REPORT AND WORKING SCHEME OF THE NILAMBÚR TEAK PLANTATIONS.

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HISTORY OF THE NILAMBÚR TEAK PLANTATIONS.

THE earliest record available which gives any information concerning the teak plantations is a report by Dr. Falconer, Superintendent of the Botanical Gardens, Calcutta, written at the beginning of 1849 on the subject of the Tennaserim teak forests. In it he refers to the planting operations on the Malabar coast: "Indiscriminate and "reckless felling had led to the exhaustion of the natural teak forests, no attention "being paid to planting or replacing the cut trees. Timber of large scantling "became scarce and the price rose from Rs. 7-3-0 per candy in 1815 to Rs. 12 in "1828-29 and to Rs. 15 in 1840. The daily increasing difficulty of procuring "suitable timber for the public wants, even at enhanced prices, brought the subject "again under the consideration of the Bombay and Madras Governments."

Dr. Falconer's report, 1849.

The Nilambúr teak plantations were first suggested in 1840 by Mr. Conolly, Collector of Malabar, who described their object as being "to replace those forests which have vanished from private "carelessness and rapacity—a work too new, too extensive "and too barren of early return to be ever taken up by the native proprietor."

Mr. Macgregor's report, 1875.

"The plantations owed their existence to the accident that one of the many "religious bodies holding temple lands happened to be in "want of funds and to own blocks of land scattered here and "there in this valley, many of which constituted the very "best sites for planting that could have been selected had the whole area been "available to choose from."

Mr. Macgregor's report, 1875.

At first considerable difficulty was experienced in making the teak seeds germinate and Mr. Conolly, in a letter of the 4th August 1842, reported that of 30,000 seeds sown, none had come up, and that of 10,000 saplings transplanted, more than half had died. At the end of 1843, the true method was suggested by Dr. Roxburgh, and this method, with a few slight modifications, is continued up to the present day.

2. The history of the plantations may be conveniently divided into three periods corresponding with the three officers who have held charge of them.

(I) 1844 to 1862—Officer Chatoo Menon, Native Conservator, working directly under the orders of the Collector.

(II) 1862 to 1883—Officer Mr. J. Ferguson, who did most of the management, but sales, &c., were held by the tahsildar under the supervision of the Collector.

(III) 1883-1894—Officer Mr. G. Hadfield, who has virtually the whole control of the plantations, management and sales, though nominally under the Collector.

3. *Period I*—1844 *to* 1862.—Very few records for this period are available. By the end of 1862 all the block known as the Nilambúr block and comprising Eddacode, Elanjery, Arevacode and Aravillykava blocks were planted up, together with three compartments at Pannengode. Especially in the earlier years, the year's planting was in scattered blocks, and only the most favourable spots chosen here and there. From 1854 onwards the planting of each year was confined to a single compartment.

In September 1846 the plantations were reported as being in a very satisfactory condition, containing 235,000 plants, which, in 1848, had increased to between 4 and 5 lakhs in different stages of growth, from half a foot to 20 feet high. Nothing further is known of the progress of the plantations until a report was made by Mr. Macgregor, Special Assistant Collector, dated 17th November 1860. The plantations then contained about 10 lakhs of seedlings in all the intermediate stages of growth from 1 to 18 years. The accounts showed

Dr. Falconer's report.

Mr. Macgregor's report, 1860.

that 1,370,000 were planted and 200,000 removed by thinning. The following table, showing the dates of thinning, is interesting :—

Year of plantation.	Number of seeds planted.	Date of first thinning.	Date of second thinning.
1843	24,764	1852	1859
1844	57,022	1852	1858-59
1845	72,964	1855	1858-59
1846	101,703	1855	1858-59
1847	107,000	1858	1859
1848	140,000	1858	1859
1849	103,880	1858	...
1850	107,500	1858	1859
1851	123,960	...	...
1852	37,201	1858	1859
1853	50,900	...	...
1854	85,000	...	...
1855	104,314	...	...
1856	93,000	...	...
1857	38,800	...	...
1858	43,460	...	...
1859	38,800	...	...
1860	41,680	...	...

Mr. Macgregor goes on to point out that the rate of planting has fallen off in the last four years owing (1) to an increase of thinnings requiring a larger establishment, and (2) to one-fourth of permanent establishment of coolies having, in 1854, transferred their services to the Nilambúr Raja.

He next points out that further thinnings are greatly needed and advises an increase of establishment, the present strength consisting of—

	RS.
1 Native Conservator	50
1 Head duffadar	10
1 Gumasta	8
2 Duffadars at Rs. 8 each	16
8 Peons at Rs. 5 each	40
23 Coolies at Rs. 5 each	115
Total ...	239 or Rs. 2,868 per annum.

The Collector in forwarding this report states that the receipts of 1859 amounted to Rs. 4,715 and the disbursements to Rs. 3,011, and advocates the strengthening of establishment up to Rs. 6,000 per annum on the grounds of an increase of planting and to carry out thinnings more efficiently.

4. Captain Morgan, after inspection, reports (16th May 1861) that the twelve plantations (1843 to 1854) require thinning, and that, the evil-effects of overcrowding were particularly manifest in 1846 to 1854. He asks for an extra grant of Rs. 2,000 for this purpose above the Rs. 6,000 required for establishment. He also points out that, in thinning, the stumps of the trees cut should be up-rooted, as the coppice shoots absorbed nourishment to the detriment of the healthy plants. Further he advocates a survey and recommends a small amount of blackwood being mixed with the teak. Government, in passing orders on the above, applied to the Government of India for a grant of Rs. 6,000, but refused to sanction the extra Rs. 2,000 asked for by the Conservator.

