

CHAPTER – VIII

STATISTICS OF GROWTH

INTRODUCTION

Statistics relating to the growing stock in natural forest and plantations has been collected by 10% enumeration in Sandal Reserves and 5% enumeration in plantations. Status of natural regeneration in Sandal Reserves and proposed Reserves have been studied.

8.1 GROWING STOCK ENUMERATION IN WATTLE PLANTATIONS

Five-percentage enumeration was carried out in the plantations of Wattle. Base line was made to cover the longest distance in the plantation. On every 20th chain one chain width strip was taken. The girths at breast height of the trees coming in these strips were taken and volume calculated. The details of the growing stock enumeration are given in **Appendix –XLIII**.

8.2 GROWING STOCK ENUMERATION IN SANDAL RESERVES

10% enumeration was carried out in all Sandal reserves in Marayoor Sandal Division. Sandal reserves were first perambulated and a base line was cut in the reserve to cover the longest distance possible with the help of prismatic compass and ranging rods. Strip lines of 1 chain width were laid out on either side of the base line at right angle to it at every 10th chain (5th, 15th, 25th, etc.). Sandal plants of and above 10cms g.b.h and all the miscellaneous species of trees of and above 70 cms gbh in the strips were enumerated and result tabulated in 10 cms girth classes. There is no volume table or ready reckoner showing the weight of heartwood obtainable from a particular girth class tree. A list of Sandal trees felled and wood collected during the last 10 years was prepared in 10 cm in girth class. The list contains weight of Sandal wood obtained before cleaning and after cleaning. Now we have the weight of the Sandal wood received from each 10 cm girth class Sandal tree. The Sandal wood is sold in weight and in enumeration we get only the girth measurement at B.H. So, as said above, from old records of Marayoor Range, we prepared a list of average quantity of Sandal wood obtained before and after cleaning in each 10 cm girth class in K.g. We have taken this as the standard and estimated the yield of Sandal wood and evaluated stock. For example class I fetches high value while the flakes fetch much lower value. We took the

average of all these rates and calculated the value of the growing stock of Sandal reserve. The details of sandal stock enumeration are given below.

8.2.1 Koodakadu: It has 30 tree species with an average representation of 85 tree per ha. *Anogeissus latifolia* is highly predominant forming over 20% of the number of trees and representation in almost all classes. *Pterocarpus marsupium*, *Gmelina arborea*, etc. are the other predominant tree species. Maximum number of trees are in between girth class 70 to 130 cm. *Anogeissus latifolia*, *Agrostistachys buniis*, *Pterocarpus marsupium*, *Cassia fistula*, *Syzygium cumini* are the predominant species in the class. The main species in the girth class 70 to 100 cm are *Anogeissus latifolia*, *Agrostistachys buniis*, *Gmelina arborea*, *Terminalia latifolia*, *Alstonia scholaris*, *Calophyllum inophyllum*, *Cassia fistula*, *Phyllanthus emblica*, *Ficus drupacea*, *Mimosa odoratissima*, *Dalbergia lanceolaria*, *Dalbergia latifolia*, *Vitex altissima* etc. The details of enumeration are given in **Appendix – XLIV**.

8.2.2 Vananthura II : It has 30 tree species with an average growing stock of 47.m³ of timber, 81.MT of firewood/Ha. The predominant tree species are *Anogeissus latifolia*, *Pterocarpus marsupium*, *Gmelina arborea*, *Anogeissus latifolia*, *Dalbergia latifolia*, *Calophyllum inophyllum*, *Elaeocarpus serratus*, *Phyllanthus emblica*, *Alstonia scholaris*, *Mimosa odoratissima* etc. The other prevalent tree species are *Grewia tiliifolia*, *Ficus benghalensis*, *Trema orientalis*, *Bridelia retusa* etc. The maximum number of trees in girth class 70 to 100cm are *Anogeissus latifolia*, *Terminalia latifolia*, *Gmelina arborea* etc. The details of enumeration are given in **Appendix – XLV**.

8.2.3 Karayoor II : It has 21 tree species with an average representation of 15 trees/ha, an average growing stock of 9.m³ of timber and 8 MT of firewood/ha. *Vitex altissima*, *Pterocarpus marsupium* are the highly predominant species. The other prevalent species are *Syzygium cumini*, *Ficus hispida*, *Anogeissus latifolia*, *Ficus hispida* etc. All species are well represented in girth class 70 to 100cm. The maximum number of tree species are represented in girth class 70 to 140 and none of the trees are absent in girth class 70 to 100cm. The maximum number of trees in the girth class are *Vitex altissima*, *Grewia tiliifolia*, *Syzygium cumini*, *Pterocarpus marsupium* etc. The details of enumeration are given in **Appendix – XLVI**.

