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Evaluation of plant diversity in unlogged and logged forest stands of varying intensities

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Title: Evaluation of plant diversity in unlogged and logged forest stands of varying intensities

Objectives: 1.To evaluate whether sustained logging has any effect on plant diversity.

2. To assess the microclimatic conditions consequent to logging.

3. To evaluate the regeneration status of extracted and other species.

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Abstract

The effect of logging on plant diversity and regeneration was studied in three tropical forest sites in Kerala. The sites are at Goodrikal RF in Ranni Forest Division in southern part of Kerala, Sholayar RF in Vazhachal Forest Division in central part of Kerala and Kottiyoor RF in Kannur Forest Division in northern part of Kerala. Statistically designed plots of suitable sizes were laid out in unlogged and logged forests of different types in all the three sites. The vegetation analysis and regeneration evaluation were done by conventional ecological methods. The microclimatic status was worked out by installing thermo hydrographs at various places and one year continuous monitoring was done. Regeneration data were gathered for unestablished and established seedlings, saplings and poles of the area. It is of interest that species, which are highly aggregated, are still present in low numbers as rare species in the same plots. The presence of *Podocarps* in some parts of Moozhiyar reserve (near Urani area) is highly interesting and such phenomenon reveals that even a species, which is no more than a competitive equal in some areas and at a distinct advantage elsewhere, can persist in the forest for very long periods before going locally extinct. The clumping of species is yet another interesting feature noted in the area. It is of interest that species, which are highly aggregated, are still present in low numbers as rare species in same plots. The spares sub-populations are self-maintaining or simply represent accidental establishments of rare individuals, because of good site factors.

Contents

INTRODUCTION

The tropical wet evergreen forests of Champion and Seth (1968), very often equated to the "Tropical Rainforest' of Schimper (1903) and Richards (1952), are encountered in the Western Ghats, Northern India and the islands of Andaman and Nicobar. The commonest silvicultural system adopted is 'selection system' where the exploitable girth class, felling cycle and the number of trees to be extracted in a unit area is the cardinal factors involved.

Although the forest working plans prescribe guidelines for extraction, very often they are not strictly adhered to, endangering the continuity of operation. Nair (1985) provided a brief account of the merits and demerits of this system in relation to socio-economic and marketability aspects and Balasubramanyan (1987) conducted an in depth impact assessment of selection felling in relation to logging damages, phenology and dynamism of the vegetation. Based on the report of Balasubramanyan (1987), submitted to the Government of India, the Kerala Government had imposed a moratorium on selective logging (Govindankutty, 1987).

Accounts of selection felling system in various countries were given by Fox (1967a) for the Philippines; Borhan et al. (1987) for Malayasia; Chapman and Chapman (1997) for Uganda; Stracey (1959) for India; *de* Rosaryo (1957) for Srilanka, *etc.* The microclimatic features of selection felled areas; especially those of the Western Ghats in India, were studied by Pascal (1989). A similar study was conducted by Svenning (1999) for Amazon forests. With regard to regeneration of forests, even though a large number of studies were conducted by various researchers (Grubb, 1997; Itoh, 1995; Manokaran and Kochummen, 1987), the regeneration studies, specific to logged areas, are rather few (Walton, 1954; Nicholson, 1958;Wyatt- Smith and Fochander, 1962).

Many authors studied light as one of the crucial factors for the regeneration and establishment of dominant formations and a number of publications are available (Ashton, 1988; Manokaran and Kochummen, 1987; Manokaran and LaFrankie, 1990; Nicholson, 1963; Whitmore, 1984). The vegetation development is a slow process of replacement of one community to another during the course of progressive succession. The studies on this line also contribute much to the knowledge of forest development and establishment. The primary vegetation developed earlier will gradually change to the secondary vegetation

status due to felling and logging operations. Studies pertaining to these aspects are rather few with exceptions like Brokaw (1982), Denslow (1980) and Whitmore (1985).

A number of studies were done in earlier days on logging operations and damages to the system. Some of the important publications on these lines are Nicholson (1958) and Fox (1967a).

SYSTEMS OF MANAGEMENT

WORKING PLANS

Kannur forest division

The forest management is fundamentally based on the working plan of the respective area. Mr.Faulk wrote the first working plan for the erstwhile Wayanad division for the period from 1902 to 1915. He proposed artificial regeneration of teak for 12 ha annually in Begur range with the intention of restocking. The plan provisions were revised in 1909 and accordingly artificial regeneration was attempted in the forests. Improvement felling for introduction of teak, where its natural regeneration failed, combined with cleaning and thinning were undertaken for inducing natural regeneration. In 1912 seedlings were raised and planted in open patches. Patch regeneration was attempted by dibbling teak seeds also. In 1921, the conservator of forests issued orders for burning infested plantations, uprooting of lantana and cutting back of poles. During the period a variety of experiments were carried out for regenerating teak and other species in the area. An experiment was conducted on site species matching for regeneration along the margins of Poonam paddy with the involvement of the tribal group 'Kurichyas'. The Kurichyas were to sow or plant the forestry species along their Poonam crop, and to tend the species for two years growth.

Mr. Cosde's working plan was for the period 1929-38 for Wayanad plateau. It included all the planted artificial regeneration of teak after clear felling the good quality deciduous forests with appreciable quantity of natural teak.

Shri Sharma's Working Plan (1932-41)

This working plan included the degraded forests of the foothills, subjected to shifting cultivation with regrowth of inferior species. The major objective of this working plan was to replace the inferior standing growth by an even aged high forest of valuable

species, after selling the standing growth and handing over the cleared area to Poonamdhars for regeneration purpose.

Shri P.W.Davis'Working Plan (1933-42)

In this plan, plantations of Kasaragod range were included under Plantation working circle. He prescribed improvement felling of under story of miscellaneous species retaining teak poles. He also prescribed soil-working, pruning of shoots, weeding and clear felling.

ShriVenkiteswara Iyer's Working Plan (1939-48)

The Conversion working circle included 8,686ha of moist deciduous forests, suitable for teak planting and concentrated on artificial regeneration of other species. He prescribed clear felling and planting of *Dalbergia latifolia* and *Swietenia macrophylla* as under planting in areas not to be felled. Planting of one-year-old teak (7-22mm diameter at collar) and planting of two-year-old rosewood (5to 15mm diameter at collar) during middle of May. He implemented 80 years rotation period for teak and the same was reduced to 70 years under special case. He also prescribed Thinning cycles for teak.

Shri Kesava Bitals Working Plan (1943-58)

In this working plan, under Teak conversion working circle over 125 ha in Parappa, Adoor and Karadka reserves were included. The thinning schedule was modified and thinning was carried out to be at 4^{th}, 7^{th} and 12^{th} year; the first two being mechanical.

Shri Kariappa's Working Plan for Wayanad Division(1951-60)

The Conversion working circle included existing plantations of 5625 ha of moist deciduous forests in Begur and Kannoth ranges. The raising of softwood plantations was prescribed with teak as principal species. Two thinning schedules, one at 8^{th} and the other at 12^{th} year, were prescribed for softwood stands.

Shri Natarajan Chettiar's Working Plan (1962-71)

This working plan was drawn up for the replacement of low yielding forests by high yielding valuable species and by planting the barren or degraded lands with useful species. The Conversion working circle included all existing plantations and the plantings

of Teak at Bavali and Tolpatty in Begur ranges were continued. Planting of soft wood species in 40 ha in Thirunelli, Thrissileri-Hildale series of Begur range; 80 ha per year in Nedumpayil series and 20 ha each in Kottiyoor and Kannoth series in Kannoth ranges were also proposed. Thinning for soft wood was not prescribed in this working plan.

Shri P.N.Adiyodi's Working Plan (1974-83)

Shri.P.N. Adiyodi prescribed seven working circles, *viz*. Soft wood plantation working circle, Miscellaneous plantation working circle, Cashew plantation working circle, Selection cum improvement working circle, Minor forest produce working circle, and Protection working circle. Shri.P.N Adiyodi included 3,404 ha of existing teak plantations and 3700 ha of deciduous forests of erstwhile Wayanad division suitable for conversion under Teak plantation working circle. Under Softwood plantation working circle he included the existing 3030 ha of pure softwood and softwood mixed with teak. He also recommended conversion of 1500 ha of natural forests of moist deciduous and semi evergreen types in Kannoth, Peria and Thirunelly of erstwhile Wayanad division. The Miscellaneous plantation working circle included 1910 ha of existing fast growing species, in addition, miscellaneous plantations raised in erstwhile Wayanad division till 1972, together with 2350 ha of moist deciduous and semi evergreen forests of Hill dale, Kannoth and Adoor revenue forests of erstwhile Wayanad division. But only 97.77 ha of natural forests had been clear felled and planted with miscellaneous species in the present Kannur division. The Selection cum improvement working circle covered 8400 ha of Hilldale reserve forests of erstwhile Wayanad division. During the plan period Kannur district was subjected to selection cum improvement felling (Table1).

Table 1. Selection felling coups in Kottiyoor and Kannavam range

Sl. No	SFC	Area (Ha)	Yield		Year
			Timber	Firewood	
1	I	98.00	4596.251	53.00	1978-79
2	II	98.45	9434.804	N.A	1978-79
3	III	99.00	5670.541	547.00	1978-79
4	IV	103.00	5348.718	194.00	1979-80
5	V	98.00	6576.066	N.A	1979-80

6	VI	156.00	5009.816	N.A	1979-80
7	VII	N.A	5704.389	4980.59	1980-81
8	VIII	104.96	5839.128	4000.00	1980-81
9	IX	150.00	3995.171	639.75	1980-81
10	X	94.00	4684.890	2300.00	1980-81
11	XI	32.00	1974.780	N.A	1981-82
12	XII	N.A	2709.952	N.A	1981-82
13	XIII	100.00	7290.078	4000.00	1981-82
Total		1153.41	68834.67	16714.32	

Shri.P .Gopinathan`s Working Plan of Thalassery Special Division (1981-82 to1990-91).

This working plan prescribed 9 working circles, as:

1) Selection cum Improvement working circle

This covered 2000ha of evergreen and semi evergreen forests of Koothuparambu range of Thalassery special division. This working circle comprised a single felling series and improvement workings were proposed to be taken up in a systematic way by partial removal of comparatively inferior species. The rotation period for all evergreen species was fixed as 25 years. During the plan period about 1000 ha of evergreen and semi evergreen forests were subjected to selection cum improvement felling.

2) Social forestry working circle

This working circle included, the then existing 450 ha semi evergreen forests of Vayakkara, Kunnathurpaady areas of Thaliparambu range and Jessy estate, Pulinjal malavaram of Mananthawady range of Thalassery division. The object of management was to augment the less valuable forests. The species recommended were *Grewia robusta, Eucalyptus tereticornis, Swietenia integrifolia*. The total area of social forestry plantations, raised in the rain forest of Kannur division was 294 ha, raised between 1985 and 1990 in Kannavam and Kottiyoor ranges.

3) Protection working circle

An area of 4400 ha was under this working circle. The area was characterized by low stocking of economically important species. Hence it was prescribed to retain the area as such without any operations.

4) Miscellaneous regulations working circle

This working circle included the operations like verification and fixing of reserve boundaries, fire protection, etc.

5) Minor forest produce working circle

This working circle overlapped the entire division and was mainly concerned with minor forest produce like, honey, wax, cardamom, cashew, bamboo, etc.

6) Wildlife working circle

This included the marshy and waterlogged areas, deep inside the forest. Felling operations were not carried out in this circle.

7) Coffee working circle

Four blocks of Dindumal forests in Thalassery division were selected under this.

8) Cardamom working circle

The tropical evergreen and semievergeeen forests of Mananthawady range to an extent of 500 ha were brought under this for cardamom planting.

9) Rubber working circle

This included an area of 500 ha of Odanthodumala in Aralam area.

Shri V.K.Sinha's Working Plan for Wayanad Forest division (1990-91 to 1999-2000)

Shri V.K.Sinha prepared the 8th working plan for Wayanad forest division for the period 1990-2000. This plan was not approved and implemented.

Vazhachal forest division

The Vazhachal forest division was formed with effect from 1/8/1981 as per GO (M.S) 197/811 Forest dated 31/7/1981. Before the integration of the then Travancore and Cochin States, the forest areas were under the possession and control of Naduvazhis - the feudal chiefs who in turn owed allegiance to the Raja of Cochin. On many occasions these forests were claimed from several quarters.

i.) In 1853, Coimbatore claimed the famous Parambikulam valley, which was rejected by the Jury after an inquiry.

ii.) In 1886, Travancore claimed the whole of Indiyara valley, and all the forests south of Idiyara.

iii.) In 1893, Malabar also put forth a claim for Parambikulam valley.

The claim of Malabar was allowed in to, but that of Travancore was only partly, *ie.* the forests from Athirapally to Ezhattumugham were handed over to Travancore.

The forests were first divided into territorial divisions during 1809-1810. In 1907-1908, the above system was abolished and the whole forests of Cochin were divided into ranges with sub ranges under them. Again, a change was effected during 1937-38 for

decentralizing the powers. This is the starting point of the administration with Ranges and their units. Till 1944 this system continued and due to pressure of works, again the Division system was restored. Consequent to the integration of the then Travancore and Cochin states in 1949, the forests of Cochin were divided into two Divisions *viz.* Chalakkudy and Thrissur.

The Teak, Rosewood and Ebony trees were considered as monopoly trees and were the property of State Government. But by a royal proclamation issued on 13/10/1928, the full rights of the monopoly trees standing in private lands were conferred to the owners.

Four out of five Ranges of the present Vazhachal and the remaining one range, *ie.* Athirappally was part of Kalady range of Chalakudy Division. Sholayar Range was formed in 1962 and the remaining three Ranges *viz.* Athirappally, Charpa and Kollathirumedu in 1981.

Before the formation of Vazhachal division the forests were managed as per the working plan prescription of Chalakudy division (T.P.Viswanathan's working plan-1951-53 to 1966-67).

Chalakudy forest division

Shri.T.P.Viswanathan wrote the working plan for Chalakudy division for the period 1951 to 1967 and Shri S.John Koilparambil did the revision of the same for the period of 1969 to 1979. Five working circles were prescribed by the former in his working plan *viz.* i) Conversion working circle, ii) Selection working circle, iii) Bamboo working circle, iv) Minor forest produce working circle and v) Protection working circle.

The Conversion working circle was divided into two felling series *viz*.1) Teak felling series and 2) Softwood felling series. The teak felling series consisted of all the existing Teak plantations and the areas suitable for conversion (Pariyaram range of present Chalakudy division). An area of 890 ha. in Vazhachal range, was set apart for planting softwood species under softwood felling series. The earliest Teak and Elavu (softwood) plantations were raised in Vazhachal range in 1972 and 1955 respectively. Mixed plantations of Teak and Elavu were first raised in Vazhachal range in the year 1958.

In the Selection working circle, there were four felling series *viz.* i) Kodassery felling series, ii) Vazhachal felling series, iii) Anakkayam felling series and iv) Chandanathodu felling series. Group 1 and 2 of Kodassery series were only worked out, during the years 1956-1958.

The Bamboo working circle overlapped all the areas of Conversion, Selection, Protection and Minor forest produce working circles. The Bamboo working circle was not divided into annual crops.

The Minor forest produce working circle area included over the whole of the plan area, overlapping every other working circle. The rights of collection of MFP were sold in public auction for each Range separately.

The Protection working circle formed the areas not included in the Selection working circle, for reasons of inadequate stocking and requiring rest and recuperation, inaccessible areas, where no extraction of timber was possible on account of the extremely difficult terrain and for want of extraction facilities, and areas that were protected for reasons of climate and erosion.

Shri S.John Koilparambil prepared the working plan for the period of 1969-70 to 1978-79. According to this there were six working circles. Of these Soft wood working circle alone was relevant for Vazhachal and Sholayar ranges.

An area of 814 ha was prescribed as Softwood working circle for Vazhachal range, and 599ha was cleared and planted; with Teak (100ha) and Teak and Elavu mixture (499ha), respectively. In 1970, another 24.21 ha was planted with Silver Oak.

The Total area proposed under Evergreen selection working circle was 5521 ha *viz.* Chandanathodu felling series (3206 ha) and Anakkayam felling series (2320 ha), both in Sholayar range. The minimum girth limit fixed was 180cm. except for *Evodia* for which 120cm. was fixed. Estimated yield per hectare from Chandanathodu felling series was 11.58 cu.m. and from Anakkayam felling series 7.13 cu.m. The species selected for felling were *Vateria indica, Palaquium ellipticum, Machilus macrantha, Lophopetalam whitianum, Mangifera indica, Dipterocarpus* species, *Cullenia excelsa, Dysoxylum malabaricum* and *Calophyllum tomentosum.* During the plan period, 2856.56 ha. was worked in Chandanthodu felling series and 564.04 ha in Anakkayam felling series. On actual working it is seen that 18.82 cu.m. of timber per hectare have been obtained from Chandanathodu felling series and 11.05 cu.m., from Anakkayam felling series. The number of trees per hectare to be removed as per working plan prescriptions was 25 trees/ha. On actual working it is seen that on an average of 6 trees were removed from Chandanthodu and 5 trees from Anakkayam felling series.

Industrial Plantations Division

This division was constituted from an area of the then I.P divisions, Permuzhy, Vazhachal part of Kalady range of Chalakudy division. The major operations carried out included raising species of trees of industrial importance *viz., Eucalyptus, Albizia, Erythrina, Trema* and *Bombax.* For this purpose, large tracts of good Evergreen and Semi evergreen forests were cut and removed. However, this led in a pitiable condition with the failure of Eucalyptus plantations and also the extinction of a large tracts of Evergreen and Semi evergreen forests from Kannankuzhithodu to Anakayam Bridge over a length of 22 km.

The marking of trees for sleeper extraction was been completed in Evergreen and Semi evergreen forests of Vazhachal and Sholayar, but due to policy changes in the later stage, the felling was not taken up.

SELECTION SYSTEM

The silvicultural system called “Selection system” was used for the management of tropical wet evergreen forests of the Western Ghats in India. It involves selective removal of mature or over-mature trees of the forests so that the sustainability of the forest resources is not endangered. The girth limit prescribed for extraction is generally above 180 cm GBH and the felling cycle is usually 30 years. Under this system, maximum number of trees to be removed from any one-hectare varies from 8 to 12 individuals. Due to increase in demand of wood, at times, a shorter felling cycle is adopted and sometimes the number of trees extracted is also beyond the prescriptions of working plans, thus endangering the canopy continuity. The manipulation of canopy continuity leads to canopy openings, which ultimately results in the invasion and dominance of light demanding species. Thus, gradually the forest structure changes to a different composition, with the preponderance of light demanding and draught resistant species and the habitat slowly changes, supporting different vegetation types instead of the originally occupied evergreen/semi evergreen components. Thus, the selective felling system prescribed earlier for the management of forests of Kerala has both direct and indirect impact on ecosystem, especially affecting the regeneration of forest trees. Because of various reasons, though this system is not currently practiced in Kerala, information related to tree regeneration due to the felling system is of

high importance in the ecosystem study. Hence in the present study, an attempt was made for evaluating the previous felling operations with respect to forest regeneration.

HISTORICAL INFORMATION

The status of timber extraction in different regions viz. southern, central and northern Kerala was gathered from respective forest offices and the status evaluated. The quality and quantity status of the timber extracted were obtained from the records, with respect to coups, species, height, girth, volume etc. Since the information is very exhaustive, few selected tables (56-60) are included in the report, which will give a general status of the felling operations performed.

Table 2. Status of timber extraction of Nilakkal SF Group VIII in Goodrikal Range -1986 felling.

Hardwood Species			**Semi hardwood**			**Softwood species**		
%	**Name**	**No**			**%**	**Name**	**No**	**%**
	89		Tanni	61		Punnappa	279	
	54		Kalmanikkam	55	8.33	Nedunar	150	
	52	17.90				Pali	124	53.93
	27					Akil	104	
	24					Vellapine	84	
	15					Chorapine	65	
	8					Klavu	51	
	8	3.35				Cheeni	48	
	10					Karakil	17	
	3					Tellipine	14	
	2					Ambazham	6	
						Gnaval	4	
						Vhandanavembu	4	16.38
						Kulamavu	4	
						Vallabahm	3	
						Pala	3	
						Mavu	3	
						Punna	1	
						Vhiru	1	
						Vencotta	1	
Total	**292**	**21.25%**		**116**	**8.33%**		**966**	**70.31%**

Table 3. Status of timber extraction of Anathodu Coup No. II (Sub- coup -A) –1981 felling

Name of species	Volume c.u.m	%	
Pali	2392.7	57.94	
Vedipilavu	1018.5	24.66	82.60%
Nangu	250.7	6.07	
Kunthirikkapine	250.0	6.05	
Vellakil	95.7	2.32	
Chandana vembu	48.1	1.16	17.40%
Nedunara	4.2	0.10	
Plavu	37.9	0.92	
Akil	31.9	0.77	
Total	**4129.6**	**100**	

Table 4. Status of timber removed from Moozhiyar SF coup VIII (Strip 3&4A) – 1983 felling

Name of species	Quantity c.u.m	%	
Karanjili	427.6	42.38	
Vellapine	215.8	21.39	
Pali	178.3	16.67	94.25%
Vedipilavu	70.2	6.96	
Vellakil	59.0	5.85	
Thalipine kulamavu	17.3	1.71	
Punnappa	16.8	1.67	
Nangu	13.7	1.36	
Chorapine	4.9	0.49	5.75%
Mavu	3.3	1.33	
	2.0	0.20	
Total	**1008.9**	**100**	

Table 5. Status of timber extraction of Anathode coupe II (Sub coupe B) – 1981 felling

Name of species	Volume	%	
Pali	2466.9	69.54	84.42
Vedipilavu	527.9	14.88	
Kundirikkapine	207.9	5.86	
Nangu	99.9	2.82	
Chahdana vembu	92.8	2.62	
Plavu	40.7	1.15	15.58
Vellakil	24.2	0.68	
Akil	22.4	0.63	
Mavu	5.0	0.14	
	3547.7	**100**	

Table 6. List of species selected for felling from Goodrikal Reserves

Plywood Species

Vellapine – *Vatteria indica*

Kurungadi – *Acrocarpus*

Karanjili/Kalpine – *Dipterocarpus sp*.

Kulamavu/Ooravu – *Machilus macrantha*

Pali – *Palequium*

Kundirikkapine/Pandapyne – *Canarium strictum*

Kulamavu – *Hardwickia pinnata*

Mavu – *Mangifera indica*

Poon/ Punna _ *Calophyllum tomentosum*

Red cedar – *Calophyllum tomentosum*

Vedipilavu/Mullanpali – *Cullenia exelsa*

Cheru – *Holigarna arnotiana*

Pethondi – *Stereulia alata*

Cheeni – *Tetrameles nudiflora*

Nenmenivaha – *Albizzia lebbeck*

Chemmaram – *Amoora rohituka*

Malaveppu – *Chukrasia tabularis*

Vazhappunna – *Dellienia pentagyna*

Njaval – *Eugenia jambolana*

Kumbil – *Gmelina arborea*

Champakam – *Michelia champaka*

Nedunar – *Polyalthia fragrans*

Cherukonna – *Pterospermum acerifolium*

Mullilum – *Xanthoxylum rhetsa*

Vallabham – *Caralla integrima*

Neermaruthu – *Terminalia arjuna*

Kallilavu – *Bombax insigne*

Silver oak – *Grevelia robusta*

Vembu – *Kydia calycina*

Peenari – *Sterculia villosa*

Thavala – *Trewia nudiflora*

Matchwood species

Nasakam/Kanala/Kambli – *Evodia roxburghiana*

Elavu/Poola – *Bombax malabaricum*

Matty – *Ailanthus malabaricum*

Uthi – *Lannea grandis*

Arayanjili – *Antiaris toxicaria*

Kalavappu – *Melia dubia*

Vatta – *Macaranga peltata*

Pala – *Alstonia scholaris*

Packing case wood species:

Kara / Bhadraksham – *Elaeocarpus* species

Ambazham – *Spondius pinnata*

Aval – *Holoptelia integrifolia*

Other inferior species:

Pencil – slate wood species:

White cedar

Manjakadambu – *Adina cordifolia*

ADVANTAGES OF SELECTION FELLING SYSTEM

The major advantages of selection felling system are:

1. It ensures gross production making for increase merchantable yield.
2. It offers stability of environmental conditions.
3. It helps to maintain a continuous cover of a protection forests on steep slopes in order to prevent erosion, landslides and runoff.
4. The danger of fire is less, in uneven stands, since the fuel loads are shaded.
5. It is generally regarded as being less susceptible to damage from biotic enemies like fungi, mistletoe etc.
6. Since environmental conditions are maintained in a more or less stable equilibrium, the entire plant and animal populations of the stands remains relatively stable.
7. It ensures presence of a permanent seed source.
8. Due to permanent vertical closure of the stand, damage due to wind is reduced.

DISADVANTAGES OF SELECTION FELLING SYSTEM

The selection felling system has the following disadvantages.

1. The progress of regeneration and the conditions of the growing stock are often submerged in an uneven stand and hence more difficult to evaluate the results of operations.
2. It is necessary to cover a larger area to harvest a given volume in one operation.
3. It reduces the productivity of the forest by contributing to hygienic selection.
4. Environmental factors like shade, root competition, microclimate, etc. would be subjected to drastic fluctuations, which may retard natural regenerations of important species.
5. When a tree is felled, a lot of damage is being done to the surrounding trees and the gap caused, depending upon the height of the tree and size of the crown. The sawyer will cut out all saplings in the vicinity of the tree trunks for operation easiness. The resultant litter and debris are generally burnt, affecting the regeneration in the gaps.
6. When large gaps are created, they are colonized by species like *Macaranga, Leea, Eupetorium, Lantana* etc. that are difficult to exterminate.

7. The complexity of operation is such that it requires supervisory skill and attention by an experienced and efficient forester.

The selection felling system was practised continuously without any in depth study on regeneration and other environmental parameters. In the present project, an attempt was made to evaluate the system with respect to regeneration status with the following major objectives:

1. To evaluate whether sustained logging has any effect on plant diversity.

2. To assess the microclimatic changes consequent to logging operations, and

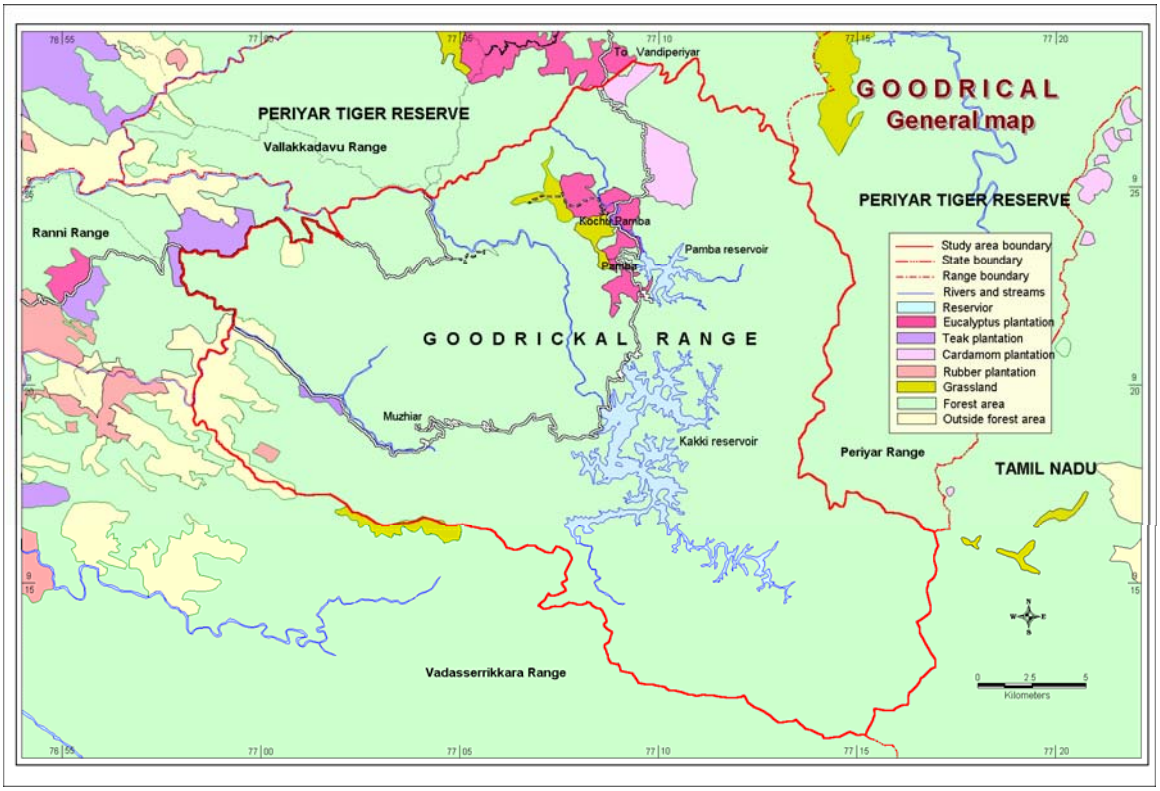
3. To assess the regeneration status of extracted and other tree species.

MATERIALS AND METHODS

STUDY AREA

The study was conducted at three sites *viz*. Goodrical, Sholayar and Kottiyoor . Goodrikal reserves in Ranni Forest division lies between 9^0 10' and 9^0 30' N latitude and between 76^0 55' and 77^0 17' E longitude at in Southern part of Kerala; Sholayar region lies between 10° 15' and 10° 25' N latitude and 76° 40' and 76° 55' E longitude in Central part of Kerala and Kottiyoor reserves lies between 11° 45' and 12° 10' N latitude and 75° 30' and 77° 00' E longitude in Northern part of Kerala (Fig. 1).

Fig.1: Map of Goodrical RF and its surroundings



The climate is of typical monsoon type. The mean annual rainfall is about 3000 mm and at least four seasons could be encountered. The dry season (January-March) accounts for just 2% of the total rainfall. The pre monsoon thunder showers (April – May) accounts for about 7% of the total rainfall. The bulk of the precipitation is brought

(about 76%) about by the southwest monsoon (June-September) and the retreating monsoon (October-December) accounts for 14%.

There is not much difference in the mean annual temperature. It fluctuates from 20 ^{0}C (November) to 25^{0} C (May), as the hottest season of the year.

The soils of evergreen forests are blackish in color, rich in humus content and organic carbon. They are acidic and the pH is around 5.

PHYTOSOCIOLOGICAL STUDIES

The phytosociological evaluation was done using stratified random sampling method. Based on vegetation type and density status, quadrats were laid throughout the study area. The size of the quadrat was of 33 m x 33 m. The density sliced mosaics of satellite imageries were used to determine the position of the quadrates. Thus, the vegetation type, density status and extend of coverage were considered while laying the quadrat. The location of previous felling operations were also considered while laying the quadrat for enumeration. The information regarding the previous felling operation was gathered from the forest department records. The plots were identified using Garmin 3plus GPS for subsequent observations, in a later stage for change detection studies. The enumeration of all tree species and the GBH measurement of all trees above 15 cm GBH were carried out. Subplots of 5 m x 5 m were selected in opposite corner of each plot and enumerations of shrubs were done. Five 1 m x 1 m plots (at four quadrant and a center plot) were identified for herbal species enumeration. Regeneration of all tree species was noted in all the study samples. The seedlings were categorized, based on height differences *viz*., less than 40 cm, 40 to 1m, and above 1m categories to assess the mortality rate. The primary analysis of the vegetation was done using the method of Muller-Dombois and Ellenberg, (1978). The tabulated details are given at the end of each chapter.

Regeneration Studies

Regeneration studies were conducted in selected locations by laying out sample plots of 5 m x 5 m. The regeneration plots were laid within the tree enumeration plots of

33 m x 33 m size. Two regeneration plots were selected within the sample plots diagonally.

The following classification was followed for regeneration enumeration:

i) Un-established seedlings -- less than 40 cm height,

ii) Established seedlings -- 40 to 100 cm height but below 10 cm GBH,

iii) Advanced growth -- Over 100 cm height but below 10 cm GBH,

iv) Saplings -- Young trees from 10-50 cm GBH.

Phenological studies

The phenological study was restricted to the species of second and third story in evergreen forests. Monthly visits were made and with the help of devised scorecard, visual observations were made on flowering and fruiting.

Microclimatic studies

To study the atmospheric temperature and relative humidity monthly, automatic recording thermo- hygrographs were installed at a height of 2 meters above the ground level in all the study sites, *viz*., Moozhiyar reserves (Gavi in Pamba area and Kochandy in Angamoozhy range), Sholayar reserves (Anakkayam area) and Kottiyoor reserves (Aralam wildlife sanctuary). Regular monthly visits were made and the graph papers were changed every month on a fixed date for a period of one year from January to December 2003.

OBSERVATIONS

A. VEGETATION STATUS OF GOODRICAL RESERVED FORESTS OF SOUTHERN CIRCLE

1. West Coast Tropical Evergreen Forests (*Selection Felled*)

Status of Tree Vegetation

With respect to tree vegetation status, ten dominant species as per IVI (values in bracket) are:

Memecylon deccanense (24.39), *Ficus tsjakela* (11.33), *Macaranga peltata* (9.13), *Cullenia exarillata* (8.42), *Vateria indica* (6.98), *Baccaurea courtellensis* (6.66), *Palaquium ellipticum* (6.61), *Knema attenuata* (6.38), *Vitex altissima* (6.01) and *Diospyros paniculata* (5.74). – Table 7.

Ten dominants with respect to density status alone are:

Memecylon deccanense (1219), *Macaranga peltata* (304), *Cullenia exarillata* (263), *Baccauria courtellensis* (193), *Palaquium ellipticum* (174), *Vateria indica* (172), *Knema attenuata* (134), *Turpinia malabaricum* (139), *Agrostistachys borneensis* (125) and *Mesua ferrea* (116) - Table 7.

The dominant species with respect to percentage frequency are:

Macaranga peltata (53), *Knema attenuata* (53), *Vateria indica* (49), *Baccauria courtellensis* (47), *Diospyros paniculata* (47), *Xanthophyllum arnottiana* (40), *Polyalthia fragrans* (40), *Strombosia zeylanica* (8), *Turpenia malabaricum* (37) and *Aporusa lindleyana* (35) - Table 7.

Table 7. Vegetation status of trees of West Coast Tropical Evergreen forests of Goodrical R.F. (Non-Selection Felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	144.44	33.33	3.03	4.05	4.33	277.62	0.76	0.13	7.85
2	Actinodaphne malabarica	11.11	11.11	0.23	1.35	1.00	97.44	0.27	0.09	1.85
3	Agrostistachys borneensis	233.33	22.22	4.90	2.70	10.50	263.22	0.73	0.47	8.32
4	Ailanthus sp	33.33	11.11	0.70	1.35	3.00	871.43	2.40	0.27	4.45
5	Ardisia sonchifolia	11.11	11.11	0.23	1.35	1.00	133.72	0.37	0.09	1.95
6	Bhesa indica	44.44	33.33	0.93	4.05	1.33	370.53	1.02	0.04	6.01
7	Canarium strictum	33.33	11.11	0.70	1.35	3.00	1303.27	3.59	0.27	5.64

8	Canthium rheedii	11.11	11.11	0.23	1.35	1.00	147.08	0.41	0.09	1.99
9	Cedrela toona	66.67	22.22	1.40	2.70	3.00	905.05	2.49	0.14	6.60
10	Cinnamomum keralensis	44.44	22.22	0.93	2.70	2.00	245.02	0.68	0.09	4.31
11	Cleidion javanicum	88.89	11.11	1.86	1.35	8.00	303.31	0.84	0.72	4.05
12	Clerodendrum viscosum	33.33	11.11	0.70	1.35	3.00	115.07	0.32	0.27	2.37
13	Croton malabaricus	44.44	11.11	0.93	1.35	4.00	567.97	1.57	0.36	3.85
14	Cullenia exarillata	344.44	44.44	7.23	5.41	7.75	1829.25	5.04	0.17	17.67
15	Dendrocnide sinuata	22.22	11.11	0.47	1.35	2.00	103.09	0.28	0.18	2.10
16	Dimocarpus longan	122.22	22.22	2.56	2.70	5.50	340.80	0.94	0.25	6.21
17	Diospyros paniculata	100.00	33.33	2.10	4.05	3.00	546.52	1.51	0.09	7.66
18	Drypetes elata	11.11	11.11	0.23	1.35	1.00	346.50	0.95	0.09	2.54
19	Dysoxylum malabaricum	11.11	11.11	0.23	1.35	1.00	2464.00	6.79	0.09	8.37
20	Elaeocarpus munronii	33.33	11.11	0.70	1.35	3.00	579.23	1.60	0.27	3.65
21	Elaeocarpus serratus	33.33	11.11	0.70	1.35	3.00	583.77	1.61	0.27	3.66
22	Elaeocarpus tuberculatus	11.11	11.11	0.23	1.35	1.00	1789.77	4.93	0.09	6.52
23	Euodia lunu-ankenda	155.56	33.33	3.26	4.05	4.67	683.77	1.88	0.14	9.20
24	Flaccourtia montana	22.22	11.11	0.47	1.35	2.00	471.63	1.30	0.18	3.12
25	Gnidia glauca	44.44	11.11	0.93	1.35	4.00	298.42	0.82	0.36	3.11
26	Gomphandra coriacea	255.56	22.22	5.36	2.70	11.50	151.73	0.42	0.52	8.48
27	Holigarna arnottiana	11.11	11.11	0.23	1.35	1.00	2036.36	5.61	0.09	7.20
28	Hydnocarpus pentandra	66.67	22.22	1.40	2.70	3.00	278.46	0.77	0.14	4.87
29	Knema attenuata	22.22	22.22	0.47	2.70	1.00	1695.59	4.67	0.05	7.84
30	Macaranga peltata	333.33	33.33	6.99	4.05	10.00	353.89	0.98	0.30	12.02
31	Meiogyne pannosa	133.33	11.11	2.80	1.35	12.00	147.08	0.41	1.08	4.55
32	Meliosma pinnata	77.78	11.11	1.63	1.35	7.00	648.42	1.79	0.63	4.77
33	Memecylon deccanense	1600.00	44.44	33.57	5.41	36.00	900.07	2.48	0.81	41.45
34	Memecylon subramaniani	22.22	11.11	0.47	1.35	2.00	108.90	0.30	0.18	2.12
35	Meogyne pannosa	33.33	11.11	0.70	1.35	3.00	103.09	0.28	0.27	2.33

36	Mesua ferrea	44.44	33.33	0.93	4.05	1.33	3016.97	8.31	0.04	13.30
37	Mesua ferrea	11.11	11.11	0.23	1.35	1.00	2165.63	5.97	0.09	7.55
38	Microtropis stocksii	11.11	11.11	0.23	1.35	1.00	91.95	0.25	0.09	1.84
39	Nageia wallichiana	11.11	11.11	0.23	1.35	1.00	240.63	0.66	0.09	2.25
40	Palaquium ellipticum	200.00	33.33	4.20	4.05	6.00	4656.36	12.83	0.18	21.08
41	Persea macrantha	66.67	22.22	1.40	2.70	3.00	1024.72	2.82	0.14	6.92
42	Polyalthia fragrans	33.33	11.11	0.70	1.35	3.00	378.72	1.04	0.27	3.09
43	Toona ciliata	11.11	11.11	0.23	1.35	1.00	1303.27	3.59	0.09	5.18
44	Vepris bilocularis	11.11	11.11	0.23	1.35	1.00	534.86	1.47	0.09	3.06
45	Vernonia monosis	100.00	22.22	2.10	2.70	4.50	816.81	2.25	0.20	7.05
Grand Total		**4766.67**	**822.22**	**100.00**	**100.00**	**192.42**	**36290.97**	**100.00**	**10.54**	**300.0**

MI=74

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, MI = Maturity Index RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index.