Conservator's report, 16th May 1861.

5. In 1860-61 the receipts from the plantations amounted to Rs. 4,615 and the disbursements as shown in Board's Proceedings, dated 15th September 1862. The Conservator in his administration report of the same year states that the plantations are growing well, but that they need more thinning, and points out that in the last three years the acreage planted has only amounted to 50 acres instead of 100 as in previous years.

Board's Proceedings, 15th September 1862.

Administration reports, 1860-61.

6. On the 13th March 1862 Major Babington was put in charge of the teak plantations, and in his administration report for that year (1861-62) he states that the receipts only amounted to Rs. 808 and the expenditure to Rs. 5,358: 49,705 saplings were thinned, but the sale of these will not realize much; in fact, many are not worth carrying away. The Conservator (Major Morgan) does not agree with this, and thinks that these should realize at least 5 annas each, which, with 7,500 cubic feet of old teak cut from natural forests, should amount to Rs. 20,000.

Administration report, 1861-62.

This ends the first period of the history as, on the 20th May 1862, Forester Ferguson was appointed, Chatoo Menon having been admitted to a special pension of Rs. 37-8-0 for his excellent work.

7. *Period II*—1862-1883.—Mr. Ferguson, on his appointment was perfectly astonished at the flourishing aspect of the plantations, declaring he had never seen any plantation in Scotland to compare with them. He appears to have set to work to measure up the girths of the trees in his older plantations, and has furnished some useful statistics which will be referred to later. He at once perceived the necessity of thinning, pruning and weeding, and the Collector in his letters, dated 2nd August and 28th August, pointed out the urgency of these works. In the latter he states that pruning and weeding, were urgently required in the 1857-61 plantations (one to five years' old), that 50,000 saplings required to be thinned from the 1854-56 (one to eight years' old) and a similar number from the older plantations, and on the 24th September Rs. 6,000 was sanctioned for the purpose.

8. On 18th October Colonel Beddome, the Conservator, after visiting the plantations, submitted his report. He stated that all the older plantations were falling back from want of thinning. The most thinned portions required a removal of 1 in 5 trees. In the younger plantations 25,000 saplings were marked for removal in 1854, and 1855-56 required thinning in a less degree. He pointed out that, owing to want of proper thinning, parts of 1854 were as advanced as 1844, and in summing up he estimates that at least 160,000 saplings, value Rs. 40,000, should be taken out during 1863-64 from the first 10 years' planting, and another 150,000 in 1864-65.

Colonel Beddome's report, 18th October 1862.

He also calls attention to the need of weeding and pruning, stating that in some parts the undergrowth is almost impenetrable in the younger plantations.

He also advocates the extension of planting in 1863-64 which had fallen off in the previous years.

As regards the growth, he remarks that, though the plantations have laboured under great disadvantages, their success is wonderful.

On this report Government sanctioned an additional Rs. 900 for thinning, and ordered that provision for planting should be provided in the budget of 1863-64.

A grant of Rs. 1,000 for a boundary survey was also approved. In November 1862, £80 was spent in pruning tools.

9. The Administration report of 1862-63 shows that considerable progress was made in thinning. The total expenditure amounted to Rs. 6,740 and the revenue to Rs. 17,721, of which Rs. 12,000 was realized by the sale of saplings and the remainder for timber and bamboos from the leased forests. 60,000 saplings, valued at Rs. 30,000, and other timber, amounting to Rs. 23,000 in value, remained on hand, and a proposal was made to start a depôt at Calicut.

Administration report, 1862-63.

10. In 1863-64 a large increase in expenditure was allotted, no less than Rupees 17,426 being budgeted, of which Rs. 13,000 was for thinning, and planting operations and Rs. 1,000 for survey.

Budget, 1863-64.

Eighty-one acres were planted up in Pannengode, but a flood destroyed 40 per cent. of the young plants, which had to be replaced in the following year. [*Note.*—This plantation is now a very forward one.] 2,000 acres were weeded, but no pruning was done. The

Administration report, 1863-64.

flood referred to above floated thousands of saplings, which were only recovered at considerable cost. The contractor for saplings failed in his contract, and they were not delivered in time, and a combination of merchants prevented the sales at the depôt newly established at Kallai from proving a success. All these causes combined to render the year's work a failure. Rs. 13,925 were expended and the revenue realized only amounted to Rs 6,691, a large amount of stock lying undisposed of both in the forest and at the depôt.

11. In 1864–65, on the other hand, there was a very successful outturn of work. 120 acres were planted in Pannengode and Valuvashery, 2,000 acres were weeded and 340 pruned, 40,000 saplings were thinned and 100 acres cleared for new planting. The receipts amounted to Rs. 27,158 and the disbursements to Rs. 16,099. The depôt, however, did not prove a success.

Administration report, 1864–65.