8.2.4 Vananthur – I: It has 15 tree species with an average growing stock of 20 m³ of timber, 29.MT of firewood/Ha. *Anogeissus latifolia* is the highly predominant, forming nearly 32 percentage of trees and in all girth classes. Other prevalent species are *Pterocarpus marsupium*, *Bridelia retusa*, *Dalbergia latifolia*, *Mimosa odoratissima*, *Phyllanthus emblica* etc. In the highest girth classes of 171 to 180cm, *Pterocarpus marsupium*, *Anogeissus latifolia*, and *Mimosa odoratissima* are represented. The maximum numbers of all species are of girth classes 70 to 100cms. Important species in girth classes 70 to 100cms are *Santalum album*, *Anogeissus latifolia*, *Bridelia retusa* and *Dalbergia latifolia*. The details of enumeration are given in **Appendix – XLVII**.

8.2.5 Karayoor I: It has 30 tree species with an average representation of 33 trees/ha an average growing stock of 15.m³ of timber, 12.MT of firewood/ha. The predominant representation is *Wrightia tinctoria* and *Dalbergia latifolia*. The highest girth classes of above 230 are seen in case of *Ficus drupacea* and *Gmelina arborea*. *Syzygium cumini*, *Grevillea robusta*, *Mimosa odoratissima*, *Dalbergia latifolia*, *Acacia meavnsii*, *Ficus drupacea*, *Cassia fistula*, *Ficus hispida*, *Ficus benghalensis*, *Dalbergia lanceolaria*, *Albizia lebbeck*, *Melia dubia*, *Vitex altissima*, *Anogeissus latifolia*, *Gmelina arborea*, *Agrostistachys buniis*, *Pterocarpus marsupium*, *Terminalia latifolia* are represented in almost all classes main species in 70 to 100cm girth class are *Dalbergia latifolia*, *Cassia fistula*, *Santalum album*, *Mimosa odoratissima* and *Anogeissus latifolia*. Details of enumeration are given in **Appendix – XLVIII**.

8.2.6 Nachivayal block I: It has 27 tree species with an average representation of 162 trees/ha, an average growing stock of 98.m³ of timber, 103 MT of firewood/ha. *Pterocarpus marsupium* is highly predominant forming over 10% of the trees and representation in almost all classes. Karuvetty *Agrostistachys buniis*, *Syzygium cumini*, *Santalum album*, *Mimosa odoratissima*, *Dalbergia latifolia*, are the other main species. The maximum number of trees is in between girth class 70 to 130 cm. *Cassia fistula*), *Syzygium cumini*, *Dalbergia latifolia*, *Bombax ceiba*, *Mimosa odoratissima*, *Agrostistachys buniis*, *Grewia tiliifolia* etc are the predominant species in this class. The main species in the girth class 70 to 100cm are *Agrostistachys buniis*, *Santalum album*, *Pterocarpus marsupium*, *Euodia roxburghiana*, *Anogeissus latifolia* etc. The details of enumeration are given in **Appendix –XLIX**.

8.2.7 Nachivayal block II: It has 29 tree species with an average representation of 99 trees/ha, an average growing stock of 64m³ of timber, 52 MT of firewood/ha. The predominant representatives are *Anogeissus latifolia*, *Pterocarpus marsupium*, *Agrostistachys buniis*, *Cassia fistula*, *Gmelina arborea*, *Mimosa odoratissima*, *Dalbergia latifolia*, *Grewia tiliifolia*, *Syzygium cumini*, *Elaeocarpus serratus*, *Mallotus philippensis* etc. The highest girth class of above 280cm are seen in case *Pterocarpus marsupium* and *Ficus drupacea*. *Anogeissus latifolia*, *Mimosa odoratissima*, *Spathodia companulata* etc are present in almost all classes. The maximum number of trees are in girth class 70 to 220cm. Almost all the tree species are well represented in girth class 70 to 140 cm. Maximum number of tree species in girth class 70 to 140 cm are *Anogeissus latifolia*, *Pterocarpus marsupium*, *Santalum album*, *Dalbergia latifolia*, *Agrostistachys buniis*, *Grevillea robusta*, *Agrostistachys buniis*, *Grewia tiliifolia*, *Spathodia companulata* etc. The details of enumeration are given in **Appendix – L**.