Regeneration Status of Seedlings

With respect to total number of seedlings enumerated, the percentage distribution status of ten dominant species were worked out as follows along with the percentage values in parenthesis: *Aglaia lawii* (8.2), *Baccauria courtellensis* (6.4), *Dichapetalum jealanioidus* (5.9), *Knema attenuata* (5.8), *Palaquium ellipticum* (5.7), *Strombosia zeylanica* (4.9), *Catunarakam spinosum* (4.4), *Caryota urens* (3.8), *Diospyros paniculata* (3.5) and *Schleichera oleosa* (3.3).

The ten species mentioned above, together accounts for 51.9 % of the total seedlings. Among the seedlings of 119 species observed, 48.1 % belongs to 109 species and 51.9 5 exclusively coming from 10 dominant species mentioned above (Table. 8).

Table 8 Regeneration Status of seedlings of West Coast Tropical Evergreen forests of Goodrical R.F.

S.L.No	Species	U	E	A	TS
1	Acronychia pedunculata	1	0	1	2
2	Actinodaphne companulata	1	0	0	1
3	Actinodaphne malabarica	2	2	4	8
4	Aglaia barberi	0	1	0	1
5	Aglaia lawii	104	71	78	253
6	Aglaia perviridis	2	3	5	10
7	Aglaia simplicifolia	0	1	1	2
8	Agrostistachys borneensis	3	6	2	11
9	Allophyllus cobe	1	0	0	1
10	Alseodaphne semicarpifolia	0	1	2	3
11	Antidesma menasu	2	3	0	5
12	Apodytes dimidiata	6	2	0	8
13	Aporusa acuminata	1	0	0	1
14	Aporusa lindleyana	35	11	22	68
15	Ardisia pauciflora	3	3	0	6
16	Ardisia sonchifolia	1	1	0	2
17	Artocarpus heterophyllus	3	1	0	4
18	Artocarpus hirsutus	2	1	0	3
19	Atlantia racemosa	7	1	0	8
20	Baccaurea courtallensis	101	36	62	199
21	Canarium strictum	0	0	2	2
22	Canthium dicoccum	0	0	1	1
23	Careyota urens	113	0	3	116
24	Catunaragum spinosum	48	35	53	136
25	Cedrela toona	2	1	1	4
26	Cinnamomum keralensis	1	2	5	8
27	Cinnamomum malabatrum	8	3	2	13
28	Clausena indica	1	2	2	5
29	Clerodendrum viscosum	0	1	1	2
30	Croton malabaricus	0	2	5	7
31	Cullenia exarillata	3	3	9	15
32	Dendrocnide sinuata	1	5	0	6
33	Dichapetalum jealanioides	42	28	113	183
34	Dimocarpus longan	4	15	2	21
35	Dimorphocalyx lawianus	44	0	55	99
36	Diospyros bourdillonii	2	1	0	3
37	Diospyros candolleana	0	1	0	1
38	Diospyros nilgiricum	0	0	1	1
39	Diospyros paniculata	68	18	22	108

40	Dipterocarpus bourdillonii	0	0	3	3
41	Drypetes elata	7	5	23	35
42	Drypetes malabarica	1	0	1	2
43	Drypetes oblongifolia	4	0	0	4
44	Dysoxylum beddomei	2	0	0	2
45	Dysoxylum malabaricum	5	20	26	51
46	Elaeocarpus tuberculatus	2	5	0	7
47	Eletranthera rodentalis	0	1	0	1
48	Eugenia sp.	0	0	5	5
49	Euodia lunu-ankenda	2	1	4	7
50	Ficus tsjahela	0	1	0	1
51	Flaccourtia montana	1	0	3	4
52	Flemingia sp.	1	0	0	1
53	Furniana colorata	0	0	1	1
54	Garcinea gummi-gutta	39	2	0	41
55	Garcinia morella	1	3	4	8
56	Glochidion zeylanicum	0	1	1	2
57	Gmelina arborea	1	1	0	2
58	Gomphandra coriacea	1	5	2	8
59	Guania microcarpa	40	14	9	63
60	Holigarna arnottiana	2	0	0	2
61	Holigarna grahami	0	0	1	1
62	Hopea parviflora	62	11	13	86
63	Hopea racophloea	0	0	1	1
64	Humboltia vahlii	1	0	0	1
65	Hydnocarpus pentandra	0	5	4	9
66	Isonandra lanceolata	4	4	6	14
67	Ixora brachiata	21	10	29	60
68	Ixora elongata	0	3	2	5
69	Ixora sp.	2	4	4	10
70	Knema attenuata	65	65	49	179
71	Leea indica	2	1	1	4
72	Lepianthus erectus	0	2	0	2
73	Litsea floribunda	1	3	3	7
74	Litsea insignis	1	0	2	3
75	Lophopetalum wightianum	6	10	0	16
76	Macaranga peltata	3	0	0	3
77	Mallotus philippensis	1	2	1	4
78	Mallotus tetracoccus	17	2	0	19
79	Mangifera indica	4	0	0	4
80	Meiogyne pannosa	9	7	1	17
81	Memecylon deccanense	38	14	14	66
82	Memecylon malabaricum	10	4	1	15

83	Memecylon umbellatum	0	1	2	3
84	Mesua ferrea	3	2	3	8
85	Mesua thwaitesii	0	4	5	9
86	Myristica malabarica	9	0	0	9
87	Naringi crenulata	0	0	2	2
88	Neolitsea sp	2	0	2	4
89	Olea dioica	2	0	1	3
90	Ostodes zeylanicus	1	1	1	3
91	Otonephelium stipulaceum	4	5	4	13
92	Palaquium ellipticum	118	37	21	176
93	Pandanus sp.	0	3	71	74
94	Persea macrantha	1	1	4	6
95	Pheanthus malabaricus	46	9	12	67
96	Polyalthia fragrans	28	13	19	60
97	Sagararia dazalsi	1	1	1	3
98	Sageraea laurifolia	2	1	0	3
99	Schleichera oleosa	26	39	38	103
100	Sterculia guttata	1	15	7	23
101	Strombosea zeylanica	84	32	34	150
102	Strychnos nux vamica	0	0	1	1
103	Symplocos rosea	13	24	19	56
104	Syzygium cumini	0	0	2	2
105	Syzygium elatum	0	0	12	12
106	Syzygium gardneri	1	0	0	1
107	Syzygium mundagam	12	7	4	23
108	Syzygium munronii	0	0	1	1
109	Syzygium zeylanicum	5	1	0	6
110	Terminalia bellirica	1	1	0	2
111	Turpinia malabarica	1	2	1	4
112	Urdisea pauciflora	0	0	2	2
113	Vateria indica	19	15	6	40
114	Vepris bilocularis	2	14	6	22
115	Vernonia monosis	0	1	0	1
116	Vitex altissima	0	0	1	1
117	Xanthophyllum arnottianum	37	21	33	91
118	Zanthoxylum rhetsa	1	0	0	1
119	Zizyphus jujuba	1	0	0	1
Grand Total		**1389**	**717**	**983**	**3089**

U= Unestablished, E= Established, A= Advanced growth, TS= Total seedlings

The percentage wise distribution status of unestablished (Un esta.), established (Esta.) and advanced growth (Adv. Gr.) seedlings of selected dominent species (32 out of 119) are as follows:(Table.9).

Table 9. Distribution status of seedlings of selection felled area of West Coast Tropical Evergreen forest

Sl. No.	Species	U	E	A
1	Aglaia lawii	41.1	28.1	30.8
2	Aporusa lindleyana	51.4	16.2	32.4
3	Baccauria courtellensis	50.8	18.1	31.1
4	Caryota urense	97.4	0	2.6
5	Catunaragum spinosum	35.3	25.7	39.0
6	Dichapetalum jealanioides	23.0	15.3	61.7
7	Dimocarpus longan	19.0	71.5	9.5
8	Dimorphocalyx lawianus	44.4	0	55.6
9	Diospyros paniculata	63.0	16.7	20.3
10	Drypetes elata	20.0	14.3	65.7
11	Dysoxylum malabaricum	9.8	39.2	51.0
12	Garcinia gummigutta	95.1	49.0	0
13	Guania microcarpa	63.5	22.2	14.3
14	Hopea parviflora	72.1	12.8	15.1
15	Ixora brachiata	35.0	16.7	48.3
16	Knema attenuata	36.3	36.3	27.4
17	Lophopetalum wightianum	37.5	62.5	0
18	Mallotus phillipensis	89.5	10.5	0
19	Meiogyne pannosa	52.9	41.2	5.9
20	Memecylon deccanensis	57.6	21.2	21.2
21	Memecylon malabaricum	66.7	26.7	6.6
22	Palaquium ellipticum	67.0	21.0	11.9
23	Pheanthus malabaricum	68.7	13.4	17.9
24	Polyalthea fragrans	46.7	21.7	31.7
25	Schleichera oleosa	25.2	37.9	36.9
26	Sterculia guttata	4.3	65.2	30.4
27	Strombosia zeylanica	56.0	21.3	22.7
28	Symplocos rosea	23.2	42.9	33.9
29	Syzygium mundagam	52.2	30.4	17.4
30	Vateria indica	47.5	37.5	15.0
31	Vipris bilocularis	9.0	63.6	27.3
32	Xanthophyllum arnottianum	40.6	23.1	36.3

More than 60% of unestablished seedlings were observed in the case of Caryota urens, Diospyros paniculata, Grewia microcarpa, Hopea parviflora, mallotus phillipensis, Memecylon malabaricum, Palaquium ellipticum and Pheanthus malabaricum (Table 8).

Status of saplings

With respect to IVI status of saplings, species of *Cryptocarya anamalayanum*, *Baccaurea courtellensis* and *Polyalthia fragrans* dominate the area with IVI values 16.48, 11.86 and 11.09 respectively. In total, 106 species were recorded and the detailed structural status of the species was worked out (Table 10).

Table 10. Vegetation Status of Saplings of West Coast Tropical Evergreen Forests of Goodrical R.F. (Selection Felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	14.29	7.14	0.87	0.78	2.00	26.74	0.78	0.28	2.43
2	Actinodaphne malabarica	40.48	23.81	2.47	2.58	1.70	41.22	1.21	0.07	6.26
3	Aglaia elaeagnoidea	9.52	2.38	0.58	0.26	4.00	13.49	0.40	1.68	1.23
4	Aglaia lawii	78.57	26.19	4.79	2.84	3.00	17.05	0.50	0.11	8.13
5	Aglaia perviridis	4.76	2.38	0.29	0.26	2.00	22.99	0.67	0.84	1.22
6	Agrostistachys borneensis	30.95	11.90	1.89	1.29	2.60	26.22	0.77	0.22	3.95
7	Agrostistachys indica	7.14	2.38	0.44	0.26	3.00	36.20	1.06	1.26	1.76
8	Allophyllus cobe	2.38	2.38	0.15	0.26	1.00	11.45	0.34	0.42	0.74
9	Alseodaphne semicarpifolia	16.67	9.52	1.02	1.03	1.75	94.29	2.77	0.18	4.82
10	Antidesma acuminata	7.14	2.38	0.44	0.26	3.00	17.11	0.50	1.26	1.20
11	Antidesma menasu	26.19	11.90	1.60	1.29	2.20	30.39	0.89	0.18	3.78
12	Apodytes dimidiata	14.29	14.29	0.87	1.55	1.00	19.94	0.58	0.07	3.01
13	Aporusa lindleyana	35.71	19.05	2.18	2.07	1.88	15.89	0.47	0.10	4.71
14	Artocarpus hirsutus	4.76	2.38	0.29	0.26	2.00	31.82	0.93	0.84	1.48
15	Atlantia racemosa	4.76	2.38	0.29	0.26	2.00	12.43	0.36	0.84	0.91
16	Baccaurea courtallensis	111.90	40.48	6.82	4.39	2.76	21.87	0.64	0.07	11.86
17	Bombax ceiba	2.38	2.38	0.15	0.26	1.00	28.72	0.84	0.42	1.25
18	Callicarpa tomentosa	2.38	2.38	0.15	0.26	1.00	17.90	0.52	0.42	0.93
19	Calophyllum polyanthum	2.38	2.38	0.15	0.26	1.00	11.45	0.34	0.42	0.74
20	Canthium didymum	2.38	2.38	0.15	0.26	1.00	42.08	1.23	0.42	1.64
21	Catunaragam spinosum	14.29	9.52	0.87	1.03	1.50	12.83	0.38	0.16	2.28
22	Chionanthus ramiflorus	4.76	4.76	0.29	0.52	1.00	15.59	0.46	0.21	1.26
23	Cinnamomum keralensis	26.19	21.43	1.60	2.33	1.22	40.43	1.19	0.06	5.11
24	Cinnamomum malabatrum	16.67	11.90	1.02	1.29	1.40	21.47	0.63	0.12	2.94
25	Clausena indica	2.38	2.38	0.15	0.26	1.00	8.11	0.24	0.42	0.64
26	Clerodendrum viscosum	16.67	7.14	1.02	0.78	2.33	19.71	0.58	0.33	2.37
27	Croton malabaricus	4.76	4.76	0.29	0.52	1.00	21.66	0.64	0.21	1.44

28	Cryptocarya anamalayana	2.38	2.38	0.15	0.26	1.00	547.99	16.07	0.42	16.48
29	Cullenia exarillata	28.57	19.05	1.74	2.07	1.50	34.80	1.02	0.08	4.83
30	Dichapetalum jealanioides	26.19	11.90	1.60	1.29	2.20	15.59	0.46	0.18	3.35
31	Dimocarpus longan	7.14	7.14	0.44	0.78	1.00	12.43	0.36	0.14	1.58
32	Diospyros buxifolia	7.14	4.76	0.44	0.52	1.50	32.89	0.96	0.32	1.92
33	Diospyros nilgiricum	2.38	2.38	0.15	0.26	1.00	31.82	0.93	0.42	1.34
34	Diospyros paniculata	59.52	35.71	3.63	3.88	1.67	18.83	0.55	0.05	8.06
35	Drypetes elata	38.10	23.81	2.32	2.58	1.60	71.59	2.10	0.07	7.01
36	Drypetes malabarica	4.76	2.38	0.29	0.26	2.00	14.50	0.43	0.84	0.97
37	Drypetes oblongifolia	7.14	4.76	0.44	0.52	1.50	17.11	0.50	0.32	1.45
38	Dysoxylum malabaricum	40.48	21.43	2.47	2.33	1.89	25.60	0.75	0.09	5.54
39	Elaeocarpus munronii	2.38	2.38	0.15	0.26	1.00	28.72	0.84	0.42	1.25
40	Elaeocarpus serratus	4.76	4.76	0.29	0.52	1.00	31.82	0.93	0.21	1.74
41	Elaeocarpus tuberculatus	2.38	2.38	0.15	0.26	1.00	25.77	0.76	0.42	1.16
42	Eugenia bractiata	2.38	2.38	0.15	0.26	1.00	66.90	1.96	0.42	2.37
43	Ficus tsjahela	2.38	2.38	0.15	0.26	1.00	15.59	0.46	0.42	0.86
44	Furniana colorata	2.38	2.38	0.15	0.26	1.00	13.44	0.39	0.42	0.80
45	Garcinea gummi-gutta	2.38	2.38	0.15	0.26	1.00	57.99	1.70	0.42	2.10
46	Garcinea morella	4.76	4.76	0.29	0.52	1.00	8.11	0.24	0.21	1.05
47	Gmelina arborea	2.38	2.38	0.15	0.26	1.00	53.77	1.58	0.42	1.98
48	Gnidia glauca	2.38	2.38	0.15	0.26	1.00	42.08	1.23	0.42	1.64
49	Gomphandra corriacea	14.29	9.52	0.87	1.03	1.50	30.25	0.89	0.16	2.79
50	Goniothalamus rhyncatherus	2.38	2.38	0.15	0.26	1.00	11.45	0.34	0.42	0.74
51	Gordonia obtusa	2.38	2.38	0.15	0.26	1.00	28.72	0.84	0.42	1.25
52	Guania microcarpa	7.14	7.14	0.44	0.78	1.00	10.34	0.30	0.14	1.51
53	Holigarna grahami	2.38	2.38	0.15	0.26	1.00	8.28	0.24	0.42	0.65
54	Hopea parviflora	14.29	11.90	0.87	1.29	1.20	18.70	0.55	0.10	2.71
55	Hopea racophloea	2.38	2.38	0.15	0.26	1.00	28.72	0.84	0.42	1.25
56	Hydnocarpus pentandra	26.19	21.43	1.60	2.33	1.22	20.64	0.61	0.06	4.53
57	Isonandra lanceolata	7.14	4.76	0.44	0.52	1.50	19.52	0.57	0.32	1.52
58	Ixora brachiata	14.29	11.90	0.87	1.29	1.20	15.22	0.45	0.10	2.61
59	Ixora sp	2.38	2.38	0.15	0.26	1.00	13.44	0.39	0.42	0.80
60	Knema attenuata	33.33	30.95	2.03	3.36	1.08	20.73	0.61	0.03	6.00
61	Leea indica	21.43	16.67	1.31	1.81	1.29	30.77	0.90	0.08	4.02
62	Lepisanthes erectus	2.38	2.38	0.15	0.26	1.00	9.63	0.28	0.42	0.69
63	Litsea coreacea	9.52	9.52	0.58	1.03	1.00	15.59	0.46	0.11	2.07
64	Litsea floribunda	35.71	19.05	2.18	2.07	1.88	36.20	1.06	0.10	5.31
65	Litsea oleoides	4.76	4.76	0.29	0.52	1.00	27.22	0.80	0.21	1.61
66	Litsea wightiana	4.76	2.38	0.29	0.26	2.00	12.43	0.36	0.84	0.91
67	Lophopetalum wightianum	14.29	9.52	0.87	1.03	1.50	20.79	0.61	0.16	2.51
68	Macaranga peltata	4.76	4.76	0.29	0.52	1.00	36.77	1.08	0.21	1.89
69	Mallotus philippensis	14.29	7.14	0.87	0.78	2.00	38.50	1.13	0.28	2.78

70	Mallotus tetracoccus	7.14	7.14	0.44	0.78	1.00	25.77	0.76	0.14	1.97
71	Mangifera indica	2.38	2.38	0.15	0.26	1.00	17.90	0.52	0.42	0.93
72	Meiogyne pannosa	4.76	2.38	0.29	0.26	2.00	62.36	1.83	0.84	2.38
73	Memecylon deccanense	26.19	16.67	1.60	1.81	1.57	13.82	0.41	0.09	3.81
74	Memecylon malabaricum	11.90	9.52	0.73	1.03	1.25	13.03	0.38	0.13	2.14
75	Memecylon subramaniani	2.38	2.38	0.15	0.26	1.00	28.72	0.84	0.42	1.25
76	Mesa indica	2.38	2.38	0.15	0.26	1.00	22.99	0.67	0.42	1.08
77	Mesua ferrea	11.90	11.90	0.73	1.29	1.00	186.19	5.46	0.08	7.48
78	Mesua twaitesii	4.76	4.76	0.29	0.52	1.00	8.19	0.24	0.21	1.05
79	Mimusops elengi	4.76	2.38	0.29	0.26	2.00	10.52	0.31	0.84	0.86
80	Myristica malabarica	7.14	7.14	0.44	0.78	1.00	35.08	1.03	0.14	2.24
81	Ostodes zeylanicus	4.76	2.38	0.29	0.26	2.00	30.25	0.89	0.84	1.44
82	Otonephelium stipulaceum	7.14	4.76	0.44	0.52	1.50	22.99	0.67	0.32	1.63
83	Palaquium ellipticum	42.86	21.43	2.61	2.33	2.00	20.86	0.61	0.09	5.55
84	Pandanus sp	4.76	4.76	0.29	0.52	1.00	10.52	0.31	0.21	1.12
85	Persea macrantha	16.67	11.90	1.02	1.29	1.40	49.72	1.46	0.12	3.77
86	Pheanthus malabaricus	19.05	7.14	1.16	0.78	2.67	22.32	0.65	0.37	2.59
87	Polyalthea fragrans	107.14	35.71	6.53	3.88	3.00	23.31	0.68	0.08	11.09
88	Sagararia dazalsi	7.14	7.14	0.44	0.78	1.00	40.99	1.20	0.14	2.41
89	Schleichera oleosa	7.14	7.14	0.44	0.78	1.00	17.27	0.51	0.14	1.72
90	Sterculia guttata	40.48	14.29	2.47	1.55	2.83	20.32	0.60	0.20	4.61
91	Strombosea zeylanica	52.38	21.43	3.19	2.33	2.44	16.96	0.50	0.11	6.02
92	Symplocos rosea	80.95	28.57	4.93	3.10	2.83	18.04	0.53	0.10	8.56
93	Sysygium cumini	2.38	2.38	0.15	0.26	1.00	20.36	0.60	0.42	1.00
94	Syzygium arnottianum	7.14	4.76	0.44	0.52	1.50	22.10	0.65	0.32	1.60
95	Syzygium gardneri	4.76	4.76	0.29	0.52	1.00	47.75	1.40	0.21	2.21
96	Syzygium laetum	4.76	4.76	0.29	0.52	1.00	21.00	0.62	0.21	1.42
97	Syzygium mudagam	4.76	2.38	0.29	0.26	2.00	28.72	0.84	0.84	1.39
98	Syzygium munronii	7.14	2.38	0.44	0.26	3.00	27.72	0.81	1.26	1.51
99	Tabernae montana gamblei	2.38	2.38	0.15	0.26	1.00	38.50	1.13	0.42	1.53
100	Tetrameles nudiflora	4.76	4.76	0.29	0.52	1.00	31.82	0.93	0.21	1.74
101	Trichilla conoraria	2.38	2.38	0.15	0.26	1.00	17.90	0.52	0.42	0.93
102	Turpinia malabarica	21.43	4.76	1.31	0.52	4.50	18.70	0.55	0.95	2.37
103	Vateria indica	42.86	16.67	2.61	1.81	2.57	33.79	0.99	0.15	5.41
104	Vepris bilocularis	16.67	7.14	1.02	0.78	2.33	22.22	0.65	0.33	2.44
105	Vernonia monosis	19.05	7.14	1.16	0.78	2.67	39.60	1.16	0.37	3.10
106	Xanthophyllum arnottianum	26.19	16.67	1.60	1.81	1.57	20.62	0.60	0.09	4.01
Grand Total		**1640.48**	**921.43**	**100**	**100**	**166.2**	**3409.21**	**100**	**36.37**	**300**

MI=8.69

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB=Abundance, BA=BasalArea, MI = Maturity Index RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index.

2. West Coast Tropical Evergreen Forests *(Non selection Felled)*

Status of Tree vegetation

The ten dominent species recorded with respect to IVI status are *Memecylon deccanensis* (41.46), *Palaquium ellipticum* (21.08), *Cullania exarillata* (17.67), *Messua ferrea* (13.30), *Macaranga peltata* (12.o2), *Gomphandra coriacea* (8.48), *Dysoxylum malabaricum* (8.37), *Agrostistachys borneensis* (8.32), *Achronychian pedunculata* (7.85) and *Knema attenuata* (8.37). In total 45 species were recorded and the structural status were worked out (Table 11).

Table 11. Vegetation status of trees of West Coast Tropical Evergreen forests of Goodrical R.F. (Non-Selection Felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	144.44	33.33	3.03	4.05	4.33	277.62	0.76	0.13	7.85
2	Actinodaphne malabarica	11.11	11.11	0.23	1.35	1.00	97.44	0.27	0.09	1.85
3	Agrostistachys borneensis	233.33	22.22	4.90	2.70	10.50	263.22	0.73	0.47	8.32
4	Ailanthus sp	33.33	11.11	0.70	1.35	3.00	871.43	2.40	0.27	4.45
5	Ardisia sonchifolia	11.11	11.11	0.23	1.35	1.00	133.72	0.37	0.09	1.95
6	Bhesa indica	44.44	33.33	0.93	4.05	1.33	370.53	1.02	0.04	6.01
7	Canarium strictum	33.33	11.11	0.70	1.35	3.00	1303.27	3.59	0.27	5.64
8	Canthium rheedii	11.11	11.11	0.23	1.35	1.00	147.08	0.41	0.09	1.99
9	Cedrela toona	66.67	22.22	1.40	2.70	3.00	905.05	2.49	0.14	6.60
10	Cinnamomum keralensis	44.44	22.22	0.93	2.70	2.00	245.02	0.68	0.09	4.31
11	Cleidion javanicum	88.89	11.11	1.86	1.35	8.00	303.31	0.84	0.72	4.05
12	Clerodendrum viscosum	33.33	11.11	0.70	1.35	3.00	115.07	0.32	0.27	2.37
13	Croton malabaricus	44.44	11.11	0.93	1.35	4.00	567.97	1.57	0.36	3.85
14	Cullenia exarillata	344.44	44.44	7.23	5.41	7.75	1829.25	5.04	0.17	17.67

15	Dendrocnide sinuata	22.22	11.11	0.47	1.35	2.00	103.09	0.28	0.18	2.10
16	Dimocarpus longan	122.22	22.22	2.56	2.70	5.50	340.80	0.94	0.25	6.21
17	Diospyros paniculata	100.00	33.33	2.10	4.05	3.00	546.52	1.51	0.09	7.66
18	Drypetes elata	11.11	11.11	0.23	1.35	1.00	346.50	0.95	0.09	2.54
19	Dysoxylum malabaricum	11.11	11.11	0.23	1.35	1.00	2464.00	6.79	0.09	8.37
20	Elaeocarpus munronii	33.33	11.11	0.70	1.35	3.00	579.23	1.60	0.27	3.65
21	Elaeocarpus serratus	33.33	11.11	0.70	1.35	3.00	583.77	1.61	0.27	3.66
22	Elaeocarpus tuberculatus	11.11	11.11	0.23	1.35	1.00	1789.77	4.93	0.09	6.52
23	Euodia lunu-ankenda	155.56	33.33	3.26	4.05	4.67	683.77	1.88	0.14	9.20
24	Flaccourtia montana	22.22	11.11	0.47	1.35	2.00	471.63	1.30	0.18	3.12
26	Gnidia glauca	44.44	11.11	0.93	1.35	4.00	298.42	0.82	0.36	3.11
27	Gomphandra coriacea	255.56	22.22	5.36	2.70	11.50	151.73	0.42	0.52	8.48
28	Holigarna arnottiana	11.11	11.11	0.23	1.35	1.00	2036.36	5.61	0.09	7.20
29	Hydnocarpus pentandra	66.67	22.22	1.40	2.70	3.00	278.46	0.77	0.14	4.87
30	Knema attenuata	22.22	22.22	0.47	2.70	1.00	1695.59	4.67	0.05	7.84
31	Macaranga peltata	333.33	33.33	6.99	4.05	10.00	353.89	0.98	0.30	12.02
32	Meiogyne pannosa	133.33	11.11	2.80	1.35	12.00	147.08	0.41	1.08	4.55
33	Meliosma pinnata	77.78	11.11	1.63	1.35	7.00	648.42	1.79	0.63	4.77
34	Memecylon deccanense	1600.00	44.44	33.57	5.41	36.00	900.07	2.48	0.81	41.45
35	Memecylon subramaniani	22.22	11.11	0.47	1.35	2.00	108.90	0.30	0.18	2.12
36	Meogyne pannosa	33.33	11.11	0.70	1.35	3.00	103.09	0.28	0.27	2.33
37	Mesua ferrea	44.44	33.33	0.93	4.05	1.33	3016.97	8.31	0.04	13.30
38	Mesua ferrea	11.11	11.11	0.23	1.35	1.00	2165.63	5.97	0.09	7.55
39	Microtropis stocksii	11.11	11.11	0.23	1.35	1.00	91.95	0.25	0.09	1.84
40	Nageia wallichiana	11.11	11.11	0.23	1.35	1.00	240.63	0.66	0.09	2.25
41	Palaquium ellipticum	200.00	33.33	4.20	4.05	6.00	4656.36	12.83	0.18	21.08
42	Persea macrantha	66.67	22.22	1.40	2.70	3.00	1024.72	2.82	0.14	6.92
43	Polyalthia fragrans	33.33	11.11	0.70	1.35	3.00	378.72	1.04	0.27	3.09
44	Toona ciliata	11.11	11.11	0.23	1.35	1.00	1303.27	3.59	0.09	5.18

45	Vepris bilocularis	11.11	11.11	0.23	1.35	1.00	534.86	1.47	0.09	3.06
46	Vernonia monosis	100.00	22.22	2.10	2.70	4.50	816.81	2.25	0.20	7.05
Grand Total		4766.67	822.22	100.00	100.00	192.42	36290.97	100.00	10.54	300.00

MI=74

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB=Abundance, BA = Basal Area, MI = Maturity Index RBA = Relative Basal Area, AB/F=Abundance/Frequency, IVI = Importance Value Index.

Regeneration Status of Seedlings

With regard to percentage distribution of seedlings, the following six species together accounts for 53.4% of total seedlings observed. Viz., *Palquium ellipticum* (18.7%), *Cinnamomum keralensis* (12.6%), *Clerodendrum viscosum* (6.5%), *Dimocarpus longan* (6.5%), *Mesa indica* (4.8%) and *Croton aromaticus* (4.3%). Other 40 species (Table 12) together forms 46.6% of seedlings. The percentage wise status of unestablished (Un esta.), Established (Esta.) and Advanced growth (Adv.Gr.) seedlings of most common species are as follows.

Table 12. Distribution status of Seedlings of West Coast Tropical Evergreen Forests of Goodrical R.F. (Selection Felled)

Sl. N0.	Species	U	E	A	TS
1	Acronychia pedunculata	5	3	0	8
2	Actinodaphne malabarica	1	1	1	3
3	Agrostistachys borneensis	2	1	0	3
4	Aporusa lindleyana	0	1	0	1
5	Ardisia pauciflora	2	0	0	2
6	Bamboosa bamboos	3	0	0	3
7	Canthium dicoccum	0	1	0	1
8	Caseria ovata	0	2	0	2
9	Cassine paniculata	1	0	0	1
10	Catunaragum spinosum	0	0	1	1
11	Cedrela toona	2	0	0	2
12	Cinnamomum keralensis	28	1	0	29
13	Cinnamomum malabatrum	0	1	0	1
14	Clerodendrum viscosum	13	2	0	15

15	Croton aromaticus	10	0	0	10
16	Cullenia exarillata	2	1	1	4
17	Dichapetalum jealanioides	2	4	0	6
18	Dimocarpus longan	13	2	0	15
19	Diospyros bourdillonii	1	1	0	2
20	Diospyros paniculata	6	2	1	9
21	Drypetes elata	0	1	0	1
22	Dysoxylum malabaricum	4	1	0	5
23	Eugenia thwaitesii	1	1	1	3
24	Euodia lunu-ankenda	1	1	0	2
25	Garcinea gummi-gutta	3	0	0	3
26	Gnidia glauca	1	0	0	1
27	Guania microcarpa	1	0	0	1
28	Knema attenuata	0	0	2	2
29	Litsea coriacea	0	2	0	2
30	Litsea floribunda	0	2	1	3
31	Macaranga peltata	3	0	0	3
32	Meliosma pinnata	0	0	1	1
33	Memecylon deccanense	0	1	0	1
34	Memecylon malabaricum	4	1	4	9
35	Mesa indica	9	2	0	11
36	Microtropis stocksii	0	0	1	1
37	Muraya paniculata	2	0	0	2
38	Neolitsea scorbiculata	2	0	0	2
39	Olea dioica	0	1	1	2
40	Ostodes zeylanicus	2	0	1	3
41	Otonephelium stipulaceum	0	0	1	1
42	Palaquium ellipticum	37	4	2	43
43	Persea macrantha	1	1	0	2
44	Symplocos rosea	6	0	0	6
45	Tournefortia heyniana	1	0	0	1
46	Trichilla conoraria	0	1	0	1
Grand Total		**169**	**42**	**19**	**230**

U= Unestablished, E= Established, A= Advanced growth, TS= Total seedlings

Table 13. Distribution status of seedlings of West Coast Tropical Evergreen forests of Goodrical RF. (Non- selection felled)

Sl. No.	Species	U	E	A.
1	Cinnamomum keralensis	96.6	3.4	0
2	Clerodendrum viscosum	86.7	13.3	0
3	Croton aromaticus	100	0	0
4	Cullenia exarillata	86.7	13.3	0
5	Dichapetalum jealanioides	33.3	66.7	0
6	Dimocarpus longan	86.7	13.3	0
7	Diospyros paniculata	66.7	22.2	11.1
8	Mesa indica	81.8	18.2	0
9	Palaquium ellipticum	86.0	9.3	4.7

The percentage of unestablished seedlings are more than 60% in almost all cases except to that of *Dicapetalum jealanioides.*

Status of Saplings

In total 34 sapling species were recorded with IVI ranging from 4.47 (*Canthium rheedi* and ***Cassia*** *paniculata*) to 29.03 (*Clerodendrum viscosum*) – Table 14. While grouping the saplings on density wise, *Clerodendrum viscosum* dominates following *Croton aromaticus* and *Macaranga peltata* with values 267.67, 166.67 and 100 respectively.

Table 14 . Vegetation status of saplings of West Coast Tropical Evergreen forests of Goodrical R.F. (Non-Selection Felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	83.33	33.33	5.49	4.17	2.50	26.06	4.20	0.08	13.86
2	Actinodaphne malabarica	66.67	50.00	4.40	6.25	1.33	19.73	3.18	0.03	13.83
3	Agrostistachys borneensis	50.00	33.33	3.30	4.17	1.50	22.10	3.56	0.05	11.03
4	Agrostistachys indica	16.67	16.67	1.10	2.08	1.00	11.45	1.85	0.06	5.03
5	Antidesma menasu	16.67	16.67	1.10	2.08	1.00	25.77	4.16	0.06	7.34

6	Aporusa lindleyana	83.33	33.33	5.49	4.17	2.50	16.49	2.66	0.08	12.32
7	Ardisia sonchifolia	16.67	16.67	1.10	2.08	1.00	25.77	4.16	0.06	7.34
8	Canthium rheedii	16.67	16.67	1.10	2.08	1.00	7.95	1.28	0.06	4.47
9	Cassine paniculata	16.67	16.67	1.10	2.08	1.00	7.95	1.28	0.06	4.47
10	Cinnamomum keralensis	66.67	33.33	4.40	4.17	2.00	19.11	3.08	0.06	11.64
11	Cinnamomum malabatrum	50.00	33.33	3.30	4.17	1.50	21.22	3.42	0.05	10.89
12	Cleidion javanicum	16.67	16.67	1.10	2.08	1.00	9.63	1.55	0.06	4.73
13	Clerodendrum viscosum	266.67	50.00	17.58	6.25	5.33	32.22	5.20	0.11	29.03
14	Croton aromaticus	116.67	16.67	7.69	2.08	7.00	19.11	3.08	0.42	12.86
15	Croton malabaricus	16.67	16.67	1.10	2.08	1.00	49.72	8.02	0.06	11.20
16	Cryptocarya anamalayana	33.33	16.67	2.20	2.08	2.00	13.44	2.17	0.12	6.45
17	Cullenia exarillata	33.33	33.33	2.20	4.17	1.00	14.50	2.34	0.03	8.70
18	Dichapetalum jealanioides	16.67	16.67	1.10	2.08	1.00	9.63	1.55	0.06	4.73
19	Diospyros paniculata	33.33	16.67	2.20	2.08	2.00	9.63	1.55	0.12	5.83
20	Dysoxylum malabaricum	50.00	33.33	3.30	4.17	1.50	9.63	1.55	0.05	9.02
21	Elaeocarpus tuberculatus	16.67	16.67	1.10	2.08	1.00	11.45	1.85	0.06	5.03
22	Garcinea gummi-gutta	33.33	16.67	2.20	2.08	2.00	12.43	2.00	0.12	6.29
23	Knema attenuata	16.67	16.67	1.10	2.08	1.00	9.63	1.55	0.06	4.73
24	Litsea coreacea	16.67	16.67	1.10	2.08	1.00	28.72	4.63	0.06	7.81
25	Litsea floribunda	50.00	33.33	3.30	4.17	1.50	22.99	3.71	0.05	11.17
26	Macaranga peltata	100.00	33.33	6.59	4.17	3.00	39.68	6.40	0.09	17.16
27	Mesa indica	16.67	16.67	1.10	2.08	1.00	11.45	1.85	0.06	5.03
28	Mesua thwaitesii	33.33	33.33	2.20	4.17	1.00	20.36	3.28	0.03	9.65
29	Microtropis stocksii	33.33	16.67	2.20	2.08	2.00	12.43	2.00	0.12	6.29
30	Otonephelium stipulaceum	33.33	16.67	2.20	2.08	2.00	11.45	1.85	0.12	6.13
31	Palaquium ellipticum	33.33	16.67	2.20	2.08	2.00	8.77	1.41	0.12	5.70
32	Pheanthus malabaricus	16.67	16.67	1.10	2.08	1.00	9.63	1.55	0.06	4.73
33	Schleichera oleosa	33.33	16.67	2.20	2.08	2.00	11.45	1.85	0.12	6.13
34	Vepris bilocularis	16.67	16.67	1.10	2.08	1.00	38.50	6.21	0.06	9.39
Grand Total		1516.67	800.00	100.00	100.00	59.67	620.05	100.00	2.77	300.00

MI=48

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

3. West Coast Semi Evergreen Forests

Status of Tree vegetation

The ten dominant species based on IVI are (IVI in parenthesis):- *Palquium ellipticum* (22.88), *Macaranga peltata* (12.17), *Strombosia zeylanica* (10.75), *Hopea*

parviflora (8.36), *Terminalia paniculata* (7.76), *Tetrameles nudiflora* (7.34), *Vateria indica* (7.13) and *Hydnocarpus pentandra* (7.11). The above mentioned ten species together accounts for 32.86% of the total IVI and the balance 80 species together constitute 67.14% of the total IVI.

The species with high Density status are *Macaranga peltata* (8.2%), *Zanthophyllum arnottianum* (6.2%), *Strombosia zeylanica* (5.9%), *Drypetus elata* (3.6%), *Baccauria courtallensis* (3.5%), *Vateria indica* (3.4%), *Knema attenuata* (3.3%), *Polyalthia fragrans* (3.1%), *Hydnocarpus pentandra* (3.0%), *Mallotus philipensis* (2.8%), *Myristicca malabarica* (2.4%), *Terminalia paniculata* (2.4%), *Hopea parviflora* (2.3%) and *Vitex altissima* (2.3%).