12. In 1865–66 only 56 acres were planted, 2,500 were weeded and 420 pruned and 100 acres prepared for planting. "Considerable portions "suffered from fire, which were more severe than in previous "years." This is the first record of a fire, and the plantations burnt are not mentioned; but from the sentence quoted it is evident that fires had occurred before. The receipts amounted to Rs. 14,621, which would have been larger had not Captain Gamble failed in his contracts. The expenditure incurred amounted to Rs. 18,073.

Administration report, 1865–66.

During the year Dr. Cleghorn, the Conservator, visited the plantations and reported on them as being very satisfactory, commending the pruning and thinning especially, and suggesting that half of the planting should in future be carried on in Nellikutta. Commissariat and hired elephants were used for the timber operations.

Conservator's report, No. 135, 28th April 1865.

13. 1866–67 was again a satisfactory year, and the Conservator specially comments on the satisfactory growth of the plantations, some of the trees being upwards of 5 feet girth in the older plantations. At the same time he notices the appearance of a destructive parasite (a species of *loranthus*): 128 acres were planted, 3,200 weeded, 200 pruned and 100 acres cleared for planting. A case of trespass was compounded.

Administration report, 1866–67.

Administration report, 1867–68.

The expenditure was Rs. 12,248 and the revenue Rs. 27,006. The operations for the year were—

Planting	Acres.	105
Weeding	„	2,500
Pruning	„	692
Parasite-clearing	„	400
Site prepared	„	130
Saplings cut	No.	9,600
Saplings collected	„	16,000
Receipts	Rs.	3,097
Disbursements	„	14,557

Hired elephants were employed as being superior for this work to the Commissariat elephants. The new work of parasite-clearing is noticed as "entailing much dangerous work." Experiments were commenced in sowing blackwood and other jungle wood seeds. The sales were bad on account of the Abyssinian war drawing off the means of transport. Saplings stored in the depôt for two years had deteriorated a little. No saplings were floated, as contracts could not be obtained at fair rates.

14. In 1868–69, 145 acres were planted up in Valuvashery, 3,350 acres were weeded and 39 pruned. Parasites were cleared from 700 acres, and it is reported that this pest was nearly eradicated: 20,000 saplings were thinned.

Administration report, 1868–69.

An experiment was tried in planting grain and native vegetables with the teak, but failed as the vegetable crops realized little or nothing, being destroyed by wild animals, whilst the teak seedings came up weak and straggly, comparing very

unfavourably with the seedings put down by themselves. Some indigenous seeds and a few introduced (Belgaum walnuts) were put down, but the seeds after germinating damped off in the monsoon. Part of the Nilambúr block was surveyed, Rs. 586 being spent in cutting traces and planting boundary stones.

A disastrous fire occurred, which overran about 300 acres of Valuvashery, damaging compartments 1865, 1866, 1867 and 1868, which had to be cut back and destroying Rs. 5,400 worth of saplings stored in the plantation. Expenditure amounted to Rs. 17,308 and receipts to Rs. 15,906.

15. In 1869–70, 53 acres were planted up in Valuvashery with blackwood interspersed, 2,300 acres were weeded and 590 pruned. The survey was continued, Rs. 509 being spent on trace-cutting and labour, exclusive of the price of stones. Fire-tracing was successful. The expenditure amounted to Rs. 18,414 and the receipts to Rs. 10,454.

Administration report, 1869–70.

16. In 1870–71, 74 acres of teak were planted in Nellikutta and 2½ acres of sappan wood near Karumpoya. (This was cut down in 1886, a few rupees being realized by the sale, and the area planted up with teak). 2,695 acres were weeded and 625 pruned: 4,075 saplings were floated. The survey was completed and Rs. 351 spent on it during the year.

Administration report, 1870–71.

17. In 1871–72, 46 acres were planted in Nellikutta, 3,000 were weeded and 1,200 pruned. 25,000 saplings were felled, 14,370 collected and 8,202 floated to the depôt; 13 miles of line were fire-traced. The receipts were Rs. 8,508 and disbursements, Rs. 27,538.

Administration report, 1871–72.

18. In 1872–73, 207 acres were planted up in Chatamborai, 1,540 were weeded, 235 hoed and 800 pruned. 29,000 saplings were felled, 12,942 collected and 11,343 floated to the depôt; 13½ miles of fire-tracing were done. Two new blocks—Amrampolliem and Karumpoya—were purchased at a cost of * Rs. 80,000 and were surveyed and demarcated at a cost of Rs. 106.

Administration report, 1872–73.

A note in this report shows that pruning was continued up to twenty and thirty years.

In June 1872, Major Beddome reported unfavourably on the plantations doubting the quality of the timber and stating that he saw signs of premature decay in some of the older trees and suggested a careful report being made before more was spent on acquiring land and planting it. In the same year Mr. Athol Macgregor's exhaustive report, published in the next year, was compiled.

Conservator's report, No. 1301, 12th June 1872.

19. 1873–74, 99·8 acres were planted in Chatamborai and 42 acres in Amrampolliem (Mr. Stanborough being in charge of the works at Amrampolliem), 3,200 acres were weeded, 125 hoed, 1,600 pruned. 29,000 saplings were felled, 12,942 collected and 11,343 floated to depôt. Receipts amounted to Rs. 24,312, disbursements to Rs. 31,782.

Administration report, 1873–74.

20. Mr. Macgregor's valuable report, which has already been referred to more than once, was published during he year. After detailing the difficulties of getting the seed to germinate and the site selected for planting, he proceeds to enquire into the financial aspect, and shows that, by thinnings, the cost of upkeep and 4 per cent. on the actual outlay should easily be covered.