8.2.8 Theerthalar Proposed Reserve: It has 38 tree species with an average representation of 84 trees / ha, an average growing stock of 91 m³ of timber and 101 MT of firewood / ha. *Anogeissus latifolia* is highly predominant with representation in all girth classes. The other predominant species are *Pterocarpus marsupium*, *Anogeissus latifolia*, *Dalbergia latifolia*, *Gmelina*

arborea, *Syzygium cumini*, *Phyllanthus emblica*, *Grewia tiliifolia*) etc. Main tree species above 250 cm girth classes are *Pterocarpus marsupium*, *Anogeissus latifolia*, *Anogeissus latifolia* and *Dalbergia latifolia*. The maximum no of trees in all the species are of girth class 70cm to 170cm and none of the tree species is absent in the lower girth class 70 to 100cm. The highest number of trees in 70cm to 100cm girth class are *Anogeissus latifolia*, *Pterocarpus marsupium*, *Anogeissus latifolia*, *Phyllanthus emblica*, *Gmelina arborea*, *Grewia tiliifolia*, *Syzygium cumini*, *Mimosa odoratissima*, *Ficus hispida* etc. The details of enumeration are given in **Appendix – LI.**

8.2.9 Pallanadu: It has 17 tree species with an average representation of 238 trees /Ha, average growing stock of 105 m³ of timber, 70MT of firewood /Ha. The predominant tree species are *Syzygium cumini* and *Cassia fistula*. The other prevalent tree species are *Agrostistachys buniis*, *Mimosa odoratissima*, *Bombax ceiba*, *Pterocarpus marsupium*, *Dalbergia latifolia*, *Euodia roxburghiana*, etc. The highest girth classes above 150cm are *Bombax ceiba*, *Mimosa odoratissima* and *Grewia tiliifolia*. The highest number of trees in girth class 70 to 100 are *Santalum album*, *Cassia fistula*, *Dalbergia lanceolaria*, *Agrostistachys buniis*, *Grewia tiliifolia*, *Euodia roxburghiana*, etc. The details of enumeration are given in **Appendix – LII.**

8.2.10 Sandal Reserve 52: It has 19 tree species with an average representation are of 110 trees/ha. an average growing stock of 175.m³ of timber, 206 MT of firewood/ha. The predominant species are *Dalbergia lanceolaria*, *Syzygium cumini*, *Gmelina arborea*, *Alstonia scholaris*, *Ficus hispida*, *Dalbergia lanceolaria*, *Pterocarpus marsupium* etc. *Dalbergia latifolia* and *Syzygium cumini* are highly predominant species forming 60% of total number of trees and with representation in all the girth class from 70 cm to 150 cm. The highest number of trees in all the species are in the girth class 70 cm to 160 cm. The main species in 70 cm to 100 cm girth classes are *Dalbergia lanceolaria*, and *Agrostistachys buniis*, *Alstonia scholaris*, *Vitex altissima*, etc. The details of enumeration are given in **Appendix – LIII.**

8.2.11 Sandal Reserve 54: It has 42 tree species with an average growing stock 34m³ of timber and 40MT of firewood /Ha. *Anogeissus latifolia* is highly predominant with representation in all girth class. The predominant tree species are *Pterocarpus marsupium*, *Anogeissus latifolia*, *Alstonia scholaris*, *Mimosa odoratissima*, *Dalbergia lanceolaria*, *Syzygium cumini*, *Calophyllum inophyllum*, *Mallotus philippensis*, *Cassia fistula* etc. *Syzygium cumini* and *Dalbergia latifolia* are represented in the highest girth class of above 260 cm. The highest number of tree species are of girth class 72-140. All tree species are represented in lower girth class 70-100. The highest numbers of trees in this girth class are *Anogeissus latifolia*, *Syzygium cumini*, *Vitex altissima*, *Dalbergia latifolia*, *Agrostistachys buniis*, *Pterocarpus marsupium* and *Mimosa odoratissima* etc. The details of enumeration are given in **Appendix – LIV.**

8.3 REGENERATION SURVEY

Along with strip enumeration 1% regeneration survey was also conducted in the sandal reserves and proposed reserves. Seedlings, saplings and poles of all categories were enumerated (Seedlings up to 1 M height, Saplings up to 25cm g.b.h/3cm height, poles g.b.h. 25cm to 74 cm.) The details of data collected in the regeneration survey are given in the **Appendix- LV**.