The species with high percentage frequency (more than 50%) are *Hopea parviflora, Hydnocarpus pentandra, Knema attenuata, Macaranga peltata, Mallotus philipensis, Myristica malabarica, polyalthia fragrans, Strombosia zeylanica, Terminalia paniculata, Tetrameles nudiflora, Vateria indica, Vitex altissima* and *Xanthophyllum arnottianum* (Table 15).

Table 15. Vegetation status of tees of West Coast Tropical Semi-evergreen frests of Goodrical RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	A/F	IVI
1	Actinodaphne companulata	30.77	23.08	0.69	1.12	1.33	557.94	0.77	0.058	2.59
2	Actinodaphne malabarica	7.69	7.69	0.17	0.37	1.00	616.00	0.85	0.130	1.40
3	Aglaia lawii	92.31	15.38	2.08	0.75	6.00	284.14	0.39	0.390	3.22
4	Aglaia perviridis	7.69	7.69	0.17	0.37	1.00	2901.90	4.02	0.130	4.57
5	Alstonia scholaris	23.08	15.38	0.52	0.75	1.50	358.86	0.50	0.098	1.77
6	Antidesma menasu	23.08	15.38	0.52	0.75	1.50	397.23	0.55	0.098	1.82
7	Apodytes dimidiata	15.38	15.38	0.35	0.75	1.00	140.32	0.19	0.065	1.29
8	Aporusa lindleyana	76.92	46.15	1.73	2.25	1.67	215.26	0.30	0.036	4.28
9	Artocarpus gomezianus	7.69	7.69	0.17	0.37	1.00	630.08	0.87	0.130	1.42
10	Artocarpus heterophyllus	15.38	15.38	0.35	0.75	1.00	147.08	0.20	0.065	1.30
11	Artocarpus hirsutus	38.46	23.08	0.87	1.12	1.67	1747.08	2.42	0.072	4.41
12	Atlantia racemosa	46.15	7.69	1.04	0.37	6.00	132.63	0.18	0.780	1.60
13	Baccaurea courtallensis	153.85	46.15	3.47	2.25	3.33	206.90	0.29	0.072	6.00
14	Bombax ceiba	30.77	15.38	0.69	0.75	2.00	1208.34	1.68	0.130	3.12
15	Callicarpa tomentosa	7.69	7.69	0.17	0.37	1.00	198.86	0.28	0.130	0.82
16	Callophyllum decipiens	7.69	7.69	0.17	0.37	1.00	127.27	0.18	0.130	0.72
17	Canarium strictum	15.38	15.38	0.35	0.75	1.00	140.32	0.19	0.065	1.29

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	A/F	IVI
18	Carallia brachiata	7.69	7.69	0.17	0.37	1.00	2577.27	3.57	0.130	4.12
19	Cassine paniculata	7.69	7.69	0.17	0.37	1.00	190.99	0.26	0.130	0.81
20	Cedrela toona	23.08	15.38	0.52	0.75	1.50	173.23	0.24	0.098	1.51
21	Chukrasia tabularis	7.69	7.69	0.17	0.37	1.00	91.95	0.13	0.130	0.68
22	Cinnamomum malabatrum	69.23	46.15	1.56	2.25	1.50	172.41	0.24	0.033	4.05
23	Cochlospermum religiosum	30.77	7.69	0.69	0.37	4.00	172.00	0.24	0.520	1.31
24	Croton malabaricus	7.69	7.69	0.17	0.37	1.00	97.44	0.14	0.130	0.68
25	Dimocarpus longan	15.38	15.38	0.35	0.75	1.00	435.59	0.60	0.065	1.70
26	Diospyros buxifolia	15.38	7.69	0.35	0.37	2.00	1145.45	1.59	0.260	2.31
27	Diospyros paniculata	53.85	23.08	1.21	1.12	2.33	596.16	0.83	0.101	3.16
28	Dipterocarpus bourdillonii	23.08	23.08	0.52	1.12	1.00	1611.49	2.23	0.043	3.88
29	Drypetes elata	161.54	30.77	3.64	1.50	5.25	488.10	0.68	0.171	5.81
30	Dysoxylum beddomei	15.38	7.69	0.35	0.37	2.00	2722.44	3.77	0.260	4.50
31	Dysoxylum malabaricum	53.85	46.15	1.21	2.25	1.17	1073.00	1.49	0.025	4.95
32	Elaeocarpus serratus	7.69	7.69	0.17	0.37	1.00	1088.90	1.51	0.130	2.06
33	Elaeocarpus tuberculatus	53.85	15.38	1.21	0.75	3.50	1425.27	1.98	0.228	3.94
34	Erythrina indica	7.69	7.69	0.17	0.37	1.00	748.44	1.04	0.130	1.59
35	Ficus hispida	15.38	15.38	0.35	0.75	1.00	84.02	0.12	0.065	1.21
36	Ficus tsjahela	7.69	7.69	0.17	0.37	1.00	962.50	1.33	0.130	1.88
37	Flaccourtia montana	69.23	38.46	1.56	1.87	1.80	482.58	0.67	0.047	4.10
38	Furniana colorata	7.69	7.69	0.17	0.37	1.00	76.44	0.11	0.130	0.65
39	Garcinea gummi-gutta	23.08	23.08	0.52	1.12	1.00	240.63	0.33	0.043	1.98
40	Garcinia morella	15.38	7.69	0.35	0.37	2.00	86.63	0.12	0.260	0.84
41	Grewia tilaefolia	7.69	7.69	0.17	0.37	1.00	346.50	0.48	0.130	1.03
42	Herteria papilio	46.15	30.77	1.04	1.50	1.50	916.40	1.27	0.049	3.81
43	Holigarna arnottiana	38.46	15.38	0.87	0.75	2.50	269.44	0.37	0.163	1.99
44	Hopea parviflora	100.00	53.85	2.25	2.62	1.86	2515.96	3.49	0.034	8.36
45	Hopea racophloea	7.69	7.69	0.17	0.37	1.00	2577.27	3.57	0.130	4.12
46	Hydnocarpus pentandra	130.77	76.92	2.95	3.75	1.70	298.39	0.41	0.022	7.11
47	Ixora brachiata	76.92	23.08	1.73	1.12	3.33	208.52	0.29	0.144	3.15
48	Ixora elongata	15.38	7.69	0.35	0.37	2.00	202.86	0.28	0.260	1.00
49	Kingiodendron pinnatum	7.69	7.69	0.17	0.37	1.00	367.82	0.51	0.130	1.06
50	Knema attenuata	146.15	53.85	3.29	2.62	2.71	1051.99	1.46	0.050	7.37
51	Lagerstroemia flos-reginae	7.69	7.69	0.17	0.37	1.00	91.95	0.13	0.130	0.68
52	Lagerstroemia microcarpa	15.38	15.38	0.35	0.75	1.00	980.08	1.36	0.065	2.45
53	Leea indica	92.31	38.46	2.08	1.87	2.40	122.28	0.17	0.062	4.12
54	Leea sambusina	15.38	15.38	0.35	0.75	1.00	127.27	0.18	0.065	1.27

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	A/F	IVI
55	Lophopetalum wightianum	46.15	30.77	1.04	1.50	1.50	2096.19	2.91	0.049	5.44
56	Macaranga peltata	361.54	69.23	8.15	3.37	5.22	469.54	0.65	0.075	12.17
57	Mallotus philippensis	123.08	69.23	2.77	3.37	1.78	402.40	0.56	0.026	6.70
58	Mallotus tetracoccus	61.54	38.46	1.39	1.87	1.60	490.18	0.68	0.042	3.94
59	Myristica dactyloides	30.77	15.38	0.69	0.75	2.00	815.47	1.13	0.130	2.57
60	Myristica malabarica	107.69	53.85	2.43	2.62	2.00	1220.27	1.69	0.037	6.74
61	Olea dioica	23.08	15.38	0.52	0.75	1.50	231.95	0.32	0.098	1.59
62	Pajanelia longifolia	7.69	7.69	0.17	0.37	1.00	378.72	0.53	0.130	1.07
63	Palaquium ellipticum	7.69	7.69	0.17	0.37	1.00	16107.95	22.33	0.130	22.88
64	Persea macrantha	38.46	23.08	0.87	1.12	1.67	245.90	0.34	0.072	2.33
65	Polyalthia coffeoides	30.77	15.38	0.69	0.75	2.00	923.53	1.28	0.130	2.72
66	Polyalthia fragrans	138.46	53.85	3.12	2.62	2.57	663.15	0.92	0.048	6.66
67	Pterocarpus marsupium	15.38	7.69	0.35	0.37	2.00	223.44	0.31	0.260	1.03
68	Reinwardtidendron anamalaiense	30.77	7.69	0.69	0.37	4.00	111.86	0.16	0.520	1.22
69	Sageraea laurifolia	15.38	15.38	0.35	0.75	1.00	771.77	1.07	0.065	2.17
70	Samadera indica	7.69	7.69	0.17	0.37	1.00	86.63	0.12	0.130	0.67
71	Schleichera oleosa	53.85	38.46	1.21	1.87	1.40	291.84	0.40	0.036	3.49
72	Sterculia guttata	7.69	7.69	0.17	0.37	1.00	206.90	0.29	0.130	0.83
73	Stereospermum colais	23.08	15.38	0.52	0.75	1.50	215.09	0.30	0.098	1.57
74	Strombosea zeylanica	261.54	84.62	5.89	4.12	3.09	532.18	0.74	0.037	10.75
75	Symplocos rosea	15.38	7.69	0.35	0.37	2.00	111.86	0.16	0.260	0.88
76	Syzygium cumini	15.38	15.38	0.35	0.75	1.00	885.36	1.23	0.065	2.32
77	Syzygium lanceolatum	15.38	7.69	0.35	0.37	2.00	206.90	0.29	0.260	1.01
78	Syzygium munronii	7.69	7.69	0.17	0.37	1.00	103.09	0.14	0.130	0.69
79	Syzyigium elatum	7.69	7.69	0.17	0.37	1.00	161.08	0.22	0.130	0.77
80	Taberna montana gamblei	7.69	7.69	0.17	0.37	1.00	240.63	0.33	0.130	0.88
81	Terminalia bellirica	61.54	23.08	1.39	1.12	2.67	338.67	0.47	0.116	2.98
82	Terminalia paniculata	107.69	53.85	2.43	2.62	2.00	1953.59	2.71	0.037	7.76
83	Tetrameles nudiflora	169.23	53.85	3.81	2.62	3.14	639.77	0.89	0.058	7.32
84	Turpinia malabarica	76.92	46.15	1.73	2.25	1.67	533.56	0.74	0.036	4.72
85	Vateria indica	153.85	53.85	3.47	2.62	2.86	749.99	1.04	0.053	7.13
86	Vitex altissima	100.00	53.85	2.25	2.62	1.86	2050.09	2.84	0.034	7.72
87	Vitex leucoxylon	7.69	7.69	0.17	0.37	1.00	86.63	0.12	0.130	0.67
88	Wrightia tinctoria	7.69	7.69	0.17	0.37	1.00	223.44	0.31	0.130	0.86
89	Xanthophyllum arnottianum	276.92	69.23	6.24	3.37	4.00	236.63	0.33	0.058	9.94
90	Zanthoxylum rhetsa	7.69	7.69	0.17	0.37	1.00	295.99	0.41	0.130	0.96
Grand total		4438.46	2053.85	100.00	100.00	164.07	72132.13	100.00	11.270	300.00

MI=22.82

D = Density, F = Frequency, RD = Relative Density, RF = RelativeFrequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F=Abundance/Frequency, IVI = Importance Value IndexMI = Maturity Index.

Status of Saplings

The dominant saplings species are (IVI in parenthesis) *Xanthophyllum arnottianum* (22.36), *Aglaia lawii* (23.55), *Diospyros paniculata* (14.58), *Baccaurea courtellensis* (12.25) and *Dysoxylum malabaricum* (10.13). The above mentioned five species together constitutes 27.6**%** of the total IVI values and the rest 38 species together account for the balance 78.4**%** of IVI (Table 16). The Density ranking of sapling species also shows similar trend with a few additions like *Leea sambusina, Symplocosn rosea, Sterculia guttata* and *Strombosca zeylanica*.

Table.16. Vegetation status of saplings of West Coast Tropical Semi-evergreen forests of Goodrical RF

Sl.No	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Aglaia lawii	166.67	33.33	16.26	5.97	5	12.73	1.32	0.150	23.55
2	Antidesma menasu	8.33	8.33	0.81	1.49	1	15.59	1.62	0.120	3.93
3	Aporusa lindleyana	8.33	8.33	0.81	1.49	1	9.63	1.00	0.120	3.31
4	Ardisia pauciflora	8.33	8.33	0.81	1.49	1	66.90	6.95	0.120	9.26
5	Artocarpus gomezianus	16.67	8.33	1.63	1.49	2	25.77	2.68	0.240	5.80
6	Artocarpus hirsutus	8.33	8.33	0.81	1.49	1	11.45	1.19	0.120	3.50
7	Baccaurea courtallensis	58.33	25.00	5.69	4.48	2	20.00	2.08	0.093	12.25
8	Callicarpa tomentosa	25.00	8.33	2.44	1.49	3	16.34	1.70	0.360	5.63
9	Catunaragam spinosum	25.00	8.33	2.44	1.49	3	31.82	3.31	0.360	7.24
10	Cinnamomum malabatrum	16.67	16.67	1.63	2.99	1	27.22	2.83	0.060	7.44
11	Dendrocnide sinuata	8.33	8.33	0.81	1.49	1	11.45	1.19	0.120	3.50
12	Diospyros paniculata	75.00	33.33	7.32	5.97	2	12.41	1.29	0.068	14.58
13	Drypetes elata	8.33	8.33	0.81	1.49	1	15.59	1.62	0.120	3.93
14	Dysoxylum malabaricum	41.67	25.00	4.07	4.48	2	15.24	1.58	0.067	10.13
15	Elaeocarpus tuberculatus	16.67	8.33	1.63	1.49	2	11.45	1.19	0.240	4.31
16	Ficus hispida	8.33	8.33	0.81	1.49	1	17.90	1.86	0.120	4.17
17	Glochidion zeylanicum	8.33	8.33	0.81	1.49	1	28.72	2.98	0.120	5.29
18	Gmelina arborea	8.33	8.33	0.81	1.49	1	13.44	1.40	0.120	3.70
19	Holigarna arnottiana	16.67	8.33	1.63	1.49	2	15.59	1.62	0.240	4.74
20	Hopea parviflora	16.67	16.67	1.63	2.99	1	14.50	1.51	0.060	6.12
21	Ixora brachiata	16.67	8.33	1.63	1.49	2	12.43	1.29	0.240	4.41
22	Knema attenuata	16.67	16.67	1.63	2.99	1	31.82	3.31	0.060	7.92
23	Leea indica	33.33	16.67	3.25	2.99	2	27.22	2.83	0.120	9.07

Sl.No	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
24	Leea sambusina	16.67	8.33	1.63	1.49	2	51.72	5.37	0.240	8.49
25	Litsea floribunda	8.33	8.33	0.81	1.49	1	25.77	2.68	0.120	4.98
26	Macaranga peltata	16.67	16.67	1.63	2.99	1	28.72	2.98	0.060	7.59
27	Mallotus philippensis	16.67	8.33	1.63	1.49	2	12.43	1.29	0.240	4.41
28	Memecylon deccanense	16.67	16.67	1.63	2.99	1	9.63	1.00	0.060	5.61
29	Ostodes zeylanicus	8.33	8.33	0.81	1.49	1	49.72	5.17	0.120	7.47
30	Otonephelium stipulaceum	8.33	8.33	0.81	1.49	1	17.90	1.86	0.120	4.17
31	Polyalthia fragrans	8.33	8.33	0.81	1.49	1	9.63	1.00	0.120	3.31
32	Sagararia dazalsi	8.33	8.33	0.81	1.49	1	15.59	1.62	0.120	3.93
33	Schleichera oleosa	8.33	8.33	0.81	1.49	1	13.44	1.40	0.120	3.70
34	Sterculia guttata	25.00	16.67	2.44	2.99	2	18.70	1.94	0.090	7.37
35	Strombosea zeylanica	25.00	16.67	2.44	2.99	2	17.11	1.78	0.090	7.20
36	Symplocos rosea	33.33	16.67	3.25	2.99	2	22.32	2.32	0.120	8.56
37	Syzygium arnottianum	16.67	8.33	1.63	1.49	2	22.99	2.39	0.240	5.51
38	Tectona grandis	16.67	8.33	1.63	1.49	2	38.50	4.00	0.240	7.12
39	Turpinia malabarica	16.67	8.33	1.63	1.49	2	24.36	2.53	0.240	5.65
40	Vateria indica	16.67	16.67	1.63	2.99	1	35.08	3.65	0.060	8.26
41	Vepris bilocularis	8.33	8.33	0.81	1.49	1	31.82	3.31	0.120	5.61
42	Vitex altissima	8.33	8.33	0.81	1.49	1	25.77	2.68	0.120	4.98
43	Xanthophyllum arnottianum	125	41.67	12.20	7.46	3	25.96	2.70	0.072	22.36
Grand Total		**1025.0**	**558.33**	**100.0**	**100.0**	**68.25**	**962.37**	**100.0**	**6.15**	**300.0**

MI=12.98

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

3. Moist Deciduous Forests (Selection Felled Area)

Status of Tree Vegetation

The ten dominant species as per IVI status are (IVI in parenthesis): *Terminalia paniculata* (24.86), *Memecylon deccanensis* (14.34), *Xylia xylocarpa* (13.68), *Lageerstroemia microcarpa* (13.70), *Grewia* ***tillifolia*** (16.13), *Vateria indica* (12.93), *Macaranga peltata* (11.52), *Tetrameles nudiflora* (10.14), *Dillenia pentagyna* (10.83) and *Holoptelia integrifolia* (10.90). They together contribute 46.34% of the total IVI. The balance 41 species together contribute for 53.65% of IVI.

The percentage density analysis of the dominant species shows that *Terminalia paniculata* (14.77%) followed by *Memecylon deccanense* (12.40%), *Xylia xylocarpa* (10.04%), *Grewia tillifolia* (8.04%), *Macaranga peltata* (5.72)%), *Lagerstroemia*

microcarpa (5.02%) and *Dillenia pentagyna* (4.68%) are together accounting for 60.67% of the total tree density. The rest of 44 species together accounts for 40% tree density in the area. *Terminalia paniculata, lagerstroemia microcarpa* and *Grewia tillifolia* shows highest frequency in the area (Table 17).

Table 17. Vegetation status of trees of Moist Deciduous forests of Goodrical RF

Sl. No.	Species	D	E	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne companulata	18.18	9.09	0.67	0.89	2.00	84.02	0.16	0.22	1.73
2	Actinodaphne malabarica	36.36	18.18	1.34	1.79	2.00	141.99	0.28	0.11	3.40
3	Antidesma menasu	27.27	9.09	1.01	0.89	3.00	212.34	0.41	0.33	2.31
4	Aporusa lindleyana	54.55	18.18	2.01	1.79	3.00	270.68	0.53	0.17	4.33
5	Artocarpus hirsutus	9.09	9.09	0.34	0.89	1.00	412.36	0.80	0.11	2.03
6	Bombax ceiba	36.36	36.36	1.34	3.57	1.00	2218.44	4.31	0.03	9.23
7	Carallia brachiata	18.18	18.18	0.67	1.79	1.00	868.66	1.69	0.06	4.15
8	Caraya arborea	9.09	9.09	0.34	0.89	1.00	81.45	0.16	0.11	1.39
9	Cassia fistula	9.09	9.09	0.34	0.89	1.00	447.44	0.87	0.11	2.10
10	Cinnamomum malabatrum	9.09	9.09	0.34	0.89	1.00	71.59	0.14	0.11	1.37
11	Cochlospermum religiosum	27.27	18.18	1.01	1.79	1.50	231.95	0.45	0.08	3.24
12	Dalabergia lanceolata	9.09	9.09	0.34	0.89	1.00	114.86	0.22	0.11	1.45
13	Dalbergia latifolia	72.73	36.36	2.68	3.57	2.00	656.91	1.28	0.06	7.53
14	Dellenia pentagyna	127.27	36.36	4.70	3.57	3.50	1317.86	2.56	0.10	10.83
15	Dillenia retusa	18.18	9.09	0.67	0.89	2.00	74.48	0.14	0.22	1.71
16	Diospyros paniculata	9.09	9.09	0.34	0.89	1.00	2298.86	4.47	0.11	5.70
17	Dysoxylum malabaricum	18.18	18.18	0.67	1.79	1.00	301.84	0.59	0.06	3.04
18	Ficus benghalensis	9.09	9.09	0.34	0.89	1.00	183.27	0.36	0.11	1.58
19	Ficus hispida	9.09	9.09	0.34	0.89	1.00	336.08	0.65	0.11	1.88
20	Flaccourtia montana	9.09	9.09	0.34	0.89	1.00	962.50	1.87	0.11	3.10
21	Grewia tilaefolia	218.18	72.73	8.05	7.14	3.00	477.46	0.93	0.04	16.13
22	Haldina cordifolia	18.18	9.09	0.67	0.89	2.00	210.97	0.41	0.22	1.97
23	Holoptelia integrifolia	9.09	9.09	0.34	0.89	1.00	4971.59	9.67	0.11	10.90
24	Holorina pubscense	18.18	18.18	0.67	1.79	1.00	595.18	1.16	0.06	3.61
25	Hopea racophloea	9.09	9.09	0.34	0.89	1.00	378.72	0.74	0.11	1.96
26	Hydnocarpus pentandra	9.09	9.09	0.34	0.89	1.00	412.36	0.80	0.11	2.03
27	Knema attenuata	27.27	27.27	1.01	2.68	1.00	1566.52	3.05	0.04	6.73
28	Lagerstroemia flos-reginae	9.09	9.09	0.34	0.89	1.00	763.95	1.49	0.11	2.71
29	Lagerstroemia microcarpa	136.36	72.73	5.03	7.14	1.88	783.83	1.52	0.03	13.70
30	Macaranga peltata	154.55	36.36	5.70	3.57	4.25	1155.58	2.25	0.12	11.52
31	Mallotus philippensis	27.27	18.18	1.01	1.79	1.50	264.52	0.51	0.08	3.31
32	Memecylon deccanense	336.36	9.09	12.42	0.89	37.00	531.34	1.03	4.07	14.34

Sl. No.	Species	D	E	RD	RF	AB	BA	RBA	AB/F	IVI
33	Myristica malabarica	9.09	9.09	0.34	0.89	1.00	1559.09	3.03	0.11	4.26
34	Olea dioica	9.09	9.09	0.34	0.89	1.00	267.59	0.52	0.11	1.75
35	Phyllanthus emblica	27.27	18.18	1.01	1.79	1.50	149.37	0.29	0.08	3.08
36	Polyalthia fragrans	18.18	18.18	0.67	1.79	1.00	2766.77	5.38	0.06	7.84
37	Pterocarpus marsupium	18.18	9.09	0.67	0.89	2.00	919.25	1.79	0.22	3.35
38	Schleichera oleosa	81.82	36.36	3.02	3.57	2.25	387.30	0.75	0.06	7.34
39	Sterculia guttata	9.09	9.09	0.34	0.89	1.00	1672.44	3.25	0.11	4.48
40	Stereospermum colais	45.45	27.27	1.68	2.68	1.67	860.36	1.67	0.06	6.03
41	Strombosea zeylanica	9.09	9.09	0.34	0.89	1.00	1672.44	3.25	0.11	4.48
42	Tectona grandis	27.27	9.09	1.01	0.89	3.00	2236.19	4.35	0.33	6.25
43	Terminalia bellirica	18.18	18.18	0.67	1.79	1.00	3024.72	5.88	0.06	8.34
44	Terminalia paniculata	400.00	81.82	14.77	8.04	4.89	1058.74	2.06	0.06	24.86
45	Tetrameles nudiflora	81.82	27.27	3.02	2.68	3.00	2283.86	4.44	0.11	10.14
46	Turpinia malabarica	9.09	9.09	0.34	0.89	1.00	1344.32	2.61	0.11	3.84
47	Vateria indica	9.09	9.09	0.34	0.89	1.00	6015.63	11.70	0.11	12.93
48	Vitex altissima	9.09	9.09	0.34	0.89	1.00	843.90	1.64	0.11	2.87
49	Wrightia tinctoria	63.64	45.45	2.35	4.46	1.40	236.89	0.46	0.03	7.27
50	Xanthophyllum arnottianum	81.82	27.27	3.02	2.68	3.00	239.65	0.47	0.11	6.16
51	Xylia xylocarpa	272.73	27.27	10.07	2.68	10.00	479.83	0.93	0.37	13.68
Grand Total		**2709.09**	**1018.18**	**100**	**100**	**128.33**	**51417.99**	**100.0**	**9.81**	**300.0**

MI=19.96

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/FAbundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Regeneration Status of Seedlings

The enumeration and analysis of seedling status reveals that, among the total seedlings of 1203 enumerated, 48.13% are in the category of unestablished (579 Nos.), 24.11% in established category (290 Nos.) and 27.76% are of Advanced growth (334 Nos.) (Table 18). More than sixteen percent (16.41%) of unestablished seedlings belongs to *Aglaia lawii* followed by 10.2% by *Gompholeguma erioplere*, 7.3% by *Ixora brachiata*, 6.6% by *Knema attenuata*, 5.9% by *Xanthophyllum arnottianum*, 5.45 by *Cinnamomum malabaricum*, 6% by *Baccauria courtellensis*, 4.5% by *Aporusa lindleyana*, 4.5% by *Polyalthia fragrans* and 4% by *Schleichera oleosa*. The above mentioned 10 species together forms 70.63% of unestablished seedlings in the area. With regard to germination, establishments and advanced growth of species, the species of

Aporusa lindleyana, Baccauria courtellensis, Canthium dioecum, Diospyros paniculata, Dysoxylum malabaricum, Hopea parviflora, Ixora brachiata, Knema attenuata, Mallotus phillipensis, Polyalthia fragrans, Schleichera oleosa, Strombosea zeylanica and *Xanthophyllum arnottianum* exhibits normal status of regeneration depicting "Established and Advanced growth seedling" in more or less regular fashion (Table 18).

Table. 18. Regeneration status of seedlings of Moist Deciduous forests of Goodrical RF

Sl. No	Species	U	E	A	TS
1	Actinodaphne companulata	1	3	0	4
2	Aglaia lawii	95	2	4	101
3	Aglaia simplicifolia	0	2	0	2
4	Allophyllus cobe	1	0	0	1
5	Antidesma menasu	0	0	2	2
6	Aporusa lindleyana	26	9	9	44
7	Artocarpus hirsutus	8	7	9	24
8	Baccaurea courtallensis	35	35	73	143
9	Canthium dicoccum	7	11	4	22
10	Careyota urens	1	0	0	1
11	Catunaragam spinosum	0	2	2	4
12	Cedrela toona	0	2	0	2
13	Cinnamomum malabatrum	31	0	17	48
14	Dendrocnide sinuata	0	2	1	3
15	Dichapetalum jealanioides	5	1	2	8
16	Dillenia pentagyna	1	0	0	1
17	Dimocarpus longan	0	1	1	2
18	Diospyros bourdillonii	3	1	3	7
19	Diospyros buxifolia	11	2	0	13
20	Diospyros paniculata	5	11	29	45
21	Drypetes elata	4	1	0	5
22	Dysoxylum malabaricum	11	10	9	30
23	Elaeocarpus tuberculatus	0	4	0	4
24	Ficus hispida	3	1	0	4
25	Flaccourtia montana	3	1	0	4
26	Garcinea gummi-gutta	0	1	0	1
27	Glochidion zeylanicum	0	0	1	1
28	Gompholeguma erioplere	58	24	0	82
29	Guania microcarpa	1	0	0	1
30	Haldina cordifolia	0	1	2	3
31	Herteria papilio	2	5	0	7

Sl. No	Species	U	E	A	TS
32	Holigarna arnottiana	0	0	1	1
33	Hopea parviflora	13	6	10	29
34	Hydnocarpus pentandra	3	0	0	3
35	Ixora brachiata	42	10	24	76
36	Knema attenuata	38	15	15	68
37	Lagerstroemia microcarpa	0	0	1	1
38	Lannea coromandelica	1	0	0	1
39	Leea indica	12	1	0	13
40	Litsea floribunda	0	0	2	2
41	Lophopetalum wightianum	1	0	0	1
42	Macaranga peltata	0	1	1	2
43	Mallotus philippensis	13	7	18	38
44	Mallotus tetracoccus	1	3	0	4
45	Memecylon deccanense	3	0	7	10
46	Memecylon malabaricum	2	0	0	2
47	Mesa indica	1	0	0	1
48	Mesua thwaitesii	0	0	1	1
49	Olea dioica	7	4	1	12
50	Ostodes zeylanicus	0	0	1	1
51	Palaquium ellipticum	0	5	0	5
52	Pavetta zeylanica	3	0	0	3
53	Persea macrantha	1	1	1	3
54	Pheanthus malabaricus	0	1	11	12
55	Polyalthia fragrans	26	19	12	57
56	Schleichera oleosa	23	19	25	67
57	Sterculia guttata	2	2	0	4
58	Stereospermum colais	1	0	0	1
59	Strombosea zeylanica	20	15	7	42
60	Sweitenia mahagony	0	0	1	1
61	Symplocos rosea	13	5	2	20
62	Syzygium arnottianum	0	0	1	1
63	Syzygium cumini	0	1	0	1
64	Syzygium densiflorum	0	1	0	1
65	Syzygium elatum	3	0	2	5
66	Syzygium mudagam	0	0	1	1
67	Tectona grandis	0	0	2	2
68	Turpinia malabarica	1	4	0	5
69	Vateria indica	2	5	2	9
70	Vepris bilocularis	0	12	0	12
71	Vitex altissima	1	3	0	4
72	Xanthophyllum arnottianum	34	11	8	53

Sl. No	Species	U	E	A	TS
73	Xylia xylocarpa	0	0	1	1
74	Cleidion javanicum	0	0	8	8
Grand Total		**579**	**290**	**334**	**1203**

U= Unestablished, E= Established, A= Advanced growth, TS= Total seedlings.

Status of Saplings

Thirtyone tree species were recorded from the site and the structural status of saplings was worked out (Table 19). *Xylia xylocarpa, Tectona grandis, Wrightia tinctoria, Xanthophyllum arnottianum, Terminalia paniculata* and *Grewia tillifolia* are the dominant sapling species in the study area (Table 14). With respect to sapling density, *Xylia xylocarpa* (109) followed by *Tectona grandis* (73), *Aporusa lindleyana* (36) and *Dalbergia latifolia* (27) together constitute 38% of the total sapling density. Other 27 species recorded, together accounts for 62% sapling density.

Table 19. Vegetation status of saplings of Moist Deciduous forests of Goodrical RF

Sl. No.	Species	D	E	RD	RF	AB	BA	RBA	AB/F	IVI
1	Aporusa lindleyana	36.36	18.18	5.48	4.44	2.00	10.07	1.28	0.11	11.20
2	Artocarpus hirsutus	18.18	18.18	2.74	4.44	1.00	16.72	2.12	0.06	9.31
3	Cinnamomum malabatrum	18.18	9.09	2.74	2.22	2.00	17.90	2.27	0.22	7.24
4	Dalbergia latifolia	27.27	18.18	4.11	4.44	1.50	24.83	3.15	0.08	11.71
5	Dillenia pentagyna	9.09	9.09	1.37	2.22	1.00	11.45	1.46	0.11	5.05
6	Diospyros buxifolia	18.18	9.09	2.74	2.22	2.00	11.45	1.46	0.22	6.42
7	Ficus hispida	9.09	9.09	1.37	2.22	1.00	22.99	2.92	0.11	6.51
8	Flaccourtia montana	18.18	9.09	2.74	2.22	2.00	45.82	5.82	0.22	10.78
9	Grewia tilaefolia	18.18	18.18	2.74	4.44	1.00	49.72	6.32	0.06	13.50
10	Guania microcarpa	9.09	9.09	1.37	2.22	1.00	9.63	1.22	0.11	4.81
11	Holorina pubscense	9.09	9.09	1.37	2.22	1.00	7.95	1.01	0.11	4.60
12	Hopea racophloea	9.09	9.09	1.37	2.22	1.00	66.90	8.50	0.11	12.09
13	Hydnocarpus pentandra	18.18	9.09	2.74	2.22	2.00	16.72	2.12	0.22	7.09
14	Ixora brachiata	36.36	9.09	5.48	2.22	4.00	19.11	2.43	0.44	10.13
15	Knema attenuata	9.09	9.09	1.37	2.22	1.00	62.36	7.92	0.11	11.51
16	Lagerstroemia flos-reginae	9.09	9.09	1.37	2.22	1.00	11.45	1.46	0.11	5.05
17	Lagerstroemia microcarpa	18.18	18.18	2.74	4.44	1.00	22.99	2.92	0.06	10.10
18	Leea indica	9.09	9.09	1.37	2.22	1.00	49.72	6.32	0.11	9.91
19	Olea dioica	9.09	9.09	1.37	2.22	1.00	22.99	2.92	0.11	6.51
20	Phyllanthus emblica	9.09	9.09	1.37	2.22	1.00	22.99	2.92	0.11	6.51
21	Schleichera oleosa	18.18	18.18	2.74	4.44	1.00	21.66	2.75	0.06	9.94

Sl. No.	Species	D	E	RD	RF	AB	BA	RBA	AB/F	IVI
22	Strombosea zeylanica	9.09	9.09	1.37	2.22	1.00	7.95	1.01	0.11	4.60
23	Tectona grandis	72.73	18.18	10.96	4.44	4.00	17.07	2.17	0.22	17.57
24	Terminalia bellirica	18.18	18.18	2.74	4.44	1.00	13.55	1.72	0.06	8.91
25	Terminalia paniculata	18.18	18.18	2.74	4.44	1.00	33.43	4.25	0.06	11.43
26	Turpinia malabarica	9.09	9.09	1.37	2.22	1.00	7.95	1.01	0.11	4.60
27	Vepris bilocularis	18.18	9.09	2.74	2.22	2.00	10.52	1.34	0.22	6.30
28	Wrightia tinctoria	18.18	9.09	2.74	2.22	2.00	60.16	7.64	0.22	12.60
29	Xanthophyllum arnottianum	27.27	27.27	4.11	6.67	1.00	14.14	1.80	0.04	12.57
30	Xylia xylocarpa	109.09	27.27	16.44	6.67	4.00	25.06	3.18	0.15	26.29
31	Zizyphus oenoplea	9.09	9.09	1.37	2.22	1.00	7.95	1.01	0.11	4.60

MI=12.78

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative BasalArea, AB/F=Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

4.Sub tropical Hill Forests

Status of Tree Vegetation

The dominant species of this type in Goodrickal reserves with respect to IVI (value in parenthesis) are, *Gomphandra coriacea* (19.36), *Mesua ferrea* (11.99), *Cullenia exerillata* (11.81), *Knema attenuata* (10.89) and *Canarium strictum*. High species density was observed in the case of *Gomphandra coriacea, Knema attenuata, Palaquium ellipticum, Schleichera oleosa, Apodytes dimidiata, Cullenia exarillata* and *Bhesa indica* (Table.20). The maximum percentatge frequency (percentage values in brackets) was observed with *Gomphandra coriacea* (100), *Knema attenuata* (75) and Cullenia exarillata (75).

