve the capital without any depletion, while catering the present needs of the society. As such, the forest planning becomes a multifaceted, consistent and well integrated affair, where due weightage has to be given to soil and moisture conservation along with satisfaction of the present and future demands of the society and that of the industries utilizing forest produces.

The Planning Commission of India, which is approving plans for the most effective and balanced utilization of the Country's resources, for the development of the Country, had given due importance to planning in forestry sector too. Accordingly, special attention was given in the Five Year Plans to enhance the productivity of the Forests by adopting sound schemes, such as rehabilitating the depleted forests and creating valuable man-made forests to cater to the needs of the industrial sector. The successive Five Year Plans have aimed at accelerating the pace of Forestry Development and expansion of the forestry activities in the Country. Our forests have also benefitted from these schemes.

5.4. Introduction of Pulpwood Plantations:

During the third Plan, a beginning was made to alter the purely conservative and biological management system hitherto followed to a system in which significance is given to maximum production of raw materials required by the society. To attain this objective, manmade forest plantations of quick growing valuable species were started. Full assistance was given to State Governments to undertake large scale planting of quick growing species, mainly to meet the requirements of paper and pulp as well as cottage industries. In accordance with this proposal, the Forest Department took up a scheme to raise pulpwood plantations like Acacia, Eucalypts etc within the forest areas with the financial assistance of the Central government. Following are some of the plan head in which central assistance are given for various works. Integrated Forest Protection (IFP), Nilgiri Biosphere Reserve (NBR), XII Finance Commission, Regeneration of Denuded

Forests (RDF), Survey of Forest Boundaries, Forest Resource Survey (FRS), Conservation of Fragile Ecosystems, Forest Consolidation and Acquisition of Private Forests. Some of the Schemes under Plan Head with annual allotment and its expenditure are given in the Table here under.

Table - 9 - Expenditure Since 2001 to 2010

Sl. No.	Year	Expenditure (Rs in lakhs)
1	2001-2002	60.17
2	2002-2003	67.00
3	2003-2004	109.00
4	2004-2005	103.00
5	2005-2006	109.17
6	2006-2007	125.53
7	2007-2008	148.37
8	2008-2009	202.50
9	2009-2010	135.85

CHAPTER – VI

STAFF AND LABOUR SUPPLY

6.1. Staff:

The Mannarkkad Forest Division has three Ranges viz. Mannarkkad, Attappady and Agali. The Ranges are further divided into Stations under the control of Deputy Rangers. This division was re-constituted on 1.4.90 as per G.O. (Ms) 121/89/F &WID dt. 28.12.89.

Mannarkkad Division has staff strength of 3 Range Officers, 8 Deputy Rangers, 19 Foresters, 103 Forest Guards and 8 Reserve Watchers for protection of the field. The Division has to face problems like encroachment and protection as it borders with Tamil Nadu on two sides. Similarly, Ganja eradication and sandal smugglings also pose a grave threat to protection. Division has at present only 6 Deputy Rangers, 16 Foresters, 94 Forest Guards and two Reserve Watchers.

The existing establishment of the controlling, executive, protective and ministerial staff in the Division as on 31.10.2010 is given in Table 10 and 11 below.

Table - 10 - Staff Particulars-Mannarkkad Division

Sl.No	Designation	Sanctioned Strength	Present Strength
1	Divisional Forest Officer	1	1
2	Range Officers	3	3
3	Senior Superintendent	1	1
4	Junior Superintendent	1	1
5	Deputy Rangers	8	6
6	Head Accountant	1	1
7	LD/UD Clerks	17	13
8	Typist	2	2
9	Surveyor	1	0
10	Draughtsman	1	1
11	Foresters	19	16
12	Forest Guards (34 Provisional)	103	94
13	Compiler	1	1
14	Reserve Watchers	8	6
15	Night Watcher	1	0
16	Drivers (1 Provisional)	8	7
17	Peon	7	6
Total		**183**	**159**

Table - 11 - Range and Station wise Details of Staff

Forest Station	Dy. Ranger	Foresters	Guards	Watchers
I. Mannarkkad Range				
1. Palakkayam	1	3	14	1
2. Mannarkkad	1	3	14	1
3. Thiruvizhamkunnu	1	3	14	1
II. Attappady Range				
1. Mukkali	1	3	14	1
2. Pudur	1	3	14	1
III. Agali Range				
1. Sholayur	1	3	13	1
2. Ommala	1	3	13	1
3. Singappara	1	1	13	1
Total	**8**	**22**	**109**	**8**

Table - 12 - Expenditure on Establishment from 2001 to 2010

Year	Salary including DA, OA, MR and wages	T. A. and PTA	Total
2001-02	1,47,02,656	232409	1,49,35,065
2002-03	1,30,57,976	213841	1,32,71,817
2003-04	1,47,02,656	2,32,409	1,49,35,065
2004-05	1,34,12,628	70,889	1,34,83,517
2005-06	1,38,79,493	96,744	1,39,76,237
2006-07	1,62,99,265	2,63,086	1,65,62,351
2007-08	1,76,37,552	3,13,641	1,79,51,193
2008-09	2,04,57,306	2,32,241	2,06,89,547
2009-10	2,33,43,500	1,68,328	2,35,11,828

6.2. Labour Supply:

Forest Department utilizes the services of hired labourers for both skilled and unskilled works. There is no permanent labour force; they are recruited as and when the need arises from among the local people. Preference will be given to tribes; nearly 80% of the labour will be from nearby tribal settlements. Since the works are implemented through convenor system, the convener arranges the labour from among the locals. The works such as raising of nursery, planting, cultural operations and tending works such as weeding, climber-cutting, soil working, extraction of timber, poles firewood, fire-protection works and boundary consolidation works are carried out through VSS and NREGS Most of the works require only unskilled labourers and they are engaged from the surrounding villages as and when needed. Usually difficulty is experienced in getting adequate number of labourers, because of NREGS and high wage rate prevailing in the locality.

In the past, contractors used to bring skilled labourers from the plains and station them in camps near the work sites. The contractors would supply the required provisions to them and the workers used to camp in the temporary sheds for long periods. At present the workers do not camp in the Forests as the department cannot extend the facilities, which the contractors were providing. Hence, they prefer walking to reach the work site and return to their houses in the evening resulting in poor outturn of work.

From 1986-95, a scheme of providing food commodities to the workers at concessional rates, namely WFP (World Food Programme) instituted by WHO was introduced. The labourers in the forestry sector were benefited by this unique project. In this scheme one labourer from each family was supplied with “One Unit” of ration, containing 2 Kg rice, 200g Pulse and 200g Vegetable oil for each day of work for which a nominal amount was realised from him. This was limited to 25 days for 30 days of work. Because of the short supply of food commodities from the organization, the government was constrained to reduce the ration to a worker, for 30 days work to 20 units and thence to 15 units for a short period. The fund so generated was used for developmental works for the upliftment of tribal and backward classes.

CHAPTER – VII

PAST SYSTEM OF MANAGEMENT

7.1 General History of the Tract:

The present Palakkad District includes Alathur, Chittur, Palakkad, Ottappalam and Mannarkkad Taluks. The Forests of Palakkad District were owned and managed in the past by its erstwhile Rulers/Kings. The British's could declare vast extent of forest areas as Reserve Forests. But an equal extent of forest was left with the local Rajas / Rulers and these forests remained as private forests till 1971. In 1971 the private forests were nationalized by Government of Kerala, Act 26/71 "The Kerala Private Forest (Vesting and Assignment) Act", and thereafter the management of these forests is with government. Territorial Divisions managed the reserve forests while Special Divisions managed vested forests. In 1989 the forest area within the District of Palakkad, but outside Parambikulam and Silent Valley Wildlife Divisions were reorganized amalgamating both the Reserve Forests and Vested Forests and brought under 3 territorial divisions for administrative convenience and effective protection. The newly re-constituted divisions are Palakkad, Nemmara and Mannarkkad. The Mannarkkad division comprises the Forests within the Revenue Taluk of Mannarkkad, excluding the area under Silent Valley National Park.

7.2. Early History of Management of Forests:

Palakkad came under British Rule in 1702 AD; it was a Taluk of the then Malabar District. The Malabar District Board, which came into being in 1809, played an important role in the development of this district.

7.3. Forestry Features:

As mentioned already, very little was documented about the Forests of this division. Large tracts were under the control of private Jenmies or landlords. It was not possible for the Rulers to exercise control over the management of the Forests owned by private individuals. Owing to the social conditions then prevailing these forests were not managed scientifically. Given below is a quotation from The Malabar Gazette published in 1915.

"Most of the Forests belong to private Jenmies, unscientific forestry, the ravages of timber theft and the destructive Punam/shifting cultivation are slowly but surely denuding the Ghat slopes of all the valuable timber and the paddy flats below have already been injured by the wash of sand and

gravel. The average Jenmy is anxious to turn his trees into money with the least possible delay and in this perhaps he is hardly to blame; for if he hesitates others will not be slow to take advantage of his procrastination. He has not the means adequately to conserve his forests and of late year's timber theft has been bolder and more ubiquitous than ever. Generally a Mappla gets from the Jenmy, in the guise of an honest merchant, permission to fell and remove a certain number of trees on payment of a Kuttikanam or stump fee. Usually he fells ten times as many trees as he has paid for nor is he particular on whose land they stand. The cultivation of Punam, which involves the clearing of all timber from the land cultivated is fatal to tree growth, but it is unrestricted in Private Forests".