8.3.1. Analysis of Regeneration Survey

1. Karayoor I: Regeneration status is below satisfactory level. 88 seedlings, 127 saplings and 9 poles/ha are present. The main established regeneration are *Pterocarpus marsupium*, *Mimosa odoratissima*, (*Dalbergia latifolia*, *Santalum album*, *Syzygium cumini*, etc. Other species regenerated are *Vitex altissima*, *Anogeissus latifolia*, *Phyllanthus emblica*, *Cedrela toona*) etc. 6 species are in pole stage. Establishing Diversity of established regeneration is very poor. The data shows that the reserve is under going severe degradation due to biotic pressure like grazing and suppression from heavy weed growth of lantana **Appendix- LV (1)**.

2. Koodakadu: The regeneration survey shows only 30 seedlings, 42 saplings and 30 poles /Ha. The diversity of regenerations is very poor with 19 species represented in the seedlings, saplings and pole stages. Established regenerations are *Anogeissus latifolia*, *Grewia tiliifolia*, *Santalum album*, *Agrostistachys buniis*, *Alstonia scholaris* etc. The reason for poor regeneration is heavy grazing **Appendix – LV (2)**.

3. Nachivayal I: Regeneration recorded is 91 seedlings, 159 saplings and 36 poles/ha. The diversity of regeneration is good with 23 species represented in seedlings, sapling and pole stages. The established regeneration are of rosewood, Kanikonna, Vekkali, Nelli, Potti etc. Details regarding regeneration survey are given in **Appendix – LV (3)**.

4. Vannathura I: The regeneration is very poor in the reserve due the thick growth of lantana and severe grazing. The regeneration noticed is 29 seedlings, 23 saplings, and 29 poles /Ha. The diversity of establishment is also very poor and the major species that attained the pole stage are (*Dalbergia latifolia*), *Pterocarpus marsupium*, *Anogeissus latifolia*, *Cassia fistula*, *Mimosa odoratissima*, *Santalum album*, *Grewia tiliifolia* etc **Appendix – LV(4)**.

5. Vannathura II: This Reserve shows good regeneration with 378 seedlings 900 saplings and 304 poles/ha. The diversity of establishment is some what good compared to other sandal reserves with 18 species represented in pole, sapling, seedling stages. The established regeneration of *Syzygium cumini*, *Cassia fistula*, *Anogeissus latifolia*, *Grewia tiliifolia* etc. Other regeneration in the order of abundance are *Careya arborea*, *Dalbergia latifolia*, *Trema*

oreantal, *Agrostistachys buni*, *Mimosa odoratissima*, *Santalum album* etc
Appendix – LV(5).

6. Pallanadu: The natural regeneration is relatively poor, 228 seedlings, 300 saplings, and 71 poles /ha. Regeneration does not get established due to grazing and weed growth. The regeneration of sandal is comparatively satisfactory in this area. The main established regeneration are of *Santalum album*, *Dalbergia latifolia*, *Mimosa odoratissima*, *Agrostistachys buni* and *Pterocarpus marsupium* **Appendix – LV (6).**

7. Karayoor II: The natural regeneration recorded in the survey is with 50 seedlings, 84 saplings and 11 poles /ha. 13 tree species are represented in seedlings saplings and pole stages. The main established regeneration are *Vitex altissima*, *Phyllanthus emblica*, and *Anogeissus latifolia*. The other regeneration in order of abundance is *Dalbergia latifolia*, *Santalum album*, *Syzygium cumini*, *Mangifera axillaris* and *Wrightia tinctoria*. Grazing is the major biotic pressure. Regeneration do not get established due to over grazing.
Appendix – LV (7).

8. Nachivayal II: In this reserve the regeneration is very poor with 140 seedlings, 246 saplings and 53 poles/ha. The regeneration do not get established due to grazing and thick growth of lantana. The diversity of regenerating is rather good with 24 species represented in seedling and sapling stages. Established regeneration are mainly of *Anogeissus latifolia* and *Phyllanthus emblica*. The species in order of abundance are *Cassia fistula*, *Agrostistachys buni*, *Dalbergia latifolia*, *Mimosa odoratissima*, *Trema oreantis*, *Grewia tiliifolia*, *Anogeissus latifolia*, *Gmelina arborea* etc.
Appendix – LV (8).