Table 20. Vegetation status of trees of Sub-Tropical Hill forests of Goodrical RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	25.00	25.00	0.37	1.22	1.00	1695.59	3.25	0.04	4.84
2	Aglaia perviridis	50.00	50.00	0.73	2.44	1.00	658.72	1.26	0.02	4.44
3	Agrostistachys borneensis	50.00	25.00	0.73	1.22	2.00	384.22	0.74	0.08	2.69
4	Antiaris toxicaria	75.00	25.00	1.10	1.22	3.00	1703.34	3.27	0.12	5.59
5	Antidesma menasu	25.00	25.00	0.37	1.22	1.00	103.09	0.20	0.04	1.78
6	Apodytes dimidiata	325.00	25.00	4.76	1.22	13.00	388.92	0.75	0.52	6.73
7	Aporusa lindleyana	50.00	50.00	0.73	2.44	1.00	267.59	0.51	0.02	3.69
8	Artocarpus heterophyllus	25.00	25.00	0.37	1.22	1.00	2464.00	4.73	0.04	6.31

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
9	Beilsehmiedia bourdillonii	50.00	25.00	0.73	1.22	2.00	418.11	0.80	0.08	2.75
10	Bhesa indica	325.00	25.00	4.76	1.22	13.00	655.93	1.26	0.52	7.24
11	Canarium strictum	25.00	25.00	0.37	1.22	1.00	4620.08	8.87	0.04	10.45
12	Canthium dicoccum	25.00	25.00	0.37	1.22	1.00	190.99	0.37	0.04	1.95
13	Canthium rheedii	50.00	50.00	0.73	2.44	1.00	105.97	0.20	0.02	3.37
14	Canthium umbellatum	50.00	25.00	0.73	1.22	2.00	320.75	0.62	0.08	2.57
15	Casaria sp.	25.00	25.00	0.37	1.22	1.00	795.45	1.53	0.04	3.11
16	Cedrela toona	175.00	50.00	2.56	2.44	3.50	2536.53	4.87	0.07	9.87
17	Celtis philippensia	25.00	25.00	0.37	1.22	1.00	733.09	1.41	0.04	2.99
18	Cinnamomum keralensis	75.00	25.00	1.10	1.22	3.00	910.72	1.75	0.12	4.07
19	Cinnamomum malabatrum	50.00	50.00	0.73	2.44	1.00	1471.27	2.82	0.02	5.99
20	Cleidion javanicum	175.00	25.00	2.56	1.22	7.00	142.23	0.27	0.28	4.06
21	Cullenia exarillata	400.00	75.00	5.86	3.66	5.33	1196.12	2.30	0.07	11.81
22	Dimocarpus longan	75.00	25.00	1.10	1.22	3.00	220.64	0.42	0.12	2.74
23	Dimorphocalyx lawianus	25.00	25.00	0.37	1.22	1.00	258.44	0.50	0.04	2.08
24	Diospyros candolleana	50.00	25.00	0.73	1.22	2.00	980.08	1.88	0.08	3.83
25	Diospyros paniculata	25.00	25.00	0.37	1.22	1.00	1386.00	2.66	0.04	4.25
26	Donella roxburghii	175.00	25.00	2.56	1.22	7.00	618.00	1.19	0.28	4.97
27	Drypetes elata	175.00	25.00	2.56	1.22	7.00	212.73	0.41	0.28	4.19
28	Elaeocarpus serratus	75.00	25.00	1.10	1.22	3.00	1944.10	3.73	0.12	6.05
29	Elaeocarpus tuberculatus	25.00	25.00	0.37	1.22	1.00	1145.45	2.20	0.04	3.78
30	Eugenia sp.	25.00	25.00	0.37	1.22	1.00	147.08	0.28	0.04	1.87
31	Ficus nervosa	25.00	25.00	0.37	1.22	1.00	137.00	0.26	0.04	1.85
32	Garcinia morella	125.00	50.00	1.83	2.44	2.50	275.02	0.53	0.05	4.80
33	Gomphandra coriacea	950.00	100.00	13.92	4.88	9.50	291.16	0.56	0.10	19.36
34	Herteria papilio	25.00	25.00	0.37	1.22	1.00	733.09	1.41	0.04	2.99
35	Holigarna arnottiana	75.00	25.00	1.10	1.22	3.00	1015.72	1.95	0.12	4.27
36	Hydnocarpus pentandra	50.00	50.00	0.73	2.44	1.00	272.22	0.52	0.02	3.69
37	Isonandra lanceolata	25.00	25.00	0.37	1.22	1.00	97.44	0.19	0.04	1.77
38	Ixora brachiata	25.00	25.00	0.37	1.22	1.00	147.08	0.28	0.04	1.87
39	Knema attenuata	375.00	75.00	5.49	3.66	5.00	905.05	1.74	0.07	10.89
40	Litsea coriacea	25.00	25.00	0.37	1.22	1.00	198.86	0.38	0.04	1.97
41	Litsea floribunda	50.00	25.00	0.73	1.22	2.00	94.68	0.18	0.08	2.13
42	Litsea ligustrina	25.00	25.00	0.37	1.22	1.00	534.86	1.03	0.04	2.61
43	Litsea oleoides	100.00	50.00	1.47	2.44	2.00	658.72	1.26	0.04	5.17
44	Litsea stockssii	25.00	25.00	0.37	1.22	1.00	120.99	0.23	0.04	1.82
45	Lophopetalum wightianum	25.00	25.00	0.37	1.22	1.00	378.72	0.73	0.04	2.31
46	Mastixia arborea	25.00	25.00	0.37	1.22	1.00	534.86	1.03	0.04	2.61
47	Melia dubia	25.00	25.00	0.37	1.22	1.00	496.44	0.95	0.04	2.54
48	Memecylon deccanense	100.00	25.00	1.47	1.22	4.00	423.90	0.81	0.16	3.50
49	Mesua ferrea	200.00	25.00	2.93	1.22	8.00	4085.37	7.84	0.32	11.99
50	Myristica dactyloides	100.00	25.00	1.47	1.22	4.00	1247.87	2.39	0.16	5.08

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
51	Myristica malabarica	75.00	50.00	1.10	2.44	1.50	1113.86	2.14	0.03	5.68
52	Neolitsia sp.	50.00	25.00	0.73	1.22	2.00	124.11	0.24	0.08	2.19
53	Nothopegia racemosa	25.00	25.00	0.37	1.22	1.00	1015.72	1.95	0.04	3.53
54	Palaquium ellipticum	300.00	25.00	4.40	1.22	12.00	1198.56	2.30	0.48	7.92
55	Persea macrantha	75.00	50.00	1.10	2.44	1.50	2087.59	4.01	0.03	7.54
56	Phoebe lanceolata	75.00	25.00	1.10	1.22	3.00	806.10	1.55	0.12	3.87
57	Schleichera oleosa	300.00	50.00	4.40	2.44	6.00	846.63	1.62	0.12	8.46
58	Syzygium gardneri	200.00	25.00	2.93	1.22	8.00	684.29	1.31	0.32	5.46
59	Syzygium laetum	225.00	50.00	3.30	2.44	4.50	443.47	0.85	0.09	6.59
60	Turpinia malabarica	75.00	25.00	1.10	1.22	3.00	588.32	1.13	0.12	3.45
61	Vateria indica	175.00	25.00	2.56	1.22	7.00	1518.00	2.91	0.28	6.70
62	Vernonia monosis	100.00	25.00	1.47	1.22	4.00	161.08	0.31	0.16	2.99
63	Xanthophyllum arnottianum	50.00	25.00	0.73	1.22	2.00	198.86	0.38	0.08	2.33

MI=32.54

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance**,** BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index,

Status of Saplings

In subtropical hill forests of Goodrickal reserves 28 species are recorded in sapling stage (Table. 21), of which the dominant species with respect to IVI status (value in parenthesis) are *Algaia simplicifolia* (23.60), *Chrysophyllum roxburghiana* (19.53), *Hydnocarpus pentandra* (15.79), *Garcinia gummigutta* (15.60), *Macaranga peltata* (15.0), *Mesua thwaiterii* (15.07), *Canthium umbellatum* (13.76), and *Vatteria indica* (11.01). The sapling density status of *Chryophyllum roxburghiana*, *Aglaia simplicifolia* and *Vateria indica* are more when compared to others (Table.21).

Table 21. Vegetation status of saplings of Sub-Tropical Hill forests of Goodrical RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne companulata	25.00	25.00	1.89	3.33	1.00	9.63	1.52	0.04	6.74
2	Aglaia simplicifolia	150.00	75.00	11.32	10.00	2.00	12.50	1.97	0.03	23.30
3	Alseodaphne semicarpifolia	75.00	25.00	5.66	3.33	3.00	12.23	1.93	0.12	10.93
4	Aporusa lindleyana	25.00	25.00	1.89	3.33	1.00	11.45	1.81	0.04	7.03
5	Artocarpus hirsutus	25.00	25.00	1.89	3.33	1.00	31.82	5.03	0.04	10.25
6	Canthium rheedii	25.00	25.00	1.89	3.33	1.00	11.45	1.81	0.04	7.03
7	Canthium umbellatum	50.00	25.00	3.77	3.33	2.00	42.08	6.65	0.08	13.76
8	Casseria esculenta	25.00	25.00	1.89	3.33	1.00	8.44	1.33	0.04	6.55
9	Chrysophyllum roxburghiana	175.00	25.00	13.21	3.33	7.00	18.94	2.99	0.28	19.53
10	Cinnamomum keralensis	75.00	25.00	5.66	3.33	3.00	12.76	2.02	0.12	11.01

11	Cinnamomum malabatrum	25.00	25.00	1.89	3.33	1.00	13.44	2.12	0.04	7.34
12	Dendrocnide sinuate	25.00	25.00	1.89	3.33	1.00	17.90	2.83	0.04	8.05
13	Donella roxburghii	50.00	25.00	3.77	3.33	2.00	24.36	3.85	0.08	10.96
14	Flemingia sp.	50.00	25.00	3.77	3.33	2.00	9.63	1.52	0.08	8.63
15	Garcinea gummi-gutta	50.00	25.00	3.77	3.33	2.00	53.77	8.50	0.08	15.60
16	Hydnocarpus pentandra	25.00	25.00	1.89	3.33	1.00	66.90	10.57	0.04	15.79
17	Ixora sp	50.00	25.00	3.77	3.33	2.00	22.99	3.63	0.08	10.74
18	Knema attenuata	25.00	25.00	1.89	3.33	1.00	11.45	1.81	0.04	7.03
19	Macaranga peltata	25.00	25.00	1.89	3.33	1.00	62.36	9.85	0.04	15.07
20	Mastixia arborea	50.00	25.00	3.77	3.33	2.00	24.36	3.85	0.08	10.96
21	Memecylon deccanense	25.00	25.00	1.89	3.33	1.00	20.36	3.22	0.04	8.44
22	Mesua thwaitesii	25.00	25.00	1.89	3.33	1.00	62.36	9.85	0.04	15.07
23	Microtropis stocksii	25.00	25.00	1.89	3.33	1.00	11.45	1.81	0.04	7.03
24	Palaquium ellipticum	50.00	25.00	3.77	3.33	2.00	9.63	1.52	0.08	8.63
25	Pavetta zeylanica	25.00	25.00	1.89	3.33	1.00	11.45	1.81	0.04	7.03
26	Syzygium arnottianum	25.00	25.00	1.89	3.33	1.00	15.59	2.46	0.04	7.68
27	Syzygium gardneri	25.00	25.00	1.89	3.33	1.00	13.44	2.12	0.04	7.34
28	Vateria indica	100.00	25.00	7.55	3.33	4.00	10.16	1.60	0.16	12.49

MI=26.79

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F=Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Regeneration Status of Seedlings

Seedlings of different stages (Unestablished, Established and Advanced growth) were observed for 25 species from subtropical hill forests in Goodrickal reserves. (Table.22). The percentage wise distribution status of Unestablished, Establilshed and Advanced growth seedlings are 43, 37 and 20 respectively (Table.22). Among the unestablished seedlings 55% was contributed by two species *viz. Syzygium gardneri* (30%) and *Mesua ferrea* (25%)

Table 22. Regeneration status of seedlings of Sub Tropical Hill forests of Goodrical RF

Sl. No.	Species	U	E	A	TS
1	Actinodaphne malabarica	1	1	0	2
2	Alseodaphne semicarpifolia	0	0	1	1
3	Ardisia pauciflora	0	0	2	2
4	Chionanthus mala elengi	0	1	0	1
5	Cinnamomum keralensis	0	1	0	1
6	Dendrocnide sinuata	7	2	0	9
7	Dichapetalum jealanioides	3	0	0	3

8	Diospyros bourdillonii	0	1	0	1
9	Donella roxburghii	0	0	1	1
10	Elaeocarpus tuberculatus	0	1	0	1
11	Guania microcarpa	0	0	1	1
12	Ixora sp.	0	3	0	3
13	Litsea insignis	1	0	0	1
14	Litsea ligustrina	0	0	3	3
15	Mastixia arborea	1	1	1	3
16	Melia dubia	3	1	3	7
17	Memecylon deccanense	0	0	2	2
18	Mesua ferrea	11	5	5	21
19	Microtropis stocksii	1	3	0	4
20	Neolitsea scorbiculata	0	10	0	10
21	Neolitsea sp	1	3	0	4
22	Pheanthus malabaricus	1	0	0	1
23	Syzygium gardneri	13	4	0	17
24	Syzygium munronii	0	0	1	1
25	Turpinia malabarica	1	1	1	3
Grand Total		**44**	**38**	**21**	**103**

U= Unestablished, E= Established, A= Advanced growth, TS= Total seedlings

5. Vegetation status of Goodrickal reserves (Clear felled area)

Status of Tree Vegetation

The clear felled area was almost completely dominated by species of *Macaranga peltata* (IVI-221) and *Mesa indica* (IVI-79) – Table.23.

Table 23. Vegetation status of trees of Sub-Tropical Hill forests of Goodrical RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	25.00	25.00	0.37	1.22	1.00	1695.59	3.25	0.04	4.84
2	Aglaia perviridis	50.00	50.00	0.73	2.44	1.00	658.72	1.26	0.02	4.44
3	Agrostistachys borneensis	50.00	25.00	0.73	1.22	2.00	384.22	0.74	0.08	2.69
4	Antiaris toxicaria	75.00	25.00	1.10	1.22	3.00	1703.34	3.27	0.12	5.59
5	Antidesma menasu	25.00	25.00	0.37	1.22	1.00	103.09	0.20	0.04	1.78
6	Apodytes dimidiata	325.00	25.00	4.76	1.22	13.00	388.92	0.75	0.52	6.73
7	Aporusa lindleyana	50.00	50.00	0.73	2.44	1.00	267.59	0.51	0.02	3.69
8	Artocarpus heterophyllus	25.00	25.00	0.37	1.22	1.00	2464.00	4.73	0.04	6.31
9	Beilsehmiedia bourdillonii	50.00	25.00	0.73	1.22	2.00	418.11	0.80	0.08	2.75

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
10	Bhesa indica	325.00	25.00	4.76	1.22	13.00	655.93	1.26	0.52	7.24
11	Canarium strictum	25.00	25.00	0.37	1.22	1.00	4620.08	8.87	0.04	10.45
12	Canthium dicoccum	25.00	25.00	0.37	1.22	1.00	190.99	0.37	0.04	1.95
13	Canthium rheedii	50.00	50.00	0.73	2.44	1.00	105.97	0.20	0.02	3.37
14	Canthium umbellatum	50.00	25.00	0.73	1.22	2.00	320.75	0.62	0.08	2.57
15	Casaria sp.	25.00	25.00	0.37	1.22	1.00	795.45	1.53	0.04	3.11
16	Cedrela toona	175.00	50.00	2.56	2.44	3.50	2536.53	4.87	0.07	9.87
17	Celtis philippensia	25.00	25.00	0.37	1.22	1.00	733.09	1.41	0.04	2.99
18	Cinnamomum keralensis	75.00	25.00	1.10	1.22	3.00	910.72	1.75	0.12	4.07
19	Cinnamomum malabatrum	50.00	50.00	0.73	2.44	1.00	1471.27	2.82	0.02	5.99
20	Cleidion javanicum	175.00	25.00	2.56	1.22	7.00	142.23	0.27	0.28	4.06
21	Cullenia exarillata	400.00	75.00	5.86	3.66	5.33	1196.12	2.30	0.07	11.81
22	Dimocarpus longan	75.00	25.00	1.10	1.22	3.00	220.64	0.42	0.12	2.74
23	Dimorphocalyx lawianus	25.00	25.00	0.37	1.22	1.00	258.44	0.50	0.04	2.08
24	Diospyros candolleana	50.00	25.00	0.73	1.22	2.00	980.08	1.88	0.08	3.83
25	Diospyros paniculata	25.00	25.00	0.37	1.22	1.00	1386.00	2.66	0.04	4.25
26	Donella roxburghii	175.00	25.00	2.56	1.22	7.00	618.00	1.19	0.28	4.97
27	Drypetes elata	175.00	25.00	2.56	1.22	7.00	212.73	0.41	0.28	4.19
28	Elaeocarpus serratus	75.00	25.00	1.10	1.22	3.00	1944.10	3.73	0.12	6.05
29	Elaeocarpus tuberculatus	25.00	25.00	0.37	1.22	1.00	1145.45	2.20	0.04	3.78
30	Eugenia sp.	25.00	25.00	0.37	1.22	1.00	147.08	0.28	0.04	1.87
31	Ficus nervosa	25.00	25.00	0.37	1.22	1.00	137.00	0.26	0.04	1.85
32	Garcinia morella	125.00	50.00	1.83	2.44	2.50	275.02	0.53	0.05	4.80
33	Gomphandra coriacea	950.00	100.00	13.92	4.88	9.50	291.16	0.56	0.10	19.36
34	Herteria papilio	25.00	25.00	0.37	1.22	1.00	733.09	1.41	0.04	2.99
35	Holigarna arnottiana	75.00	25.00	1.10	1.22	3.00	1015.72	1.95	0.12	4.27
36	Hydnocarpus pentandra	50.00	50.00	0.73	2.44	1.00	272.22	0.52	0.02	3.69
37	Isonandra lanceolata	25.00	25.00	0.37	1.22	1.00	97.44	0.19	0.04	1.77
38	Ixora brachiata	25.00	25.00	0.37	1.22	1.00	147.08	0.28	0.04	1.87
39	Knema attenuata	375.00	75.00	5.49	3.66	5.00	905.05	1.74	0.07	10.89
40	Litsea coriacea	25.00	25.00	0.37	1.22	1.00	198.86	0.38	0.04	1.97
41	Litsea floribunda	50.00	25.00	0.73	1.22	2.00	94.68	0.18	0.08	2.13
42	Litsea ligustrina	25.00	25.00	0.37	1.22	1.00	534.86	1.03	0.04	2.61
43	Litsea oleoides	100.00	50.00	1.47	2.44	2.00	658.72	1.26	0.04	5.17
44	Litsea stockssii	25.00	25.00	0.37	1.22	1.00	120.99	0.23	0.04	1.82
45	Lophopetalum wightianum	25.00	25.00	0.37	1.22	1.00	378.72	0.73	0.04	2.31

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
46	Mastixia arborea	25.00	25.00	0.37	1.22	1.00	534.86	1.03	0.04	2.61
47	Melia dubia	25.00	25.00	0.37	1.22	1.00	496.44	0.95	0.04	2.54
48	Memecylon deccanense	100.00	25.00	1.47	1.22	4.00	423.90	0.81	0.16	3.50
49	Mesua ferrea	200.00	25.00	2.93	1.22	8.00	4085.37	7.84	0.32	11.99
50	Myristica dactyloides	100.00	25.00	1.47	1.22	4.00	1247.87	2.39	0.16	5.08
51	Myristica malabarica	75.00	50.00	1.10	2.44	1.50	1113.86	2.14	0.03	5.68
52	Neolitsia sp.	50.00	25.00	0.73	1.22	2.00	124.11	0.24	0.08	2.19
53	Nothopegia racemosa	25.00	25.00	0.37	1.22	1.00	1015.72	1.95	0.04	3.53
54	Palaquium ellipticum	300.00	25.00	4.40	1.22	12.00	1198.56	2.30	0.48	7.92
55	Persea macrantha	75.00	50.00	1.10	2.44	1.50	2087.59	4.01	0.03	7.54
56	Phoebe lanceolata	75.00	25.00	1.10	1.22	3.00	806.10	1.55	0.12	3.87
57	Schleichera oleosa	300.00	50.00	4.40	2.44	6.00	846.63	1.62	0.12	8.46
58	Syzygium gardneri	200.00	25.00	2.93	1.22	8.00	684.29	1.31	0.32	5.46
59	Syzygium laetum	225.00	50.00	3.30	2.44	4.50	443.47	0.85	0.09	6.59
60	Turpinia malabarica	75.00	25.00	1.10	1.22	3.00	588.32	1.13	0.12	3.45
61	Vateria indica	175.00	25.00	2.56	1.22	7.00	1518.00	2.91	0.28	6.70
62	Vernonia monosis	100.00	25.00	1.47	1.22	4.00	161.08	0.31	0.16	2.99
63	Xanthophyllum arnottianum	50.00	25.00	0.73	1.22	2.00	198.86	0.38	0.08	2.33

MI=32.54

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index.

Only five species were recorded in seedling form, from the clear felled area of Goodrickal reserves, *viz. Actinodaphne malabarica, Clerodendron viscosum, Humboltia vahli, Mesa indica* and *Schleichera oleosa*; of which 21% is of unestablished seedling growth (Table.24).

Table 24. Regeneration status of seedlings of Goodrical RF
(Clear felled area)

Sl. No.	Species	U	E	A	TS
1	Actinodaphne malabarica	2	0	0	2
2	Clerodendrum viscosum	0	1	1	2
3	Humboltia vahlii	1	0	0	1
4	Mesa indica	0	5	2	7
5	Schleichera oleosa	0	0	2	2
Grand Total		**3**	**6**	**5**	**14**

U= Unestablished, E= Established, A= Advanced growth, TS= Total seedlings

Regeneration Status of Saplings

Very few species were recorded in sapling stage from clear felled area (Table. 25). The area was dominated by *Mesa indica* with maximum number of individuals (22) and minimum of 1, in the case of *Actinodaphne malabarica.*

Table 25. Regeneration status of saplings of Goodrical RF
(Clear felled area)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	100.00	100.00	3.70	33.33	1.00	11.45	25.91	0.01	62.95
2	Clerodendrum viscosum	400.00	100.00	14.81	33.33	4.00	11.45	25.91	0.04	74.06
3	Mesa indica	2200.00	100.00	81.48	33.33	22.00	21.30	48.18	0.22	162.99
Grand Total		2700.00	300.00	100.00	100.00	27.00	44.21	100.00	0.27	300.00

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

6. Vegetation status of Non-Selection felled forests of Gavi in Goodrical reserves

Among the 66 species recorded from the area only 4 species *viz. Agrostistachys borneensis, Cullenia exarillata* and *Drypetus elata* and *Palaquium ellipticum* are dominant with respect to IVI status (Table. 26). The species showing high frequency distribution are *Agrostistcchys borneensis, Cedrela toona, Cullinia exarillata, Drypetes elata, Knema attenuata, Palaquium ellipticum* and *Schleichera oleosa* (more than 60% frequency) – Table. 21. High species density was observed in the case of *Agrostistachys*

borneensis Schleichera oleosa, Palaquium ellipticum, Bhesa indica, Drypetus elata and *Garcenia morella* (Table. 26)

Table 26. Vegetation status of West Coast Tropical Evergreen forests of Gavi area in Goodrical RF. (Non-Selection Felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	120.00	30.00	2.12	1.68	4.00	243.55	0.39	0.13	4.18
2	Actinodaphne companulata	20.00	20.00	0.35	1.12	1.00	258.44	0.41	0.05	1.88
3	Actinodaphne malabarica	30.00	20.00	0.53	1.12	1.50	312.38	0.50	0.08	2.15
4	Agrostistachys borneensis	1390.00	80.00	24.51	4.47	17.38	253.70	0.41	0.22	29.39
5	Alseodaphne semicarpifolia	70.00	40.00	1.23	2.23	1.75	602.08	0.96	0.04	4.43
6	Anacolosa densiflora	20.00	10.00	0.35	0.56	2.00	588.32	0.94	0.20	1.85
7	Antiaris toxicaria	80.00	50.00	1.41	2.79	1.60	2785.34	4.45	0.03	8.65
8	Antidesma menasu	70.00	40.00	1.23	2.23	1.75	130.94	0.21	0.04	3.68
9	Aphanamixis polystachya	20.00	10.00	0.35	0.56	2.00	121.92	0.19	0.20	1.11
10	Aporusa lindleyana	10.00	10.00	0.18	0.56	1.00	276.90	0.44	0.10	1.18
11	Artocarpus heterophyllus	20.00	20.00	0.35	1.12	1.00	5031.43	8.04	0.05	9.51
12	Bhesa indica	160.00	30.00	2.82	1.68	5.33	551.29	0.88	0.18	5.38
13	Canarium strictum	10.00	10.00	0.18	0.56	1.00	4971.59	7.94	0.10	8.68
14	Canthium rheedii	10.00	10.00	0.18	0.56	1.00	215.09	0.34	0.10	1.08
15	Cedrela toona	180.00	90.00	3.17	5.03	2.00	329.22	0.53	0.02	8.73
16	Cinnamomum keralensis	10.00	10.00	0.18	0.56	1.00	658.72	1.05	0.10	1.79
17	Cinnamomum malabatrum	20.00	20.00	0.35	1.12	1.00	78.93	0.13	0.05	1.60
18	Clausena indica	10.00	10.00	0.18	0.56	1.00	97.44	0.16	0.10	0.89
19	Cryptocarya anamalayana	10.00	10.00	0.18	0.56	1.00	161.08	0.26	0.10	0.99
20	Cullenia exarillata	450.00	90.00	7.94	5.03	5.00	2577.91	4.12	0.06	17.08
21	Dimocarpus longan	110.00	50.00	1.94	2.79	2.20	614.73	0.98	0.04	5.72
22	Dimorphocalyx lawianus	20.00	20.00	0.35	1.12	1.00	373.25	0.60	0.05	2.07
23	Diospyros bourdillonii	20.00	10.00	0.35	0.56	2.00	100.25	0.16	0.20	1.07
24	Diospyros candolleana	60.00	40.00	1.06	2.23	1.50	685.52	1.10	0.04	4.39
25	Drypetes elata	330.00	90.00	5.82	5.03	3.67	967.81	1.55	0.04	12.39
26	Dysoxylum malabaricum	70.00	40.00	1.23	2.23	1.75	2560.94	4.09	0.04	7.56
27	Elaeocarpus serratus	110.00	20.00	1.94	1.12	5.50	186.06	0.30	0.28	3.35
28	Ficus nervosa	10.00	10.00	0.18	0.56	1.00	5091.63	8.13	0.10	8.87
29	Filicium decipiens	10.00	10.00	0.18	0.56	1.00	2548.72	4.07	0.10	4.81
30	Garcinea gummi-gutta	40.00	10.00	0.71	0.56	4.00	127.27	0.20	0.40	1.47
31	Garcinia morella	130.00	50.00	2.29	2.79	2.60	257.05	0.41	0.05	5.50
32	Gomphandra coriacea	100.00	40.00	1.76	2.23	2.50	237.57	0.38	0.06	4.38
33	Gordonia obtusa	10.00	10.00	0.18	0.56	1.00	3676.99	5.87	0.10	6.61
34	Guania microcarpa	10.00	10.00	0.18	0.56	1.00	76.44	0.12	0.10	0.86
35	Herteria papilio	20.00	20.00	0.35	1.12	1.00	1396.52	2.23	0.05	3.70
36	Holigarna beddomei	20.00	10.00	0.35	0.56	2.00	2339.61	3.74	0.20	4.65

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
37	Hydnocarpus pentandra	10.00	10.00	0.18	0.56	1.00	423.90	0.68	0.10	1.41
38	Kingiodendron pinnatum	20.00	10.00	0.35	0.56	2.00	763.95	1.22	0.20	2.13
39	Knema attenuata	120.00	70.00	2.12	3.91	1.71	857.61	1.37	0.02	7.40
40	Litsea ligustrina	50.00	30.00	0.88	1.68	1.67	1090.76	1.74	0.06	4.30
41	Litsea oleoides	30.00	30.00	0.53	1.68	1.00	683.07	1.09	0.03	3.30
42	Macaranga peltata	50.00	30.00	0.88	1.68	1.67	650.06	1.04	0.06	3.60
43	Mallotus tetracoccus	10.00	10.00	0.18	0.56	1.00	1789.77	2.86	0.10	3.59
44	Mastixia arborea	30.00	10.00	0.53	0.56	3.00	140.32	0.22	0.30	1.31
45	Meleosma simplicifolia	10.00	10.00	0.18	0.56	1.00	154.00	0.25	0.10	0.98
46	Meliusma pinnata	10.00	10.00	0.18	0.56	1.00	2841.44	4.54	0.10	5.27
47	Memicylon decanensii	10.00	10.00	0.18	0.56	1.00	183.27	0.29	0.10	1.03
48	Memicylon subramanianii	10.00	10.00	0.18	0.56	1.00	77.43	0.12	0.10	0.86
49	Memicylon umbellatum	40.00	20.00	0.71	1.12	2.00	196.88	0.31	0.10	2.14
50	Mesua ferrea	100.00	50.00	1.76	2.79	2.00	1254.86	2.00	0.04	6.56
51	Mesua thwaitesii	60.00	50.00	1.06	2.79	1.20	547.99	0.88	0.02	4.73
52	Myristica dactyloides	10.00	10.00	0.18	0.56	1.00	127.27	0.20	0.10	0.94
53	Myristica malabarica	30.00	20.00	0.53	1.12	1.50	625.37	1.00	0.08	2.65
54	Neolitsea lamarkiana	30.00	20.00	0.53	1.12	1.50	1113.86	1.78	0.08	3.43
55	Ostodus zeylanica	10.00	10.00	0.18	0.56	1.00	346.50	0.55	0.10	1.29
56	Otonephilium stipulaceum	60.00	30.00	1.06	1.68	2.00	953.77	1.52	0.07	4.26
57	Palaquium ellipticum	740.00	100.00	13.05	5.59	7.40	949.07	1.52	0.07	20.15
58	Schleichera oleosa	240.00	60.00	4.23	3.35	4.00	291.36	0.47	0.07	8.05
59	Sysigium gardneri	60.00	30.00	1.06	1.68	2.00	1132.76	1.81	0.07	4.54
60	Sysigium laetum	40.00	30.00	0.71	1.68	1.33	173.85	0.28	0.04	2.66
61	Sysigium munronii	10.00	10.00	0.18	0.56	1.00	81.45	0.13	0.10	0.87
62	Terpaenia malabarica	10.00	10.00	0.18	0.56	1.00	1145.45	1.83	0.10	2.57
63	Trichilla conoraria	20.00	10.00	0.35	0.56	2.00	103.09	0.16	0.20	1.08
64	Vateria indica	60.00	30.00	1.06	1.68	2.00	1061.16	1.70	0.07	4.43
65	Vernonia monosis	10.00	10.00	0.18	0.56	1.00	1344.32	2.15	0.10	2.88

MI=27.54

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Saplings

The phytosociological status of saplings of non-selection felled area of Gavi forests in Goodrical Reserves were worked out. Accordingly, 47 species were recorded (Table.27) with the dominance of following species (IVI in parenthesis) *viz.*

Agrostistachys indica (18.68), *Ardisia pauciflora* (12.02), *Palaquium ellipticum* (13.02) *Scheichera oleosa* (13.27) and *Syzygium elatum* (13.27).

Table 27. Vegetation status of saplings West Coast Tropical Evergreen forests of Gavi area in Goodrical RF (Non Selection Felled)

Sl. No.	Species	D	F	RD	RF		BA	RBA	AB/F	IVI
1	Achronichea pedunculata	11.11	11.11	0.58	1.10	1.00	28.72	2.91	0.09	4.59
2	Actinodaphne malabarica	44.44	33.33	2.31	3.30	1.33	21.72	2.20	0.04	7.81
3	Aglaia pervirdis	22.22	22.22	1.16	2.20	1.00	17.31	1.75	0.05	5.11
4	Aglaia simplicifolia	11.11	11.11	0.58	1.10	1.00	8.11	0.82	0.09	2.50
5	Agrostistachys borneensis	33.33	11.11	1.73	1.10	3.00	37.34	3.78	0.27	6.61
6	Agrostistachys indica	255.56	33.33	13.29	3.30	7.67	20.61	2.09	0.23	18.68
7	Alseodaphne semicarpifolia	44.44	22.22	2.31	2.20	2.00	18.56	1.88	0.09	6.39
8	Antidesma menasu	77.78	33.33	4.05	3.30	2.33	18.24	1.85	0.07	9.19
9	Antiraris toxicaria	11.11	11.11	0.58	1.10	1.00	17.90	1.81	0.09	3.49
10	Ardisia pauciflora	111.11	44.44	5.78	4.40	2.50	18.26	1.85	0.06	12.02
11	Canthium rheedi	11.11	11.11	0.58	1.10	1.00	11.45	1.16	0.09	2.84
12	Canthium umbellatum	11.11	11.11	0.58	1.10	1.00	9.63	0.97	0.09	2.65
13	Cedrella toona	33.33	33.33	1.73	3.30	1.00	13.44	1.36	0.03	6.39
14	Cinnamomum malabatrum	33.33	22.22	1.73	2.20	1.50	14.86	1.50	0.07	5.44
15	Cledion javanicum	22.22	11.11	1.16	1.10	2.00	14.50	1.47	0.18	3.72
16	Cryptocarya anamalayana	33.33	33.33	1.73	3.30	1.00	16.34	1.66	0.03	6.69
17	Cullenia exarillata	88.89	22.22	4.62	2.20	4.00	21.00	2.13	0.18	8.95
18	Dichapetalum jealanioides	77.78	33.33	4.05	3.30	2.33	14.96	1.52	0.07	8.86
19	Dimocarpus longan	11.11	11.11	0.58	1.10	1.00	19.11	1.94	0.09	3.61
20	Diospyros bourdilloni	11.11	11.11	0.58	1.10	1.00	28.72	2.91	0.09	4.59
21	Diospyros paniculata	44.44	22.22	2.31	2.20	2.00	22.99	2.33	0.09	6.84
22	Drypetes elata	44.44	33.33	2.31	3.30	1.33	23.67	2.40	0.04	8.01
23	Garcinea morella	33.33	33.33	1.73	3.30	1.00	45.82	4.64	0.03	9.67
24	Gomphandra corriacea	66.67	33.33	3.47	3.30	2.00	22.10	2.24	0.06	9.00
25	Gomphandra polimorpha	22.22	11.11	1.16	1.10	2.00	30.25	3.06	0.18	5.32
26	Herteria papilio	11.11	11.11	0.58	1.10	1.00	11.45	1.16	0.09	2.84
27	Holigarna arnottina	11.11	11.11	0.58	1.10	1.00	45.82	4.64	0.09	6.32
28	Knema attenuata	22.22	22.22	1.16	2.20	1.00	16.72	1.69	0.05	5.05
29	Litsea coreacea	11.11	11.11	0.58	1.10	1.00	35.08	3.55	0.09	5.23
30	Litsea floribunda	77.78	33.33	4.05	3.30	2.33	19.29	1.95	0.07	9.30
31	Litsea oleoides	11.11	11.11	0.58	1.10	1.00	7.95	0.81	0.09	2.48
32	Memicylon edule	33.33	11.11	1.73	1.10	3.00	15.59	1.58	0.27	4.41
33	Memicylone deccanens	11.11	11.11	0.58	1.10	1.00	17.90	1.81	0.09	3.49
34	Memicylone malabaricum	22.22	11.11	1.16	1.10	2.00	10.52	1.07	0.18	3.32
35	Memicylone umbulatum	11.11	11.11	0.58	1.10	1.00	20.36	2.06	0.09	3.74
36	Mesua ferrea	44.44	22.22	2.31	2.20	2.00	20.36	2.06	0.09	6.57

37	Olea dioica	22.22	22.22	1.16	2.20	1.00	15.59	1.58	0.05	4.93
38	Otonephelium stipulaceum	22.22	11.11	1.16	1.10	2.00	8.85	0.90	0.18	3.15
39	Palaquium ellipticum	111.11	55.56	5.78	5.49	2.00	17.19	1.74	0.04	13.02
40	Persea macrantha	11.11	11.11	0.58	1.10	1.00	38.50	3.90	0.09	5.58
41	Pheanthus malabaricus	22.22	22.22	1.16	2.20	1.00	13.44	1.36	0.05	4.72
42	Phoeb lanceolata	11.11	11.11	0.58	1.10	1.00	22.99	2.33	0.09	4.01
43	Schleichera oleosa	133.33	44.44	6.94	4.40	3.00	19.15	1.94	0.07	13.27
44	Strombosea zeylanica	11.11	11.11	0.58	1.10	1.00	42.08	4.26	0.09	5.94
45	Sysygium laetum	77.78	44.44	4.05	4.40	1.75	19.29	1.95	0.04	10.40
46	Syzygium mundagum	55.56	33.33	2.89	3.30	1.67	18.62	1.89	0.05	8.07
47	Syzygium munronii	11.11	11.11	0.58	1.10	1.00	35.08	3.55	0.09	5.23

MI=21.53

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Regeneration Status of Seedlings

Seventy-four species were recorded in regeneration stage (Table 28) with a total of 889 individuals in different stages of regeneration. The percentage wise distribution status of Unestablished, Established and Advanced growth stages of seedlings are 60, 18.6 and 21.4 respectively. With respect to total number of seedlings recorded 56% was contributed by 3 species alone *viz. Palaquium ellipticum* (33%), *Knema attenuata* (15.3%) and *Cullenia exarillata* (57%). Eventhough maximum number of seedlings (296) was recorded in the case of *Palaquium ellipticum* more than 75% were in unestablished category, 16% established and 9% in advanced growth stage. Similarly the second large species was *Knema attenuata* with 89% unestablished, 10% established and 1% in advanced growth stage.