7.4. History of the Reserve Forests, Attappady Block I to VI:

According to the information available in Madras district Gazette, Volume I (Malabar and Anjengo) 1915, Attappady Valley was inhabited by Tamil and Canaries, Goundars, Ballagas, Irulas, Kurumbas and other hill-tribes, who practiced shifting cultivation on an extensive scale. Twenty one "Hills" and part of another belonged to government and the rest were in dispute between the powerful Jenmies. The valley was very feverish and hence Europeans seldom visited these forests.

The Attappady Block I to IV were constituted as Reserve Forests as per notification No. 332 dt. 13.07.1900.

As both Attappady block V and VI belonged to private parties, they had to be acquired under the Land Acquisition Act. Attappady Block VI was purchased for Rs.11,379-4-0 and Block VI was acquired for Rs. 91,571-12-0. These two blocks were notified as RF vide notification No. 314 dt. 22.7.1912.

The primary idea was to keep the above blocks as protection forests in order to protect the catchment of Bhavani River and its tributaries. During 1920-28, the forests received a great deal of attention owing to post-war activity in the timber trade. A number of rest houses and bridle paths were constructed with a view to develop these Forests.

NTFP collection was the only activity in these Reserves since reservation up to 1932. During that year, the selection felling was started in Panthenthodu valley of Attappady Block I. Sri. Venkiteswara Iyer brought the blocks under regular Working Plan (1933 to 42), for the first time.

7.4.1. History of Panakkadan and Kottanikkunnu Reserve:

This was a small bit of forest, became Government poramboke by escheat. It was notified under section 16 vide

notification No. 338 dt. 27.07.1906. Panakkadan, extension I was added in April, 1918 and extension II also called as Kottanikkunnu, was added in November, 1918. An attempt was made in 1920 to regenerate Kottanikkunnu extension II by Kumari method, but could not be materialized due to the Mapla rebellion in 1921. Sri. Venkiteswara Iyer brought this area under regular WP for the first time.

7.5. Past system of Management and their Results:

Vast tracts of forestland unoccupied at the time of original land revenue settlement, nearly a century ago were considered as property of some prominent Jenmy or others. Survey conducted by Madras Government during 1945 revealed that the private forests then measured 1200 sq. mile (3,100 Km^2.) and belonging to 116 individuals, the extent owned by them varying from 100 to 10,000 acres.

7.6. The Madras Preservation of Private Forest Act:

The private forests of Malabar did not attract the land hungry men or the government until World War II. The government was convinced about the need for a comprehensive legislation to prevent the uncontrolled alienation and consequent denudation of these forests. The Madras Preservation of Private Forest Act (MPPF), "an Act to prevent the indiscriminate destruction of private forests and interference with customary and prescriptive rights therein" was enacted, pending further legislation as Act XXVII of 1949.

Though the MPPF Act was extended from time to time for various reasons, changing circumstances and legal questions intervened in making further legislation to replace the MPPF Act. The implementation was not satisfactory. The penalties provided were often on papers only because prosecutions were not successful. The area being mostly un-surveyed, felling permits could not be strictly monitored. The owners were interested in easy money obtained by felling the timber than proper management of the forests. The destroyers of forests stampeded in these Forests by obtaining money receipts from the owners. This system of occupying the forestland on the strength of money-receipts was a clever ruse, because while there is no clear alienation of the land, the owner allowed some other persons to cultivate the area from year to year contravening the condition regarding regeneration of the felled areas. In general the objective of preserving the forests was not achieved.

Consequently in 1971, the Kerala Private Forest (Vesting and Assignment) Act was passed by the legislature and after a long legal battle the Hon'ble Supreme Court of India approved the Legislation. Thus all the lands, which were governed by the MPPF Act, 1949 were vested with the government as on 10.05.1971.

7.7. Working Plans:

Vested Forests of this Division were not having Working Plans prior to vesting. The first Working Plan for the Vested Forests of this Division was prepared by Sri. P.K. Zacharia for the entire special division of Palakkad from 1980 to 1989. Before the coming into effect of this Working Plan some plantations were raised by the division and prior to vesting some plantations were raised by the ex-owners. After the expiry of the above Working Plan, they were managed as per management plans prepared from time to time. The current Management Plan was prepared by Sri. A. M. Babu Bonaventure, former DFO, Mannarkkad. Management Plan is covering for both Vested Forests and Reserve Forests and its currency is from 1998 to 2000.

7.8. Buildings and Roads:

At the time of Sri. P. K. Zacharia's Working Plan there consisted only one building Thenkkara range office and few roads constructed by ex-owners. Later on several buildings and roads were added.

7.9. Special Works of Improvements:

The erstwhile owners of vested forests made no efforts to improve these forests. On the other hand mismanagement has caused heavy deterioration. However, there is one exception in the tract where the owner Sri. K. P. Mohammed Haji had raised one teak plantation of 800 acres in Mukkalivenga Malavaram.

7.10. History of Mukkalivenga Teak Plantation:

Late Sri. Kalladi Cheria Kunju Mohammed raised teak plantations over an area of approximately 1100 acres. By the side of these teak plantations, he planted miscellaneous species over an area of 75 acres. These plantations raised in 1957 as per the provisions of a government approved working scheme were so well maintained that they drew applause from the visitors. The Chief Conservator of Forests and Palakkad District Collector recorded great appreciation for the works done in these plantations (Malayala Manorama 22/4/1980).

Subsequent to vesting of these forests, Palakkad Special Division had tried to improve their condition by artificial regeneration of different species. Improvement works in the RFs of this division was carried out by Palakkad Territorial Division till 31.3.90 under various Working Plans. From 1.4.90 onwards they were merged with Mannarkkad Division. The following were the improvement activities carried out in the reserve forests of this division. These RF came under regular Working Plan from the plan of Sri. T.V. Venkiteswara Iyer (1933 to 42).

Planting was started in 1934 in Panakkadan and Chindakki series. Chindakki series was suspended in 1937 as no sale could be found for wood from the areas taken up for conversion due to lack of conversion facilities. Though the decision was to raise mixed plantations, the plantations raised were more or less monoculture. The rotation fixed was 70 years. The thinning schedule prescribed was not timely, light and hence many plantations have not fared well.

The following plantations were raised during the Plan period of Sri. T. V. Venkiteswara Iyer.

7.10.1. Panakkadan Series:

Moist deciduous forests were not worked since reservation. The first plantation was started in 1934.

7.10.2. Chindakki Series:

This comprised the lower slopes of Attappady Block I, IV and V, heavily supported deciduous type of vegetation. The series was planted for only 3 years and then discontinued due to the reasons noted above.

The moist deciduous Forests of Panthenthode and Bhavani valley were recommended for planting in Mr. Van Haeften's (1943 to 57) Working Plan, Rotation was 70 years and average annual planted area was 12 acres (4.85 ha). In 1951-52 an experimental planting was done in Pottikkal in 0.81 ha and this gave a promising result. It was then decided to plant teak in Pottikkal area.

7.11. Eucalyptus Plantations:

Under the scheme of fast growing species (1967-68) *Eucalyptus grandis* plantation was raised in 50 ha in Panthenthodu valley of Attappady Block I Compartment No. 16 by clear felling semi-evergreen shola. The plantation came up well though the girth is comparatively less than other places.

Under the scheme Rosewood areas were selected in Panthenthodu and planted with Rosewood on an experimental basis.

1. 1974 - 1 ha 2 × 2 m

2. 1975 -2 ha 3 × 3 m Inter planting in failed Softwood plantation.

3. 1976-84 - 42 ha 2 × 2m

7.12. Plantation of Non-Forest Species:

7.12.1. Cashew Plantations:

Under the second Five Year Plan 106.52 ha of the un-reserve in Thiruvizhamkunnu in Mannarkkad Range were planted with cashew. The following are the plantations.

1. 1956 Mulaguvallam - 40.468 ha
2.1957 Kanjiramkunnu - 39.676 ha
3.1958 Mulaguvallam - 13.302 ha
4.1958 Kanjiramkunnu - 13.069 ha

7.13. Achievements and Deviations from the past Working Plan:

This is the first Working Plan for the re-organised Mannarkkad Forest Division formed with effect from 1.4.90 comprising ranges of former Palakkad Special Division and parts of former Palakkad Territorial Division. The previous Working Plan of Palakkad special division was by Sri. P. K. Zacharia (1980-89) and that of Palakkad Division was by Sri. Chand Basha (1975- 84). Sri. Chand Basha (1975-84) in his plan proposed to convert 600 ha of forests in Gottiyarkandy area, now under Attappady range of present Mannarkkad Division into teak plantations over a period of 10 years, at the rate of 60 ha per year. Accordingly teak plantations were raised as follows.

1) 1981 Gottiyarkandy Teak Plantation	-	130.44 ha
2) 1982 Gottiyarkandy Teak Plantation	-	26.41 ha
Total area	**-**	**156.85 ha**

Though the prescription was for the conversion of 600 ha into teak plantations, during the plan period only 156.85 ha were converted. There after conversion was discontinued due to promulgation of the Forest Conservation Act 1980. The above two plantations are a total failure. The few teak plants standing scattered throughout the area do not show height and girth proportionate to age. The plantations are rich in bamboos and miscellaneous growth suppressing teak. There was no maintenance or cultural operations after the first two years, it is recommended to revert them to natural forests.

7.13.1. Working Plan by Shri. P.K. Zacharia (1980-89):

Sri. P. K. Zacharia in his plan for Palakkad Special Division (1980 – 89) had proposed conversion of 600 ha of forest in Vettilachola area in Mannarkkad range of present Mannarkkad Division to raise softwood plantation during the plan period at the rate of 60ha per year. The species suggested was *Eucalyptus tereticornis*. However, no area was taken up for conversion in the locality during the plan period.