Mr. Macgregor's report, March 1874.

He then proceeds to estimate the number of trees remaining per acre at 10, 20, 30 and 80 years, which he decides should be, respectively, 750, 500, 150 and 50.

He estimates that each tree of the final crop will contain 50 cubic feet and that the outturn will be 70 (acres) × 50 × 50 per annum. He estimates the value a

* Amrampolliem included 87·44 acres of plantation, of which 62 acres were planted about 1861 and the rest about 186

Rs. 1-8-0 per cubic foot and allows 11 annas for floating charges, &c., and sums up that the plantation can hardly fail to be a financial success and will contribute to the wants of the country an immense stock of useful material.

Administration report, 1874-75.

21. During this year Mr. Ferguson went on leave and the plantations were managed by Mr. Stanborough. 84 acres were planted in Chatamborai and 73 in Amrampolliem: 157 acres were hoed and 994 acres pruned; site for fresh planting 140 acres.

34,745 saplings were cut, 21,598 collected and 10,601 were floated to Calicut; 17 miles were fire-traced. On account of the late arrival of the saplings at the depôt, the sales were not good. The receipts were Rs. 14,919 and the disbursements Rs. 25,676. A fire occurred in Valuvashery and overran part of compartment 1864; but, as the plantation had been recently weeded and as the fire was quickly extinguished, very little damage was done.

Administration report, 1875-76.

22. During this year 110 acres were planted and 125 cleared for planting. Thinning was more largely carried out, but weeding and pruning were not carried on so extensively as could be wished owing to the prevalence of cholera. Receipts, Rs. 20,857; disbursements, Rs. 27,736. In his report Mr. Ferguson strongly advocated the extension of planting, pointing out that the plantations, on the whole, had been a decided success.

Administration report, 1876-77.

23. During the year, 147 acres were planted at Amrampolliem. A great number of casualties occurred in the previous year's planting, and these were replaced. Weeding, pruning and parasite-clearing were more extensive than in the previous year. The receipts amounted to Rs. 33,212; disbursements, Rs. 27,966. The early monsoon caused the teak to winter in October. Land was prepared for the Castilloa plants expected from Kew and the mahogany is reported to be doing well.

Conservator's report, 20th June 1876.

24. In this report the Conservator states that he has visited the plantations and that they look healthy and promising. That during his visit he saw no signs of the premature decay noticed in his report of 1873. He does not consider under-planting necessary. He advises that, for the present, there should be no extension of planting (1) because he would rather see the money spent on the improvements of mountain teak forests; (2) because he doubts the quality of the plantation teak; (3) because he thinks that the plantation teak will mature very early and, therefore, prove to be of indifferent quality; (4) because the closing of the Bombay dockyard and the Suez Canal have lessened the demand for teak, whilst the rich North Canara forests have increased the supply. In forwarding his report the Collector (Mr. Logan) reports his diffidence in expressing an opinion as to the advisability of extending the plantations, but notes the following points: (1) that the best way of finding out the value of the teak is to submit specimens to the tests of the dockyard authorities; (2) that even if it be found to be inferior in quality to mountain teak, the increased number of trees per acre and the facility of transport will render the plantation teak valuable; (3) that, as the Karumpoya block was purchased for this *express purpose* (*i.e.*, to extend the plantations), it is a pity it should not be utilized in this way. From the foregoing it will be judged that the Collector was in favour of the extension. The Board, however, inclined to the Conservator's view, and this opinion was upheld by Government, and, in consequence, orders were passed not to extend the plantations.

Administration report, 1877-78.

25. Very little information is to be gained from this report, as the district report was not printed. There was no planting, but 3,476 acres were weeded and 175 pruned, whilst parasites were cleared over 150 acres, 13,772 saplings were cut and 8,436 collected. Receipts, Rs. 22,515; disbursements, Rs. 22,735. The experiments with mahogany and bamboos were continued.

Colonel Beddome during the year collected statistics for his *Magnum opus* on the plantations, which was published in the following year.

Administration report, 1878-79.

26. The work done during the year was as follows:—

	ACRES.
Weeded	2,881
Pruned	320

The year under report was an unfortunate one in many ways.

(1) Mr. Ferguson began his unfortunate mania for horticulture, and from his reports it may be judged that he rather neglected the plantations for his experiments with mahogany, rubber, &c. In one of his reports he seems to regard the loss of the leader of one of his promising rubbers more seriously than the effect of a bad storm on his plantations.

(2) In March 1879 a fire occurred in Amrampolliem, damaging the plantation and destroying 3,800 saplings valued at Rs. 2,660.

(3) In May 1879 fire overran compartments 1872, 1873, 1874 and 1875 of Chatamborai. The plantations were all in fresh leaf and were much scorched and nearly all the trees had to be cut back in subsequent years.

In a report dated 16th September 1879, Mr. Ferguson estimates the damage done by these fires at Rs. 15,000 to Rs. 20,000.

(4) In May 1879 a bad windstorm occurred, which uprooted and topped a large number of trees, especially in Aravillykava 1844.

Colonel Beddome's report, 20th April 1878.