Table 28. Regeneration status of West Coast Tropical Evergreen forests of Gavi area (Non Selection Felled)

Sl. No.	Species	U	E	A	TS
1	Achronichea pedunculata	8	1	0	9
2	Actinodaphne companulata	7	0	1	8
3	Actinodaphne malabarica	2	1	4	7
4	Aglaia pervirdis	1	0	0	1
5	Aglaia simplicifolia	0	2	0	2
6	Agrostystachys borneensis	8	0	13	21
7	Agrostystachys indica	5	12	7	24

8	Alseodaphne semicarpifolia	0	1	1	2
9	Anacolosa densiflora	3	0	0	3
10	Antiaris toxicaria	0	0	1	1
11	Antidesma menasu	0	1	2	3
12	Aporusa lindleyana	0	0	1	1
13	Ardisia pauciflora	7	3	6	16
14	Artocarpus heterophyllus	0	4	0	4
15	Bhesa indica	0	0	0	0
16	Canthiun dicoccum	0	0	0	0
17	Canthiun rheedii	0	0	1	1
18	Careyota urens	9	0	2	11
19	Cedrela toona	0	2	5	7
20	Cinnamomum keralaense	1	1	1	3
21	Cinnamomum malabatrum	6	0	1	7
22	Clediom javanicam	0	0	2	2
23	Clerodendron viscosum	0	4	5	9
24	Croton malabaricus	0	3	0	3
25	Cryptocareya anamalayana	2	6	1	9
26	Cullenia exarillata	34	14	3	51
27	Dichopetalum jealanoides	3	6	16	25
28	Dimocarpus longan	15	2	3	20
29	Diospyros bourdillonii	6	0	2	8
30	Diospyros buxifolia	0	0	1	1
31	Diospyros paniculata	2	0	1	3
32	Dipterocarpus indicus	0	0	2	2
33	Drypetus elata	0	12	4	16
34	Dysoxylon malabaricum	0	3	0	3
35	Garcinia gummi-gutta	0	0	2	2
36	Garcinia morella	1	0	1	2
37	Glycosmis cymosa	0	0	1	1
38	Gomphandra polymorpha	0	0	3	3
39	Goniothalamus rhynchantherus	0	0	0	0
40	Gordonia obtusa	0	0	4	4
41	Guania microcarpa	6	0	3	9
42	Holigarna beddomei	0	0	1	1
43	Isonandra lanceolata	0	0	1	1
44	Knema attenuata	121	13	2	136
45	Leea indica	0	0	1	1
46	Litsea corriacea	0	0	0	0
47	Litsea deccanense	0	0	1	1

48	Litsea ligustrina	0	0	3	3
49	Litsea oleoides	0	0	0	0
50	Meiogyne pannosa	5	0	0	5
51	Memecylon umbellatum	1	1	0	2
52	Memecylon deccanense	0	3	1	4
53	Memecylon edule	0	0	1	1
54	Memecylon malabaricum	0	0	1	1
55	Mesa indica	0	0	0	0
56	Mesua ferrea	6	0	3	9
57	Mesua twaitesii	8	8	5	21
58	Neolitsea lamarckiana	0	0	1	1
59	Olea dioica	0	1	0	1
60	Ostodus zeylanica	0	0	2	2
61	Otonephilium stipulaceum	2	4	8	14
62	Palaquium ellipticum	223	47	26	296
63	Persea macrantha	2	1	1	4
64	Pheanthus malabarica	1	0	0	1
65	Schleichera oleosa	14	2	2	18
66	Symplocos cochinchinensis	0	0	1	1
67	Sysigium gardnerii	0	0	2	2
68	Syzygium laetum	8	0	0	8
69	Syzygium lanceolatum	0	0	1	1
70	Syzygium mundagum	4	3	7	14
71	Syzygium munronii	0	0	6	6
72	Turpinia malabarica	0	2	1	3
73	Vateria indica	13	2	12	27
74	Vernonia monosis	0	0	0	0
Grand Total		**534**	**165**	**190**	**889**

Two study sites of *Nageia wallichiana* habitat in Goodrical reserves *viz*. Kadaman kunnu and Sundarimukku in Urani area was specially studied. The vegetation status of Kadamankunnu (Study site 1) was given in Table. 29 and that of Sundarimukku (Study site 2) in Table. 30 Both the localities are dominated by *Palaquium ellipticum* (IVI 52.65, and 65.17 respectively). The species with more than 60% frequency in study site 1 (Kadamankunnu) are *Agrostistachys borneensis, Cullenia exari*llata, *Dimocarpus longan, Gomphandra coriacea, Holigarna arnottiana, Hydnocarpus pentandra, Meiogyne pannosa, Palaquium ellipticum* and *Schleichera oleosa*; whereas that of Study site 2 (Sundarimukku) are *Acronychia pedunculata, Agrostistachys borneensis, Cullenia*

exarillata, Dimocarpus longan, Diospyros paniculata, Drypetes elatum Gomphandra coriacea, Hydnocarpus pentandra Knema attenuata, Meiogyne pannosa, Memecylon subramanii, Mesua ferrea, Palaquium ellipticum and Nageia wallichana (Table. 30 and 25).The biodiversity indices of the sites were studied using Shannon's, Simpson's and Margaliffs indices (Table. 31)

Table 29. Vegetation status of Kadamankunnu area of Goodrical RF (Study site –1 of *Nageia wallichiana* habitat)

Sl. No.	Species	D	F	BA	RD	RF	RBA	AB	AB/F	IVI
1	Acronychia pedunculata	7.35	40	1251.9	1.36	2.67	0.21	2	0.05	4.24
2	Actinodaphne malabarica	9.18	20	1996.5	1.7	1.33	0.33	5	0.25	3.36
3	Agrostistachys borneensis	25.7	60	6405	4.76	4	1.05	4.67	0.078	9.81
4	Alseodaphne semecarpifolia	3.67	20	311.04	0.68	1.33	0.05	2	0.1	2.06
5	Ardisia sonchifolia	1.84	20	160	0.34	1.33	0.03	1	0.05	1.7
6	Bhesa indica	1.84	20	201.14	0.34	1.33	0.03	1	0.05	1.7
7	Calophyllum polyanthum	1.84	20	1243.6	0.34	1.33	0.2	1	0.05	1.87
8	Canthium rheedi	5.51	40	936.2	1.02	2.67	0.15	1.5	0.0375	3.84
9	Cinnamomum keralaense	3.67	40	2424	0.68	2.67	0.4	1	0.025	3.75
10	Cryptocarya anamalayana	1.84	20	583.14	0.34	1.33	0.1	1	0.05	1.77
11	Cullenia exarillata	84.5	80	165543	15.7	5.33	27.2	11.5	0.144	48.17
12	Dimocarpus longan	23.9	60	12551	4.42	4	2.06	4.33	0.072	10.48
13	Diospyros paniculata	5.51	40	1990.1	1.02	2.67	0.33	1.5	0.037	4.02
14	Drypetes elata	27.6	40	8259.8	5.1	2.67	1.36	7.5	0.187	9.13
15	Elaeocarpus serratus	1.84	20	9182.7	0.34	1.33	1.51	1	0.05	3.18
16	Elaeocarpus tuberculatus	1.84	20	1810.3	0.34	1.33	0.3	1	0.05	1.97
17	Euodia lunu-ankenda	1.84	20	132.23	0.34	1.33	0.02	1	0.05	1.69
18	Ficus hispida	9.18	20	2622.9	1.7	1.33	0.43	5	0.25	3.46
19	Garcinia morella	3.67	40	1873.7	0.68	2.67	0.31	1	0.025	3.66
20	Gomphandra coriacea	45.9	80	11129	8.5	5.33	1.83	6.25	0.078	15.66
21	Holigarna arnottiana	5.51	60	21463	1.02	4	3.52	1	0.016	8.54
22	Holigarna beddomei	1.84	20	564.78	0.34	1.33	0.09	1	0.05	1.76
23	Hydnocarpus pentandra	22	60	27644	4.08	4	4.54	4	0.066	12.62
24	Knema attenuata	9.18	40	4246.4	1.7	2.67	0.7	2.5	0.0625	5.07
25	Lophopetalum wightianum	1.84	20	3808.4	0.34	1.33	0.63	1	0.05	2.3
26	Macaranga peltata	47.8	20	9306.5	8.84	1.33	1.53	26	1.3	11.7
27	Meiogyne pannosa	42.2	60	5145.3	7.82	4	0.84	7.67	0.127	12.66
28	Memecylon deccanense	7.35	40	729.04	1.36	2.67	0.12	2	0.05	4.15

Sl. No.	Species	D	F	BA	RD	RF	RBA	AB	AB/F	IVI
29	Memecylon subramanii	3.67	20	340.86	0.68	1.33	0.06	2	0.1	2.07
30	Mesua ferrea	16.5	40	17804	3.06	2.67	2.92	4.5	0.113	8.65
31	Miliusa pinnata	1.84	20	150.45	0.34	1.33	0.02	1	0.05	1.69
32	Myristica malabarica	3.67	20	13899	0.68	1.33	2.28	2	0.1	4.29
33	Neolitsea lamarkiana	1.84	20	150.45	0.34	1.33	0.02	1	0.05	1.69
34	Nothopegia colebrookeana	3.67	20	2502.4	0.68	1.33	0.41	2	0.1	2.42
35	Palaquium ellipticum	55.1	80	226058	10.2	5.33	37.1	7.5	0.0938	52.65
36	Persea macrantha	9.18	40	2163.2	1.7	2.67	0.36	2.5	0.0625	4.73
37	Polyalthia fragrans	3.67	20	5777.8	0.68	1.33	0.95	2	0.1	2.96
38	Prunus ceylanica	3.67	20	763.12	0.68	1.33	0.13	2	0.1	2.14
39	Schleichera oleosa	18.4	60	7791	3.4	4	1.28	3.33	0.056	8.68
40	Spondias pinnata	1.84	20	1469.2	0.34	1.33	0.24	1	0.1	1.91
41	Sysigium cumini	1.84	20	6479.3	0.34	1.33	1.06	1	0.1	2.73
42	Sysigium laetum	1.84	20	284.44	0.34	1.33	0.05	1	0.1	1.72
43	Nageia wallichiana	7.35	40	19801	1.36	2.67	3.25	2	0.05	7.28
Total		**540**	**1500**	**608948**	**100**	**100**	**100**			**300**

Table 30. Vegetation status of Sundarimukku area in Goodrical RF
(Study site-2 of *Nageia wallichiana* habitat)

Sl. No.	Species	D	F	BA	RD	RF	RBA	AB	AB/F	IVI
1	Acronychia pedunculata	14.7	60	5460.3	2.36	3.41	0.88	2.67	0.037	6.65
2	Actinodaphne malabarica	3.67	20	691.28	0.59	1.14	0.11	2	0.1	1.84
3	Agrostistachys borneensis	40.4	80	8237.6	6.49	4.55	1.33	5.5	0.068	12.37
4	Alseodaphne semecarpifolia	7.35	40	943.4	1.18	2.27	0.15	2	0.05	3.6
5	Aporusa lindleyana	1.84	20	620.75	0.3	1.14	0.1	1	0.05	1.54
6	Ardisia sonchifolia	5.51	40	578.57	0.89	2.27	0.09	1.5	0.038	3.25
7	Bhesa indica	3.67	20	2169.3	0.59	1.14	0.35	2	0.1	2.08
8	Canarium strictum	1.84	20	10396	0.3	1.14	1.68	1	0.05	3.12
9	Canthium rheedi	3.67	40	627.81	0.59	2.27	0.1	1	0.025	2.96
10	Cinnamomum keralaense	3.67	40	2761.1	0.59	2.27	0.45	1	0.025	3.31
11	Clerodendrum viscosum	1.84	20	460.75	0.3	1.14	0.07	1	0.05	1.51
12	Cullenia exarillata	82.6	100	146910	13.3	5.68	23.8	9	0.09	42.75
13	Dendrocnide sinuata	1.84	20	150.45	0.3	1.14	0.02	1	0.05	1.46
14	Dichopetalum jealanoides	1.84	20	367.31	0.3	1.14	0.06	1	0.05	1.5
15	Dimocarpus longan	38.6	80	18348	6.2	4.55	2.97	5.25	0.066	13.72
16	Diospyros paniculata	14.7	60	7193.7	2.36	3.41	1.17	2.67	0.045	6.94
17	Drypetes confertiflora	1.84	20	620.75	0.3	1.14	0.1	1	0.05	1.54
18	Drypetes elata	22	60	4730.1	3.54	3.41	0.77	4	0.067	7.72

Sl. No.	Species	D	F	BA	RD	RF	RBA	AB	AB/F	IVI
19	Dysoxylum malabaricum	1.84	20	963.97	0.3	1.14	0.16	1	0.05	1.6
20	Ficus nervosa	1.84	20	397.28	0.3	1.14	0.06	1	0.05	1.5
21	Garcinia gummi-gutta	1.84	20	259.17	0.3	1.14	0.04	1	0.05	1.48
22	Gomphandra coriacea	66.1	100	16781	10.6	5.68	2.72	7.2	0.072	19.02
23	Holigarna arnottiana	3.67	40	5571.5	0.59	2.27	0.9	1	0.025	3.76
24	Hydnocarpus pentandra	22	60	5949.5	3.54	3.41	0.96	4	0.067	7.91
25	Knema attenuata	9.18	80	7420.1	1.47	4.55	1.2	1.25	0.016	7.22
26	Litsea floribunda	1.84	20	190.41	0.3	1.14	0.03	1	0.05	1.47
27	Litsea oleoides	1.84	20	201.14	0.3	1.14	0.03	1	0.05	1.47
28	Lophopetalum wightianum	3.67	20	6938.5	0.59	1.14	1.12	2	0.1	2.85
29	Macaranga peltata	11	20	5321.8	1.77	1.14	0.86	6	0.3	3.77
30	Meiogyne pannosa	79	80	15135	12.7	4.55	2.45	10.8	0.134	19.68
31	Memecylon deccanense	7.35	60	1047.6	1.18	3.41	0.17	1.33	0.022	4.76
32	Memecylon subramanii	7.35	40	742.55	1.18	2.27	0.12	2	0.05	3.57
33	Mesua ferrea	25.7	100	48664	4.13	5.68	7.88	2.8	0.059	17.69
34	Myristica malabarica	3.67	20	4401.3	0.59	1.14	0.71	2	0.1	2.44
35	Neolitsea lamarkiana	1.84	20	546.7	0.3	1.14	0.09	1	0.05	1.53
36	Palaquium ellipticum	90	100	278067	14.5	5.68	45	9.8	0.098	65.17
37	Schleichera oleosa	1.84	20	160	0.3	1.14	0.03	1	0.05	1.47
38	Symplocos rosea	7.35	40	975.72	1.18	2.27	0.16	2	0.05	3.61
39	Syzygium mundagam	1.84	20	150.45	0.3	1.14	0.02	1	0.05	1.46
40	Turpinia malabarica	3.67	20	867.58	0.59	1.14	0.14	2	0.1	1.87
41	Nageia wallichiana	16.5	60	5328.1	2.66	3.41	0.86	3	0.05	6.93
Total		**623**	**1760**	**617347**	**100**	**100**	**100**			**300**

D-Density, F-Frequency, BA-Basal area, RBA-Relative basal area, RD-Relative density, RF-Relative frequency, AB-Abundance, IVI-Importance Value Index

Table 31. Comparison of biodiversity indices among the study sites of *Nageia wallichiana* habitat

Index	Study site-1	Study site-2
Shannon's species diversity- (H')	1.333	1.262
Simpson's dominance (CD)	0.066	0.079
Margaleffs species richness (R1)	22.687	22.133

Regeneration status of Sundarimukku area was worked out in Table 32. In total 52 species were recorded in seeding stage. On critical examination it was observed that 43% of seedlings were unestablished, 20% established and 37% of advanced growth.

Similarly 56 species are recorded in seedling stage from study site Kaddamanmukku (Table. 33) With regard to general status of seedling 46% were Unestablished, 23% Established, and 31% of Advanced growth. In short both Established and Advanced growth seedlings together contribute more than 50% of the total numbers in both the sites.

Table 32. Regeneration status of seedlings of Sundharimukku area of Goodrical RF (*Nageia wallichian a* habitat)

Sl. No.	Species	U	E	A	TS
1	Achronichea pedunculata	0	0	6	6
2	Actinodaphne malabarica	6	0	36	42
3	Agleia perverdis	9	27	12	48
4	Agleia simplicifolia	0	0	0	0
5	Agrostistachys borneensis	6	0	15	21
6	Alseodaphne semicarpifolia	4	2	6	12
7	Annonaceae	0	0	9	9
8	Apoditis dimidienta	0	0	6	6
9	Aporusa lindleyana	2	1	0	3
10	Artocarpus integrifolia	0	3	0	3
11	Baccaurea courtallensis	0	0	0	0
12	Blepharistemma serratum	0	0	0	0
13	Careyota urens	18	6	6	30
14	Cinnamomum keralensis	6	12	9	27
15	Cinnamomum malabatram	0	0	3	3
16	Clerodendron infortunatum	0	0	3	3
17	Cryptocareya anamaliense	0	0	6	6
18	Cullenia exarillata	21	9	36	66
19	Dendrocnide sinuata	0	0	3	3
20	Dichopetalum jealanoides	1	2	18	21
21	Dimocarpus longan	9	15	15	39
22	Diospyros paniculata	0	0	3	3
23	Drypetus elata	6	3	12	21
24	Garcinea gummi-gutta	0	3	0	3
25	Garcinea morella	0	0	0	0
26	Gomphandra corriacea	12	21	6	39
27	Humboldtia vahliana	0	0	6	6
28	Isonandra lanceolata	0	0	36	36
29	Ixora brachiata	0	0	3	3
30	Knema attenuata	18	3	12	33

Sl. No.	Species	U	E	A	TS
31	Litsea correasea	6	3	6	15
32	Litsea floribunda	3	6	6	15
33	Mallotus tetracoccus	0	0	6	6
34	Memicylon decanensii	21	3	39	63
35	Memicylon malabaricum	3	6	3	12
36	Memicylon subramaniani	9	9	21	39
37	Meogyne pannosa	0	6	27	33
38	Mesua ferrea	12	18	12	42
39	Muraya paniculata	0	3	3	6
40	Myristica dactyloides	42	30	3	75
41	Neolitsea lamarkiana	3	0	0	3
42	Ochlandra travancorica	0	0	9	9
43	Palaqium ellipticum	309	42	30	381
44	Persea macrantha	0	0	6	6
45	Schleichera oleosa	0	0	3	3
46	Symplocos rosea	15	9	18	42
47	Sysigium laetum	0	0	3	3
48	Sysigium monronii	0	3	0	3
49	Sysigium mundagam	0	3	9	12
50	Terpaenia malabarica	0	0	3	3
51	Podocarpus wallichianum	75	45	24	144
52	Ardisia sonchifolia	9	0	27	36
53	Vepris bilocularis	3	0	0	3
Grand total		**628**	**293**	**525**	1446

U= Un established, E= Established, A= Advanced growth, TS= Total seedlings

Table 33. Regeneration status of seedlings of Urani area of Goodrical RF. (*Nageia wallichiana* habitat)

Sl. No.	Species	U	E	A	TS
1	Achronichea pedunculata	5	4	3	12
2	Actinodaphne malabarica	13	11	18	42
3	Agleia perverdis	9	15	36	60
4	Agrostistachys bourneensis	24	9	15	48
5	Alseodaphne semicarpifolia	0	0	3	3
6	Apoditis dimidienta	3	2	1	6
7	Aporusa lindleyana	0	0	3	3

Sl. No.	Species	U	E	A	TS
8	Ardisia sonchifolia	60	42	57	159
9	Artocarpus hirsutus	9	3	6	18
10	Baccaurea courtallensis	1	5	3	9
11	Canthium rheedii	0	0	6	6
12	Careyota urens	6	2	1	9
13	Cinnamomum keralensis	18	18	27	63
14	Cleidion javanicum	0	0	0	0
15	Clerodendron infortunatum	18	15	15	48
16	Cryptocareya anamaliense	0	3	0	3
17	Cullenia exarillata	27	12	21	60
18	Dendrocnide sinuata	9	3	6	18
19	Dichopetalum jealanoides	6	3	27	36
20	Dimocarpus longan	39	33	18	90
21	Diospyros paniculata	3	0	6	9
22	Drypetus elata	3	0	6	9
23	Elaeocarpus serratus	0	0	0	0
24	Garcinea gummi-gutta	3	0	0	3
25	Gomphandra corriacea	1	2	3	6
26	Guania macrocarpa	3	1	5	9
27	Heriteria papilli	9	18	9	36
28	Holigarna arnottiana	0	0	3	3
29	Humboldtia vahliana	0	0	6	6
30	Hydnocarpus pentandra	0	0	3	3
31	Isonandra lanceolata	0	0	15	15
32	Ixora brachiata	0	0	3	3
33	Knema attenuata	0	9	6	15
34	Litsea correasea	6	3	3	12
35	Litsea floribunda	9	6	6	21
36	Lophopetalum wightianum	9	2	1	12
37	Macaranga peltata	24	21	15	60
38	Meiogyne pannosa	6	3	9	18
39	Melia dubia	0	0	0	0
40	Memicylon decanensii	15	30	81	126
41	Memicylon malabaricum	0	0	3	3
42	Memicylon subramaniani	21	9	6	36
43	Mesua ferrea	9	12	6	27
44	Miliusma simplicofolia	0	6	0	6
45	Neolitsea lamarkiana	6	3	6	15
46	Nothopegia colebrookeana	33	24	15	72

Sl. No.	Species	U	E	A	TS
47	Palaqium ellipticum	297	54	33	384
48	Paracroton penduloides	0	0	0	0
49	Persea macrantha	30	12	6	48
50	Podocarpus wallichianum	165	78	75	318
51	Prunus ceylanica	0	0	0	0
52	Schleichera oleosa	45	6	21	72
53	Symplocos rosea	0	0	0	0
54	Sysigium laetum	0	0	3	3
55	Sysigium mundagam	12	0	6	18
56	Terpaenia malabarica	0	3	6	9
Total		**956**	**482**	**632**	**2070**

The status of saplings was also worked out for both the sites (Table 34 and 35) Saplings of 26 species were recorded from Kadamankunnu site and 36 species from Sundarimukku area. The highest numbers of saplings were recorded for the following species, *viz*., *Memecylon deccanense, Mesua ferrea*, *Clerodendrum infortunatum* and *Ardisia sonchifolia* in Kadanmankunnu area (Table 35). *Dichopetalum jealanoides, Meiogyne pannosa, Memecylon deccanense* and *Nageia Wallichiana* are having highest number of saplings in study site Sundarimukku (Table 34).

Table 34. Vegetation status of saplings of Sundarimukku in Goodrical RF (*Nageia wallichiana* habitat)

Sl. No.	Species	D	F	RD	RF		BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	20.00	20.00	1.41	2.86	1.00	25.77	4.51	0.05	8.78
2	Agleia simplicifolia	40.00	20.00	2.82	2.86	2.00	16.72	2.93	0.10	8.60
3	Agrostistachys borneensis	40.00	20.00	2.82	2.86	2.00	13.65	2.39	0.10	8.06
4	Aporusa lindleyana	40.00	20.00	2.82	2.86	2.00	13.76	2.41	0.10	8.08
5	Ardisia sonchifolia	80.00	20.00	5.63	2.86	4.00	10.20	1.79	0.20	10.28
6	Baccaurea courtallensis	20.00	20.00	1.41	2.86	1.00	28.72	5.03	0.05	9.29
7	Blepharistemma serratum	60.00	20.00	4.23	2.86	3.00	12.76	2.23	0.15	9.32
8	Cryptocareya anamaliense	20.00	20.00	1.41	2.86	1.00	17.90	3.13	0.05	7.40
9	Cullenia exarillata	80.00	40.00	5.63	5.71	2.00	11.17	1.96	0.05	13.30
10	Dichopetalum jealanoides	260.00	60.00	18.31	8.57	4.33	9.42	1.65	0.07	28.53
11	Dimocarpus longan	20.00	20.00	1.41	2.86	1.00	15.59	2.73	0.05	6.99
12	Garcinea morella	40.00	20.00	2.82	2.86	2.00	47.75	8.36	0.10	14.03
13	Gomphandra corriacea	80.00	60.00	5.63	8.57	1.33	23.33	4.08	0.02	18.29
14	Humboldtia vahliana	20.00	20.00	1.41	2.86	1.00	28.72	5.03	0.05	9.29
15	Isonandra lanceolata	60.00	40.00	4.23	5.71	1.50	12.76	2.23	0.04	12.17

16	Litsea correasea	20.00	20.00	1.41	2.86	1.00	22.99	4.02	0.05	8.29
17	Litsea floribunda	20.00	20.00	1.41	2.86	1.00	25.77	4.51	0.05	8.78
18	Meiogyne pannosa	140.00	20.00	9.86	2.86	7.00	23.85	4.17	0.35	16.89
19	Memicylon decanensii	120.00	20.00	8.45	2.86	6.00	11.30	1.98	0.30	13.29
20	Memicylon malabaricum	20.00	20.00	1.41	2.86	1.00	11.45	2.00	0.05	6.27
21	Memicylon subramaniani	20.00	20.00	1.41	2.86	1.00	31.82	5.57	0.05	9.83
22	Nageia wallichiana	100.00	60.00	7.04	8.57	1.67	24.36	4.26	0.03	19.88
23	Palaqium ellipticum	40.00	40.00	2.82	5.71	1.00	49.72	8.70	0.03	17.23
24	Schleichera oleosa	20.00	20.00	1.41	2.86	1.00	20.36	3.56	0.05	7.83
25	Symplocos rosea	20.00	20.00	1.41	2.86	1.00	22.99	4.02	0.05	8.29
26	Syzygium mundagam	20.00	20.00	1.41	2.86	1.00	38.50	6.74	0.05	11.00

MI=26.92

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA=RelativeBasalArea, AB/F=Abundance/Frequency, IVI = Importance Value Index, MI =Maturity Index.

Table 35. Vegetation status of saplings of Kadamankundu area in / Urani region of Goodrical RF (*Nageia wallichiana* habitat)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	60.00	20.00	2.91	1.89	3.00	28.72	3.27	0.15	8.07
2	Aglaia perverdis	20.00	20.00	0.97	1.89	1.00	9.63	1.10	0.05	3.95
3	Agrostistachys borneensis	20.00	20.00	0.97	1.89	1.00	9.63	1.10	0.05	3.95
4	Ardisia sonchifolia	140.00	40.00	6.80	3.77	3.50	22.22	2.53	0.09	13.10
5	Canthium rheedii	20.00	20.00	0.97	1.89	1.00	66.90	7.62	0.05	10.47
6	Cinnamomum keralensis	80.00	60.00	3.88	5.66	1.33	129.67	14.76	0.02	24.31
7	Cleidion javanicum	20.00	20.00	0.97	1.89	1.00	8.28	0.94	0.05	3.80
8	Clerodendron infortunatum	180.00	40.00	8.74	3.77	4.50	32.17	3.66	0.11	16.17
9	Cryptocareya anamaliense	20.00	20.00	0.97	1.89	1.00	20.36	2.32	0.05	5.18
10	Cullenia exarillata	120.00	60.00	5.83	5.66	2.00	22.32	2.54	0.03	14.03
11	Dendrocnide sinuata	20.00	20.00	0.97	1.89	1.00	13.44	1.53	0.05	4.39
12	Dichopetalum jealanoides	40.00	40.00	1.94	3.77	1.00	15.59	1.78	0.03	7.49
13	Dimocarpus longan	40.00	20.00	1.94	1.89	2.00	13.97	1.59	0.10	5.42
14	Drypetus elata	120.00	40.00	5.83	3.77	3.00	23.90	2.72	0.08	12.32
15	Elaeocarpus serratus	20.00	20.00	0.97	1.89	1.00	35.08	3.99	0.05	6.85
16	Gomphandra corriacea	100.00	60.00	4.85	5.66	1.67	29.45	3.35	0.03	13.87

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/ F	IVI
17	Heriteria papilli	20.00	20.00	0.97	1.89	1.00	13.44	1.53	0.05	4.39
18	Humboldtia vahliana	20.00	20.00	0.97	1.89	1.00	11.45	1.30	0.05	4.16
19	Hydnocarpus pentandra	20.00	20.00	0.97	1.89	1.00	49.72	5.66	0.05	8.52
20	Knema attenuata	20.00	20.00	0.97	1.89	1.00	13.44	1.53	0.05	4.39
21	Litsea floribunda	20.00	20.00	0.97	1.89	1.00	11.45	1.30	0.05	4.16
22	Litsea oleoides	20.00	20.00	0.97	1.89	1.00	22.99	2.62	0.05	5.47
23	Macaranga peltata	20.00	20.00	0.97	1.89	1.00	13.44	1.53	0.05	4.39
24	Meiogyne pannosa	120.00	60.00	5.83	5.66	2.00	24.83	2.83	0.03	14.31
25	Melia dubia	40.00	20.00	1.94	1.89	2.00	10.52	1.20	0.10	5.03
26	Memecylon deccanense	240.00	60.00	11.65	5.66	4.00	15.81	1.80	0.07	19.11
27	Memicylon subramaniani	20.00	20.00	0.97	1.89	1.00	11.45	1.30	0.05	4.16
28	Mesua ferrea	140.00	60.00	6.80	5.66	2.33	22.99	2.62	0.04	15.07
29	Nageia wallichiana	60.00	20.00	2.91	1.89	3.00	22.99	2.62	0.15	7.42
30	Neolitsea lamarkiana	40.00	20.00	1.94	1.89	2.00	12.43	1.42	0.10	5.24
31	Palaqium ellipticum	100.00	40.00	4.85	3.77	2.50	23.26	2.65	0.06	11.28
32	Paracroton penduloides	20.00	20.00	0.97	1.89	1.00	8.77	1.00	0.05	3.86
33	Persea macrantha	20.00	20.00	0.97	1.89	1.00	25.77	2.93	0.05	5.79
34	Prunus ceylanica	20.00	20.00	0.97	1.89	1.00	49.72	5.66	0.05	8.52
35	Symplocos rosea	40.00	20.00	1.94	1.89	2.00	15.59	1.78	0.10	5.60
36	Syzygium mundagam	40.00	20.00	1.94	1.89	2.00	16.96	1.93	0.10	5.76

MI=29.44

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

B. VEGETATION STATUS OF SHOLAYAR RESERVED FORESTS OF CENTRAL CIRCLE

1.West-Coast Tropical Evergreen Forests (Selection Felled).

Status of Tree Vegetation

Altogether 94 species were recorded from the area. The dominent species with respect to IVI status are *Cullenia exarillata* (9.59), *Dysoxylum malabaricum* (8.60), *Elaeocarpus serratus* (7.94), *Ficus nervosa* (13.85), *Knema attenuata* (11.69), *Macaranga peltata* (8.10), *Otonephilium stipulaceum* (9.16), *Palaquium ellipticum* (12.93), *Terminalia bellirica* (9.27) and *Vateria indica* (8.15) – IVI in parenthesis (Table 36). The dominant species with respect to species density are, *Palaquium ellipticum, Knema attenuata, Otonephilium stipulatum, Reinwardtiodendron anamalaiense, Vateria indica, Dysoxylon fisciforme, Macaranga peltata, Agrostistachys bourneensis, Mesua ferrea* and *Chukresia tabularis* (Table 36). *Cullenia exarillata, Dysoxylon malabaricum, Knema attenuata, Macaranga peltata, Otonephilium stipulaceum, Palaquium ellipticum* and *Vateria indica* are highly frequent (more than 60% F.).

Table 36. Vegetation status of trees - West Coast Tropical Evergreen Forests of Sholayar RF (Selection Felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Achronichea pedunculata	10.00	5.00	0.20	0.25	2.00	320.75	0.34	0.40	0.79
2	Actinodaphne companulata	25.00	15.00	0.50	0.76	1.67	563.95	0.60	0.11	1.86
3	Actinodaphne malabarica	15.00	5.00	0.30	0.25	3.00	769.16	0.82	0.60	1.37
4	Aglaia lawii	40.00	20.00	0.80	1.01	2.00	279.48	0.30	0.10	2.11
5	Agrostystachys bourneensis	195.00	35.00	3.91	1.77	5.57	238.39	0.25	0.16	5.93
6	Alseodaphne semicarpifolia	85.00	35.00	1.71	1.77	2.43	157.31	0.17	0.07	3.64
7	Antidesma menasu	45.00	25.00	0.90	1.26	1.80	387.30	0.41	0.07	2.58
8	Apodytes dimidiata	35.00	15.00	0.70	0.76	2.33	293.22	0.31	0.16	1.77
9	Aporusa lindleyana	50.00	45.00	1.00	2.27	1.11	165.40	0.18	0.02	3.45

10	Artocapus heterophyllus	15.00	15.00	0.30	0.76	1.00	702.86	0.75	0.07	1.80
11	Baccaurea courtallensis	90.00	55.00	1.81	2.78	1.64	137.44	0.15	0.03	4.73
12	Callicarpa tomentosa	20.00	10.00	0.40	0.51	2.00	185.19	0.20	0.20	1.10
13	Calophyllum polyanthum	35.00	25.00	0.70	1.26	1.40	2544.65	2.70	0.06	4.66
14	Canarium strictum	35.00	25.00	0.70	1.26	1.40	761.73	0.81	0.06	2.77
15	Canthium rheedii	30.00	15.00	0.60	0.76	2.00	745.87	0.79	0.13	2.15
16	Caryota urens	5.00	5.00	0.10	0.25	1.00	1242.90	1.32	0.20	1.67
17	Cedrella toona	5.00	5.00	0.10	0.25	1.00	140.32	0.15	0.20	0.50
18	Celtis philippensis	20.00	10.00	0.40	0.51	2.00	221.34	0.23	0.20	1.14
19	Chukrasia tabularis	140.00	45.00	2.81	2.27	3.11	1058.53	1.12	0.07	6.20
20	Cinnamomum malabatrum	5.00	5.00	0.10	0.25	1.00	795.45	0.84	0.20	1.20
21	Clerodendron infortunatum	10.00	10.00	0.20	0.51	1.00	94.68	0.10	0.10	0.81
22	Croton malabaricus	115.00	20.00	2.31	1.01	5.75	198.17	0.21	0.29	3.53
23	Cullenia exarillata	230.00	65.00	4.61	3.28	3.54	1594.34	1.69	0.05	9.59
24	Dendrocnide sinuata	25.00	20.00	0.50	1.01	1.25	186.34	0.20	0.06	1.71
25	Dillenia retusa	10.00	5.00	0.20	0.25	2.00	231.95	0.25	0.40	0.70
26	Diospyros paniculata	50.00	30.00	1.00	1.52	1.67	878.99	0.93	0.06	3.45
27	Dipterocarpus indicus	85.00	55.00	1.71	2.78	1.55	1729.92	1.83	0.03	6.32
28	Drypetus elata	100.00	30.00	2.01	1.52	3.33	413.51	0.44	0.11	3.96
29	Drypetus oblongifolia	190.00	45.00	3.81	2.27	4.22	459.77	0.49	0.09	6.57
30	Drypetus wightii	25.00	5.00	0.50	0.25	5.00	322.16	0.34	1.00	1.10
31	Dysoxylon fisciforme	30.00	10.00	0.60	0.51	3.00	170.77	0.18	0.30	1.29
32	Dysoxylum malabaricum	215.00	60.00	4.31	3.03	3.58	1186.66	1.26	0.06	8.60
33	Elaeocarpus serratus	5.00	5.00	0.10	0.25	1.00	7159.09	7.59	0.20	7.94
34	Elaeocarpus tuberculatus	85.00	35.00	1.71	1.77	2.43	775.00	0.82	0.07	4.29

35	Euodia lunu-ankenda	80.00	30.00	1.60	1.52	2.67	687.99	0.73	0.09	3.85
36	Ficus nervosa	5.00	5.00	0.10	0.25	1.00	12727.27	13.49	0.20	13.85
37	Flaccourtia montana	15.00	10.00	0.30	0.51	1.50	678.16	0.72	0.15	1.52
38	Garcinea gummi-gutta	20.00	15.00	0.40	0.76	1.33	183.65	0.19	0.09	1.35
39	Gmelina arborea	55.00	20.00	1.10	1.01	2.75	224.36	0.24	0.14	2.35
40	Gnidia glauca	10.00	10.00	0.20	0.51	1.00	1024.72	1.09	0.10	1.79
41	Gomphandra corriacea	5.00	5.00	0.10	0.25	1.00	717.90	0.76	0.20	1.11
42	Goniothalamus rhynchatherus	10.00	5.00	0.20	0.25	2.00	509.09	0.54	0.40	0.99
43	Harpullia arborea	5.00	5.00	0.10	0.25	1.00	389.77	0.41	0.20	0.77
44	Holigarna arnottiana	25.00	20.00	0.50	1.01	1.25	914.12	0.97	0.06	2.48
45	Holigarna grahami	15.00	15.00	0.30	0.76	1.00	1994.16	2.11	0.07	3.17
46	Holigarna nigra	15.00	10.00	0.30	0.51	1.50	1276.26	1.35	0.15	2.16
47	Hopea parviflora	10.00	5.00	0.20	0.25	2.00	5565.02	5.90	0.40	6.35
48	Hydnocarpus pentandra	45.00	25.00	0.90	1.26	1.80	524.77	0.56	0.07	2.72
49	Ixora arborea	5.00	5.00	0.10	0.25	1.00	97.44	0.10	0.20	0.46
50	Ixora brachiata	10.00	10.00	0.20	0.51	1.00	117.91	0.13	0.10	0.83
51	Ixora nilgiricanse	5.00	5.00	0.10	0.25	1.00	161.08	0.17	0.20	0.52
52	Knema attenuata	305.00	95.00	6.12	4.80	3.21	732.94	0.78	0.03	11.69
53	Lannea coromandelica	5.00	5.00	0.10	0.25	1.00	997.82	1.06	0.20	1.41
54	Leea indica	15.00	10.00	0.30	0.51	1.50	108.90	0.12	0.15	0.92
55	Litsea coriacea	5.00	5.00	0.10	0.25	1.00	910.72	0.97	0.20	1.32
56	Litsea floribunda	15.00	15.00	0.30	0.76	1.00	234.83	0.25	0.07	1.31
57	Litsea oleoides	45.00	15.00	0.90	0.76	3.00	571.71	0.61	0.20	2.27
58	Litsea wightiana	20.00	15.00	0.40	0.76	1.33	512.28	0.54	0.09	1.70
59	Lophopetalum wightianum	5.00	5.00	0.10	0.25	1.00	6280.99	6.66	0.20	7.01
60	Macranga peltata	205.00	70.00	4.11	3.54	2.93	422.20	0.45	0.04	8.10

61	Mallotus aureopunctatus	5.00	5.00	0.10	0.25	1.00	198.86	0.21	0.20	0.56
62	Mallotus philippensis	10.00	10.00	0.20	0.51	1.00	147.08	0.16	0.10	0.86
63	Memecylon deccanense	20.00	15.00	0.40	0.76	1.33	219.25	0.23	0.09	1.39
64	Mesua ferrea	105.00	40.00	2.11	2.02	2.63	1850.51	1.96	0.07	6.09
65	Mesua thwaitesii	5.00	5.00	0.10	0.25	1.00	91.95	0.10	0.20	0.45
66	Myristica dactyloides	35.00	5.00	0.70	0.25	7.00	1140.01	1.21	1.40	2.16
67	Myristica malabarica	30.00	15.00	0.60	0.76	2.00	332.98	0.35	0.13	1.71
68	Ostodes zeylanicus	5.00	5.00	0.10	0.25	1.00	1223.9	1.30	0.20	1.65
69	Ostodus zeylanica	10.00	5.00	0.20	0.25	2.00	496.44	0.53	0.40	0.98
70	Otonephilium stipulaceum	265.00	70.00	5.32	3.54	3.79	290.56	0.31	0.05	9.16
71	Palaquium ellipticum	350.00	90.00	7.02	4.55	3.89	1287.61	1.37	0.04	12.93
72	Persea macrantha	25.00	15.00	0.50	0.76	1.67	1126.44	1.19	0.11	2.45
73	Polyalthea coffeoides	5.00	5.00	0.10	0.25	1.00	154.00	0.16	0.20	0.52
74	Polyalthea fragrans	100.00	45.00	2.01	2.27	2.22	725.02	0.77	0.05	5.05
75	Presmatomeris tetrandra	5.00	5.00	0.10	0.25	1.00	168.32	0.18	0.20	0.53
76	Reinwardtiodendron anamalaiense	245.00	45.00	4.91	2.27	5.44	393.87	0.42	0.12	7.61
77	Sagerarea lawrifolia	5.00	5.00	0.10	0.25	1.00	86.63	0.09	0.20	0.44
78	Schleichera oleosa	85.00	35.00	1.71	1.77	2.43	345.88	0.37	0.07	3.84
79	Spatholobus roxburgii	5.00	5.00	0.10	0.25	1.00	183.27	0.19	0.20	0.55
80	Symplocos rosea	10.00	10.00	0.20	0.51	1.00	97.44	0.10	0.10	0.81
81	Sysigium arnottianum	10.00	10.00	0.20	0.51	1.00	868.66	0.92	0.10	1.63
82	Sysigium cumini	40.00	35.00	0.80	1.77	1.14	1920.34	2.04	0.03	4.61
83	Sysigium laetum	75.00	20.00	1.50	1.01	3.75	185.31	0.20	0.19	2.71

84	Sysigium lanceolatum	35.00	20.00	0.70	1.01	1.75	270.23	0.29	0.09	2.00
85	Terminalia bellirica	20.00	10.00	0.40	0.51	2.00	7892.90	8.37	0.20	9.27
86	Terminalia paniculata	10.00	10.00	0.20	0.51	1.00	2534.50	2.69	0.10	3.39
87	Terpenia malabarica	50.00	25.00	1.00	1.26	2.00	553.28	0.59	0.08	2.85
88	Tetrameles nudiflora	40.00	20.00	0.80	1.01	2.00	373.25	0.40	0.10	2.21
89	Toona ciliata	15.00	10.00	0.30	0.51	1.50	1101.34	1.17	0.15	1.97
90	Unknown sp.	5.00	5.00	0.10	0.25	1.00	175.72	0.19	0.20	0.54
91	Vateria indica	210.00	60.00	4.21	3.03	3.50	859.58	0.91	0.06	8.15
92	Vepris bilocularis	15.00	10.00	0.30	0.51	1.50	784.88	0.83	0.15	1.64
93	Vernonia monosis	50.00	40.00	1.00	2.02	1.25	394.24	0.42	0.03	3.44
94	Xanthophyllum arnottianum	55.00	25.00	1.10	1.26	2.20	170.32	0.18	0.09	2.55
Grand total		**4985.00**	**1980**	**100.00**	**100.00**	**188.40**	**94322.6**	**100.0**	**15.62**	**300.0**

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F=Abundance/Frequency, IVI = Importance Value Index, No. Sps = Number of species, Qtd. Occ = Quadrate of occurrence, MI = Maturity Index

Status of Saplings

In total 54 species were recorded in sapling species were recorded in sapling stage from the study plot. Species with maximum IVI are *Agrostistachys borneensis* (12.86), *Cullenia exarillata* (12.72), *Kneme attenuata* (11.84), *Palaquium ellipticum* (10.43) and *Reinwardtidendron anamalaiensis* (16.13)-Table 37.