In Thathengalam area of Mannarkkad Range, the former Palakkad Special Division, an area of 600 ha was proposed for conversion into teak plantation by Sri. P. K. Zacharia in his Plan for Palakkad Special Division for the period from 1980 to 89. The following plantations were raised during the period from 1981 to 86.

1981 Miscellaneous plantations (Social Forestry)	-	48.50ha
1981 Cashew Plantations	-	31.86 ha
1984 Teak Plantation	-	21.42 ha
1986 Cashew and Acacia	-	15.00 ha
1986 Cashew and Matty	-	20.00 ha
1981 Cashew by Plantation Corporation	-	125.00 ha
1983 Cashew by Plantation Corporation	-	40.00 ha
Total	**-**	**301.78 ha**

Thus 301.78 ha of natural forests were converted to plantations during the period from 1981 to 86. The Plantation Corporation of Kerala (PCK) has raised two cashew plantations over an extent of 165 ha and the plantations raised by forest department are only 136.78 ha, out of this, area under teak is 21.42 ha This teak plantation is fairly satisfactory with an average height of 18 meters and girth from 38 cm to 106 cm. Stocking is also fairly good. However, there is no more area suitable for teak planting in the locality and hence no more conversion is proposed in this plan.

7.14. History of Selection Felling:

Selection felling is the oldest practice followed in the working of forests by the department as well as by Jenmies of private forests in this division. In the past the required species were selected and felled for definite purpose. The girth was decided based on the purpose of utilization. It was a commercial exploitation of forests irrespective of the Silvicultural needs of the crop and no attempts were made for regenerating the depleted portions. This sort of working denuded the easily accessible portions. The state of the forests prevailing then was described by Mr. P. M. Lushington in his memorandum dt. 6.10.1906 as *"If we are really to conserve the areas our cutting must be limited and the most we can expect is to be able to fell mature trees and those sparingly. I do not see why the Forest Department looks only to the commercial side. We are called conservators, Deputy Conservators etc. I am of the opinion that the first idea of the department should be conservation and the making of revenue is only of secondary importance".*

Almost all the forests in the division were once with private landlords who were practicing some sort of selection felling before the Forests were nationalized (vested).

Selection felling was started in Silent Valley Reserve Forest during 1928 under a scheme for exploitation of sholas of Silent Valley and Attappady Blocks. According to the scheme, *Mesua* were to be worked for railway sleeper, *Discospermum*,

Calophyllum, *Hopea* and *Pterocarpus* were to be worked for Kolmarams and Chattams. The limit prescribed was 3 trees from One Acre. The minimum girth fixed was 7' for Mesua and 6' for others. No two trees marked for felling was to be within 30' of each other. This was extended to Panthanthodu and Kalladikode in the same year. Sri. T. V. Venkiteswara Iyer in his Working Plan for Ghat Forests (1933 to 42) also prescribed selection felling similar to those carried out between 1928 and 1931 in Silent Valley, Attappady and Kalladikode. In his prescription the girth was altered as follows.

Table - 13 - Girth of Miscellaneous Species in Selection Felling

Sl. No.	Species	Girth
1	*Mesua ferrea* I Quality	7' to 7½' (2.13 to 2.32 m)
2	*Mesua ferrea* II Quality	7' to 6½' (2.13 to 2.01 m)
3	*Dalbergia latifolia* *Pterocarpus marsupium* *Palaquim ellipticum* and *Calophyllum elatum*	6' to 7½' (1.82 to 2.32 m)
4	*Xylia xylocarpa*	6' to 6½' (1.82 to 2.01 m)

It was prescribed that marking to be done keeping the distance of at least 60' (18.28m) between 2 trees marked instead of 30' (19.14m) prescribed in the past and not more than 3 trees per acre average were to be extracted with felling cycle of 15 years.

Sri. Iyer included the workable portions of wet evergreen Forests of Attappady and some of the deciduous and semi-deciduous Forests of Panakkadan and Attappady Block I in the selection-working circle. 16,192 acres were constituted as Attappady felling series. Felling cycle was 15 years for the selection Forests. He calculated the yield based on the total number of Mesua trees in the prescribed girth classes found available in actual enumeration and then prescribed removal of 50% of the available trees in the lower exploitable diameter class and 60% of trees in all the higher diameter classes in each compartment. He also took into consideration the average number of trees already exploited from the various coupes worked previously.

The selection felling has continued uninterruptedly in Attappady series as it was an easy terrain. Large sums of money was spent on gap regeneration which failed, and ultimately given up in 1937.

Mr. Van Haeften in his Working Plan (1942-57) prescribed a modified form of selection felling followed by tending of natural regeneration of valuable species fixing the rotation at 150 years with a felling cycle of 15 years. He prescribed an exploitable girth of 6' for Mesua and 4' for *Xylia* and 6½' for other species. Since the coupe system allotting definite areas for a particular year do not work satisfactorily, he prescribed the sequence in which the compartments were to be worked and the maximum number of

Mesua trees that could be felled every year as 550 trees from the Attappady series because, only Mesua was in good demand for Railway sleepers. He prescribed a maximum of 11 trees per acre in the case of non-sleeper species however, the actual number to be felled was left to the discretion of the management, with condition that trees so selected in a particular year should be in areas worked for *Mesua* in that year.

Artificial regeneration was not prescribed; instead he recommended a more concentrated form of tending. All tending works to be done during a felling cycle was to be restricted to one block to be called “regeneration block”.

Mr. Van Haeften deleted some of the compartments from the original list of compartments formed by Sri. T. V. Venkiteswara Iyer and limited selection felling to tropical wet evergreen Forests of Attappady Block I to VI only. Most portions of the deciduous and semi deciduous Forests were proposed for conversion into plantations. He also recognized two felling series viz. Attappady with a total of 15,336 acre and Silent Valley with 17,274 acre. Sri. Mohammed in his working plan (1959 to 73) prescribed careful selection felling of species which can be profitably removed without excessive opening in the canopy cover, followed by tending of natural regeneration of valuable species and introduction of valuable species in openings created by felling.

He also recognized a felling series in Attappady having an area of 12,609 acres and yield was calculated as 4 trees per acre in the case of Attappady series. He also prescribed felling a maximum of 6 trees/acre including the sleeper species when other species become merchantable and to keep a minimum distance of 60' between two trees marked for felling. Selection felling was also done in Attappady block VI for supply of plywood timber.

7.15. History of working of NTFP:

Even before the introduction of scientific management, the collection and disposal of NTFP was going on in almost all the reserves of this division. NTFP was regularly collected year after year from Attappady areas. The main produces were cardamom, honey, wax, shikakkai, tamarind, avaran bark, pepper, gallnut, gooseberry etc. Subsequent working plans included a separate Working Circle for management of NTFP.

7.16. Harvesting of Bamboos and Reeds:

Scientific management of bamboos was started as early as 1891. Mr. Foulks in his working plan included bamboo WC in 1902. The bamboos in Thadikundu area in Attappady Block I to V and reeds in Attappady block VI and Silent Valley were not extracted for want of extraction facilities.

Mr. Van Haeften in his working plan prescribed extraction through contractors on a three-year felling cycle. He included Attappady block I to V under the bamboo- working circle.

The reeds in Attappady Block VI were sold in auction every year till 1950-51. Shri. Mohammed in his working plan prescribed Selection thinning of bamboos and reed clumps in 3 year felling cycle. Among the 3 series, Walayar, Chenat Nair and Mukkali series, only the last one is included in the area dealt with in this Plan. For the first time reeds were included under the bamboo working circle. Reed area in Attappady block VI was divided into 3 coupes to be worked on 3 year felling cycle through contractors. Provision was also made for the issue of seigneorage passes for bonafide domestic and agricultural purposes including cottage industries.

7.17. Special works of improvements:

The following special works predominantly cultural operations were taken up in the forest areas as shown below.

7.17.1. Attappady Block I to VI:

Prior to 1920 no cultural operations appear to have been done in these Forests. In 1920, 400 seedlings of *Eucalyptus tereticornis, Eucalyptus grandis* and 4500 seedlings of *Vateria macrocarpa, Cullenia excelsa* and *Dischopis elliptica* were planted around Muthikulam Bungalow at a cost of 89.12.0. By 1923, practically all were dead. In 1935, 250 natural seedlings of *Dalbergia latifolia, Pterocarpus marsupium* and other species found in the grassland around Muthikulam were tended at a cost of Rs.2.80. Gap regeneration was introduced in 1929 and continued up to 1930 then it was given up as it proved to be a failure. Concentrated regeneration was started at Singappara in 10 acres in Attappady Block VI. Special tending of advance growth was carried out in 573 acres of Attappady series during the currency of the Working Plan of Sri. Venkiteswara Iyer. As the artificial regeneration were failures, Sri. Van Haeften recommended tending of natural regeneration; even this was stopped as it proved utter failure.

Mr. Mohammed (1959) prescribed tending of natural regeneration in the evergreen forests. Till 1973 or later no attempt was made in this direction.

History of Fire Protection: In the past years different reserves received different treatments with regard to fire protection.

7.17.2. Attappady Block I to VI:

9.66 Km length southern boundary of Block I from Bhavani River westwards to the point where it meets the Panthenthode was cut and burnt from 1913-23. Later in 1923-24

this fire tracing was extended to Aruvanpara peak. The width of the fire-lines was 6.1 m. The eastern boundary of Attappady Block II to V to a width of 30-48 m and a distance of 19.31 Km was fire traced since 1912-13. Fire protection was carried out along the eastern boundary of block VI and no fire tracing was required to be done along the other boundaries, as the boundary passes through sholas.

7.17.3. Panakkadan Reserve:

The entire boundary was fire-traced up to 1924-25 to a width of 6.1 m. Two fire patrols were also engaged from 1917-18 to 1924-25. From 1925-26, only the northeastern boundary adjoining the private forests to a length of about 32 km was fire traced as the rest of the reserve being bounded mainly by paddy fields. The Mappila Rebels, during the Rebellion set fire to the whole of the reserve in 1921-22.