27. In this year was published Colonel Beddome's exhaustive report, which contains information of much value and has been the guide for subsequent operations. At the same time it contains a few inaccuracies, but those of such great importance that it must be dealt with at considerable length. In paragraph 4 Colonel Beddome gives a table of measurements of the saplings cut from each year's plantation to be sent to the Paris Exhibition. He adds "These with one exception (1847) were not taken "from the few large examples which have much outrun their neighbours, but are a "fair average of the growth of the 60 trees per acre which will eventually be "selected to stand to maturity for the ultimate crop." In this statement Colonel Beddome has made a great mistake which can be proved from his own figures.

28. The following are taken from his tables:—

Year.	L.	I. Sale measurement. Centre girth.	I. Sale measurement. Contents.	II. Sale measurement. Centre girth.	II. Sale measurement. Contents.	—
1844	70	12¼	72	11⅓	54	9⅜"—46 (Eddacode).
1845	60	12	60	9 9/10	48	
1846	72	11¾	69	9½	46	
1847	70	14½	102	9	32	
1848	55	10	42	8	31	
1858	50	7¾	23	6½	13	
1868	46	6½	12	5	6	

The columns I are from his table in paragraph 4 and the columns II are deduced from the average of the 30 best trees measured by him in each of the ½-acre sample areas given in the appendix. The great differences are readily visible.

Now the mistake would not be of much consequence were it not that in paragraphs 85 to 92 it will be seen that he has based his estimates of yield entirely on this table, and although he mentions in the concluding paragraphs these sample areas, he passes them off with the remark that they do not illustrate the growth.

29. Colonel Beddome then goes on to classify the soils and the growth on them, and this he has done with much accuracy. In paragraphs 11 to 48 he has drawn out a very careful description of the different compartments. Of course, as there generally must be in such descriptions, there are a few inaccuracies in the description (*e.g.*, in 1850, third block, he is apparently describing another compartment, probably 1849); but on the whole it is a valuable piece of work, and had it only been accompanied by a stock map illustrating the portions referred to, it would have saved a great deal of labour in the preparation of the present working plan. As pointed out by him in paragraph 3, the average girths he gives are not a real criterion of the growth of the ultimate crop, and to take the average of the biggest trees given by him would be equally misleading. Hence no comparison with the growth at the present time can be made, which is a great pity.

Colonel Beddome's report, 20th June 1878.

30. In paragraphs 49 to 57 he gives his general remarks, which are very applicable to the plantations; but, unfortunately, the year after he wrote there were two disastrous fires. The notes he has given in paragraphs 58 to 76 as regards the past financial results are of the greatest value and have been of much assistance in the preparation of the present plan. In paragraph 78 he deals with the age of maturity, and here he differs from Mr. Ferguson, who puts it at a far more advanced age than Colonel Beddome. Colonel Beddome considers that at any rate the exploitable age will be reached at 60 or 70 years, *i.e.*, when the trees have reached a quarter girth of 18 to 24 inches. It is difficult to say * upon what data he arrived at this conclusion, but it may be that, as he states in paragraph 4, he has in his older plantations a quarter girth of 12 inches, therefore at twice age (*i.e.*, 60 to 70 years) he will have twice the quarter girth. On page 58 of his report he has given a memorandum showing the tapering of the trees, and had he taken this as a guide, he would have seen the fallacy of this argument. In the first five trees he has given, he has measured only one of 70 feet high (his average bole), and that shows a girth of 5 feet 10 inches at breast height and 3 feet 11 inches at the centre. The only other big trees he has measured are No. 5 which has a girth of 6 feet 8 inches at breast and 5 feet 2 inches at centre, but this is an exceptionally short bole (57 feet) and contrasts with the very long one (95 feet) which he gives at the end of the memorandum, which has a girth of 5 feet 9 inches at breast height and of only 3 feet 8 inches at the centre. Colonel Beddome has not appreciated the fact that the trees were still spindles in shape and likely to remain so to measurement on account of their great length of bole. The measurements taken in 1894 show that the ratio $\frac{g}{G}$ varies both with the girth and length of bole. In paragraphs 80 to 84 he calculates the length of bole and puts it down at an average of 70 feet for alluvial and 50 to 55 for laterite.

Girth at centre.
Girth at breast height.

31. Paragraphs 85 to 89 show how Colonel Beddome has deduced the girth and cubic contents. From what has already been stated it will be seen that he has overestimated (1) by generalizing for his final crop from the measurements given of a few individual trees in paragraph 4; (2) by assuming that throughout the life of a tree there is a constant ratio between the girth at centre and girth at breast height.

32. In paragraph 90 he calculates the volume per acre. He starts by the assumption of a 2-feet quarter girth at 60 years and obtains 16,800 cubic feet per acre. He reduces this to 12,600 cubic feet by a deduction of 25 per cent. (or 1 tree in 4) for windfalls and disease (a very high percentage) and further reduces this to half for no particular reason though apparently the actuals obtained in his sample $\frac{1}{2}$ acres have some weight in bringing about this decision. With these sample areas before him, it is surprising he should not have used them as the starting point for his estimates.

* Since this was written a reference to Mr. Gamble's manual has shown by a foot-note that the mean quarter girth was found by finding the reducing factor to be $\frac{5}{6}$. Those trees 30 inches girth at breast height have a girth 25 inches in the middle of the bole. This almost exactly corresponds to the measurements taken in a plantation of similar age in 1894, but that it is not applicable to the larger trees is evident both from the memorandum given by Colonel Beddome and also by the actual measurements taken now.