Table 37. Vegetation status of saplings of West Coast Tropical Evergreen forests of Sholayar RF. (Selection Felled).

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	11.11	11.11	0.67	1.24	1.00	17.90	1.20	0.090	3.11
2	Aglaia malabarica	5.56	5.56	0.33	0.62	1.00	31.82	2.14	0.180	3.09
3	Aglaia simplicifolia	16.67	11.11	1.00	1.24	1.50	30.77	2.07	0.135	4.31
4	Agrostistachys borneensis	105.56	33.33	6.35	3.73	3.17	41.31	2.78	0.095	12.86
5	Alseodaphne semicarpifolia	44.44	33.33	2.68	3.73	1.33	30.25	2.03	0.040	8.44
6	Antidesma menasu	11.11	11.11	0.67	1.24	1.00	40.27	2.71	0.090	4.62
7	Apodytes dimidiata	16.67	5.56	1.00	0.62	3.00	16.34	1.10	0.540	2.72
8	Aporusa lindleyana	33.33	22.22	2.01	2.48	1.50	21.22	1.43	0.068	5.92
9	Baccaurea courtallensis	61.11	33.33	3.68	3.73	1.83	27.63	1.86	0.055	9.26
10	Chukrasia tabularis	5.56	5.56	0.33	0.62	1.00	66.90	4.50	0.180	5.45
11	Clausena indica	5.56	5.56	0.33	0.62	1.00	11.45	0.77	0.180	1.73
12	Croton malabaricus	22.22	11.11	1.34	1.24	2.00	34.25	2.30	0.180	4.88
13	Croton zeylanicus	5.56	5.56	0.33	0.62	1.00	11.45	0.77	0.180	1.73
14	Cullenia exarillata	105.56	38.89	6.35	4.35	2.71	30.00	2.02	0.070	12.72
15	Dendrocnide sinuata	77.78	27.78	4.68	3.11	2.80	30.03	2.02	0.101	9.81
16	Dillenia pentagyna	5.56	5.56	0.33	0.62	1.00	42.08	2.83	0.180	3.78
17	Dipterocarpus bourdillonii	5.56	5.56	0.33	0.62	1.00	11.45	0.77	0.180	1.73
18	Dipterocarpus indicus	5.56	5.56	0.33	0.62	1.00	28.72	1.93	0.180	2.89
19	Drypetes elata	61.11	33.33	3.68	3.73	1.83	34.17	2.30	0.055	9.70
20	Dysoxylum malabaricum	33.33	22.22	2.01	2.48	1.50	30.77	2.07	0.068	6.56
21	Elaeocarpus serratus	11.11	11.11	0.67	1.24	1.00	33.43	2.25	0.090	4.16
22	Flacourtia montana	5.56	5.56	0.33	0.62	1.00	17.90	1.20	0.180	2.16
23	Garcinea gummi-gutta	27.78	16.67	1.67	1.86	1.67	15.59	1.05	0.100	4.58

24	Holigarna arnottiana	5.56	5.56	0.33	0.62	1.00	11.45	0.77	0.180	1.73
25	Humboldtia vahliana	5.56	5.56	0.33	0.62	1.00	31.82	2.14	0.180	3.09
26	Hydnocarpus pentandra	27.78	22.22	1.67	2.48	1.25	19.36	1.30	0.056	5.46
27	Ixora brachiata	11.11	5.56	0.67	0.62	2.00	35.08	2.36	0.360	3.65
28	Knema attenuata	66.67	50.00	4.01	5.59	1.33	33.43	2.25	0.027	11.85
29	Leea indica	16.67	11.11	1.00	1.24	1.50	28.72	1.93	0.135	4.18
30	Litsea floribunda	27.78	16.67	1.67	1.86	1.67	47.36	3.18	0.100	6.72
31	Litsea wightiana	33.33	11.11	2.01	1.24	3.00	19.94	1.34	0.270	4.59
32	Mastixia arborea	11.11	5.56	0.67	0.62	2.00	17.90	1.20	0.360	2.49
33	Memecylon deccanense	55.56	38.89	3.34	4.35	1.43	20.36	1.37	0.037	9.06
34	Mesua ferrea	61.11	22.22	3.68	2.48	2.75	23.24	1.56	0.124	7.73
35	Myristica dactyloides	11.11	11.11	0.67	1.24	1.00	35.08	2.36	0.090	4.27
36	Ostodes zeylanicus	5.56	5.56	0.33	0.62	1.00	31.82	2.14	0.180	3.09
37	Otonephelium stipulaceum	61.11	27.78	3.68	3.11	2.20	20.60	1.38	0.079	8.17
38	Palaquium ellipticum	72.22	38.89	4.35	4.35	1.86	25.77	1.73	0.048	10.43
39	Persea macrantha	11.11	11.11	0.67	1.24	1.00	28.72	1.93	0.090	3.84
40	Polyalthia fragrans	44.44	38.89	2.68	4.35	1.14	26.49	1.78	0.029	8.80
41	Psychotria anamalayana	44.44	5.56	2.68	0.62	8.00	13.44	0.90	1.440	4.20
42	Reinwardtidendron anamalaiense	150.00	50.00	9.03	5.59	3.00	22.49	1.51	0.060	16.13
43	Schleichera oleosa	27.78	27.78	1.67	3.11	1.00	31.19	2.10	0.036	6.87
44	Symplocos rosea	33.33	16.67	2.01	1.86	2.00	25.30	1.70	0.120	5.57
45	Syzygium arnottianum	33.33	16.67	2.01	1.86	2.00	22.54	1.52	0.120	5.39
46	Syzygium cumini	5.56	5.56	0.33	0.62	1.00	17.90	1.20	0.180	2.16
47	Syzygium elatum	11.11	5.56	0.67	0.62	2.00	11.45	0.77	0.360	2.06
48	Syzygium mundagam	5.56	5.56	0.33	0.62	1.00	17.90	1.20	0.180	2.16
49	Syzygium munronii	61.11	5.56	3.68	0.62	11.00	16.62	1.12	1.980	5.42
50	Tetrameles nudiflora	11.11	11.11	0.67	1.24	1.00	30.25	2.03	0.090	3.94
51	Vateria indica	27.78	16.67	1.67	1.86	1.67	39.20	2.64	0.100	6.17
52	Vepris bilocularis	16.67	11.11	1.00	1.24	1.50	40.87	2.75	0.135	4.99

53	Vernonia monosis	5.56	5.56	0.33	0.62	1.00	66.90	4.50	0.180	5.45
54	Xanthophyllum arnottianum	16.67	16.67	1.00	1.86	1.00	18.70	1.26	0.060	4.12
Grand T		**1661.11**	**894.44**	**100.00**	**100.00**	**100.14**	**1487.57**	**100.00**	**10.60**	**300.00**

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, No. Sps = Number of species, Qtd. Occ = Quadrate of occurrence, MI = Maturity Index.

Status of Seedlings

The regeneration status of seedlings was evaluated. The percentage of Un established, Established and Advanced growth stage were 60,17 and 23 respectively. Among the total numbers of seedlings observed (1516), more than 35% was contributed by a single species of *Reinwardtidendron anamalaiense* (531 Nos.); of which more than 65% is in the category of Un established. More number of 'Advanced growth stage' seedlings were observed in the case of *Aglai lawii, Agrostistachys bormeemsis, Chukrasia tabularis, Cullenia exelsa, Dendrrocride sinuate, Reinwardtidendron anamalaiensis* and *Schleichera oleosa* (Table. 38)

Table 38. Regeneration status of seedlings - Sholayar Selection felled WCT Evergreen forests

Sl.No	Species	UE	E	A	TS
1	Actinodaphne malabarica	1	0	9	10
2	Aglaia barberi	1	0	0	1
3	Aglaia lawii	0	0	18	18
4	Aglaia malabarica	1	0	5	6
5	Aglaia simplicifolia	3	0	0	3
6	Agrostistachys borneensis	20	1	20	41
7	Alseodaphne semicarpifolia	7	0	2	9
8	Antidesma menasu	2	0	0	2
9	Aporusa lindleyana	10	0	0	10
10	Baccaurea courtallensis	11	1	0	12
11	Canarium strictum	0	1	0	1
12	Carayota urense	13	4	3	20

13	Chukrasia tabularis	19	5	24	48
14	Cinnamomum keralensis	4	2	1	7
15	Cinnamomum malabatrum	0	2	4	6
16	Clausena indica	15	2	8	25
17	Cleidion javanicum	0	0	1	1
18	Croton malabaricus	5	0	4	9
19	Croton zeylanicus	1	0	0	1
20	Cullenia exarillata	33	5	15	53
21	Dendrocnide sinuate	39	10	21	70
22	Dillenia pentagyna	1	0	0	1
23	Diospyros paniculata	14	4	6	24
24	Dipterocarpus indicus	7	2	1	10
25	Drypetes elata	19	3	4	26
26	Dysoxylum malabaricum	13	10	8	31
27	Elaeocarpus serratus	2	0	1	3
28	Euodia lunu-ankenda	4	1	3	8
29	Flaccourtia Montana	2	0	0	2
30	Garcinea gummi-gutta	10	2	2	14
31	Garcinia morella	1	0	1	2
32	Goniothalamus rhyncantherus	2	1	0	3
33	Holigarna arnottiana	1	0	1	2
34	Hopea parviflora	2	6	1	9
35	Humboldtia vahliana	1	0	0	1
36	Hydnocarpus pentandra	4	0	1	5
37	Ixora brachiata	3	0	6	9
38	Kingiodendron pinnatum	4	1	0	5
39	Knema attenuata	23	4	8	35
40	Leea indica	3	0	0	3
41	Litsea deccanensis	1	0	1	2
42	Litsea floribunda	5	0	0	5
43	Litsea wightiana	6	0	0	6
44	Mallotus atrovirens	3	1	2	6
45	Mallotus philippensis	0	1	0	1
46	Mastixia arborea	2	0	0	2
47	Memecylon deccanense	11	2	3	16
48	Memecylon umbellatum	1	0	0	1
49	Meiogyne pannosa	4	3	0	7
50	Mesua ferrea	16	4	2	22
51	Mesua thwaitesii	2	3	1	6
52	Myristica dactyloides	2	0	1	3

53	Neolitsea scorbiculata	0	0	1	1
54	Neolitsia sp.	3	1	1	5
55	Ostodes zeylanicus	4	1	2	7
56	Otonephelium stipulaceum	30	12	13	55
57	Palaquium ellipticum	17	4	8	29
58	Persea macrantha	2	0	0	2
59	Pheanthus malabaricus	1	1	0	2
60	Polyalthia fragrans	33	11	7	51
61	Psychotria anamalayana	9	0	5	14
62	Reinwardtidendron anamalaiense	350	98	83	531
63	Schleichera oleosa	22	20	19	61
64	Strombosea zeylanica	7	5	2	14
65	Strychnos nux vamica	0	0	1	1
66	Symplocos rosea	7	3	3	13
67	Syzygium arnottianum	12	1	4	17
68	Syzygium cumini	5	2	2	9
69	Syzygium elatum	4	2	2	8
70	Syzygium lanceolatum	1	0	0	1
71	Syzygium mundagam	6	1	2	9
72	Syzygium munronii	11	0	2	13
73	Tetrameles nudiflora	1	0	0	1
74	Vateria indica	7	1	1	9
75	Vepris bilocularis	13	8	3	24
76	Vernonia monosis	1	0	1	2
77	Xanthophyllum arnottianum	12	4	2	18
Total		**912**	**252**	**352**	**1516**

2. West-Coast Tropical Evergreen Forests (Non Selection Felled).

Status of Tree Vegetation

In total 86 species were recorded from this type. The dominent species as per IVI status are *Cullenia exarillata, Ficus tinctoria* ssp. *parasitica, Macaranga peltata, Mesua ferrea, Scheichera oleosa, Holigarna arnottiana, Drypetus elata, Dipterocarpus indicus,* and *Bhesa indica* (Table 39). The species with high density are *Schelichera oleosda, Reinwardtiadendron anamalaiense, Palaquium ellipticum, Macaranga peltata, Drypetus elata, Cullenia exarillata* and *Knema attenuata*. The species with high frequency distribution are *Cullenia exarillata, Palaquium ellipticum* and *Macaranga peltata* as observed throughout.

Table 39. Vegetation status of trees of West Coast Tropical Evergreen forests of Sholayar RF (Non selection Felled)

Sl. No	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	100.00	58.33	2.14	2.61	1.71	300.86	0.29	0.029	5.05
2	Actinodaphne malabarica	41.67	25.00	0.89	1.12	1.67	419.27	0.41	0.067	2.42
3	Aglaia lawii	16.67	16.67	0.36	0.75	1.00	477.77	0.47	0.060	1.57
4	Agrostistachys bourneensis	125.00	50.00	2.68	2.24	2.50	182.87	0.18	0.050	5.10
5	Alseodaphne semicarpifolia	150.00	75.00	3.21	3.36	2.00	324.69	0.32	0.027	6.89
6	Antidesma menasu	133.33	50.00	2.86	2.24	2.67	212.00	0.21	0.053	5.30
7	Aphanamixis polystachea	8.33	8.33	0.18	0.37	1.00	658.72	0.64	0.120	1.20
8	Apoditis dimidenta	8.33	8.33	0.18	0.37	1.00	1164.63	1.14	0.120	1.69
9	Aporusa lindleyana	58.33	25.00	1.25	1.12	2.33	385.01	0.38	0.093	2.75
10	Ardisia sonchifolia	25.00	25.00	0.54	1.12	1.00	99.31	0.10	0.040	1.75
11	Artocarpus integrifolia	16.67	16.67	0.36	0.75	1.00	4581.82	4.48	0.060	5.59
12	Atlantia racemosa	8.33	8.33	0.18	0.37	1.00	76.44	0.07	0.120	0.63
13	Baccaurea courtallensis	16.67	16.67	0.36	0.75	1.00	133.72	0.13	0.060	1.23
14	Bhesa indica	8.33	8.33	0.18	0.37	1.00	7302.99	7.15	0.120	7.70
15	Bischofia javanica	8.33	8.33	0.18	0.37	1.00	927.82	0.91	0.120	1.46
16	Blashia umbellata	16.67	8.33	0.36	0.37	2.00	172.00	0.17	0.240	0.90
17	Calophyllum polyanthum	41.67	41.67	0.89	1.87	1.00	1667.83	1.63	0.024	4.39
18	Canarium strictum	41.67	41.67	0.89	1.87	1.00	631.21	0.62	0.024	3.38
19	Catunaragam spinosa	125.00	8.33	2.68	0.37	15.00	161.56	0.16	1.800	3.21
20	Chukrasia tabularis	8.33	8.33	0.18	0.37	1.00	267.59	0.26	0.120	0.81
21	Cinnamomum keralensis	33.33	25.00	0.71	1.12	1.33	247.23	0.24	0.053	2.08
22	Cinnamomum wightii	8.33	8.33	0.18	0.37	1.00	120.99	0.12	0.120	0.67
23	Clerodendron infortunatum	8.33	8.33	0.18	0.37	1.00	76.44	0.07	0.120	0.63
24	Croton malabaricus	16.67	8.33	0.36	0.37	2.00	496.44	0.49	0.240	1.22

25	Cullenia exarillata	308.33	100.00	6.61	4.48	3.08	4332.48	4.24	0.031	15.32
26	Dendrocnide sinuata	125.00	33.33	2.68	1.49	3.75	103.86	0.10	0.113	4.27
27	Dimocarpus longan	50.00	33.33	1.07	1.49	1.50	618.34	0.61	0.045	3.17
28	Diospyros candolleana	8.33	8.33	0.18	0.37	1.00	72.55	0.07	0.120	0.62
29	Diospyros paniculata	33.33	33.33	0.71	1.49	1.00	253.93	0.25	0.030	2.46
30	Dipterocarpus indicus	100.00	66.67	2.14	2.99	1.50	1948.25	1.91	0.023	7.03
31	Drypetus confortiflora	16.67	8.33	0.36	0.37	2.00	168.32	0.16	0.240	0.89
32	Drypetus elata	208.33	75.00	4.46	3.36	2.78	379.59	0.37	0.037	8.19
33	Drypetus oblongifolia	33.33	25.00	0.71	1.12	1.33	1272.91	1.25	0.053	3.08
34	Dysoxylon malabaricum	50.00	33.33	1.07	1.49	1.50	2896.84	2.83	0.045	5.40
35	Elaeocarpus tuberculatus	83.33	33.33	1.79	1.49	2.50	1233.37	1.21	0.075	4.49
36	Erythroxylon lanceolatum	8.33	8.33	0.18	0.37	1.00	81.45	0.08	0.120	0.63
37	Euodea lunu-ankenda	50.00	16.67	1.07	0.75	3.00	479.83	0.47	0.180	2.29
38	Ficus callosa	8.33	8.33	0.18	0.37	1.00	7302.99	7.15	0.120	7.70
39	Ficus hispida	8.33	8.33	0.18	0.37	1.00	447.44	0.44	0.120	0.99
40	Ficus tinctoria ssp.parasitica	8.33	8.33	0.18	0.37	1.00	19333.44	18.92	0.120	19.47
41	Flacourtia montana	8.33	8.33	0.18	0.37	1.00	81.45	0.08	0.120	0.63
42	Furniana coloratia	8.33	8.33	0.18	0.37	1.00	76.44	0.07	0.120	0.63
43	Garcinia gummi-gutta	16.67	16.67	0.36	0.75	1.00	179.47	0.18	0.060	1.28
44	Garcinia morella	8.33	8.33	0.18	0.37	1.00	447.44	0.44	0.120	0.99
45	Glochidion ellipticum	8.33	8.33	0.18	0.37	1.00	114.86	0.11	0.120	0.66
46	Gmelina arborea	16.67	8.33	0.36	0.37	2.00	215.09	0.21	0.240	0.94
47	Gomphandra corriasea	75.00	50.00	1.61	2.24	1.50	448.77	0.44	0.030	4.29
48	Harpullia arborea	8.33	8.33	0.18	0.37	1.00	147.08	0.14	0.120	0.70
49	Holigarna arnottiana	50.00	25.00	1.07	1.12	2.00	3815.08	3.73	0.080	5.92
50	Holigarna grahami	8.33	8.33	0.18	0.37	1.00	7743.27	7.58	0.120	8.13
51	Holigarna nigra	16.67	16.67	0.36	0.75	1.00	1813.72	1.77	0.060	2.88

52	Hydnocarpus pentandra	8.33	8.33	0.18	0.37	1.00	574.72	0.56	0.120	1.11
53	Knema attenuata	116.67	58.33	2.50	2.61	2.00	988.93	0.97	0.034	6.08
54	Lannea coromandelica	16.67	16.67	0.36	0.75	1.00	175.72	0.17	0.060	1.28
55	Leea indica	16.67	16.67	0.36	0.75	1.00	84.02	0.08	0.060	1.19
56	Litsea corriasea	25.00	25.00	0.54	1.12	1.00	180.74	0.18	0.040	1.83
57	Litsea floribunda	83.33	50.00	1.79	2.24	1.67	108.31	0.11	0.033	4.13
58	Litsea wightiana	66.67	25.00	1.43	1.12	2.67	241.72	0.24	0.107	2.78
59	Macranga peltata	266.67	83.33	5.71	3.73	3.20	573.45	0.56	0.038	10.01
60	Mallotus tetracoccus	8.33	8.33	0.18	0.37	1.00	91.95	0.09	0.120	0.64
61	Memicylon deccanese	8.33	8.33	0.18	0.37	1.00	86.63	0.08	0.120	0.64
62	Memicylon umbellatum	8.33	8.33	0.18	0.37	1.00	147.08	0.14	0.120	0.70
63	Meogyne pannosa	58.33	41.67	1.25	1.87	1.40	106.39	0.10	0.034	3.22
64	Mesua ferrea	150.00	75.00	3.21	3.36	2.00	4236.87	4.15	0.027	10.72
65	Myristica dactyloides	8.33	8.33	0.18	0.37	1.00	305.77	0.30	0.120	0.85
66	Ostodes zeylanicus	25.00	25.00	0.54	1.12	1.00	561.27	0.55	0.040	2.20
67	Otonephilium stipulaceum	58.33	25.00	1.25	1.12	2.33	240.63	0.24	0.093	2.60
68	Palaquium ellipticum	266.67	83.33	5.71	3.73	3.20	3111.61	3.04	0.038	12.49
69	Persea macrantha	25.00	16.67	0.54	0.75	1.50	212.34	0.21	0.090	1.49
70	Polyalthea fragrans	25.00	16.67	0.54	0.75	1.50	408.55	0.40	0.090	1.68
71	Prismatomeris tetrandra	16.67	8.33	0.36	0.37	2.00	133.72	0.13	0.240	0.86
72	Psychotria anamalayana	50.00	25.00	1.07	1.12	2.00	97.44	0.10	0.080	2.29
73	Reinwardtiodendron anamalaiense	216.67	25.00	4.64	1.12	8.67	498.86	0.49	0.347	6.25
74	Schliechera oleosa	250.00	66.67	5.36	2.99	3.75	378.35	0.37	0.056	8.71
75	Strombosea zeylanica	8.33	8.33	0.18	0.37	1.00	3507.95	3.43	0.120	3.98
76	Symplocos cochinchinensis	8.33	8.33	0.18	0.37	1.00	231.95	0.23	0.120	0.78
77	Symplocos rosea	50.00	25.00	1.07	1.12	2.00	104.05	0.10	0.080	2.29

78	Sysigium arnottianum	16.67	16.67	0.36	0.75	1.00	5071.52	4.96	0.060	6.07
79	Sysigium cummini	41.67	16.67	0.89	0.75	2.50	514.19	0.50	0.150	2.14
80	Sysigium laetum	58.33	41.67	1.25	1.87	1.40	121.88	0.12	0.034	3.23
81	Sysigium mundagam	16.67	16.67	0.36	0.75	1.00	78.93	0.08	0.060	1.18
82	Trichilia connaroides	8.33	8.33	0.18	0.37	1.00	120.99	0.12	0.120	0.67
83	Turpinia malabarica	50.00	41.67	1.07	1.87	1.20	658.72	0.64	0.029	3.58
84	Vateria indica	158.33	41.67	3.39	1.87	3.80	520.00	0.51	0.091	5.77
85	Vernonia monosis	58.33	33.33	1.25	1.49	1.75	449.15	0.44	0.053	3.18
86	Xanthophyllum arnottianum	66.67	25.00	1.43	1.12	2.67	179.47	0.18	0.107	2.72
Grand Total		**4666.67**	**2233.33**	**100.00**	**100.00**	**156.86**	**102201.34**	**100.00**	**9.67**	**300.0**

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, No. Sps = Number of species, Qtd. Occ = Quadrate of occurrence, MI = Maturity Index.

Status of Saplings

The sapling status is recorded in table 40. Forty-nine species were recorded in sapling stage. *Psychotria anamalaiense* (25. 38). *Litsea floribunda* (14.77) and *Alseodaphne semicarpifolia* (10.46) are the dominant species with respect to species IVI (in parenthesis). The abundance of *Psychotria anamalaiense,* with respect to species occurrence and high density is notable. *Litsea floribunda* is one of the highly frequent species (Table 40).

Table 40. Vegetation status of saplings of West Coast Tropical Evergreen forests of Sholayar RF (Non selection Felled).

SI. No	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Acronychia pedunculata	10	10	0.56	1.23	1	25.77	1.84	0.100	3.64
2	Actinodaphne malabarica	30	10	1.69	1.23	3	36.20	2.59	0.300	5.52
3	Aglaia barberi	30	10	1.69	1.23	3	15.59	1.11	0.300	4.04
4	Aglaia perviridis	20	10	1.13	1.23	2	24.36	1.74	0.200	4.10
5	Agrostistachys borneensis	10	10	0.56	1.23	1	25.77	1.84	0.100	3.64
6	Alseodaphne semicarpifolia	60	30	3.39	3.70	2	47.10	3.36	0.067	10.46
7	Apodytes dimidiata	10	10	0.56	1.23	1	42.08	3.01	0.100	4.81
8	Aporusa lindleyana	20	20	1.13	2.47	1	33.43	2.39	0.050	5.99
9	Ardisia sonchifolia	10	10	0.56	1.23	1	57.99	4.14	0.100	5.94
10	Atlantia racemosa	10	10	0.56	1.23	1	28.72	2.05	0.100	3.85
11	Baccaurea courtallensis	10	10	0.56	1.23	1	31.82	2.27	0.100	4.07
12	Canarium strictum	10	10	0.56	1.23	1	11.45	0.82	0.100	2.62
13	Catunaragam spinosum	70	10	3.95	1.23	7	14.04	1.00	0.700	6.19
14	Chukrasia tabularis	20	10	1.13	1.23	2	20.36	1.45	0.200	3.82
15	Cleidion javanicum	10	10	0.56	1.23	1	22.99	1.64	0.100	3.44
16	Croton malabaricus	30	10	1.69	1.23	3	14.14	1.01	0.300	3.94
17	Cullenia exarillata	30	20	1.69	2.47	2	47.10	3.36	0.075	7.53
18	Dendrocnide sinuate	60	30	3.39	3.70	2	26.74	1.91	0.067	9.00
19	Diospyros paniculata	50	30	2.82	3.70	2	24.08	1.72	0.056	8.25
20	Dipterocarpus indicus	10	10	0.56	1.23	1	28.72	2.05	0.100	3.85

21	Drypetes elata	10	10	0.56	1.23	1	45.82	3.27	0.100	5.07
22	Garcinia morella	10	10	0.56	1.23	1	20.36	1.45	0.100	3.25
23	Gnidia glauca	20	10	1.13	1.23	2	31.82	2.27	0.200	4.64
24	Gomphandra coriacea	10	10	0.56	1.23	1	42.08	3.01	0.100	4.81
25	Guania microcarpa	60	20	3.39	2.47	3	27.72	1.98	0.150	7.84
26	Hydnocarpus pentandra	10	10	0.56	1.23	1	31.82	2.27	0.100	4.07
27	Ixora brachiata	50	20	2.82	2.47	3	20.36	1.45	0.125	6.75
28	Leea indica	40	20	2.26	2.47	2	25.77	1.84	0.100	6.57
29	Litsea deccanensis	30	10	1.69	1.23	3	17.90	1.28	0.300	4.21
30	Litsea floribunda	90	60	5.08	7.41	2	31.82	2.27	0.025	14.77
31	Mallotus philippensis	10	10	0.56	1.23	1	66.90	4.78	0.100	6.58
32	Meiogyne pannosa	30	20	1.69	2.47	2	21.22	1.52	0.075	5.68
33	Memecylon deccanense	30	20	1.69	2.47	2	27.72	1.98	0.075	6.14
34	Memecylon subramaniani	10	10	0.56	1.23	1	20.36	1.45	0.100	3.25
35	Mesua ferrea	20	10	1.13	1.23	2	42.08	3.01	0.200	5.37
36	Myristica dactyloides	10	10	0.56	1.23	1	28.72	2.05	0.100	3.85
37	Ostodes zeylanicus	20	10	1.13	1.23	2	10.52	0.75	0.200	3.12
38	Otonephelium stipulaceum	50	10	2.82	1.23	5	21.39	1.53	0.500	5.59
39	Palaquium ellipticum	80	20	4.52	2.47	4	16.72	1.19	0.200	8.18
40	Persea	50	30	2.82	3.70	2	20.88	1.49	0.056	8.02
41	Psychotria anamalayana	300	50	16.95	6.17	6	31.61	2.26	0.120	25.38
42	Reinwardtidendron anamalaiense	70	20	3.95	2.47	4	22.22	1.59	0.175	8.01
43	Schleichera oleosa	70	30	3.95	3.70	2	21.47	1.53	0.078	9.19
44	Symplocos rosea	40	30	2.26	3.70	1	27.97	2.00	0.044	7.96
45	Symplocos sp.	10	10	0.56	1.23	1	9.63	0.69	0.100	2.49
46	Syzygium arnottianum	80	20	4.52	2.47	4	33.02	2.36	0.200	9.35

47	Syzygium mundagam	30	20	1.69	2.47	2	30.77	2.20	0.075	6.36
48	Terpenia malabarica	10	10	0.56	1.23	1	22.99	1.64	0.100	3.44
49	Xanthophyllum arnottianum	10	10	0.56	1.23	1	49.72	3.55	0.100	5.35
Grand Total		**1770**	**810**	**100**	**100**	**98**	**1400.0**	**100.00**	**7.112**	**300.0**

MI=16.53

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, No.Sps = Number of species, Qtd. Occ = Quadrate of occurrence, MI = Maturity Index.

Status of Seedlings

The regeneration status of seedlings in non- selection felled evergreen forests of Sholayar area was critically studied (Table 41). In the study area 81 species were recorded in regeneration stage. The percentage of unestablished, established and that of advanced growths were worked as 58, 19 and 22 respectively. With regard to seedling establishment, high rate of initial mortality was observed in the case of *Alseodaphne semicarpifolia* (76%), *Atlantia racemosa* (71%), *Catunaragam spinosum* (78%), *Leea indica* (73%), *Litsea floribunda* (68%), *Memecylon malabaricum* (91%), *Palaquium ellipticum* (83%), *Psychtria anamalayana* (63%), *Reinwardtiodendron anamalaiense* (40%), *Schleichera oleosa* (90%), *Syzigium arnottianum* (77%) and *Syzigium mundagam* (63%) – Table 41.

Table. 41. Regeneration status of seedlings of West Coast Tropical forests of Sholayar RF (Non selection Felled)

Sl. No.	Species	UE	E	A	TS
1	Acronychia pedunculata	2	3	1	6
2	Actinodaphne companulata	2	1	1	4
3	Actinodaphne malabarica	7	3	1	11
4	Aglaia barberi	3	0	0	3
5	Aglaia lawii	2	2	1	5
6	Aglaia perviridis	2	0	1	3
7	Agrostistachys borneensis	2	2	5	9
8	Allophyllus cobbe	1	1	0	2
9	Alseodaphne semicarpifolia	10	2	1	13
10	Antidesma menasu	1	0	1	2
11	Aphanamixis polystachya	1	0	0	1

12	Apodytes dimidiata	1	0	4	5
13	Aporusa lindleyana	2	1	1	4
14	Ardisia sonchifolia	2	0	1	3
15	Atlantia racemosa	10	2	2	14
16	Baccaurea courtallensis	1	0	0	1
17	Canarium strictum	1	0	0	1
18	Canthium rheedii	1	0	0	1
19	Casaria esculanta	2	0	1	3
20	Catunaragam spinosum	14	2	2	18
21	Chukrasia tabularis	3	0	0	3
22	Cinnamomum keralensis	7	1	0	8
23	Clausena indica	3	1	1	5
24	Cleidion javanicum	1	0	0	1
25	Cullenia exarillata	5	2	1	8
26	Dendrocnide sinuata	2	1	1	4
27	Dimocarpus longan	7	0	3	10
28	Dimorphocalyx lawianus	0	2	0	2
29	Diospyros candolleana	1	1	0	2
30	Diospyros paniculata	4	0	3	7
31	Dipterocarpus indicus	7	3	2	12
32	Drypetes elata	5	1	2	8
33	Dysoxylum malabaricum	1	2	1	4
34	Flaccourtia montana	4	1	1	6
35	Garcinea gummi-gutta	1	0	1	2
36	Garcinia morella	1	0	4	5
37	Gnidia glauca	2	0	0	2
38	Gomphandra coriacea	1	0	8	9
39	Guania microcarpa	1	2	0	3
40	Hydnocarpus pentandra	1	0	11	12
41	Ixora brachiata	5	1	1	7
42	Knema attenuata	1	1	7	9
43	Laportea crenulata	3	0	0	3
44	Leea indica	11	1	3	15
45	Litsea coriacea	2	2	1	5
46	Litsea deccanensis	3	2	1	6
47	Litsea floribunda	15	1	6	22
48	Litsea wightiana	5	2	1	8
49	Macaranga peltata	1	0	0	1
50	Mallotus philippensis	5	3	1	9
51	Meiogyne pannosa	4	2	4	10
52	Memecylon deccanense	10	0	1	11
53	Memecylon malabaricum	5	1	1	7

54	Memecylon umbellatum	2	1	1	4
55	Meogyne pannosa	7	3	1	11
56	Mesua ferrea	8	3	3	14
57	Mesua thwaitesii	0	2	1	3
58	Myristica dactyloides	1	7	3	11
59	Neolitsea scorbiculata	3	2	0	5
60	Symplocos sp	0	1	3	4
61	Olea dioica	1	3	3	7
62	Ostodes zeylanicus	8	3	2	13
63	Otonephelium stipulaceum	6	2	3	11
64	Palaquium ellipticum	15	2	1	18
65	Persea macrantha	2	1	1	4
66	Pheanthus malabaricus	2	0	2	4
67	Polyalthia fragrans	2	0	5	7
68	Psychotria anamalayana	31	10	8	49
69	Reinwardtidendron anamalaiense	17	13	12	42
70	Schleichera oleosa	14	0	0	14
71	Schleichera oleosa	19	2	0	21
72	Symplocos rosea	6	1	0	7
73	Syzygium arnottianum	17	5	2	24
74	Syzygium cumini	2	0	0	2
75	Syzygium elatum	2	6	0	8
76	Syzygium lanceolatum	4	1	1	6
77	Syzygium mundagam	10	3	3	16
78	Terpenia malabarica	1	0	0	1
79	Vateria indica	3	2	1	6
80	Vepris bilocularis	1	1	0	2
81	*Xanthophyllum arnottianum*	1	0	0	1
Grand Total		**379**	**126**	**145**	**650**

3.West Coast Tropical Semi Evergreen forests of Sholayar RF (Selection Felled)

Status of Tree Vegetation

Tree vegetation status was recorded and the dominant species as per IVI status (in parenthesis) are *Aglaia lawii* (30.49), *Lagerstroemia lanceolata* (45.71) and *Terminalia bellirica* (39.75). The number of tree species recorded is less (15 only) when compared to Evergreen types in the area. (Table.42).

Table 42. Vegetation status of trees of West Coast Tropical Semi Evergreen forests of Sholayar RF (Selection Felled)

SI.No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Aglaia lawii	800	100	22.86	6.67	8	312.09	0.97	0.080	30.49
2	Atlantia racemosa	100	100	2.86	6.67	1	447.44	1.39	0.010	10.91
3	Baccaurea courtallensis	400	100	11.43	6.67	4	84.28	0.26	0.040	18.36
4	Chukrasia tabularis	300	100	8.57	6.67	3	1566.52	4.86	0.030	20.10
5	Clausena heptaphylla	100	100	2.86	6.67	1	509.09	1.58	0.010	11.10
6	Diospyros paniculata	400	100	11.43	6.67	4	988.93	3.07	0.040	21.16
7	Dysoxylon malabaricum	100	100	2.86	6.67	1	2722.44	8.45	0.010	17.97
8	Garcinea spicata	300	100	8.57	6.67	3	326.50	1.01	0.030	16.25
9	Lagerstroemia lanceolata	200	100	5.71	6.67	2	10743.11	33.33	0.020	45.71
10	Litsea deccanesii	100	100	2.86	6.67	1	509.09	1.58	0.010	11.10
11	Olea dioica	100	100	2.86	6.67	1	644.32	2.00	0.010	11.52
12	Polyalthea fragrans	300	100	8.57	6.67	3	180.74	0.56	0.030	15.80
13	Schleichera oleosa	100	100	2.86	6.67	1	876.99	2.72	0.010	12.24
14	Terminalia bellirica	100	100	2.86	6.67	1	9744.32	30.23	0.010	39.75
15	Vitex altissima	100	100	2.86	6.67	1	2577.27	8.00	0.010	17.52
Grand Total		**3500**	**1500**	**100**	**100**	**35**	**32233**	**100**	**0.3500**	**300**

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, No. Sps = Number of species, Qtd. Occ = Quadrate of occurrence, MI = Maturity Index

Status of Saplings

Altogether 54 species were recorded in sapling stage, of which the following 5 species shows high IVI, *viz., Reinwardtiodendron anamalaiense* (16.13), *Agrostisstachys borneensis* (12.86), *Cullenia exarillata* (12.72), *Knema attenuata* (11.85) and *Palaquium ellipticum* (10.43) – in parenthesis. *Chukrasia tabulensis* and Litsea floribunda are having maximum Relative Basal Area, viz., 4.50 and 3.18 respectively. High density was observed in the case of *Agrostistachys borneensis*, *Cullenia exarillata* and *Reinwarrdtiodendron anamalaiense* (Table 43).

Table 43. Vegetation status of saplings of West Coast Tropical Semi Evergreen forests of Sholayar RF (Selection Felled)

Sl.No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	100	100	9.09	14.29	1.00	42.08	19.18	0.010	42.56
2	Cassaria esculenta	300	100	27.27	14.29	3.00	19.52	8.90	0.030	50.46
3	Dysoxylum malabaricum	200	100	18.18	14.29	2.00	9.80	4.47	0.020	36.94
4	Hydnocarpus pentandra	100	100	9.09	14.29	1.00	17.90	8.16	0.010	31.54
5	Mallotus distans	200	100	18.18	14.29	2.00	49.72	22.66	0.020	55.13
6	Polyalthia fragrans	100	100	9.09	14.29	1.00	13.44	6.13	0.010	29.51
7	Vipris bilocularis	100	100	9.09	14.29	1.00	66.90	30.50	0.010	53.87
Grand Total		**1100**	**700**	**100**	**100**	**11**	**219**	**100**	**0.1100**	**300**

Status of Seedlings

With respect to seedling regeneration of selection felled WCT evergreen forests, 73 species were recorded in regeneration stage. The percentage wise status of unestablished, established and advanced growth seedlings were, 40, 23and 37respectively. Detailed distribution statuses of seedlings in different classes are given in Table 44.