The fire protection works carried out and expenditure incurred, since the formation of this division is shown below:

Table - 14 - Details of Areas fire protected and expenditure thereon

Year	Total Area (ha)	Effective Area (ha)	Expenditure (Rs)	Remarks
2001-02	529.5680	193.3214	4,84,226	Expenditure incurred in Agali, Mannarkkad, Attappady Ranges
2002-03	529.5680	44.1650	11,22,682	
2003-04	529.5599	1186.49	10,14,000	
2004-05	529.5599	134.06	18,25,000	
2005-06	529.5598	34.65	22,03565	
2006-07	378.441	401.37	35,37,477	
2007-08	422.4535	182.15	27,62,639	
2008-09	422.4535	1101.64	30,00,135	
2009-10	422.4535	168.55	24,39,693	

7.18. Influence of previous Working Plans:

7.18.1. Working Plan by Shri. S. Chand Basha (1975 to 1984):

The Reserve Forests of the division were part of Palakkad Territorial Division prior to reorganization of the divisions in 1990. The latest Working Plan covering the then Palakkad Division is that of Sri. S. Chand Basha (1975 to 84). It was aimed at the following objects:

(i) Securing the maximum sustained yield of timber, fuel, bamboos and other forest produce having regard to productive capacity of forests.

(ii) To harvest the merchantable timber from the evergreen forests without endangering their primary evergreen structures and at the same time to remove the hollow and defective higher girth to enhance the productivity.

(iii) To harvest the dry deciduous forests for the merchantable timber and to convert the suitable areas into plantations of economically important species.

(iv) To protect the steep slopes and catchment areas of projects and rivers from denudation without affecting the yield and also to protect the economically poorer high elevation Forests perpetually as climax forests.

(v) To maintain the forests in a state of increasing productivity.

(vi) To provide essential raw materials such as bamboos and other industrial wood to cater to the needs of the wood based industries.

(vii) To improve the standard of living of the hill-tribes and to give maximum facilities for the scientific utilization of the land allotted to them.

(viii) To preserve the wild fauna.

(ix) To cloth the available and suitable grass lands with economically important species.

(x) To obtain the maximum financial returns from the forests consistent with the above objects of managements.

7.19. Method of treatment:

(a) Light working of evergreen forests together with tending and removal of hollow and defective trees progressively to improve the forests and also to protect the forests in higher elevation and precipitous sholas without disturbance.

(b) Conversion of suitable areas into valuable plantations within the minimum time possible thereby, increasing the economic value of the Forests.

(c) Adoption of latest techniques of Silviculture in tending and thinning of plantations.

(d) Working of bamboos and reed forests on a three-year felling cycle.

(e) Improving the availability of NTFP and cater to the pastoral needs of the surrounding populations.

(f) Improving the living standards of the tribes by giving reasonable facilities for cultivation and affording opportunities for the scientific utilisation of their resources.

(g) Prescribing measures for the protection of fauna.

(h) Afforestation of grass lands with suitable species.

Considering the objects and mode of operations mentioned above, following working circles were framed.

1. Selection Working Circle
2. Plantation Working Circle
3. Bamboo and Reed Working Circle
4. Minor Forest Produce Working Circle
5. Protection Working Circle

In the Selection Working Circle, the area falling in the present Mannarkkad division viz. Attappady block I and VI were included and treated as Attappady felling series. Only accessible portions of the forests were worked. The main objects were exploitation of wet evergreen forests for their merchantable timber without impairing their basic character. Increasing the composition of saleable species in the growing stock.

7.20. Artificial Regeneration:

The gap resulted after felling of marked trees was artificially regenerated in this division and elsewhere in the past, with no satisfactory results. Hence, artificial regeneration was not proposed. Tending of the natural seedlings, saplings and poles were to be carried out.

7.21. Plantation Working Circle

Teak plantations have been raised in portions of Panakkadan RF, Attappady Block I to V. Small extents of softwood plantations also occur in Panakkadan and Attappady Block I to V reserves. Few miscellaneous plantations have been raised in the past in Chindakki area of Attappady Block I reserve and in Panakkadan RF. Attappady Block V was recommended for conversion to teak (600 ha). These plantations were failure and thereafter no plantations were taken since clear felling was banned during 1987. In addition, three plantations of Eucalyptus were raised, they are

1.1983 Muthikulam – 30.52 ha

2.1986 Muthikulam – 5.50 ha

3.1987 Muthikulam – 45.00 ha

All the above plantations were failure.

7.22. Bamboo and Reed Working Circle:

This Working Circle constituted all the bamboo bearing areas of Palakkad Territorial Division and the reed bearing areas of Silent Valley and Attappady Block VI (Muthikulam). The WC was divided into 2 felling series viz. Bamboo felling series and reeds felling series.

As the main bamboo bearing areas had flowered in Attappady, it was proposed to form only one coupe in Attappady Block I to V. It was designated as Attappady bamboo coupe (Coupe No. I) with an extent of 950 ha

Three coupes were formed viz. Muthikulam, Chenat Nair and Silent Valley reed coupes. The system of management was selection thinning of bamboo and un-flowered reed clumps. For bamboos, the area was already under an agreement with M/s. Grassim Gwalior Rayons Co., Mavoor. Reeds were extracted through the agency of contractors. The reed coupes prescribed were to be sold in open auction, one coupe per year. The hill men residing inside the reserve have to be given bamboos and reeds free of cost for their bonafide use.

7.23. M.F.P. Working Circle:

This Working Circle covered all the reserve forests of Palakkad Territorial Division and the un-reserve of Mukkali Venga. The Chapter was dealt with under the following two divisions based on type of products and nature of management.

7.24. Cashew Plantations & Other NTFP's:

7.24.1. Cashew Plantations:

This included Cashew plantations raised in the un-reserves in Thiruvizhamkunnu, during the second five-year plan.

The cashew plantations have come up well. The area is lateritic and was supporting a degraded forest with sparse deciduous type of vegetation and hence converted to cashew plantation. The total extent of cashew plantation was 106.52 ha Out of this 40.468 ha, raised in 1956, 39.676 ha, in 1957 and 26.371 ha in 1958. The main product obtained is fruit (nuts). The following plantations were raised after preparation of this plan:

1.1976 Thiruvizhamkunnu	2.0 ha
2.1978 Thiruvizhamkunnu	13.8 ha
3.1995 Kanjiramkunnu	10.0 ha
4.1996 Kanjiramkunnu	6.5 ha

The right of collection of nuts is being auctioned during the month of January or February i.e. just after flowering, for a period up to 30th June of the year.

7.24.2. Other NTFP:

This included all the other NTFP available in the forest. Cardamom and other NTFP were to be sold in auction separately.

Cardamom: Auctioned separately with the following as the units of sale.

1. Silent Valley and Attappady Block I to V
2. Attappady Block VI and Chenat Nair RF

Other NTFP: These were to be sold in the following units. Some species like *Rawolfia serpentina, Vinca rosea, Strychnos nux-vomica, Dioscorea* sp., *Gloreosa superba, Solanum turvum* etc are recognized as important species in various allopathic preparations.

Unit I : Silent Valley

Unit II : Attappady Block I to V and Panakkadan RF

Unit III : Attappady Block VI

7.25. Agency of harvesting:

The collection of MFP was normally through contractors but recommended to entrust with Tribal Societies. Provision was also made for departmental collection through FDA with prior approval of the Conservator of Forests.

7.26. Protection Working Circle:

The areas not included in the plantation and selection working circles were brought under protection WC. Three types of areas were included in this Working Circle. The high level sholas with low quality forests due to the nonexistence of optimum conditions required for development of better tropical evergreen forests. These forests are found beyond 1350m above MSL. These localities are mostly inaccessible and have small sized trees. Profitable extraction of timber is not possible. In these forests, the hills are precipitous and bare rocks are common. These are mostly of ecological importance and form the catchment of the important rivers namely, Kunthipuzha, Bhavani and Siruvani. Denudation of these forests will affect the continued water supply of these rivers.

The extent of each reserve under the above category was as shown below:

Table - 15 - Reserve Forests under Protection WC

Sl.No	Reserve	Area (ha)
1	Silent Valley RF	4098
2	Attappady block I	4501
3	Attappady block II to V	3594
4	Panakkadan RF	257
5	Attappady Block VI	1996
6	Chenat Nair RF	3911
7	Walayar RF	190
Total		**18,547**

Certain areas like Attappady I (431.00 ha), Attappady V (970.00 ha) and Attappady VI (351.00 ha) were under shifting cultivation in the past, even prior to reservation. Major portion of such area was not suitable for extraction because the Forests were of poor type situated in very steep localities of poor soil condition.

About 172.0 ha was recommended to be preserved as original shola in Silent valley RF (84.0 ha) and Chennat Nair RF (88.0 ha) without any working for comparison and future study. These areas are not part of the present division.

7.26.1. Prescriptions:

- Ø The areas falling under the 1st and second category were to be protected in perpetuity as they form high-level sholas. The areas coming under the last category is to be protected for comparative study of the original shola of the wet evergreen with similar worked areas.

- Ø Grazing and collection of MFP, Bamboos, Reeds and Canes were permitted in this circle. No other treatment was contemplated.

The First Working Plan for these areas was that of Sri. P. K. Zacharia (1980 to 89) for the entire Palakkad Special Division comprising of only VFs in the revenue district of Palakkad. The forest tracts dealt with in that plan now forms part of Mannarkkad, Palakkad and Nemmara Divisions, consequent to the re-organization of the divisions in consonance with district boundaries in 1990, all the vested forest area of Mannarkkad Taluk was brought under Mannarkkad division and the details pertaining to these areas are discussed here. It is pertinent to note that, even before the preparation of the Working Plan some plantations were raised in the vested forests by ex-owners and by the Department also.