33. In paragraph 94 he shows the principles on which thinnings have been conducted, and these are very interesting figures.

Colonel Beddome's report, 30th June 1878.

The following table has been drawn out, comparing it with Colonel Campbell Walker's scheme :—

Period.	Colonel Beddome's		Colonel Walker's	
	Number remaining.	Number to be removed.	Number remaining.	Number to be removed.
End of 11th year	739	321	800	200
End of 16th year	408	171	600	200
End of 21st year	237	57	400	150
End of 26th year	180	36	250	130
End of 31st year	144	...	120	...

This shows that under the old scheme the thinnings were heavier quite at the start, but lighter subsequently; whilst the periods of thinning were more frequent under the old scheme—2 years between the first two rotations, then 3 years, then 4, 5, 7, 8, 10 and 13 up to 63.

34. In paragraph 95 Colonel Beddome compares his estimate with that of Mr. Macgregor's, based on Captain Seaton's, and gives reasons for preferring his own.

35. Paragraphs 96 and 97 give his plan for the final fellings, a process of selection (*vide* end of paragraph 90) to be finished in 82 years, but which may be extended over 100 years.

36. In paragraph 98 he deals with the quality of the wood, and in paragraphs 99 and 100 with the price it is likely to fetch, which he estimates at 10 annas net.

37. In paragraph 103 he gives his reasons for not wishing to extend the plantations, and in paragraphs 104 to 106 points out the areas available for the extension of planting.

38. In paragraph 107 he proposes, on a small scale, the experiment of under-planting with teak, which, with our present knowledge, is known to be impossible.

39. In paragraph 108 he gives the cost of the nursery, &c., at Rs. 7 per acre, and allows Rs. 1-8-0 per acre for subsequent up-keep, presumably per annum.

40. In paragraph 109 he suggests an under-planting of mahogany, and in the next two paragraphs deals with the question of debiting the cost of certain blocks to the Nilambúr account instead of the plantation account; whilst in his concluding paragraphs, he testifies to the excellent work done by Mr. Ferguson.

Colonel Beddome's report, 20th June 1878.

41. Appendices A to H give the measurements of sample areas which have not been much used by Colonel Beddome in his estimates. The figures given would be very valuable as a comparison were I not compelled to doubt their accuracy. I have attempted to compare the figures given for Aravillykava, 1844, with those taken now. Using $\frac{5}{6}$ as the reducing formula, I have ascertained the average *g.* at breast high of the 30 best trees to be 54·7 inches. This is ·47 inches more than is found for the 60 best trees on the sample acre measured this year, an area certainly not under the average first class.

Appendix I gives the register of planted areas, and Appendix J the areas planted and unplanted of the several blocks included in the Nilambúr division, both of which have been found very useful.

42. The Board in reviewing the report have accepted the estimates and generally approved Colonel Beddome's proposals. On pages 58 and 59 is the memorandum showing length of bole and quarter girth at breast high and at half length already referred to. In the Government order the proposals generally are approved, and the question of further planting is held in abeyance until it has been more thoroughly discussed.

43. This printed document giving such a clear report of the working and management of the plantations has proved of great value and shows clearly how greatly the success of the plantations is due to Mr. Ferguson.

Administration report, 1879-80.

44. Work done during the year is as follows:—

Site for exotics (prepared)	Acres.	50
Weeded	„	2,530
Pruned	„	1,087
Saplings cut	No.	73,790
Saplings collected	„	16,950
Saplings floated	„	21,397
Receipts	Rs.	25,195
Disbursements	„	31,791

The administration report gives an account of the experiments in mahogany and rubbers, which will be found reported in the appendix. Mr. Ferguson's reports about this time are full of these experiments: the difficulties he has in getting the seeds to germinate and the success of a few plants are detailed at considerable length.

Administration report, 1880-81.

45. The following work was done during the year:—

Weeding	Acres.	1,982
Pruning	„	1,330
Parasite-clearing	„	172
Saplings cut	No.	76,430
Saplings collected	„	27,986
Receipts	Rs.	64,767
Disbursements	„	26,760

The growth of exotics was reported on favourably by the Conservator and Mr. Cross who inspected them. A very useful experiment was tried to test the quality of the plantation teak. The result was that in specific gravity the plantation teak was denser than natural grown, but less dense than Pegu and Anaimalai. As regards breaking strain plantation teak surpassed Pegu, but was inferior to Anaimalai. Colonel Chamier writes: "The specimens have the same appearance "as Malabar teak, but of less specific gravity, the fractions with one exception "exhibiting a good fibrous splinter."

Administration report, 1881-82.

46. Work done during the year:—

Weeding (whole)	Acres.	3,436
Pruned	„	1,813
Parasite-clearing	„	432
Saplings cut	No.	72,621
Saplings collected	„	37,569
Saplings floated	„	44,858
Receipts	Rs.	50,000
Disbursements	„	3,155

A great deal of damage in Valuvashery was done by a severe flood, and also by a heavy windstorm that occurred in November, which especially damaged the older plantations of Eddacode.

The mahoganies were damaged first by a green caterpillar and subsequently by the borer. The experiments with rubbers, &c., are reported on in full and as successful.

Administration report, 1882-83.