Table 44. Regeneration status of seedlings West Coast Tropical Evergreen forests of Sholayar RF (Selection Felled)

Sl. No	Species	UE	E	A	TS
1	Actinodaphne malabarica	1	0	9	10
2	Aglaia barberi	1	0	0	1
3	Aglaia lawii	0	0	18	18
4	Aglaia malabarica	1	0	5	6
5	Aglaia simplicifolia	3	0	0	3
6	Agrostistachys borneensis	20	1	20	41
7	Alseodaphne semicarpifolia	7	0	2	9
8	Antidesma menasu	2	0	0	2
9	Aporusa lindleyana	10	0	0	10
10	Baccaurea courtallensis	11	1	0	12
11	Canarium strictum	0	1	0	1
12	Carayota urense	13	4	3	20
13	Chukrasia tabularis	19	5	24	48
14	Cinnamomum keralensis	4	2	1	7
15	Cinnamomum malabatrum	0	2	4	6
16	Clausena indica	15	2	8	25
17	Cleidion javanicum	0	0	1	1
18	Croton malabaricus	5	0	4	9
19	Croton zeylanicus	1	0	0	1

20	Cullenia exarillata	33	5	15	53
21	Dendrocnide sinuata	39	10	21	70
22	Dillenia pentagyna	1	0	0	1
23	Diospyros paniculata	14	4	6	24
24	Dipterocarpus indicus	7	2	1	10
25	Drypetes elata	19	3	4	26
26	Dysoxylum malabaricum	13	10	8	31
27	Elaeocarpus serratus	2	0	1	3
28	Euodia lunu-ankenda	4	1	3	8
29	Flaccourtia montana	2	0	0	2
30	Garcinea gummi-gutta	10	2	2	14
31	Garcinia morella	1	0	1	2
32	Goniothalamus rhyncantherus	2	1	0	3
33	Holigarna arnottiana	1	0	1	2
34	Hopea parviflora	2	6	1	9
35	Humboldtia vahliana	1	0	0	1
36	Hydnocarpus pentandra	4	0	1	5
37	Ixora brachiata	3	0	6	9
38	Kingiodendron pinnatum	4	1	0	5
39	Knema attenuata	23	4	8	35
40	Leea indica	3	0	0	3
41	Litsea deccanensis	1	0	1	2
42	Litsea floribunda	5	0	0	5
43	Litsea wightiana	6	0	0	6
44	Mallotus atrovirens	3	1	2	6
45	Mallotus philippensis	0	1	0	1
46	Mastixia arborea	2	0	0	2
47	Memecylon deccanense	11	2	3	16
48	Memecylon umbellatum	1	0	0	1
49	Meiogyne pannosa	4	3	0	7
50	Mesua ferrea	16	4	2	22
51	Mesua thwaitesii	2	3	1	6
52	Myristica dactyloides	2	0	1	3
53	Neolitsea scorbiculata	0	0	1	1
54	Neolitsia sp.	3	1	1	5
55	Ostodes zeylanicus	4	1	2	7
56	Otonephelium stipulaceum	30	12	13	55
57	Palaquium ellipticum	17	4	8	29
58	Persea macrantha	2	0	0	2
59	Pheanthus malabaricus	1	1	0	2
60	Polyalthia fragrans	33	11	7	51
61	Psychotria anamalayana	9	0	5	14
62	Reinwardtidendron anamalaiense	350	98	83	531
63	Schleichera oleosa	22	20	19	61
64	Strombosea zeylanica	7	5	2	14

65	Strychnos nux vamica	0	0	1	1
66	Symplocos rosea	7	3	3	13
67	Syzygium arnottianum	12	1	4	17
68	Syzygium cumini	5	2	2	9
69	Syzygium elatum	4	2	2	8
70	Syzygium lanceolatum	1	0	0	1
71	Syzygium mundagam	6	1	2	9
72	Syzygium munronii	11	0	2	13
73	Tetrameles nudiflora	1	0	0	1
74	Vateria indica	7	1	1	9
75	*Vepris bilocularis*	13	8	3	24
76	*Vernonia monosis*	1	0	1	2
77	*Xanthophyllum arnottianum*	12	4	2	18
Total		**912**	**252**	**352**	**1516**

4. Moist deciduous Forests

Status of tree vegetation

Eighteen species were recorded from the moist deciduous forest type of the area. The maturity index of the study site is considerably high (58.33), when compared to other types. The species with maximum IVI are *Cinnamomum malabaricum* (49.19) *Lagerstroemia lanceolata* (29.19), *Terminalia paniculata* (27.91), *Xylia xylocarpa* (39.52) and *Grewia tilifolia* (20.46). Highest tree density was observed in the case of *Xylia xylocarpa, Lagerstroemia lanceolata, Terminalia paniculata* and *Grewia tiliifolia* (Table.45).

Table 45. Vegetation status of trees of Moist Deciduous forests of Sholayar RF

SI. No.	Species	D		RD	RF	AB	BA	RBA	AB/F	IVI
1	Albizzia lebbeck	50.00	50.00	1.27	4.76	1.00	2036.36	9.33	0.020	15.36
2	Cassia fistula	50.00	50.00	1.27	4.76	1.00	240.63	1.10	0.020	7.13
3	Cinnamomum malanbatrum	100.00	50.00	2.53	4.76	2.00	9141.44	41.90	0.040	49.19
4	Croton malabaricus	50.00	50.00	1.27	4.76	1.00	72.55	0.33	0.020	6.36
5	Erithrina indica	50.00	50.00	1.27	4.76	1.00	602.08	2.76	0.020	8.79
6	Euodea lunu-ankenda	150.00	100.00	3.80	9.52	1.50	196.22	0.90	0.015	14.22
7	Garcinea gummi-gutta	50.00	50.00	1.27	4.76	1.00	114.86	0.53	0.020	6.55
8	Grewia tilaefolia	400.00	50.00	10.13	4.76	8.00	1215.70	5.57	0.160	20.46
9	Holoptelia integrifolia	50.00	50.00	1.27	4.76	1.00	927.82	4.25	0.020	10.28
10	Ixora brachiata	50.00	50.00	1.27	4.76	1.00	763.95	3.50	0.020	9.53

11	Lagerstroemia lanceolata	650.00	100.00	16.46	9.52	6.50	700.56	3.21	0.065	29.19
12	Macranga peltata	50.00	50.00	1.27	4.76	1.00	389.77	1.79	0.020	7.81
13	Mallotus philippensis	150.00	50.00	3.80	4.76	3.00	234.83	1.08	0.060	9.64
14	Olea dioica	150.00	50.00	3.80	4.76	3.00	178.22	0.82	0.060	9.38
15	Schleichera oleosa	50.00	50.00	1.27	4.76	1.00	2245.09	10.29	0.020	16.32
16	Terminalia paniculata	500.00	100.00	12.66	9.52	5.00	1262.86	5.79	0.050	27.97
17	Wrightia tinctoria	150.00	50.00	3.80	4.76	3.00	816.81	3.74	0.060	12.30
18	Xylia xylocarpa	1250.00	50.00	31.65	4.76	25.00	678.67	3.11	0.500	39.52
Grand total		**3950.00**	**1050.00**	**100.00**	**100.00**	**66.00**	**21818.44**	**100.00**	**1.190**	**300.00**

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index

Status of Saplings

Vegetation status of saplings in moist deciduous forest was worked out (Table 46). Eleven species were recorded, of which *Xylia xylocarpa*, *Wrightia tinctoria* and *Allophyllus cobbe* are the dominant species, having IVI 57,90, 36.37 and 29.82 respectively. The density status of *Xylia xylocarpa* and *Wrightia tinctoria* are more when compared to others.

Table 46. Vegetation status of saplings of Moist Deciduous forests of Sholayar RF

SI. NO	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Allophyllus cobbe	150	50	10.71	9.09	3	25.77	10.02	0.060	29.82
2	Cinnamomum malabatrum	50	50	3.57	9.09	1	22.99	8.94	0.020	21.60
3	Cleidion javanicum	50	50	3.57	9.09	1	38.50	14.97	0.020	27.63
4	Diospyros paniculata	50	50	3.57	9.09	1	25.77	10.02	0.020	22.68
5	Gmelina arborea	50	50	3.57	9.09	1	17.90	6.96	0.020	19.62
6	Mallotus philippensis	100	50	7.14	9.09	2	17.90	6.96	0.040	23.19
7	Olea dioica	50	50	3.57	9.09	1	9.63	3.74	0.020	16.40
8	Symplocos rosea	100	50	7.14	9.09	2	17.90	6.96	0.040	23.19
9	Taberna montana gamblei	50	50	3.57	9.09	1	22.99	8.94	0.020	21.60
10	Wrightia tinctoria	200	50	14.29	9.09	4	33.43	12.99	0.080	36.37
11	Xylia xylocarpa	550	50	39.29	9.09	11	24.49	9.52	0.220	57.90
Grand Total		**1400**	**550**	**100**	**100**	**28**	**257**	**100**	**0.5600**	**300**

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, No. Sps = Number of species, Qtd. Occ = Quadrate of occurrence, MI = Maturity Index.

Status of Seedlings

Twenty-two species were recorded in seedling stage. The percentage distribution of unestablished, established and advanced growth stages of seedlings were worked out as 70, 21 and 9 respectively (Table 47).

Table 47. Regeneration status of seedlings of Moist Deciduous forests of Sholayar RF

Sl. No	Species	UE	E	A	TS
1	Actinodaphne malabarica	7	1	2	10
2	Allophyllus cobbe	8	5	0	13
3	Aporusa lindleyana	2	1	0	3
4	Cinnamomum malabatrum	2	0	2	4
5	Cleidion javanicum	1	0	0	1
6	Croton malabaricus	2	1	0	3
7	Dalbergia latifolia	2	0	0	2
8	Diospyros paniculata	1	0	0	1
9	Dysoxylum malabaricum	2	0	0	2
10	Euodia lunu-ankenda	2	2	0	4
11	Gmelina arborea	1	0	0	1
12	Mallotus philippensis	7	1	2	10
13	Olea dioica	2	0	2	4
14	Polyalthia fragrans	2	1	0	3
15	Schleichera oleosa	1	0	0	1
16	Schleichera oleosa	0	1	0	1
17	Sterculia guttata	2	1	0	3
18	Strombosea zeylanica	1	1	0	2
19	Symplocos rosea	2	0	0	2
20	Taberna montana gamblei	1	3	0	4
21	Wrightia tinctoria	5	1	0	6
22	Xylia xylocarpa	13	1	0	14
Total		**66**	**20**	**8**	**94**

C. VEGETATION STATUS OF KOTTIYUR RESERVED FORESTS OF NORTHERN CIRCLE

1. West-Coast Tropical Evergreen Forests (Non Selection Felled)

Status of Tree Vegetation

The five dominant species with respect to IVI are *Persea macarantha* (29.45), *Palaquium elliipticum* (29.29), *Vatteria in*dica (23.94), *Knema attenuata* (21.00) and *Drypetus elata* (20.22) – IVI in parenthesis. *Drypetus elata, Palaquium ellipticum* and *Syzigium cumini* are the most frequent species in the area. (Table.48). *Knema attenuata, Vateria indica, Palaquium ellipticum, Drypitus elata* and *Syzigium cumini* are highly dense in the area. There are 27 species recorded, of which *Persea macrantha* is having highest relative basal area (3676.99).

Table 48. Vegetation status of trees of West Coast Tropical Evergreen forests of Kottiyur RF (Non-selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Agleia barberi	50.00	50.00	0.91	3.33	1.00	168.32	1.11	0.020	5.35
2	Calophyllum polyanthum	50.00	50.00	0.91	3.33	1.00	717.90	4.74	0.020	8.99
3	Chionanthus mala elengi	100.00	50.00	1.82	3.33	2.00	245.02	1.62	0.040	6.77
4	Chukrasia tabularis	100.00	50.00	1.82	3.33	2.00	267.59	1.77	0.040	6.92
5	Cinnamomum keralensis	50.00	50.00	0.91	3.33	1.00	389.77	2.58	0.020	6.82
6	Diospyros paniculata	50.00	50.00	0.91	3.33	1.00	315.72	2.09	0.020	6.33
7	Dipterocarpus indica	100.00	50.00	1.82	3.33	2.00	541.41	3.58	0.040	8.73
8	Drypetus elata	550.00	100.00	10.00	6.67	5.50	537.24	3.55	0.055	20.22
9	Ficus hispida	50.00	50.00	0.91	3.33	1.00	161.08	1.06	0.020	5.31
10	Garcinea gummi-gutta	100.00	50.00	1.82	3.33	2.00	1033.77	6.83	0.040	11.98
11	Holigarna arnottiana	150.00	50.00	2.73	3.33	3.00	1033.77	6.83	0.060	12.89
12	Holigarna grahamii	50.00	50.00	0.91	3.33	1.00	412.36	2.72	0.020	6.97

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
13	Hopea parviflora	50.00	50.00	0.91	3.33	1.00	644.32	4.26	0.020	8.50
14	Knema attenuata	1050.00	50.00	19.09	3.33	21.00	452.00	2.99	0.420	25.41
15	Macranga peltata	50.00	50.00	0.91	3.33	1.00	133.72	0.88	0.020	5.13
16	Myristica dactyloides	100.00	50.00	1.82	3.33	2.00	172.00	1.14	0.040	6.29
17	Otonephilium stipulaceum	50.00	50.00	0.91	3.33	1.00	127.27	0.84	0.020	5.08
18	Palaquium ellipticum	750.00	100.00	13.64	6.67	7.50	1359.53	8.98	0.075	29.29
19	Persea macrantha	100.00	50.00	1.82	3.33	2.00	3676.99	24.29	0.040	29.45
20	Schleichera oleosa	50.00	50.00	0.91	3.33	1.00	827.59	5.47	0.020	9.71
21	Sterculea guttata	50.00	50.00	0.91	3.33	1.00	114.86	0.76	0.020	5.00
22	Strombosea zeylanica	100.00	50.00	1.82	3.33	2.00	168.32	1.11	0.040	6.26
23	Sysigium cummini	400.00	100.00	7.27	6.67	4.00	706.61	4.67	0.040	18.61
24	Sysigium laetum	100.00	50.00	1.82	3.33	2.00	187.11	1.24	0.040	6.39
25	Sysigium lanceolatum	100.00	50.00	1.82	3.33	2.00	198.86	1.31	0.040	6.47
26	Vateria indica	1000.00	50.00	18.18	3.33	20.00	366.74	2.42	0.400	23.94
27	Xanthophyllum arnottianum	150.00	50.00	2.73	3.33	3.00	175.72	1.16	0.060	7.22
Grand total		**5500**	**1500**	**100**	**99.93**	**93.00**	**15135.59**	**100**	**1.690**	**300**

MI=55.56

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Saplings

Very few species were recorded in sapling stage (Table. 49). *Drypetus elata, Vateria indica, Knema attenuata* and *Palaquium elipticum* are the dominant species.

Table 49 . Vegetation status of saplings of West Coast Tropical Evergreen forests of Kottiyur RF (Non selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Aglaia lawii	100.00	50.00	8.70	7.69	2.00	25.77	8.98	0.040	25.37
2	Cinnamomum malabatrum	50.00	50.00	4.35	7.69	1.00	31.82	11.09	0.020	23.13
3	Dipterocarpus indicus	100.00	50.00	8.70	7.69	2.00	35.08	12.23	0.040	28.62
4	Drypetes elata	200.00	100.00	17.39	15.38	2.00	16.72	5.83	0.020	38.61
5	Dysoxylum fisciformi	50.00	50.00	4.35	7.69	1.00	25.77	8.98	0.020	21.02
6	Garcinea morella	50.00	50.00	4.35	7.69	1.00	13.44	4.69	0.020	16.73
7	Knema attenuata	100.00	50.00	8.70	7.69	2.00	47.75	16.64	0.040	33.03
8	Myristica dactyloides	50.00	50.00	4.35	7.69	1.00	13.44	4.69	0.020	16.73
9	Palaquium ellipticum	100.00	100.00	8.70	15.38	1.00	17.90	6.24	0.010	30.32
10	Strombosea zeylanica	100.00	50.00	8.70	7.69	2.00	33.43	11.65	0.040	28.04
11	Vateria indica	250.00	50.00	21.74	7.69	5.00	25.77	8.98	0.100	38.41
Grand total		**1150.00**	**650.00**	**100.00**	**99.97**	**20.00**	**286.89**	**100.00**	**0.370**	**300**

MI=56.09

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Seedling

Thirteen species were recorded in seedling stage of which *Syzigium calophyllifolium* (44.23), *Syzigium mundagam* (36.57) and *Vateria indica* (32.56) are the dominatnt species – IVI in parenthesis. High regeneration was observed in the case of *Syzigium mundagam*, *Strombosea zeylanica* and *Syzigium callophyllifolium* (Table50).

Table 50. Vegetation status of seedlings of West Coast Tropical Evergreen forests of Kottiyoor RF (Non selection felled)

Sl. No.	Species	D	F	RD		AB	BA	RBA	AB/F	IVI
1	Aglaia lawii	400.00	50.00	10.00	6.25	8.00	0.02	0.06	0.160	16.31
2	Dipterocarpus indicus	100.00	50.00	2.50	6.25	2.00	0.72	2.29	0.040	11.04
3	Garcinea morella	150.00	50.00	3.75	6.25	3.00	2.86	9.17	0.060	19.17
4	Muraya paniculata	50.00	50.00	1.25	6.25	1.00	3.90	12.49	0.020	19.99
5	Myristica dactyloides	300.00	50.00	7.50	6.25	6.00	1.61	5.16	0.120	18.91
6	Palaquium ellipticum	350.00	100.00	8.75	12.50	3.50	1.56	5.00	0.035	26.25
7	Schleichera oleosa	150.00	50.00	3.75	6.25	3.00	0.03	0.09	0.060	10.09
8	Strombosea zeylanica	500.00	50.00	12.50	6.25	10.00	0.04	0.14	0.200	18.89
9	Syzygium calophyllifolium	500.00	50.00	12.50	6.25	10.00	7.95	25.48	0.200	44.23
10	Syzygium cumini	200.00	50.00	5.00	6.25	4.00	3.11	9.96	0.080	21.21
11	Syzygium mundagam	550.00	100.00	13.75	12.50	5.50	3.22	10.32	0.055	36.57
12	Vateria indica	400.00	50.00	10.00	6.25	8.00	5.09	16.31	0.160	32.56
13	Xanthophyllum arnottianum	350.00	100.00	8.75	12.50	3.50	1.10	3.52	0.035	24.77
Grand total		**4000**	**800**	**100**	**100**	**67.50**	**31.21**	**100**	**1.225**	**300**

MI=61.54

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

2. West-Coast Tropical Evergreen Forests of **Kottiyur RF.** (Selection Felled).

Status of Tree Vegetation

Fifty species were recorded from the area. The dominant species with respect to IVI (IVI above 10) are *Myristica dactyloides, Knema attenuata, Drypetus elata, Vitex altissima, Ixora brachiata* (Table.51). Species with high basal area are *Carallia bracheata, Vitex altissima* and *Hopea parviflora* (basal area more than 2000). *Myristica dactyloides, Knema attenuata, Dipterocarpus indica* and *Drypetus elata* are having high density (Table. 51).

Table 51. Vegetation status of trees of West Coast Tropical Evergreen forests of Kottiyoor RF (Selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Achronichea pedunculata	55.56	44.44	1.18	2.60	1.25	723.96	1.78	0.028	5.55
2	Actinodaphne malabarica	33.33	22.22	0.71	1.30	1.50	133.72	0.33	0.068	2.33
3	Adenanthera pavonia	11.11	11.11	0.24	0.65	1.00	389.77	0.96	0.090	1.84
4	Agleia barberi	33.33	22.22	0.71	1.30	1.50	325.82	0.80	0.068	2.80
5	Alstonia scholaris	11.11	11.11	0.24	0.65	1.00	843.90	2.07	0.090	2.96
6	Aporusa linleyana	66.67	33.33	1.41	1.95	2.00	255.43	0.63	0.060	3.99
7	Artocarpus hirsutus	11.11	11.11	0.24	0.65	1.00	1603.95	3.94	0.090	4.82
8	Baccaurea courtallensis	44.44	22.22	0.94	1.30	2.00	189.04	0.46	0.090	2.70
9	Calophyllum inophyllum	33.33	22.22	0.71	1.30	1.50	319.07	0.78	0.068	2.79
10	Canthium rheedii	11.11	11.11	0.24	0.65	1.00	346.50	0.85	0.090	1.74
11	Carallia brachiata	11.11	11.11	0.24	0.65	1.00	3920.32	9.62	0.090	10.51
12	Chukrasia tabularis	133.3	55.56	2.82	3.25	2.40	363.32	0.89	0.043	6.96
13	Cinnamomum keralensis	55.56	44.44	1.18	2.60	1.25	428.56	1.05	0.028	4.83
14	Diospyros paniculata	144.44	55.56	3.06	3.25	2.60	754.39	1.85	0.047	8.16
15	Dipterocarpus indica	300.00	33.33	6.35	1.95	9.00	575.22	1.41	0.270	9.71
16	Drypetus elata	400.00	44.44	8.47	2.60	9.00	835.27	2.05	0.203	13.12
17	Dysoxylum fusiformi	22.22	11.11	0.47	0.65	2.00	1449.72	3.56	0.180	4.68
18	Dysoxylum malabaricum	55.56	44.44	1.18	2.60	1.25	1458.32	3.58	0.028	7.35
19	Garcinea gummi-gutta	88.89	44.44	1.88	2.60	2.00	602.08	1.48	0.045	5.96
20	Gmelina arborea	22.22	11.11	0.47	0.65	2.00	1777.86	4.36	0.180	5.48
21	Holigarna arnottiana	33.33	22.22	0.71	1.30	1.50	504.86	1.24	0.068	3.24
22	Hopea parviflora	77.78	44.44	1.65	2.60	1.75	2524.37	6.20	0.039	10.44
23	Hydnocarpus pentandra	33.33	33.33	0.71	1.95	1.00	215.09	0.53	0.030	3.18
24	Ixora brachiata	288.89	66.67	6.12	3.90	4.33	163.35	0.40	0.065	10.41

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
25	Kingiodendron pinnatum	133.33	44.44	2.82	2.60	3.00	1482.11	3.64	0.068	9.06
26	Knema attenuata	388.89	77.78	8.24	4.55	5.00	334.37	0.82	0.064	13.60
27	Lannea coromandelica	44.44	11.11	0.94	0.65	4.00	346.50	0.85	0.360	2.44
28	Litsea corriasea	11.11	11.11	0.24	0.65	1.00	240.63	0.59	0.090	1.48
29	Lophopetalum wightianum	44.44	11.11	0.94	0.65	4.00	328.37	0.81	0.360	2.40
30	Macranga peltata	22.22	22.22	0.47	1.30	1.00	300.86	0.74	0.045	2.51
31	Mallotus philipensis	11.11	11.11	0.24	0.65	1.00	630.08	1.55	0.090	2.43
32	Mallotus tetracoccus	33.33	22.22	0.71	1.30	1.50	190.99	0.47	0.068	2.47
33	Melia dubia	11.11	11.11	0.24	0.65	1.00	114.86	0.28	0.090	1.17
34	Myristica dactyloides	422.22	77.78	8.94	4.55	5.43	445.87	1.09	0.070	14.58
35	Olea dioica	144.44	66.67	3.06	3.90	2.17	415.90	1.02	0.033	7.98
36	Otonephilium stipulaceum	111.11	33.33	2.35	1.95	3.33	254.11	0.62	0.100	4.92
37	Palaquium ellipticum	11.11	11.11	0.24	0.65	1.00	616.00	1.51	0.090	2.40
38	Persea macrantha	22.22	22.22	0.47	1.30	1.00	418.11	1.03	0.045	2.80
39	Polyalthea fragrans	155.56	55.56	3.29	3.25	2.80	512.73	1.26	0.050	7.80
40	Schleichera oleosa	55.56	33.33	1.18	1.95	1.67	880.33	2.16	0.050	5.29
41	Sterculea guttata	33.33	22.22	0.71	1.30	1.50	843.90	2.07	0.068	4.08
42	Stereospermum collais	122.22	44.44	2.59	2.60	2.75	1809.35	4.44	0.062	9.63
43	Steriospermum collais	11.11	11.11	0.24	0.65	1.00				
44	Strombosea zeylanica	55.56	55.56	1.18	3.25	1.00	773.34	1.90	0.018	6.32
45	Sysigium caryophyllatum	133.33	44.44	2.82	2.60	3.00	1266.21	3.11	0.068	8.53
46	Sysigium cummini	55.56	44.44	1.18	2.60	1.25	1572.48	3.86	0.028	7.63
47	Sysigium laetum	44.44	22.22	0.94	1.30	2.00	113.36	0.28	0.090	2.52
48	Sysigium lanceolatum	33.33	11.11	0.71	0.65	3.00	435.59	1.07	0.270	2.42
49	Sysigium mundagam	11.11	11.11	0.24	0.65	1.00	154.00	0.38	0.090	1.26

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
50	Tabernaemontana heyniana	11.11	11.11	0.24	0.65	1.00	154.00	0.38	0.090	1.26
51	Vateria indica	211.11	22.22	4.47	1.30	9.50	859.49	2.11	0.428	7.88
52	Vepris bilocularis	55.56	33.33	1.18	1.95	1.67	558.60	1.37	0.050	4.50
53	Vitex altissima	133.33	55.56	2.82	3.25	2.40	2027.89	4.98	0.043	11.05
54	Xanthophyllum arnottianum	200.00	55.56	4.24	3.25	3.60	229.67	0.56	0.065	8.05
55	Zanthoxylum rhetsa	11.11	11.11	0.24	0.65	1.00	168.32	0.41	0.090	1.30
Grand total		**4722.17**	**1711.04**	**100**	**100**	**129.4**	**40741**	**100.00**	**5.281**	**300**

MI=31.11

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Saplings

The sapling status of selection felled WCT Evergreen forests are worked out (Table. 52). Twenty-six species were recorded in sapling stage, of which three species *viz*., *Myristica dactyloides*, Strombosia zeylanica and *Xanthophyllum arnottianum* are the dominant species (IVI more than 20). *Myrista dactyloides* and *Strombosea zeylanica* are having maximum tree density.

Table 52. Vegetation status of saplings of West Coast Tropical Evergreen forests Kottiyoor RF (Selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Aporusa lindleyana	11.11	11.1	1.02	1.72	1.00	17.90	3.13	0.090	5.87
2	Baccaurea courtallensis	77.78	44.44	7.14	6.90	1.75	24.16	4.22	0.039	18.26
3	Calophyllum polyanthum	11.11	11.11	1.02	1.72	1.00	62.36	10.90	0.090	13.64
4	Cinnamomum malabatrum	22.22	22.22	2.04	3.45	1.00	40.27	7.04	0.045	12.53
5	Diospyros paniculata	22.22	22.22	2.04	3.45	1.00	15.59	2.72	0.045	8.21
6	Dipterocarpus indicus	66.67	11.11	6.12	1.72	6.00	36.20	6.33	0.540	14.17
7	Drypetes elata	11.11	11.11	1.02	1.72	1.00	9.63	1.68	0.090	4.43
8	Garcinea gummi-gutta	22.22	11.11	2.04	1.72	2.00	11.45	2.00	0.180	5.77

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/ F	IVI
9	Holigarna arnottiana	11.11	11.11	1.02	1.72	1.00	15.59	2.72	0.090	5.47
10	Hydnocarpus pentandra	55.56	33.33	5.10	5.17	1.67	20.36	3.56	0.050	13.83
11	Ixora brachiata	77.78	44.44	7.14	6.90	1.75	24.56	4.29	0.039	18.33
12	Knema attenuata	66.67	22.22	6.12	3.45	3.00	30.77	5.38	0.135	14.95
13	Macaranga peltata	11.11	11.11	1.02	1.72	1.00	17.90	3.13	0.090	5.87
14	Memecylon umbellatum	33.33	11.11	3.06	1.72	3.00	26.74	4.67	0.270	9.46
15	Myristica dactyloides	144.44	77.78	13.27	12.07	1.86	17.90	3.13	0.024	28.46
16	Myristica malabarica	22.22	11.11	2.04	1.72	2.00	21.66	3.78	0.180	7.55
17	Olea dioica	11.11	11.11	1.02	1.72	1.00	11.45	2.00	0.090	4.75
18	Otonephelium stipulaceum	88.89	44.44	8.16	6.90	2.00	22.99	4.02	0.045	19.08
19	Polyalthia fragrans	11.11	11.11	1.02	1.72	1.00	31.82	5.56	0.090	8.30
20	Sterculia guttata	11.11	11.11	1.02	1.72	1.00	9.63	1.68	0.090	4.43
21	Stereospermu m colais	11.11	11.11	1.02	1.72	1.00	15.59	2.72	0.090	5.47
22	Strombosea zeylanica	133.33	77.78	12.24	12.07	1.71	19.11	3.34	0.022	27.65
23	Syzygium cumini	11.11	11.11	1.02	1.72	1.00	17.90	3.13	0.090	5.87
24	Syzygium mudagam	22.22	11.11	2.04	1.72	2.00	17.90	3.13	0.180	6.89
25	Vateria indica	22.22	22.22	2.04	3.45	1.00	14.50	2.53	0.045	8.02
26	Xanthophyllu m arnottianum	100.00	66.67	9.18	10.34	1.50	18.43	3.22	0.023	22.75
Grand total		**1088.89**	**644.44**	**100.00**	**100.00**	**43.24**	**572.35**	**100.00**	**2.762**	**300.00**

MI= 24.79

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index

Status of Seedlings

Thirty-three species were noted in seedling stage (Table. 53). *Callophyllum polyanthum, Myristta dactyloides, Strombosea zeylanica* and *Xanthophyllum arnottianum*

are the dominant species. High regeneration was observed in the case of *Xanthophyllum arnottianum*, *Myristica dactyloides* and *Strombosea zeylanica*.

Table 53. Vegetation status of seedlings of West Coast Tropical Evergreen forests of Kottiyoor RF (Selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	11.11	11.11	0.32	1.30	1.00	0.72	5.33	0.09	6.94
2	Aglaia lawii	44.44	22.22	1.26	2.60	2.00	1.44	10.70	0.09	14.55
3	Aporusa lindleyana	100.00	33.33	2.84	3.90	3.00	0.06	0.41	0.09	7.15
4	Atlantia racemosa	22.22	11.11	0.63	1.30	2.00	0.32	2.37	0.18	4.30
5	Baccaurea courtallensis	66.67	11.11	1.89	1.30	6.00	0.02	0.15	0.54	3.34
6	Calophyllum polyanthum	33.33	11.11	0.95	1.30	3.00	3.90	29.01	0.27	31.26
7	Chukrasia tabularis	88.89	22.22	2.52	2.60	4.00	0.12	0.93	0.18	6.05
8	Cinnamomum malabatrum	44.44	11.11	1.26	1.30	4.00	0.66	4.89	0.36	7.45
9	Diospyros buxifolia	22.22	11.11	0.63	1.30	2.00	0.02	0.15	0.18	2.08
10	Dipterocarpus indicus	144.44	11.11	4.10	1.30	13.00	0.41	3.05	1.17	8.45
11	Drypetes elata	144.44	33.33	4.10	3.90	4.33	0.17	1.26	0.13	9.26
12	Dysoxylum malabaricum	44.44	22.22	1.26	2.60	2.00	0.50	3.70	0.09	7.56
13	Garcinea gummi-gutta	55.56	22.22	1.58	2.60	2.50	0.87	6.45	0.11	10.62
14	Gmelina arborea	22.22	11.11	0.63	1.30	2.00	0.02	0.15	0.18	2.08
15	Hydnocarpus pentandra	88.89	33.33	2.52	3.90	2.67	0.40	3.00	0.08	9.42
16	Ixora brachiata	33.33	11.11	0.95	1.30	3.00	0.72	5.33	0.27	7.57
17	Knema attenuata	44.44	11.11	1.26	1.30	4.00	0.02	0.15	0.36	2.71
18	Macaranga peltata	11.11	11.11	0.32	1.30	1.00	0.08	0.59	0.09	2.21
19	Mallotus philippensis	33.33	11.11	0.95	1.30	3.00	0.02	0.15	0.27	2.39
20	Memecylon umbellatum	33.33	11.11	0.95	1.30	3.00	0.72	5.33	0.27	7.57
21	Meogyne pannosa	144.44	33.33	4.10	3.90	4.33	0.02	0.15	0.13	8.15
22	Myristica dactyloides	811.11	77.78	23.03	9.09	10.43	0.18	1.32	0.13	33.44

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/ F	IVI
23	Myristica malabarica	22.22	11.11	0.63	1.30	2.00	0.24	1.81	0.18	3.74
24	Otonephelium stipulaceum	100.00	22.22	2.84	2.60	4.50	0.03	0.22	0.20	5.66
25	Polyalthia fragrans	122.22	44.44	3.47	5.19	2.75	0.33	2.48	0.06	11.14
26	Sterculia guttata	88.89	22.22	2.52	2.60	4.00	0.07	0.52	0.18	5.64
27	Strombosea zeylanica	444.44	100.00	12.62	11.69	4.44	0.33	2.46	0.04	26.76
28	Syzygium cumini	66.67	22.22	1.89	2.60	3.00	0.27	1.99	0.14	6.48
29	Syzygium elatum	11.11	11.11	0.32	1.30	1.00	0.08	0.59	0.09	2.21
30	Syzygium mudagam	144.44	33.33	4.10	3.90	4.33	0.02	0.15	0.13	8.15
31	Vateria indica	77.78	22.22	2.21	2.60	3.50	0.08	0.59	0.16	5.40
32	Vepris bilocularis	77.78	33.33	2.21	3.90	2.33	0.07	0.51	0.07	6.61
33	Xanthophyllum arnottianum	322.22	88.89	9.15	10.39	3.63	0.55	4.12	0.04	23.66
Grand total		**3522.22**	**855.56**	**100.00**	**100.00**	**117.75**	**13.43**	**100.00**	**6.56**	**300.00**

MI=25.93

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

3.West Coast Tropical Semi Evergreen Forests (Selection felled)

Status of Tree Vegetation

The selection felled area of WCT semi evergreen forests of Kottiyoor reserves were enumerated and 53 species were recorded (Table. 54). On the basis of IVI status, the dominant species present in the area are, *Artocarpus hirsutus, Chionanthus courtellensis, Olea dioica, Polyalthia fragrans, Schleichera oleosa, Sstereospermum collais, Vitex altissima and Xylia xyloocarpa* (Table.54). The highest number of species of occurrence was found in the case of *Olea dioica, Stereospermum collais, Chionanthus courtelensis* and *Ixora bracheata*. With respect to relative basal are of the species the dominant species are *Artocarpus hirsutus, Bischofia javaniva, Dysoxylum fusiforme, Haldina cordifolia, Hopea parviflora, Lophopetalum whitianum, Mangifera indica,*

Neolitsea cassia, Polyalthia fragrans, Schleichera oleosa, Trminala bellirica, Terminlia paniculate and *Vitex altissima*.