The Working Plan of Sri. P. K. Zacharia (1980-89) aimed at the following objects of management:

1. Securing maximum sustained yield of timber fuel, bamboos and other forest produce having regard to productive capacity of Forests for the benefit of the local community.

2. To exploit the merchantable timber from the evergreen Forests without endangering their primary structure and to remove the hollow and defective higher girth classes, to give room for important merchantable species to establish maintaining ecological balance necessary for moisture conservation.

3. To exploit dry deciduous forests for the merchantable timber and to convert the suitable areas into plantations of economically important species with special reference to agricultural and industrial needs of the people living nearby.

4. To protect the steep slopes and catchment areas of project and rivers from denudation without affecting the yield and also to protect the economically poorer high elevation Forests perpetually as climate Forests.

5. To maintain the forests in a state of increasing productivity.

6. To provide for essential raw materials of bamboos and other industrial wood to cater to the needs of wood based industries.

7. To improve the standard of living of the hill tribes and to give maximum facilities for the scientific utilisation of the land allotted to them.

8. To preserve the wild fauna.

9. To re-cloth the available and suitable grass lands, with economically important species.

10. To obtain the maximum financial return from the forests consistent with the above objects of management.

7.28. Method of Treatment:

In consideration of the above objects of management, the following methods of treatments were proposed for different types of forests in the Division.

a) Maintain existing evergreen forests as protection forests wherever the terrain is precipitous and elevation is more than 1,500 m.

b) Protecting forests growing on both the banks of water courses for maintaining the flow and preventing bank erosion.

c) Conversion of suitable areas into valuable plantations within the minimum time possible thereby increasing the economic value of the forests.

d) Adoption of latest techniques of Silviculture for tending and thinning of plantations.

e) Working of bamboo and reeds on a three- year felling cycle.

f) Improving the production of minor forest produce.

g) Introduction of fodder trees and grasses in suitable areas.

h) Improving living standards of the tribes by giving reasonable facilities for cultivation and affording opportunities for scientific utilisation of their land.

i) Taking measures for protection of fauna.

j) Afforestation of grasslands by suitable species.

k) Introduction of coffee and spices like cardamom in the evergreen Forests to get revenue.

l) Introduction of fruit trees in suitable localities to raise the tribal income.

Sri. P. K. Zacharia has divided the entire area of vested forests in the revenue district of Palakkad into XII Blocks and several compartments. Of these, the following VI Blocks comprise the present Mannarkkad Division. They are as follows:

I. Thathengalam Block (5358 ha): This block comprised the following Malavaram with the areas noted against them.

1. Thathengalam Malavaram – 830 ha
2. Paruthimala– 400 ha
3. Mezhukupara Malavaram–1051 ha
4. Anamooli Malavaram– 188 ha
5. Urulankunnu Malavaram– 826 ha
6. Kelaloor Malavaram– 560 ha
7. Pothopadam– 680 ha
8. Karapadam– 823 ha

This Block was again divided in to 7 compartments as below.

1 Thathengalam – 500 ha
2. Paruthimala –1200 ha
3. Mezhukupara– 500 ha
4. Anamooli– 440 ha
5. Urulankunnu– 445 ha
6. Karappadam–1173 ha
7. Pothenpadam Kelaloor–1100 ha

II. Karimala Mundanad Block (4190 ha): This was divided into 2 Blocks viz.

1. Vettilachola–Anakaranam–2025 ha
2. Mundanad–Karimala–2165 ha

III. Mukkalivenga Block (1200 ha): This Block was not divided into compartments.

IV. Kallamala Block (100 ha): Not divided into compartments.

V. Aralikkonam - Kinnakkara Block (8044 ha): This Block comprised of vested forest bits of Aralikkonam (7994 ha) and Kinnakkara (50 ha) and this block was again divided into three compartments Nos.1, 2 and 3 having 2925 ha, 2875 ha, and 2244 ha respectively.

VI. Thoova Block (770 ha): It was also not divided into compartments.

In pursuance of the objects already mentioned, the Vested Forests of the division (entire Palakkad Special Division) was brought under various Working Circles.

1. Village Forestry, Fuel Wood and Small Wood Working Circle (Low country series)
2. Village Forestry, Fuel Wood and Small Wood Working Circle (Tribal series)
3. Village Forestry MFP Working Circle (Tribal series)
4. Village Forestry MFP Working Circle (Low country series)
5. Grazing Working Circle
6. Bamboo Working Circle
7. Improvement cum Protection Working Circle
8. Plantation Working Circle
9. MFP Working Circle (Traditional)
10. Wildlife Management Working Circle

7.27. Village Forestry, Fuel and Small Wood Working Circle (Tribal series):

One of the important objects of management was to provide employment to tribal population and small wood and fuel for their bonafide use. The areas included in this Working Circle were in close proximity to tribal colonies. 1076.55 ha in Aralikkonam vested forest and 620.00 ha Thoova vested forest of present Mannarkkad division were included in this Working Circle. In Aralikkonam block the silvicultural system proposed was artificial regeneration of different species retaining the original miscellaneous growth and in Thoova it was artificial regeneration of *Eucalyptus tereticornis* retaining the original growth.

7.28. Village Forestry MFP Working Circle (Tribal series):

The areas of present Mannarkkad division, which were included in this Working Circle, were Mundanadu, Karimala and Mukkalivenga. These areas are lying on higher elevation and adjacent to tribal colonies. In those areas clearing the under growth was prescribed.

7.29. Village Forestry MFP Working Circle (Low Country Series):

The area comprised Urulankunnu, Anamooli and Kalladikode malavaram. The tract is strewn with boulders of varying sizes. The only species that can thrive in this area is cashew. The Working Circle also included 96.00 ha of cashew plantations raised in 1978 in Anamooli of Mannarkkad division. Planting of cashew and Eucalyptus in cleared lines of the existing growth, to a width of 1.5 m to 3.5 m in Anamooli area was recommended.

7.30. Grazing Working Circle:

Indiscriminate grazing has degraded the forests and made it prone to erosion. In the dry areas of Aralikkonam and Thoova blocks degradation is very serious. The vested Forests that are close to the villages were brought under the grazing working circle. The silvicultural system prescribed was artificial regeneration of fodder legume and grass species after clear felling.

7.31. Protection cum Improvement Working Circle:

All the areas fit for scientific forestry was brought under different Working Circle with a view to increase the capital value of the forests and to get the maximum revenue in the shortest time possible. The rest of the areas, which were not included in any of those Working Circles, were to be perpetually protected.

1. These areas are lying in inaccessible places in higher altitudes.

2. They are situated in strategic areas from the point of view of moisture conservation and soil erosion.

3. Those areas also form the catchments of important rivers.

7.32. Plantation Working Circle:

This Working Circle included 7823.41 ha of vested forests scattered at various locations, which could be planted, with forest species. It included 2145.32 ha already converted into teak plantation by ex-owners in entire Palakkad Special Division.

The areas included in this Working Circle pertaining to the present Plan are:

1.Thathenkulam	- 2000 ha
2.Vettilachola	- 300 ha
3.Mukkalivenga	- 200 ha
Total	**- 2500 ha**

7.33. Silvicultural System:

The object of management was to convert the existing stand of mixed deciduous species into more valuable plantations of teak and softwood. Hence, the silvicultural system proposed was clear felling followed by concentrated artificial regeneration of teak and softwood.

7.34. MFP - Working Circle (Traditional):

The management of Minor Forest Produce was not getting proper attention in the past. No attempts were made to improve the production of MFP. The MFP formed the basis of raw material for many of pharmaceutical products, cosmetics and condiments. MFP like cane and reeds has a significant role in providing employment to people who are traditionally engaged in cottage industries like furniture making, baskets, mat weaving, etc.

7.35. Wildlife Working Circle:

No area under the tract dealt with in the present Plan was included in this Working Circle.

7.36. Coffee Working Circle:

No area under the tract dealt with in the present Plan was included in this Working Circle.

7.37. Special Schemes:

There was a reorientation of the basic objective of forest management since 1980. Till then the focus was on the exploitation of forests on the basis of sustained yield to ensure revenue. With the promulgation of the Forest Conservation Act, 1980, emphasis was shifted from revenue to conservation. Many schemes were introduced to provide employment. NREP, RLEGP, ELEGP, TSP, SCP were some of them. WGDP focused on improvement of degraded natural forests so as to restore the ecological status of the area. Consolidation of the boundaries by constructing cairns and stone walls were done under these schemes along with construction of camp sheds at vulnerable points inside the forests. Cultural operations like cutting and removing Loranthus from the plantations, under planting bamboo in teak plantation, eco-restoration in degraded Forests etc were carried out in addition to the boundary consolidation and fire protection works. In the eco-restoration works, degraded areas with less than 0.4 density was identified, surveyed and regenerated. After soil working, miscellaneous seeds were broadcasted to get mixed heterogeneous growth. Weeding was also done to encourage the regeneration.

7.38. Working Plan by Shri. A. Ramankutty:

The Working Plan written by Shri. A. Ramankutty was for the period 2001-02 to 2010-11 and the following were the Working Circles constituted as per this Plan.