9. Sandal Reserve 52: The regeneration recorded shows 64 seedlings 145 saplings and 54 poles/ha. The diversity of establishing is satisfactory with 19 species represented in the pole stages. The established regeneration are mainly of *Anogeissus latifolia*, *Phyllanthus emblica*, *Anogeissus latifolia*, *Dalbergia latifolia*, *Grewia tiliifolia* etc. The other species in the order of abundance are *Santalum album*, *Cassia fistula*, *Mimosa odoratissima*, *Gmelina arborea*, *Syzygium cumini* etc. **Appendix – LV (9).**

10. Sandal Reserve 54: The regeneration estimated is 185 poles 410 saplings 370 seedlings. The diversity of regeneration at sapling stage is good and pole stage it is very poor The established regenerations are mainly of *Anogeissus latifolia*, *Mimosa odoratissima*, *Phyllanthus emblica*, *Terminalia latifolia*, *Pterocarpus marsupium*, *Grewia tiliifolia*, *Dalbergia latifolia*, *Santalum album*, *Syzygium cumini*, *Calophyllum inophyllum*, *Mallottus philippensis*, *Vitex altissima*, *Cassia fistula*, *Alstonia scholaris*, *Gmelina arborea*, *Mangifera axillaris*, *Terminalia bellirica* etc. The reasons for poor regeneration are heavy grazing and gregarious growth of lantana **Appendix – LV (10).**

8.4 CAPITAL VALAUE OF FORESTS

Valuation of Forest in Marayoor Division is attempted here. The possible basis for computing the value of Forest are, 1 Historical cost, 2 income value, 3 Market value. It is impossible to assess the capital value accurately in terms of money basis because of difficulty in quantifying the benevolent multifarious services it provides on nature and to the living being. The valuation made here is an attempt to evaluate capital values of the land, sandalwood, Pulpwood, timber and firewood. The assessment is based on the data collected through growing stock enumeration. The land value is calculated by assessing the value of plantation area and interior forest area separately and adding them. Plantation areas are generally easily assessable and have flatter terrain and better soil. Hence, the land value is taken as Rupees 50,000 per hectare for plantation areas and Rupees 25,000 per hectare for the natural forest tentatively. The value of timber and firewood is assessed based on the existing seniorage rates given in **Appendix – LVI**.

The value of a tree

- The tree that lives for 50 yes
- Generates Rs. 5.3 lakhs worth of oxygen
- Recycles Rs. 6.4 lakhs worth of fertility
- Facilitates Rs. 6.4 lakhs worth of soil erosion control
- Makes Rs. 10.5 lakhs work of clean air and Provides Rs. 5.3 lakhs work of shelter for birds and animals.
- Besides, it provides flowers, fruits and timbers
- So when one tree falls or is felled
- We lose something worth more than Rs. 32 lakhs and our fragile nature

8.5 VALUATION OF FORESTS - DIFFERENT PERCEPTIONS

In the past forest was treated and managed purely on a revenue earning model. That approach has changed now and the forest is considered a “life supporting system”. With the passage of time and accrual of knowledge, perceptions were revolutionized and the priorities have undergone drastic changes. In the management of natural forest the focus of attention has shifted from revenue generation to ecological and environmental considerations. Since forest is the product of interaction of various natural forces its valuation provides many hurdles. Hence, the valuation of forest is a

difficult exercise because it involves combining ecological environmental and economical values. The clarification issued in connection with the Forest Conservation Act 1980 is that the environmental value of 1 Ha of fully stocked Forest (1.00) would be taken as 126.74 lakhs. This value gets reduced with the reduction in density. Based on various studies it was estimated that a tree that lives for 50 years will generate oxygen worth of 5.30 lakhs, recycling nutrients and control of soil erosion worth of 6.40 lakhs, reduce air pollution worth of 10.50 lakhs and provide shelter for birds and insects and other animals worth of 5.30 lakhs. Besides, it provides flowers, fruits, fodder and medicines to name only a few. Covering all these, when a tree is felled nature loses something worth more than 32 lakhs since the tools of economical investigation to quantify. The natural factors that shape the forest and consideration that Forest shower on us are inefficient at present, the accounting of capital value is difficult in the absence of clear-cut parameters to quantify several intangible benefits from the forest the assessing of capital value has become an exercise in futility and the result will never reflect the real value the Forests.