47. Work done during the year:—

Weeding	Acres.	2,617
Pruning	„	1,082
Parasite-clearing	„	1,312
Saplings cut	No.	83,297
Saplings collected	„	10,921
Saplings floated	„	39,997

Receipts, Rs. 58,695 (of which Rs. 1,500 belongs to Karumpoya).
Disbursements, Rs. 29,364 (part debitable to plantations).

The increase in the receipts of the last two years was due chiefly to the improved market.

In this year the sales were further increased by 34 wind-blown saplings, of which 29 (34–38 years' old) realized Rs. 1,939 or Rs. 67 per sapling, and Rs. 2 per cubic foot. This is very interesting, as it shows that the average in the older plantations was about 33½ cubic feet per tree (for the better trees, as noted in the report). 3,425 out of 6,000 which were wind-blown were sent to the market, out of which Mr. Ferguson estimates that 3,000 should have remained for the final crop. Mr. Ferguson also makes a very interesting calculation of the damage done by the wind-storm as follows:—

He says the 3,000 trees if put into the market at its zenith would not have realized more than Rs. 13,000 to Rs. 14,600 (*sic*) [of course this must be wrong as he allows less than Rs. 5 per tree, and he has shown above that each tree sold for Rs. 67, so it is probable he intended 140,000], but that if left till maturity (30 years longer) they would have realized Rs. 200 per tree, *i.e.*, Rs. 6,00,000. He does not quite finish his comparison which would be Rs. 1,40,000 capitalized at 4 per cent. for 30 years as compared with Rs. 6,00,000.

During the year a fire occurred in the 1848 plantation, but only overran half an acre, so no damage was done.

The mahoganies are reported to be free from borer and thriving, and the rubbers are also said to be doing well. Thus ends the second period of the history, a period characterized by (1) an extension of planting, 1,732 acres having been added; (2) the introduction of sylvicultural operations in the shape of thinnings, weedings, prunings, parasite-clearings and fire protection; (3) the introduction of the produce of the plantations to the market and the disposal of timber and bamboos in the leased forests outside the plantation; (4) in the later years, the conduct of a series of experiments, trying to introduce other trees, &c., as under-planting in the shape of blackwood, mahogany, rubbers and cereal crops.

48. *Period III*, 1883 *to* 1894.—Mr. Gordon Hadfield took over charge of the plantations on the 28th July 1883, shortly after the introduction of the Forest Act. The notification under section 25 of the Amrampolliem plantation block was published during the year, and negotiations started to acquire certain rights to notify the other blocks. All the plantations were fire-traced, and the whole of the Nellikutta block and the protection was successful, the total cost being Rs. 729.

Administration report, 1883-84.

The following operations in addition were carried out:—

	ACRES.
Weeding	3,400
Pruning	677
Parasite-clearing	*Nil.*

Saplings—felled 63,712, collected 55,950, floated 36,480 [as it is difficult from the reports alone to distribute the expenditure accurately, a separate note will be given in the appendix]. Rs. 30,733 were obtained by the sale of saplings and Rs. 11,167 from the sale of wind-blowns (6,977). The timber operations in Nellikutta were successful.

As regards exotics.—The mahogany growth was not promising, being shrubby and much damaged by borer, which again appeared after the rains. The growth of rubbers was good, but eight trees were blown down.

Experiments in ipecacuanha were also tried.

Administration report, 1884-85.

49. Rules for the control of timber in transit under section 35, Forest Act, were passed by Government, but not enforced except in so far as they relate to registration of property marks.

Negotiations for acquiring rights in the plantations were carried on, but the Nilámbur-Tirumulpad was most unreasonable and obstinate.

All the plantations were successfully fire-protected, the cost being Rs. 872 under this head, of which Rs. 97 are debitable to Karumpoya.

The following operations were conducted in Amarampolliem :—

Weeding 408 acres cost Rs. 534.
Pruning 408 acres cost Rs. 115.

In addition the blocks were divided into compartments by 6 feet paths serving at once as inspection paths and fire-lines ; signboards also were affixed to the trees.

In the leased part of the plantations the works were —

	Acs.	Cost. Rs.
Weeding	2,758	1,667
Pruned	905	444
Parasites	205	125
Saplings thinned	36,952	492

and the compartments were defined as above in the Nilambúr, Valuvashery and Nellikutta blocks.

The mahogany plants remained shrubby, but the growth of the rubbers on the whole continued good, though Mr. Hadfield doubted whether they would yield much revenue, as there was but little milk in the seven year old trees. The revenue realized was Rs. 57,128, of which Rs. 8,606 was due from the former year ; 39,719 saplings were sold at good prices. Some important statistics relating to the exports of timber are contained in this report, but are not commented on as they relate rather to outside forests than to the plantations. It may be noted that 3,917 tons of teak were exported and 249 tons imported. The exports amount to Rs. 1,95,850 cubic feet of teak timber and less than half that quantity of other timber.

50. The Conservator visited the plantation, and after consultation with the Collector (Mr. Logan) and Mr. Hadfield proposed (with estimates) that 1,000 acres should be planted up in the next ten years with teak 6 feet apart and mahogany 50 feet apart—the teak to be treated as coppice and the mahogany as standards—the teak to supply an increasing demand for poles (35,000 sold in 1882–83 and 39,000 in 1883–84). The estimates were carefully drawn up, showing that the total cost of formation and maintenance would amount to Rs. 10,625 including interest at 4 per cent. that felling, floating, &c., charges and maintenance for the eleventh year would bring the total charges up to Rs. 16,951, and the receipts would amount to Rs. 25,000 per annum for ten years which would produce a handsome revenue covering the original debt at the sixteenth year, the remaining receipts being all net profit. After some correspondence this plan was sanctoned.