1. Protection cum Improvement Working Circle
2. Plantation Working Circle
3. Bamboo, Reeds and Cane Working Circle
4. Non-Wood Forest Produce Working Circle
5. Miscellaneous Regulations

7.38.1. Protection cum Improvement Working Circle:

The major objectives of this Circle was to improve the ecological and economic value of the forests, protection of forests and biodiversity, maintenance of a long-term sustainable productivity of the watershed. In order to achieve the above objectives, the area under the Circle was classified into four Zones viz. a) Attapady Dry Zone b) Mannarkkad Zone c) Kanjirapuzha Zone and d) Muthikulam Zone. The objectives prescribed for each Zone are as follows:

- Protect the forests from further encroachment by consolidating the boundary and vigilant watch
- Protect the Forests from fire, grazing illicit felling etc.
- Soil and moisture conservation coupled with re-aforestation
- Specific mention about the Muthikulam zone was to preserve the rich biodiversity.
- No operations should be carried out except collection of NTFP
- Preserve the Shola and protect it to study the growth of wet evergreen forest and for comparison with other areas.

7.39. Encroachment:

Marginal encroachment which was one of the major problems in this Division. Forest boundaries were re-fixed and permanent cairns were constructed. Total length of the boundary in the division is 650 Km of which 497 Km has been demarcated by means of 14072 permanent cairns during the current Plan Period. The remaining 153 Km of boundary has to be consolidated to prevent further encroachment. An extent of 77.594 ha forest area had been encroached out of which, 48.44 ha had been evicted and 57 cases were booked for encroachment and initiated steps to evict the balance extent of 29.15 ha.

7.40. Forest Offences:

Forest offences registered during the Plan period showed a uniform trend which shows that offences still continue even though the opportunities of alternate employment persists. The opportunities in various fields, constitution of VSS, the availability of materials etc had not reduced the occurrence of offences. It may be due to the ignorance about alternate employment opportunities. The offences booked during the past 10 years are furnished in Table given below.

Table - 16 - Cases Booked in Mannarkkad Division

Year	Under KF Act	Under Wildlife Act	Under 61A	Under KPT Act	Other cases	Total
2000	845	35	10	73	39	**1002**
2001	53	8	5	5	63	**134**
2002	69	6	3	4	46	**128**
2003	51	11	0	0	20	**82**
2004	49	1	0	0	11	**61**
2005	43	2	2	0	56	**103**
2006	74	9	1	2	77	**163**
2007	42	4	2	0	20	**68**
2008	47	9	2	0	24	**82**
2009	115	14	2	10	18	**159**
2010	43	9	4	0	3	**59**
Total	**1431**	**108**	**31**	**94**	**377**	**2041**

There are large number of civil cases pending in various courts and Forest Tribunal major chunk of VFs fall under this division and the details of these cases are shown above.

Details of VF & EFL cases pending before various Courts are narrated in Table given below.

Table - 17 - EFL Cases Booked in Mannarkkad Division

Sl. No.	Nature of cases	Filed	Disposed	Pending
1	EFL	16	-	16
2	OA	13	5	8
3	MFA	18	7	11
4	SLP	8	1	7
5	WP(C) OP	38	20	18

7.41. Degradation:

Degradation of forests in catchments are due to various reasons like annual fire, grazing, removal of ground vegetation for green manure, removal of litter fuel accelerate run-off and thereby increase soil erosion. The faulty management practices in the past had also contributed to degeneration of forests. Threat factors such as illicit felling, unregulated collection of forest produces, invasion of weeds, absence of natural regeneration, etc accelerate the process of degradation.

In order to prevent further degradation of forests, and for the eco-restoration of forest areas already degraded, the prevailing threat factors should cease to continue. Attappady area of Mannarkkad Division, with large extent of degraded area in the State has experienced severe ecological degradation. The progressive loss of water and vegetation resulted in the expansion of waste land and degraded land. AHADS, an autonomous institution under the local self Government Department; had contributed significantly in curtailing the degradation by evolving suitable conservation activities like afforestation, biomass development, soil and water conservation, water resource development etc.

7.42. Eradication of Ganja:

Attappady area of Mannarkkad Division is notorious for Ganja Cultivation. There are lot of settlements in the buffer zone of National Park namely, Anavai, Kadukamanna, Thudukki, Galasi, Gottiyarkandy, KurukathiKallu, Edavani, Padavayal, Paloor, Pottikkal, Boothivazhi, Karuvara etc were some of the areas prone to Ganja cultivation. Frequent Ganja raids conducted by the Division had helped to reduce the cultivation to a certain extent. Nearly 500 ganja raids were conducted with the help of Police end Excise officials and with help of AHADS Watchers, 7,78,267 plants had been destroyed during the Plan Period.

Details of Ganja raid conducted during the Plan Period are appended in the **Appendix - VIII.**

7.43. Eco-Tourism:

Mannarkkad Division has high potential for eco-tourism activities. A number of pristine locations are in the region especially for adventure trekking. Siruvani dam is one of the eco-tourism destinations identified during the Plan period. This place is rich in wildlife and aesthetic beauty, situated 20 Km from Mannarkkad and 45 km from Coimbatore. Two mini buses were purchased for the purpose by Mannarkkad FDA. Trekking and nature camps are being organized by the Division as part of eco-tourism activities.

7.44. Attappady Hill Area Development Society (AHADS):

AHADS, an autonomous institution under the Local Self Government Department of Government of Kerala was formed in the year 1996 with the objective of ecological restoration of Attappady, prevention of further ecological degradation, development of replicable models of participating eco-restoration and promotion of sustainable livelihood options for the local people (with special emphasis on tribal population) in harmony with the resource base. They had identified 217 Km^2 of degraded

forests for implementation of the project through Joint Forest Management.

The project had improved the landscape of Attappady and assisted local people especially the tribals to overcome poverty to a considerable extent. The eco-restoration project through the concepts, strategies and implementation activities has brought about considerable ecological and Socio-economic changes in Attappady. The details of achievements are dealt in Part two under Protection Working Circle.

7.45. Administrative Charge:

Palakkad Special Division managed the vested forests with effect from 10.5.1971 and the reserve forests were under Palakkad Territorial Division. In 1989, the Government have re-organised all the forests of Palakkad District and amalgamated vide GO (MS) 121/89 F& WLD dt. 28.12.89. Accordingly all the forest tracts of Mannarkkad Taluk were brought under the jurisdiction of Mannarkkad Division and the new Division began functioning with effect from 1.4.1990 with three ranges i.e. Mannarkkad, Attappady and Agali. The officers who held charge of the newly formed Mannarkkad Division from 1.4.90 onwards are:

Table - 18 - DFO's of Mannarkkad Division

Sl. No.	Name	Period
1	Sri. V. J. George	14.06.99 to 15.04.01
2	Sri. V. V. Mohanan, IFS	15.04.01 to 09.08.01
3	Sri. Phanindrakumar Rao, I.F.S.	09.08.01 to 27.08.01
4	Sri. V. Premkumar	27.08.01 to 07.11.01
5	Sri. N. Sudhir	07.11.01 to 25.09.02
6	Sri. K. Mukundan	25.09.02 to 15.04.04
7	Sri. M. Murali	15.04.04 to 10.12.04
8	Sri. K. O. Jose	10.12.04 to 26.10.05
9	Sri. K. V. Uthaman	26.10.05 to 14.01.08
10	Sri. C. Rajendran	14.01.08 to 27.07.09
11	Sri. James Mathew	27.07.09 to continuing

7.46. Buildings:

After the formation of Mannarkkad Division the following buildings were constructed. The construction started 1992 onwards.

Table - 19 - Buildings in Mannarkkad Division

Sl. No	Year	Description and Locality	Expenditure (Rs)
1	2001-02	Divisional Forest Office, Mannarkkad	21,662
		Watch Tower, Aanavai	93,170
2	2002-03	Picket Station, Singappara	45,017
		Research Station, Kalkkandy	2,10,168
3	2007-08	Attappady Range Office, Bldng, Mukkali	8,05,000
		Out Post Building, Thoova, Marappalam	3,73,691
		Check Post, Thenkara	1,28,899

Sl. No	Year	Description and Locality	Expenditure (Rs)
		Staff Quarters, Mannarkkad	19,550
		Forest Station Building, Mannarkkad Range	39,821
		Range Officer's Quarters, Mannarkkad	69,528
		Type I Quarters, Mukkali	11,393
		Staff Quarters, Agali Range, Kalkkandy	1,40,328
4	2008-09	Bachelors' Quarters, Division Office Compound,	3,20,000
		Thiruvizhamkunnu Forest Station	8,230
		Agali Range Officer's Quarters, Mukkali	22,840
		Staff Quarters Type I 2Nos, Thiruvizhamkunnu Forest Station	34,646
		Aanamooli Chech Post Building, Thathengalam	63,133
		Aanakkatty Check Post Building, Anakkatty	1,38,157
		Keralamedu Watching Station, Keralamedu	1,84,283
		Koodam Camp shed, Koodam	47,246
		Semi- Permanent Camp Shed, Kadukumanna	1,03,000
		Camp Shed Murukala, Murukala	3,81,578
		Anti-Poaching Camp Shed, Edavani	14,108
		Anti-Poaching Camp Shed, Thudukki	3464
5	2009-10	Ommala Forest Station building, Ommala	55,714
		Type I Duplex Building, Singappara	3,56,352
		Dormitory, Mukkali	6,41,976
		Dormitory, Paravalavu	55.463
		Out Post Building, Paravalavu	80,643
		Out Post Building, Goolikkadavu	1,48,655
		Record room, Divisional Forest Office Compound	1,84,191

Table - 20 - Roads in Mannarkkad Division as on 2001-2010

Range	All weather roads		Not-suitable for vehicle	
	Metal Road	Non-Metal Road	Metal Road	Non-metal Road
Agali	0.43 Km	25 Km	-	5.5 Km
Mannarkkad	3.0 Km	-	-	4.0 Km
Attappady	2.6 Km	13 Km	-	-

7.47. Plantation Working Circle:

The Plantation Working Circle includes all plantations in the Division. They are mainly of teak and softwood plantations. The extent of teak plantations is 628.97 ha and that of Softwood and miscellaneous plantations is 3153.52 ha. The objective of management is to improve the conditions of the existing plantations and to increase the yield per unit area.