Table 54. Vegetation status of trees of West Coast Tropical Semi Evergreen forests of Kottiyoor RF (Selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Achronichea pedunculata	66.67	33.33	1.26	1.69	2.00	406.66	0.91	0.06	3.87
2	Actinodaphne malabarica	66.67	50.00	1.26	2.54	1.33	453.43	1.01	0.03	4.82
3	Ailanthus triphysa	16.67	16.67	0.32	0.85	1.00	1242.90	2.78	0.06	3.94
4	Alstonia scholaris	16.67	16.67	0.32	0.85	1.00	103.09	0.23	0.06	1.39
5	Artocarpus hirsutus	83.33	66.67	1.58	3.39	1.25	2320.55	5.19	0.02	10.16
6	Atlantia racemosa	16.67	16.67	0.32	0.85	1.00	91.95	0.21	0.06	1.37
7	Baccaurea courtallensis	66.67	33.33	1.26	1.69	2.00	147.08	0.33	0.06	3.29
8	Bischoffia javanica	16.67	16.67	0.32	0.85	1.00	1449.72	3.24	0.06	4.40
9	Chionanthus courtallensis	333.33	66.67	6.31	3.39	5.00	196.88	0.44	0.08	10.14
10	Cinnamomum keralensis	33.33	33.33	0.63	1.69	1.00	756.18	1.69	0.03	4.02
11	Cinnamomum malabatrum	33.33	33.33	0.63	1.69	1.00	124.74	0.28	0.03	2.60
12	Diospyros paniculata	200.00	50.00	3.79	2.54	4.00	744.59	1.66	0.08	7.99
13	Dipterocarpus indica	16.67	16.67	0.32	0.85	1.00	616.00	1.38	0.06	2.54
14	Drypetus elata	16.67	16.67	0.32	0.85	1.00	127.27	0.28	0.06	1.45
15	Dysoxylum fusiformi	16.67	16.67	0.32	0.85	1.00	1386.00	3.10	0.06	4.26
16	Dysoxylum malabaricum	16.67	16.67	0.32	0.85	1.00	748.44	1.67	0.06	2.84
17	Evodea lunu-ankeinda	50.00	50.00	0.95	2.54	1.00	784.88	1.75	0.02	5.24
18	Ficus tsjahela	16.67	16.67	0.32	0.85	1.00	325.82	0.73	0.06	1.89
19	Flacourtia montana	16.67	16.67	0.32	0.85	1.00	459.45	1.03	0.06	2.19
20	Garcinea gummi-gutta	50.00	33.33	0.95	1.69	1.50	738.19	1.65	0.05	4.29
21	Haldina cordifolia	66.67	33.33	1.26	1.69	2.00	1380.75	3.09	0.06	6.04
22	Holigarna arnottiana	66.67	50.00	1.26	2.54	1.33	988.93	2.21	0.03	6.02

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
23	Hopea parviflora	116.67	50.00	2.21	2.54	2.33	1772.77	3.96	0.05	8.71
24	Hydnocarpus pentandra	100.00	50.00	1.89	2.54	2.00	355.31	0.79	0.04	5.23
25	Ixora brachiata	300.00	66.67	5.68	3.39	4.50	140.39	0.31	0.07	9.38
26	Kingiodendron pinnatum	50.00	16.67	0.95	0.85	3.00	871.43	1.95	0.18	3.74
27	Knema attenuata	66.67	50.00	1.26	2.54	1.33	138.65	0.31	0.03	4.11
28	Lagerstroemia lanceolata	16.67	16.67	0.32	0.85	1.00	962.50	2.15	0.06	3.31
29	Lophopetalum wightianum	50.00	16.67	0.95	0.85	3.00	1449.72	3.24	0.18	5.03
30	Macranga peltata	50.00	33.33	0.95	1.69	1.50	722.94	1.62	0.05	4.26
31	Mallotus philipensis	166.67	66.67	3.15	3.39	2.50	443.87	0.99	0.04	7.54
32	Mangifera indica	16.67	16.67	0.32	0.85	1.00	2036.36	4.55	0.06	5.72
33	Myristica dactyloides	166.67	66.67	3.15	3.39	2.50	301.84	0.67	0.04	7.22
34	Naringi crenulata	16.67	16.67	0.32	0.85	1.00	161.08	0.36	0.06	1.52
35	Neolitsea cassia	16.67	16.67	0.32	0.85	1.00	2722.44	6.09	0.06	7.25
36	Olea dioica	666.67	100.00	12.62	5.08	6.67	338.67	0.76	0.07	18.46
37	Otonephilium stipulaceum	83.33	50.00	1.58	2.54	1.67	340.23	0.76	0.03	4.88
38	Polyalthea fragrans	250.00	50.00	4.73	2.54	5.00	2298.86	5.14	0.10	12.41
39	Radermachera xylocarpa	16.67	16.67	0.32	0.85	1.00	1303.27	2.91	0.06	4.08
40	Schleichera oleosa	116.67	66.67	2.21	3.39	1.75	2279.59	5.10	0.03	10.69
41	Sterculea guttata	183.33	50.00	3.47	2.54	3.67	918.47	2.05	0.07	8.07
42	Stereospermum collais	500.00	83.33	9.46	4.24	6.00	946.81	2.12	0.07	15.82
43	Strombosea zeylanica	66.67	33.33	1.26	1.69	2.00	571.34	1.28	0.06	4.23
44	Tabernaemontana heyniana	66.67	33.33	1.26	1.69	2.00	192.94	0.43	0.06	3.39
45	Terminalia bellirica	33.33	16.67	0.63	0.85	2.00	1672.44	3.74	0.12	5.22
46	Terminalia paniculata	50.00	16.67	0.95	0.85	3.00	2254.01	5.04	0.18	6.83
47	Terpaenia malabarica	33.33	33.33	0.63	1.69	1.00	97.44	0.22	0.03	2.54
48	*Melia dubia*	16.67	16.67	0.32	0.85	1.00	161.08	0.36	0.06	1.52

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
49	Vepris bilocularis	16.67	16.67	0.32	0.85	1.00	509.09	1.14	0.06	2.30
50	Vitex altissima	266.67	66.67	5.05	3.39	4.00	1875.80	4.19	0.06	12.63
51	Xanthophyllum arnottianum	166.67	33.33	3.15	1.69	5.00	186.34	0.42	0.15	5.27
52	Xylia xylocarpa	316.67	83.33	5.99	4.24	3.80	942.34	2.11	0.05	12.34
53	Zanthoxylum rhetsa	16.67	16.67	0.32	0.85	1.00	168.32	0.38	0.06	1.54
Grand total		**5283.33**	**1966.67**	**100.00**	**100.00**	**111.63**	**44729.87**	**100.00**	**3.35**	**300.00**

MI=37.11

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Saplings

Twenty-one species were recorded in sapling stage. The dominant species are *Cinnamomum malabaricum, Ixora bracheata, Stereospermum collai, Baccaurea courtllenis* and *Xanthophyllum arnotianum*. Maximum relative basal area was observed in the case of *Baccaurea courtellensis* and *Xanthophyllum arnottianum*. (Table55), next to Cinnamomum malabaricum. Iixora brachiata and Cinnamomum malabaricum are also having highest species density (Table. 55)

Table 55. Vegetation status of saplings of West Coast Tropical Semi Evergreen forests of Kottiyoor RF (Selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Artocarpus hirsutus	16.67	16.67	2.04	2.70	1.00	22.99	5.34	0.06	10.08
2	Baccaurea courtallensis	33.33	33.33	4.08	5.41	1.00	35.08	8.15	0.03	17.63
3	Cassia fistula	16.67	16.67	2.04	2.70	1.00	13.44	3.12	0.06	7.87
4	Cinnamomum malabatrum	150.00	66.67	18.37	10.81	2.25	32.89	7.64	0.03	36.82
5	Garcinea gummi-gutta	33.33	16.67	4.08	2.70	2.00	19.11	4.44	0.12	11.22
6	Hydnocarpus pentandra	33.33	33.33	4.08	5.41	1.00	22.99	5.34	0.03	14.83
7	Ixora brachiata	116.67	50.00	14.29	8.11	2.33	29.59	6.87	0.05	29.26
8	Knema attenuata	16.67	16.67	2.04	2.70	1.00	22.99	5.34	0.06	10.08
9	Macaranga peltata	16.67	16.67	2.04	2.70	1.00	17.90	4.16	0.06	8.90

10	Mallotus philippensis	66.67	50.00	8.16	8.11	1.33	18.50	4.30	0.03	20.57
11	Muraya paniculata	33.33	33.33	4.08	5.41	1.00	15.59	3.62	0.03	13.11
12	Olea dioica	66.67	66.67	8.16	10.81	1.00	22.32	5.18	0.02	24.16
13	Otonephelium stipulaceum	16.67	16.67	2.04	2.70	1.00	15.59	3.62	0.06	8.36
14	Persea macrantha	16.67	16.67	2.04	2.70	1.00	11.45	2.66	0.06	7.40
15	Polyalthia fragrans	33.33	33.33	4.08	5.41	1.00	11.45	2.66	0.03	12.15
16	Sterculia guttata	16.67	16.67	2.04	2.70	1.00	22.99	5.34	0.06	10.08
17	Stereospermum colais	33.33	33.33	4.08	5.41	1.00	28.72	6.67	0.03	16.16
18	Syzygium mudagam	16.67	16.67	2.04	2.70	1.00	11.45	2.66	0.06	7.40
19	Tabernaemontana gamblei	16.67	16.67	2.04	2.70	1.00	15.59	3.62	0.06	8.36
20	Xanthophyllum arnottianum	50.00	33.33	6.12	5.41	1.50	22.10	5.13	0.05	16.66
21	Xylia xylocarpa	16.67	16.67	2.04	2.70	1.00	17.90	4.16	0.06	8.90
Grand total		**816.67**	**616.67**	**100.00**	**100.00**	**25.42**	**430.62**	**100.00**	**1.04**	**300.00**

MI=29.37

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Seedlings

Among the twenty five species recorded in seedling stage *Sterculiia guttata, Cinnamomum malabaricum, Chukrania tabularis, Kne,ma attenuata,* and *Syzigium mudagam* are the dominant species. With respect to frequency the high-ranking species are *Sterculia guttata, Cinnamomum malabaricum, Baccaurea courtellensis, Hydnocarpus pentandra, Mallotus phillipensis* and *Polyalthia fragrans*. High regeneration was observed in *Sterculia guttata, Cinnamomum* spp., *Mallotus phillipensis* and *Polyalthia fragrans* (Table 56).

Table 56. Vegetation status of seedlings of West Coast Tropical Semi Evergreen forests Kottiyoor RF (Selection felled)

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	50.00	16.67	1.69	2.22	3.00	0.02	0.15	0.180	4.07
2	Baccaurea courtallensis	133.33	50.00	4.52	6.67	2.67	0.18	1.34	0.053	12.5
3	Careyota urens	33.33	16.67	1.13	2.22	2.00	0.02	0.15	0.120	3.50
4	Cassia fistula	33.33	16.67	1.13	2.22	2.00	0.32	2.38	0.120	5.74
5	Chukrasia tabularis	50.00	16.67	1.69	2.22	3.00	3.90	29.19	0.180	33.11
6	Cinnamomum malabatrum	233.33	66.67	7.91	8.89	3.50	0.82	6.16	0.053	22.95
7	Garcinea gummi-gutta	33.33	16.67	1.13	2.22	2.00	0.08	0.60	0.120	3.95
8	Hydnocarpus pentandra	100.00	50.00	3.39	6.67	2.00	0.37	2.80	0.040	12.85
9	Knema attenuata	50.00	16.67	1.69	2.22	3.00	2.86	21.45	0.180	25.37
10	Mallotus philippensis	166.67	50.00	5.65	6.67	3.33	0.29	2.15	0.067	14.47
11	Meogyne pannosa	50.00	16.67	1.69	2.22	3.00	0.72	5.36	0.180	9.28
12	Muraya paniculata	83.33	33.33	2.82	4.44	2.50	0.23	1.72	0.075	8.99
13	Myristica dactyloides	83.33	16.67	2.82	2.22	5.00	0.16	1.17	0.300	6.21
14	Olea dioica	100.00	33.33	3.39	4.44	3.00	0.14	1.06	0.090	8.89
15	Otonephelium stipulaceum	66.67	33.33	2.26	4.44	2.00	0.18	1.34	0.060	8.04
16	Polyalthia fragrans	166.67	50.00	5.65	6.67	3.33	0.16	1.17	0.067	13.48
17	Schleichera oleosa	66.67	33.33	2.26	4.44	2.00	0.02	0.15	0.060	6.85
18	Sterculia guttata	816.67	66.67	27.68	8.89	12.25	0.22	1.67	0.184	38.24
19	Stereospermum colais	83.33	16.67	2.82	2.22	5.00	0.08	0.60	0.300	5.64
20	Strombosea zeylanica	133.33	33.33	4.52	4.44	4.00	0.04	0.28	0.120	9.25
21	Syzygium cumini	100.00	33.33	3.39	4.44	3.00	0.02	0.15	0.090	7.98
22	Syzygium mudagam	66.67	16.67	2.26	2.22	4.00	1.99	14.90	0.240	19.38
23	Vepris bilocularis	50.00	16.67	1.69	2.22	3.00	0.08	0.60	0.180	4.51
24	Xanthophyllum arnottianum	83.33	16.67	2.82	2.22	5.00	0.32	2.38	0.300	7.43
25	Xylia xylocarpa	116.67	16.67	3.95	2.22	7.00	0.15	1.10	0.420	7.27
Grand total		**2950.00**	**750.00**	**100.00**	**100.00**	**90.58**	**13.35**	**100.00**	**3.778**	**300.00**

MI=30.00

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

4. Moist Deciduous Forests

Status of Tree Vegetation

The moist deciduous forests are very rich with higher level of species composition. Forty-five species were recorded from the study site (Table. 57). The dominant species are *Bischofia javanica*, *Ficus tsjakela*, *Olea dioica*, *Polyalthia fragrans*, *Sterculia guttata*, *Terminalia bellirica, Terminalia panicculata*, *Tetramelous nudiflora* and *Xylia xylocarpa*. High species density was observed in *Xylia xylocarpa, Polyalthia fragrans, Terminalia paniculate,Bischofia javanica* and *Olea dioica*. Percentage frequency was high in the case of *Xylia xylocarpa*, *Terminalia paniculate* and *Olea dioica* (Table. 57). *Tetramelous nudiflora* is having highest basal area followed by *Ficus tsjakeda*.

Table 57. Vegetation status of trees of Moist Deciduous forests of Kottiyoor RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	42.86	14.29	1.00	1.12	3.00	513.34	1.09	0.210	3.22
2	Alstonia scholaris	28.57	28.57	0.67	2.25	1.00	2649.36	5.63	0.035	8.55
3	Aporusa lindleyana	28.57	14.29	0.67	1.12	2.00	336.08	0.71	0.140	2.50
4	Artocarpus hirsutus	28.57	28.57	0.67	2.25	1.00	2023.66	4.30	0.035	7.22
5	Atlantia racemosa	42.86	28.57	1.00	2.25	1.50	215.64	0.46	0.053	3.71
6	Bischofia javanica	285.71	28.57	6.67	2.25	10.00	2984.52	6.35	0.350	15.26
7	Calophyllum inophyllum	14.29	14.29	0.33	1.12	1.00	276.90	0.59	0.070	2.05
8	Calophyllum polyanthum	28.57	28.57	0.67	2.25	1.00	72.07	0.15	0.035	3.07
9	Cassia fistula	28.57	28.57	0.67	2.25	1.00	418.11	0.89	0.035	3.80
10	Chionanthus coromandelica	14.29	14.29	0.33	1.12	1.00	198.86	0.42	0.070	1.88
11	Cinnamomum malabatrum	42.86	28.57	1.00	2.25	1.50	95.96	0.20	0.053	3.45
12	Dalbergia latifolia	14.29	14.29	0.33	1.12	1.00	2722.44	5.79	0.070	7.25

13	Dysoxulum malabarica	28.57	28.57	0.67	2.25	1.00	114.86	0.24	0.035	3.16
14	Evodia lunu-ankeinda	28.57	14.29	0.67	1.12	2.00	300.86	0.64	0.140	2.43
15	Ficus tsjahela	28.57	28.57	0.67	2.25	1.00	4581.82	9.74	0.035	12.66
16	Haldina cordifolia	14.29	14.29	0.33	1.12	1.00	76.44	0.16	0.070	1.62
17	Hydnocarpus pentantra	14.29	14.29	0.33	1.12	1.00	471.63	1.00	0.070	2.46
18	Ixora brachiata	14.29	14.29	0.33	1.12	1.00	72.55	0.15	0.070	1.61
19	Kattukarivepu	14.29	14.29	0.33	1.12	1.00	412.36	0.88	0.070	2.33
20	Knema attenuata	14.29	14.29	0.33	1.12	1.00	763.95	1.62	0.070	3.08
21	Lagerstroemia lanceolata	142.86	28.57	3.33	2.25	5.00	1100.09	2.34	0.175	7.92
22	Lannea coromandelica	57.14	14.29	1.33	1.12	4.00	1923.43	4.09	0.280	6.55
23	Lophopetalum wightianum	14.29	14.29	0.33	1.12	1.00	1051.99	2.24	0.070	3.69
24	Macranga peltata	14.29	14.29	0.33	1.12	1.00	127.27	0.27	0.070	1.73
25	Mallotus philipensis	28.57	14.29	0.67	1.12	2.00	190.99	0.41	0.140	2.20
26	Mangifera indica	114.29	28.57	2.67	2.25	4.00	375.98	0.80	0.140	5.71
27	Muraya paniculata	28.57	28.57	0.67	2.25	1.00	194.91	0.41	0.035	3.33
28	Myristica malabarica	85.71	28.57	2.00	2.25	3.00	168.32	0.36	0.105	4.61
29	Naringi krenulata	128.57	42.86	3.00	3.37	3.00	139.58	0.30	0.070	6.67
30	Olea dioica	314.29	85.71	7.33	6.74	3.67	349.85	0.74	0.043	14.82
31	Polyalthea fragrans	428.57	28.57	10.00	2.25	15.00	414.27	0.88	0.525	13.13
32	Schleichera oleosa	28.57	28.57	0.67	2.25	1.00	2562.97	5.45	0.035	8.36
33	Sterculea guttata	371.43	57.14	8.67	4.49	6.50	535.06	1.14	0.114	14.30
34	Stereospermum collais	114.29	57.14	2.67	4.49	2.00	701.00	1.49	0.035	8.65
35	Steriospermum collais	28.57	28.57	0.67	2.25	1.00	1449.72	3.08	0.035	6.00
36	Strychnos nuxvomica	57.14	14.29	1.33	1.12	4.00	269.90	0.57	0.280	3.03
37	Taberna montana heyniana	71.43	42.86	1.67	3.37	1.67	90.98	0.19	0.039	5.23
38	Terminalia bellirica	57.14	42.86	1.33	3.37	1.33	2663.90	5.66	0.031	10.37
39	Terminalia paniculata	371.43	85.71	8.67	6.74	4.33	880.20	1.87	0.051	17.28
40	Tetrameles nudiflora	14.29	14.29	0.33	1.12	1.00	7159.09	15.22	0.070	16.68

41	Melia dubia	42.86	14.29	1.00	1.12	3.00	316.38	0.67	0.210	2.80
42	Vitex altissima	71.43	28.57	1.67	2.25	2.50	2181.40	4.64	0.088	8.55
43	Xanthophyllum arnottianum	14.29	14.29	0.33	1.12	1.00	198.86	0.42	0.070	1.88
44	Xylia xylocarpa	914.29	85.71	21.33	6.74	10.67	1295.01	2.75	0.124	30.83
45	Zanthophyllum rhetsa	14.29	14.29	0.33	1.12	1.00	1386.00	2.95	0.070	4.40
Grand total		**4285.71**	**1271.43**	**100.00**	**100.00**	**117.67**	**47028.60**	**100.00**	**4.62**	**300.00**

MI=28.25

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Saplings

Twenty-three species are in sampling stage, of which maximum number was observed in the case of *Naringi crenulata* (Table.58), followed by *Ole adioica* and *Xylia xylocarpa.* High density was observed in *Naringi crenulata*. Relatiive frequency was more in *Olea dioica* followed by *Xylia xylocarpa* and *Stereospermum colais*.

Table 58. Vegetation status of saplings of Moist Deciduous forests of Kottiyoor RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	42.86	14.29	5.26	2.78	3.00	17.11	2.91	0.210	10.96
2	Alstonia scholaris	14.29	14.29	1.75	2.78	1.00	25.77	4.39	0.070	8.92
3	Baccaurea courtallensis	14.29	14.29	1.75	2.78	1.00	9.63	1.64	0.070	6.17
4	Chukrasia tabularis	14.29	14.29	1.75	2.78	1.00	17.90	3.05	0.070	7.58
5	Cinnamomum malabatrum	14.29	14.29	1.75	2.78	1.00	15.59	2.66	0.070	7.19
6	Clerodendron infortunatum	14.29	14.29	1.75	2.78	1.00	45.82	7.80	0.070	12.34
7	Drypetes elata	28.57	14.29	3.51	2.78	2.00	17.90	3.05	0.140	9.34
8	Euodia lunu-ankenda	28.57	28.57	3.51	5.56	1.00	30.25	5.15	0.040	14.22
9	Haldina cordifolia	14.29	14.29	1.75	2.78	1.00	28.72	4.89	0.070	9.42
10	Lagerstroemia microcarpa	14.29	14.29	1.75	2.78	1.00	42.08	7.17	0.070	11.70
11	Mallotus philippensis	28.57	14.29	3.51	2.78	2.00	19.11	3.26	0.140	9.54
12	Muraya koenoegi	28.57	28.57	3.51	5.56	1.00	15.59	2.66	0.040	11.72

13	Muraya paniculata	28.57	28.57	3.51	5.56	1.00	10.52	1.79	0.040	10.86
14	Myristica dactyloides	28.57	14.29	3.51	2.78	2.00	13.44	2.29	0.140	8.58
15	Naringi crenulata	157.14	42.86	19.30	8.33	3.67	70.73	12.05	0.090	39.68
16	Olea dioica	85.71	57.14	10.53	11.11	1.50	19.52	3.33	0.030	24.96
17	Polyalthia fragrans	14.29	14.29	1.75	2.78	1.00	49.72	8.47	0.070	13.00
18	Sterculia guttata	28.57	14.29	3.51	2.78	2.00	17.90	3.05	0.140	9.34
19	Stereospermum colais	57.14	42.86	7.02	8.33	1.33	22.32	3.80	0.030	19.15
20	Strychnos nux vamica	28.57	14.29	3.51	2.78	2.00	19.11	3.26	0.140	9.54
21	Taberna montana gamblei	42.86	28.57	5.26	5.56	1.50	31.82	5.42	0.050	16.24
22	Tarena asiatica	14.29	14.29	1.75	2.78	1.00	22.99	3.92	0.070	8.45
23	Xylia xylocarpa	71.43	42.86	8.77	8.33	1.67	23.53	4.01	0.040	21.11
Grand total		**814.29**	**514.29**	**100.00**	**100.00**	**34.67**	**587.05**	**100.00**	**1.880**	**300.0**

MI=22.36

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

Status of Seedlings

Twenty-four species were recorded in seedling stage. The dominant species are *Xylia xylocarpa, Sterculia guttata, Naringi crenulata, Hydnocarpus pentandra* and *Drypetus elata* (Table. 59). High species density was observed in *Xylia xyloocarpa, Sterculia guttat, Drypetus elata* and *Naringi crenulata*.

Table 59. Vegetation status of seedlings of Kottiyoor Moist Deciduous forests of Kottiyoor RF

Sl. No.	Species	D	F	RD	RF	AB	BA	RBA	AB/F	IVI
1	Actinodaphne malabarica	28.57	14.29	0.80	2.00	2.00	0.02	0.12	0.14	2.92
2	Antidesma menasu	14.29	14.29	0.40	2.00	1.00	0.32	1.94	0.07	4.34
3	Baccaurea courtallensis	28.57	14.29	0.80	2.00	2.00	0.32	1.94	0.14	4.74
4	Bischofia javanica	28.57	14.29	0.80	2.00	2.00	0.32	1.94	0.14	4.74
5	Canthium dicoccum	28.57	14.29	0.80	2.00	2.00	0.04	0.27	0.14	3.07
6	Cinnamomum malabatrum	142.86	42.86	4.00	6.00	3.33	0.19	1.16	0.08	11.16
7	Drypetes elata	300.00	14.29	8.40	2.00	21.00	1.59	9.71	1.47	20.11

8	Euodia lunu-ankenda	71.43	28.57	2.00	4.00	2.50	0.02	0.12	0.09	6.12
9	Hydnocarpus pentandra	14.29	14.29	0.40	2.00	1.00	5.09	31.01	0.07	33.41
10	Ixora brachiata	14.29	14.29	0.40	2.00	1.00	0.02	0.12	0.07	2.52
11	Lagerstroemia microcarpa	28.57	14.29	0.80	2.00	2.00	2.41	14.66	0.14	17.46
12	Mallotus philippensis	100.00	42.86	2.80	6.00	2.33	0.05	0.30	0.05	9.10
13	Meogyne pannosa	14.29	14.29	0.40	2.00	1.00	0.08	0.48	0.07	2.88
14	Muraya koenoegi	57.14	14.29	1.60	2.00	4.00	0.32	1.94	0.28	5.54
15	Muraya paniculata	157.14	42.86	4.40	6.00	3.67	0.38	2.31	0.09	12.71
16	Myristica dactyloides	28.57	14.29	0.80	2.00	2.00	0.02	0.12	0.14	2.92
17	Naringi crenulata	414.29	71.43	11.60	10.00	5.80	0.72	4.41	0.08	26.01
18	Olea dioica	142.86	42.86	4.00	6.00	3.33	1.47	8.96	0.08	18.96
19	Polyalthia fragrans	114.29	28.57	3.20	4.00	4.00	0.32	1.94	0.14	9.14
20	Schleichera oleosa	71.43	14.29	2.00	2.00	5.00	1.54	9.38	0.35	13.38
21	Sterculia guttata	585.71	71.43	16.40	10.00	8.20	0.14	0.86	0.11	27.26
22	Strombosea zeylanica	42.86	14.29	1.20	2.00	3.00	0.08	0.48	0.21	3.68
23	Tabernaemonta-na gamblei	228.57	71.43	6.40	10.00	3.20	0.75	4.54	0.04	20.94
24	Xylia xylocarpa	914.29	71.43	25.60	10.00	12.80	0.21	1.28	0.18	36.88
Grand total		**3571.43**	**714.29**	**100.00**	**100.00**	**98.17**	**16.42**	**100.00**	**4.37**	**300.00**

MI=29.76

D = Density, F = Frequency, RD = Relative Density, RF = Relative Frequency, AB= Abundance, BA = Basal Area, RBA = Relative Basal Area, AB/F= Abundance/Frequency, IVI = Importance Value Index, MI = Maturity Index.

RESULTS AND DISCUSSION

The vegetation dynamics with respect to selection felling and also with regard to microclimatic variation was studied. The vegetation status of trees, saplings, seedlings, etc. and the regeneration of major tree species were evaluated in the present study. Since the plant regeneration and succession is highly related to the microclimatic factors, special attention was made to gather the temperature and humidity data of the study area continuously for one year for detailed analysis.

Microclimate

The atmospheric temperature in all the four areas showed much variation. The minimum temperature varied from 12.5^0 C to 20^0 C while the maximum temperature varied from 16.2 to 25.5^0 C between the core area and the area felled in the past. On an average a difference of 7.5^0 C was encountered. The differences in relative humidity between the felled and nonfelled areas were also studied. The average RH in nonfelled area remains above 60% and the minimum goes only up to 45%. In the felled area the average RH was 58% and the minimum went down even up to 35%. The difference in soil temperature of non- felled and felled area is of 5 - 6^0 C with 18.5^0 C in nonfelled and 24.9^0 C in felled area. The rise in soil temperature and changes in relative humidity together accelerated the soil dryness affecting tree regeneration. The temperature and humidity status of Goodrical RF are given in Figures 2 and 3.

Fig.2. Temperature status of the area

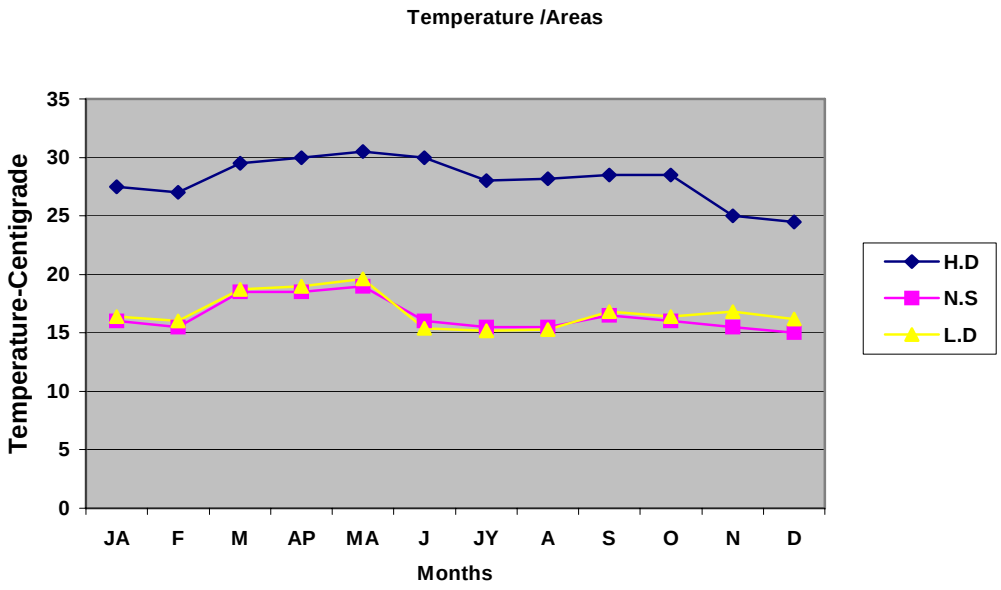
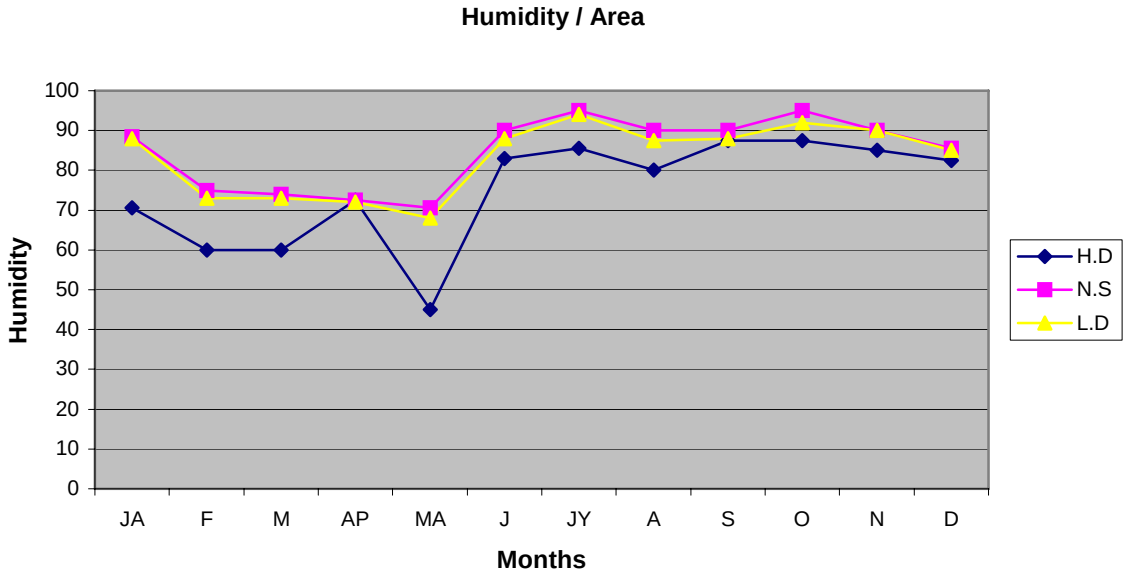


Fig.3 Humidity status of the area



H.D = Highly degraded, N.S.= Non Selection felled

L.D = Less disturbed

Vegetation Dynamics

The massive destruction of tropical rainforests worldwide comes at a tragic time when our knowledge of the organization, functional dynamics and even the alpha taxonomy of many threatened forests is still rudimentary (Hubbel *et al*,. 1983). Most of the tree species appear to have their own individualistic dispersion patterns with weekly-developed associations within the habitat with some selected species. Most of the species in the plots are unevenly distributed and many are highly clumped, often represented in low numbers as rare species. This type of contagious distribution can be attributed to the specific factors. Thus the clumping of species can be attribute to site-specific microclimatic factors, as observed elsewhere by Hubbell et *al*.,(1983).

The difference in tree distribution can be explained in different ways. For species of essentially random dispersion in the study sites, it is reasonable to think that all sites are equally good for successful establishment and community formation and that ecological efficiency of those species is of high magnitude to cope with varying site conditions. The clumping of species or restricted distribution can, to some extent, attribute to the site quality (micro site quality) and thus lead to special site-specific adaptations. Equilibrium models of tropical forest organization would not predict the continuing persistence of a tree species which does not enjoy a competitive advantage at some site in the forest (Connell, 1978).

However, non-equilibrium models reveal that even a species which is no more than a competitive equal in some areas and at a distinct advantage elsewhere, can persist in the forest for very long periods before going locally extinct (Hubbell, 1979). The presence of *Podocarps* in some part of Moozhiyar reserve (near Urani area) can only be explained in these terms.

For species which are distributed in patches which bear no discriminate relationship to topography or soils, it is tempting to conclude that these species whose success is more strongly influenced by transient historical factors, such as tree fall distribution rather than micro site factors fixed in space or very slowly changing, like topography. The impact of felling is more crucial at this juncture. The sudden outbreak

of a number of light demanding species and their subsequent colonization in the study sites can be looked on these lines.

It is of interest that species, which are highly aggregated, are still present in low numbers as rare species in same plots. The spare sub-populations are self maintaining or they simply represent accidental establishments of rare individuals, because of good site factors, or better to say `fortune' outside the normal habitats of species, is a matter of debate. Perhaps the spare populations are largely maintained by continual immigration from adjacent dense population and may disappear relatively faster, without such immigration. The species distribution status of *Nageia wallichiana, Strombosea zeylanica, Samadera indica, Vepris bilocularis, etc*. is considered accordingly. It is required to have more detailed reproductive studies of such isolated and aggregated populations before having a word regarding the sustainability of such populations.

The selective felling system rests on the theory that sufficient medium sized trees can be retained during harvest to contribute to the bulk of the next crop. Seedling and sapling regeneration, present on the ground, and able to respond to the open conditions would form initially as understorey, whose growth would provide the residuals for the second cut, and possibly, some of the second cut itself (Fox, 1967). According to Fox (1967), the selective logging will not be suitable where non-Dipterocarp species canopy or where invasive species are likely to swamp large areas of logged over land. The representation of species like *Bombax ceiba, Ficus hispida, Flacourtia Montana, Erythrina indica, Grewia tilaefolia, Macaranga peltata, Schleichera oleosa, Terminalia paniculata, Wrightia tinctoria* etc. in Semi-evergreen forests of Goodrical reserves and other similar sites of Sholayar and Kottiyur reserves can be looked on these lines.

There is a distinct conflict between maximum outturn at the first cut, with the added desire of using non-commercial species, and the retention of a maximum residual stand. Selective logging rules imply higher growth limits for more valuable species and it is often expected that violation of the logging 'rules is the rule' and not the exception (Bureau of Forestry, 1965).

Dawkins (1959) is of the opinion that opposition to selection is usually on the ground of impracticability from a silvicultural point of view. It is equally impossible if

the extractive method is unsuited to it, or if management is unable to rigidly enforce the observance of the rules necessary. The earlier studies also reveal that high-level productivity is essential to sustain selective logging; thus accelerating regeneration status of the system. In this context, the present study is of high relevance to have a detailed vegetation status, with special reference to regeneration of species. The drastic changes in the habitat due to more openings will definitely promote the existence of more light demanding species as observed in the study area, thus gradually changing the structural and compositional status of the system; which ultimately results in a changed cover types of differential preference as observed in many sites of selection felled area. In such a situation high level of productivity is a question of doubt, thus instead of accelerating the regeneration status of the system, there is every chance of depletion of the ecosystem. This is what has happened in the selection felled areas of the study sites.

Logging has a major impact on the structural and compositional development of the forests (Cannon *e. al*., 1994; Johns, 1997; Kassenene, 1984; Pinard and Putz, 1996). The species composition and the distribution of wildlife in the regenerating forest differed from those of the primary forest. Similar observations have also been noticed in earlier studies in tropics (Okuda *et al.,* 2000). The tall above ground biomass in the regenerating forest has not fully recovered to the level of primary forest even after 30 years of logging, even though theoretically possible. Another indirect impact of logging is mainly concerned with soil erosion due to creation of openings and the exposure. It is an accepted fact that the removal of vegetation and the construction of roads, trails, etc. for logging will accelerate the soil erosion, as observed in other places (Abdul Rahim and Harding, 1992; Oyenbande, 1988).

Within the primary forest the occurrence of individuals of a species in any particular spot is determined by the presence of regeneration of that species (Poore,1968). The occurrence of regeneration of a species is goverened by the presence of the mother trees, dispersal mechanism and the flowering and fruiting behaviour (Kartawinata,1978).It is also determined by the gap formation. The lowland tropical evergreen forest is considered as the climax forest which is in a stable and steady state conditions. It is true that small scale destruction does exist, such as the gap left by old trees falling down in the forest. Within such gaps, dynamic changes occur where some

seedlings grow rapidly due to light stimulation while the growth of other species is suppressed. These gap formation is acclerated due to selective felling. Gap formation seems to be an important part of the life and dynamics of the climax forest (Richards, 1952). The size of the gaps will determine the degree of change in floristic composition (Kramer, 1926). Logging in a sense is equivalent to the gap formation in a larger scale and will surely alter the nature of the original forest. The logging cycle in general should be based on the regenerating capacity and recouping frequency of the forests. There is no record that the logging cycle in the selection felled areas was based on such a scientific observation. But very little scientific evidence is available regarding the recovery process of ecosystem after logging. The logging cycle of 25-30 years, used commonly, is too short to permit a healthy stocking of regeneration and many of the timber and canopy forming species reproduce at an interval of 2-10 years in mass fruiting (the phenomenon of 'masting' in forestry) events (Appanah, 1985; 1993; Aston *et al.*, 1988). Such phonological characters of species must be considered for maintaining the genetic diversity of the crop, which in turn maintains the adaptive potential of the younger generations. Unfortunately, while demarcation of the selection felled area or identifying the trees for felling, such aspects are usually not considered, since the managers, outlook during selection felling or even clear felling, is mainly revenue oriented.

The changes in the structure of the canopy layer after logging will definitely affect the light spectrum on the forest floor, and this in turn, will eventually favours the growth of light demanding invading species like *Macaranga peltata*, *Anthocephalus* spp., *Trema* spp. *etc.*, thus affecting the competitive relationships between saplings and seedlings (Lee *et al.*, 1995). The creation of gaps in the dense over storey due to logging, gradually leads to a different species composition as observed in the current study. The thick growth of these secondary forest species will undoubtedly suppress the growth of primary species. For sustainable management of forests for the better use of timber and other natural resources, special care is needed to maintain the functional aspects of the forests, by maintaining the structural composition. It is necessary to thin the forest by artificial removal of the canopy trees, minimizing damage to the residual trees, thus to recreate the complexity of the canopy structure and heterogeneity of the forest floor environment.

These conditions would, in turn, promote highly diverse regeneration, as observed by Denslow (1980) and Denslow *et al.,* (1990) including regeneration in gap species.

The growth and establishment of rainforest communities are controlled to a greater extent by openings and gaps in the canopy (Brokaw, 1985; Denslow, 1980; Hartshow, 1980). The canopy space occupancy is partially determined by the interaction of the existing saplings with environmental regime. Thus the established seedlings and presence of saplings at the time of gap formation play a key role in subsequent regeneration and establishment of vegetation. The short time exposure of saplings in gaps due to selective felling will accelerate the growth of saplings, thus to fill the gaps and openings. Most species have some degree of shade tolerance but respond positively to canopy openings. The question, to what extent does adaptive specialization and competition among seedlings and saplings influence the canopy occupance, requires debate and much more studies. The matters related to canopy openings are not at all considered in planning the selection felling procedure, since the selective felling is mainly revenue oriented.

The trees that dies standing produce very small gap over an extended period of time, whereas, the fall of canopy emergent due to selection felling, can open a gap sufficiently large for the establishment of high light demanding species, as observed in many of the selected study sites. The condition becomes more crucial by adopting crude form of extraction procedure as practised. The studies of Brokaw (1982), Leigh (1995), Lieberman *et al.,* (1985), *etc*. reveal that forest turn over time, based on tree mortality, is about half, to those based on gap formation in the same area.

For ecologically sustainable management (Whitman *et al.,* 1997), aiming to have better use of timber and other natural resources, care should be given to monitor the functional aspects of the forests, especially related to forest structure. It is true that canopy manipulation, by way of thinning is needed, for recreating the complexity of the canopy structure, with minimal damage to the existing forests. But in most of the case where selective felling was performed, a large number of residual trees were damaged due to improper felling procedures, thus creating large forest gaps, leading to species structural

and compositional changes. Thus in lieu of primary species, a large number of secondary species occupys the stands, changing the forest status.

The studies on microclimatological studies are of high significance in gap dynamics. The variation in temperature and humidity was observed continually for more than a year for the different regions. Similar studies performed earlier (Fetcher *et. al.* 1987) suggest that the microclimatic temperature and humidity return to pre-gap level, within two years of tree fall. This aspect also requires more extensive studies.

With the growth of surviving shrubs and establishing saplings, light availability declines, as a result, the germination of light demanding species slows down. The canopy openings trigger the germination of seeds of light demanding species. But the timings of establishment and source of mortality vary, very often among species, which requires more specific auto-ecological studies. The sapling density of shade tolerant species is more or less constant in contrast to that of light demanding species, suggesting that the seedlings of shade tolerant species are present in a suppressed condition, at the time of canopy opening due to selection felling.

Regeneration

The process of natural regeneration in evergreen forest is a complex process and less known. Although it is of practical importance to foresters, scientific knowledge regarding the field factors affecting natural regeneration is practically unexplored. Much of what is written about the so-called natural regeneration refers to the reproduction of a few economic species under conditions rendered more or less unnatural by timber exploitation. Further, the various factors that control the intensity and direction of natural regeneration *viz*., phenology, seed production, seed predation, viability, germination, establishment and survival, light and shade conditions, microclimate, *etc.* are unknown or imperfectly known.

Conclusion

The selective logging system rests on the theory that sufficient medium sized trees can be retained during a harvest to contribute to the bulk of the next crop. Seedling and sapling regeneration present on the ground and able to respond to the open conditions would form, initially, an understorey whose growth would provide the residuals for the second cut.The effect of logging on plant diversity and regeneration was studied in three regions, viz. Goodrical reserve forests in southern part, Sholayar reserve forests in central part and Kottiyur reserve forests in northern part of Kerala. Based on the historical evidence related to selective felling of these regions, study sites were selected and conventional phyto-sociological methods were adopted for the vegetation status evaluation. Phytosociological analysis reveals that *Palaquium ellipticum* and *Knema attennuata* are the common dominant species in all the three study sites along with other co-dominants such as, *Memecylon deccanense, Macaranga peltata, Vatteria indica,* etc. More than 50 per cent of the established seedlings in the study sites are contributed by the dominant and co-dominant species. The numbers of unestablished seedlings are more, mainly due to forest clearing and subsequent change in light conditions, paving way to establishment of light demanding species. Thus there is a gradual shift of natural evergreen species composition to, the more light demanding moist deciduous elements, as an indication of the slow trend of habitats change, probably due to selection felling or more precisely due to over-felling. Clumping of selected species is yet another interesting feature observed in many sites, and may be due to microclimatic variations followed by the selection felling procedure.

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