7.47.1 Teak:

The method of treatment suggested was felling followed by artificial regeneration. Rotation for teak was fixed at 60 years. Thinning cycle prescribed was 5, 10, 15, 20, 30 and 40 years. The 5th year thinning is mechanical and to be done in fully stocked areas. All other thinnings are silivicultural thinnings. Proposed

method of planting was by stumps. Planting was proposed to be done by April during pre-monsoon showers. Espacement suggested was 2m×2m. Fertilizer applications was suggested in second rotation plantations so as to rejuvenate the decreasing site quality, soil conservation measures like contour bunding, gully plugging etc have been suggested. Teak Plantations were raised in 47.08 ha area during the Plan Period.

Thinning: The prescriptions with regard to the thinning have not been complied fully. The plantations which were proposed for thinning were not thinned for reasons not known. In some plantations marking was completed but thinning was not done.

1st Mechanical thinning has not been carried out in the younger plantations which are normally aimed to reduce the root-shoot competition and lack of timely operations may cause considerable retardation and congestions to these plantations. List of plantations which were proposed in the current plan but could not be carried out and left as arrears are furnished in the table below.

Table - 21 - Plantations proposed but not thinned

Sl. No	Year Proposed	Range	Plantation	Extent (ha)	Nature of thinning
1	2006-07	Attappady	1966, Pottikkal	20.52	Final thinning
2	2007-08	Attappady	1967, Pottikkal	12.39	Final thinning
3	2007-08	Attappady	2002, Chindakki	4.05	1st Mechanical (transferred to Bhavani Range)
4	2008-09	Mannarkkad	1968, Panakkadan	06.38	Final thinning
5	2008-09	Mannarkkad	2003, Panakkadan	12.12	1st Mechanical
6	2008-09	Attappady	2003, Chindakki	4.75	1st Mechanical
7	2009-10	Mannarkkad	2004, Panakkadan	16.14	1st Mechanical
8	2009-10	Attappady	2004, Chindakki	4.05	1st Mechanical

7.48. Kerala Forestry Project (KFP):

Kerala Forestry Project was implemented in the state since 1998 with a view to treat the natural Forests governed by certain methodologies and procedures. Range Officer and Divisional Forest Officer prepare the Site Specific Plan (SSP) and the Conservator of Forests approves the same. For preparation of SSP, the area was to be surveyed and stock mapped. Treatment maps were to be prepared based on the stock analysis and general features of the terrain, incorporating relevant details. Cost estimates were to be sanctioned only after the approval of SSP by the Conservator of Forests. Natural areas were treated based upon the regeneration status of the area and the treatments under different heads are as follows:

7.48.1 Assisted Natural Regeneration (ANR):

Natural regeneration is to be assisted in areas having more than 600 seedlings of local species per hectare. Improvement of such forests will be supported through various cultural operations like weeding, soil working cutting of climbers, fire protection etc by promoting natural regeneration and sowing of seeds of nature species.

7.48.2. Restoration of Degraded Forests - I (RDF - I):

The degraded area where natural regeneration is less than 300 seedlings per hectare, are planted with not more than 1100 plants preferably with species yielding timber, firewood, fodder, fruit and other NTFP items.

7.48.3. Restoration of Degraded Forests – II (RDF – II):

The degraded area having 300-600 seedlings of local species and planted with not more than 550 seedlings per hectare are classified under this head. Regeneration operations are mainly undertaken by sowing seeds or dibbling. Choice of species for planting RDF-I and RDF-II areas were based on matching site species.

7.48. 4. Reed, Rattans and Bamboo (RRB):

The area under this component was identified based on the degradation status of the reed, bamboos and cane brakes. Area with poor clump development and areas with depleted stock owing to over-exploitation in the past, areas with less than 200 clumps per hectare were selected. Weeding and tending operations like line weeding, dressing, cleaning and hygienic operations of clumps, soil working, fire protection, soil and moisture conservation works were carried out. No harvesting will be done till the crop matures. Details of area treated under Kerala Forestry Project in Mannarkkad Division are given in Table.

Table- 22 Treatment under KFP in Mannarkkad Division

Sl. No	Year	Range	Category	Treatment area	Extent (ha)
1	1998-99	Attappady	ANR	Manthampotty	100.50
2	"	"	RDF – 1	Panthanthode	82.00
3	"	Agali	Pulpwood	Kallamala	20.00
4	"	"	"	Onthumala	26.50
5	1999-2000	Mannarkkad	ANR	Panthanthode east	92.50
6	"	"	"	Panthanthode east	92.50
7	"	"	"	Pangode	110.50
8	"	"	RRB	Achilatty	100.00
9	"	Attappady	RDF –2	Panthanthode	63.00
Total					**687.50**

The treatment area under ANR head viz. Panakkadan east and Panakkadan west of Mannarkkad Range was successful. The inspecting team of World Bank appreciated the treatments offered and it is still maintained as a good natural forest. Similarly, the treatment area under RRB was partly successful but due to biotic interference the desired result could not be achieved, where as the RDF-I and RDF-II areas of Panthenthode had been transferred to Bhavani Range for the constitution of Buffer Zone to Silent Valley National Park.

7.49. Soft Wood Plantations:

7.49.1. Acacia and Eucalyptus Plantations: The existing Acacia and Eucalyptus plantations constitute the pulpwood plantations of this Circle. All the pulpwood plantations are well suited as short rotation crops for degraded sites like Agali and Attappady areas. The basic purpose is to produce pulpwood for industries and firewood for local consumption, with the above consideration and due to economic reasons, the rotation for Acacia species was fixed at 8 years. Prescriptions are to clear fell and artificially regenerate with similar pulpwood species on attaining rotation age. Eucalyptus plantations, which were due for felling on rotation, remain un-felled for reasons unknown. Acacia and eucalyptus plantations in Agali range have more than 50% stock and succeeded in thriving in the dry zone of Attappady region.

7.50. Cashew Plantations:

Cashew Plantations exist only in Mannarkkad Range. Revenue generated from these plantations is decreasing. The extent of cashew plantations in the Division is 213.693 ha Apart from this cashew trees are planted as under planting in the teak plantations as well. The average yield per ha of cashew in the above plantations is just about 50 Kg where as in other States like Goa, it is as high as 430 Kg per ha. This shows the poor yielding of the cashew plantations. Neither they are economical nor ecologically suited in the locality.

Table- 23 Revenue from Cashew sales

Year	Extent	Weight (MT)	Income (Rs)
2001-02	213.693	--	266251
2002-03	213.693	3.44518	568016
2003-04	,,	11.280	342917
2004-05	249.083	9.7060	658026
2005-06	,,	11.555	385006
2006-07	,,	13.337	840039
2007-08	,,	14.061	840039
2008-09	,,	19.602	729160
2009-10	,,	9.259	729160

7.51. Bamboo, Reeds and Cane Working Circle:

This Working Circle includes all the Bamboo, Reed and Rattans bearing forests of Mannarkkad Division. It was to be an overlapping Working Circle covering the entire forests of Mannarkkad Division. It was mainly constituted with specific objective of improving the growing stock of Reeds and Rattans by artificial regeneration but this prescription could not be taken care of in plantations soon after final thinning. The same was not executed during the Plan Period. In the case of reeds, three year felling cycle was proposed and reeds were not to be extracted for industrial requirements. Deviation from the Plan prescriptions were made by allotting 7,84,200 no of reeds to M/s. Hindustan News Print Limited, Velloor for periodical extraction. It is prescribed to raise 20 ha areas of natural forests, every year with canes as well as in degraded Semi-evergreen forests, but a meager extent was raised with cane. Bamboos were extracted by M/s. HNL and 97,465 numbers were removed during the Plan Period.

7.52. Non-Wood Forest Produce Working Circle:

The objective of NWFP Working Circle was to collect MFP without causing damage to the forest. The collection of MFP was to be done through Girijan Service Co-operative Society. The collection of MFP had to be effected by the tribes, wherein the collected produce to be taken to the society for disposal. In Mannarkkad Division, MFP collection is done by Mannarkkad Girijan Co-operative Society, Sholayar Girijan Co-operative Society, Kurumba Girija Co-operative Society. They collect mainly Karimkurinji, Thippali, Cheenika, Kunthirikkam, Honey, Kurumthotti, Orila, Moovila, Chunda, Cherutheku, Cheruvazhuthana, Padakizhangu etc. but, quite often, the tribes preferred to sell the collected produce to other agencies for better returns. In addition to the tribes other people were also engaged in unauthorized collection of MFP. There was a proposal to allot the collection and disposal of MFP through Vana Samrakshana Samithies (VSS) but it has not materialized so far. These Girijan Co-operative Societies are exempted from remittance of lease rent and hence no revenue is generated from NWFP collection.

7.53. Miscellaneous Regulations:

A. Wildlife:

Wildlife conservation in areas outside the protected areas is often vital ecological corridor links and must be protected. Thus conservation efforts in Mannarkkad Division by virtue of its proximity to Silent Valley National Park assume immense significance. The forests of Mannarkkad Division are lying contiguous to Silent Valley National Park which is rich in wildlife. As these forests are not easily accessible and are away from

habitation, wildlife by and large finds a free and peaceful life in these forests. The trees and lush vegetation present in these reserved along with the perennial water sources and marshes create an ideal habitat for wildlife.

B. Man-Animal Conflict:

Increasing man-animal conflict in the locality is mainly due to shrinkage, fragmentation and deterioration of habitats. It has affected wildlife and generated animosity against wild animals and conservation efforts. Large scale crop damages are increasing and hence this issue has to be addressed through innovative approaches.

C. Forest Fire:

The initiatives taken by the Division were to create fire line for fire protection and engage fire protection Mazdoor for preventing fire. Protection activities were carried out through Vana Samrakshana Samithies (VSS) from 2008 onwards. During the Plan Period 250 fire incidences were reported and an extent of 3167 ha area was affected by fire.

CHAPTER – VIII

STATISTICS OF GROWTH AND YIELD

8.1. Introduction:

The National Forest Policy envisages the need to ensure regular and continuous supply of raw materials to the wood based Industries, which are fast developing. To achieve this, advance planning in the forestry sector has become unavoidable. Advance planning will be a difficult task, if proper inventory regarding the growing stock and yield is wanting. Hence, statistical data has become a must and forms major component of planning. The conventional methods have been relied upon to assess the growing stock and yield in the present context. The yield table developed by FRI and the volume table by Sri. N. R. Nair for the forest species of Kerala, which give reasonably accurate data, were relied upon to determine the growing stock and yield available from the plantations of this division.

8.2. Statistics of Natural Forests:

8.2.1. Assessment of growing stock in Natural Forests:

All the natural forest areas including the vested forest tracts were perambulated and the catchments were identified. The growing stock in these tracts was assessed through partial enumeration. The method adopted was 2 % systematic strip sampling. A base line traversing the forest tract was cleared and one-chain wide strips were taken perpendicular to the base line at every 50 chain. All trees of and above 75 cm girth at breast height in strips of one chain width were enumerated. All the trees thus enumerated were then classified into 10 cm girth classes and tabulated for compilation. The compiled data in the tabular forms are attached to this plan as **Appendix - IX to XVIII.**

8.2.2. Regeneration Survey of Natural Forests:

Along with the enumeration of trees for assessing the growing stock in the natural Forests, regeneration survey was also taken up by adopting 1 % systematic sampling. The regeneration met with in all 100th chain strips were fully taken into account for regeneration survey. All the regeneration in the strips were identified counted and classified species-wise, under three groups such as recruits (current year seedlings) established seedlings of previous years, saplings and poles. All the seedlings below 30 cm,

in height were considered as recruits and those with a height of 30 cm to 1 m were considered as established seedlings. Though the parameter adopted for differentiation is an arbitrary one, it is particularly convenient for this purpose. Likewise all plants with height of 1 m to 3 m and with girth of 30 cm to 75 cm at BH were treated as poles. While sampling, 1 sq. chain plots were treated as units. If there are ample recruits along with 30 established seedlings 10 saplings and 2 to 5 poles in one unit, that unit was considered as an adequately regenerated and fully stocked one.

The regeneration survey was carried out in various catchments. The survey shows that sufficient regeneration is present in almost all the forest areas. In evergreen tracts as expected, there are sufficient number of seedlings and poles. In the deciduous tracts, although regeneration is present it fails to establish as expected due to various adverse factors like annual fires, biotic interferences etc, especially in the marginal tracts close to human habitations. It is evident that the existing regeneration can establish and give rise to good vegetal cover, comprising economically valuable species if adequate protection is given. Proper tending operations without endangering the ecological balance, if provided will result in a luxuriant growth.

The study of the vegetations in this tract clearly indicates that the forest is not in the path of retrogression. The present comparative poor condition of crop found in some areas especially in the vested forest tracts, which is the result of the past can be restricted through appropriate management practices. The gradual progression of the succession indeed requires a helping hand to speed up the process.

8.3. Enumeration of Plantations:

8.3.1. Quality class mapping and growing stock assessment:

All the teak plantations of and above 13 years of age were assessed to its site quality. Quality class mapping was done by dividing the plantation area into one sq. chain plots and measuring the top height of the tallest tree in each plot. Based on the height and considering the age of the plantation, the site quality was decided referring to FRI yield table. Determining the site quality of the area, the same were incorporated in the sketches of the plantation, thus completing the quality class mapping process. Details are given in the Annexure in separate volume.

Along with the quality class mapping, 5% systematic strip enumeration was also carried out to arrive at the growing stock in each plantation. For this purpose grid lines were taken

on the 5th, 10th, 15th, 20th, etc of the base line and then "1 square chain plots" on the grid lines at 5th, 10th, 15th at chain age were selected and all the trees in the plot were enumerated. The trees thus enumerated were then classified into 10 cm girth classes and the result tabulated. Based on this sampling, the growing stock and density per ha were found out. The FRI yield table gives the number of trees per ha for each site quality at various ages.

The growing stock in the small plantations raised under the World Bank aided social forestry scheme and in the HMS plots was not assessed because of the insignificant size of the plantations. The area planted with teak in this tract is 1093.72 ha, including 177.00 ha of teak plantation raised by the ex-owners.

The details of quality class assessment of each plantations and the cubical content of produce likely to obtain from such plantations are given in **Annexure – XXI**.

Growing stock enumeration in the Natural Forests:

Two percent enumeration was carried out in the natural forests. The area is divided into convenient blocks, preferably with reference to natural boundaries and watersheds. Convenient baseline for each block was selected in map to cover the entire length of the block from a known point. The baseline was laid out in the field.

One chain wide strips were then laid out at right angles to the baseline on every 5th, 55th, 105th etc, chains. All the trees in the strips are enumerated by taking girth at breast height. The volume is found out by using Shri. N.R. Nair's Volume Table. The enumeration details are given in **Appendix – IX to XVIII**.

In the previous Working Plan, the forest area in the Division is broadly divided into four Zones viz. Attappady Dry Zone, Mannarkkad Zone, Kanjirapuzha Zone and Muthikulam Zone. But in the present Working Plan emphasis is given for watershed treatment and hence watersheds are taken as the unit for implementing conservation measures. Accordingly, Mannarkkad Division falls under five watersheds namely Bhavani, Siruvani, Kanjirapuzha, Nellipuzha and Kunthipuzha. Enumeration was carried out based on these watersheds and growing stock is assessed and the inference is as follows.

Attappady Reserve of Bhavanipuzha watershed has 71 tree species with an average representation of 56 trees/ha. The main

species are *Grewia tiliaefolia, Pterocarpus marsupium, Dalbergia latifolia, Albizzia lebbeck, Terminalia bellerica, Lagerstroemia latifolia, Schleichira oleosa, Erythrina indica,* etc. Among the species *Grewia tiliaefolia* occupies major portion of the watershed. The regeneration survey of the area shows vigorous growth of *Schleichira oleosa, Conocarpus lactifolia, Grewia tiliaefolia, Albizzia procera* seedlings.

Similarly in Muthikulam Reserve of Siruvani watershed, the main species are *Mesua ferrea, Palaquium ellipticum, Schleichira oleosa, Grewia tiliaefolia, Machillus macrantha, Cullenia excelsa, Syzygium cumini* etc. The type of forests is evergreen to semi-evergreen. Regeneration survey shows profuse growth of *Syzygium cumini, Palaquium ellipticum, Macrantha peltata* in seedling stages. It is evident from the enumeration survey that the percentage of species composition has increased during the period as compared with the enumeration details of the past Working Plan.

CHAPTER – IX

CAPITAL VALUE OF FORESTS

The valuation of the forests can be attempted based on factors such as historical value, income value, ecological value, the market value etc. While computing the historical value, the role-played by the Forests in the history of the locality and benefits desired are to be taken into consideration. As such the figures pertaining to past centuries will have to be relied on. These figures will be irrelevant in the present context. The assessment of the capital value based on the income from the forest tracts will be a real assessment. But most of the forest areas derive no direct income. So this method cannot be relied upon. The ecological or environmental value based on the indirect benefits cannot be quantified and assessed accurately in the present context, and so this method is also not attempted. It is true that the cost of these indirect benefits will far out-weigh the value of the direct benefits that we are harvesting now. As a result of all these the valuation is based on the market value of the land and the growing stock therein.

9. Valuation:

To arrive at the capital value of the forests the land value and the timber value are considered and added together. Total land value is calculated by assessing the value of the accessible and interior areas separately. The lands, which are lying close to human habitation, with communication facilities, will generally have a flatter terrain and better conditions. The plantation areas come under this category. A higher value may be fixed for these tracts. In regard to the interior forests that are undulating in terrain and mostly inaccessible, a lower rate may be fixed. The value of the forests includes the value of the growing stock also. The growing stock in the natural Forests and plantations were assessed separately. The quantity of timber, poles, firewood etc available from the forest tracts are calculated and separate rates fixed per unit of these produce. While fixing rates, the scheduled rates approved by the government and at same the market rates are to be considered with due allowance for extraction costs.

The forests were treated purely as an economic entity in the past. The priorities had undergone a sharp change. The focus of attention in the management of natural resources had shifted to ecological and environmental consideration instead of revenue accrued. The valuation of forests is an abstract concept because of the inter-play of various natural processes shaping it. So the concept of Capital Value narrows down to the Growing Stock

assessment. The Growing Stock of the plantations as well as natural forests of the Division is assessed and the future system of management suggested.

Table - 24 - Capital Value of Mannarkkad Forest Division

Sl. No.	Class	Quantity	Amount (in lakhs)
1	Growing stock of Natural Forests	832316 M^3	**20810**
		493432 MT	**5830**
2	Growing stock of Teak Plantations	16535 M^3	**5080**
3	Stock of Cashew Plantations	153 ha	**40**
4	Stock of Acacia Plantations	3849 MT	**70**
5	Eucalyptus Plantations	2303 MT	**5**
Total			**31880**