Conservator's report, 6th February 1885.

51. During the year, Chatamborai was declared a reserved forest. The following operations were carried out :—

Administration report, 1885-86.

	Acs.	Cost. Rs.
Weeding	2,206	2,099
Pruning	763	199
Thinned	927	1,037

All the plantations in Nellikutta were successfully protected from fire at a cost of Rs. 817. The site for planting 100 acres was cleared and burnt at a cost of Rs. 1,046.

A large number of bamboos (*Cephalostachyum pergracile* and *Dendocalamus longispathus*) were put down along the river banks to prevent erosion. The cost was Rs. 481. 8,195 mahogany plants were raised and potted. The rubber continued to grow well, but yielded very little milk.

Mr. Lawson, who visited the plantations, was surprised at the growth of ipecacuanha.

Timber operations were carried on in Nellikutta and Pannengode forests, and the new clearing yielded 2,590 logs. Saplings felled 33,539, collected 36,952, floated, 53,360. 54,080 were sold for Rs. 59,720, and the firewood contained in the rafts realized Rs. 1,150; 20,000 bamboos used for rafting were sold at good prices. The market was good, but not much better than the preceding year. The revenue amounted to Rs. 81,139, the net profit being Rs. 36,000 nearly. Two cow elephants were captured in Nellikutta. Improved supervision was exercised over floating operations, resulting in all the saplings being brought to depôt. Owing to fraud on the part of the depôt-keeper and loss on the way, the loss of saplings in previous years was considerable.

52. Colonel Campbell Walker inspected the plantations in October 1885. In his report he states that the condition of the older plantations is critical, and that great care must be exercised in thinning. He also remarks that the demand for large saplings (measurables) is limited, but for the smaller classes in excess of the supply. He therefore drew up a preliminary plan for thinnings with the help of Mr. Porter and Mr. Hadfield. This was put into operation for the next five years. [This plan will be further commented on in the appendix.]

Conservator's Report—*vide* Board's Proceedings, No. 3263—F. 659, 30th Nov. 1885.

He also suggests the collection of statistics with a view to the formation of a definite working plan.

In paragraphs 11 and 13 he discusses the question of working the outlying blocks of natural forest on a definite plan by dividing them into compartments and working them in rotation, extracting the inferior as well as the mature trees of the better descriptions, giving preference to teak, vengai and rosewood in improvement fellings.

He then proposes a definite scheme for Nellikutta, to which, however, not much attention has been paid.

53. The district was visited by the Collector, Conservator and Mr. Peake.

Administration report, 1886-87.

Thinnings were carried out in accordance with the plan, but it was shown that the stock had not been counted properly previously, so there were discrepancies. It is also pointed out that in Pannengode there was no stock in places where the teak had died out, though the acreage was entered in the plan. 59,090 saplings were taken out, being the amount for the first two years as provided in the plan *minus* 28,379 which were not found to be on the ground for the causes mentioned above. An enumeration of the trees was made for all the plantations except Nellikutta and Amrampolliem. 100 acres of natural forest in Nellikutta were cut over and 519 logs were removed by a contractor paying a royalty of 8 annas per log. The whole of the plantations in Nellikutta were fire-traced with success at a cost of Rs. 616. The work during the year was as follows :—

	Acs.	Cost. Rs.	
Planting	108	3,343	and casualties replaced.
Weeding	2,958	2,332	
Pruning	20	9	
Thinning	510	170	
Site cleared	100	476	

It was discovered that the mahogany borer was the same as attacked the brinjal. A cart-road of 1,112 yards to the Kalserambi was constructed, cost Rs. 90, and 493 yards of compartment roads in new plantation, cost Rs. 72.

The Kalserambi in Pannengode was constructed at a cost of Rs. 191, and estimates were drawn out for the District Forest Officer's *bungalow* at Nilambúr (Rs. 12,900).

52,723 saplings were floated. Owing to combination on the part of the merchants insufficient prices were offered and the stock remained unsold. The revenue collected amounted to Rs. 17,672.

Two young tuskers were caught in Nellikutta.

Administration report, 1887-88.

54. The Palghat range was added to the division during the year, and also the Amrampolliem block (120 square miles) which was purchased for Rs. 42,100.

The works of the year were—

	Acs.	Cost. Rs.
Weeding	2,287	1,860
Pruning	141	49
Thinning	461	261

resulting in 15,111 saplings. 6,107 yards of new compartment roads were constructed and 2,483 yards of old roads, &c., repaired; cost Rs. 352.

The whole of the plantations in Nellikutta block were fire-traced at a cost of Rs. 834. 85 acres of teak with 1,207 mahoganies were planted and casualties replaced; total cost Rs. 2,871.

The District Forest Officer remarks concerning the mahogany that the plants in Aravillykavu, Ramalur and Pannengode suffered so severely from borer that he thinks it advisable to give up planting this tree altogether. Part of the District Forest Officer's bungalow was constructed before the end of the year at a cost of Rs. 4,387.

The rubbers continued to do well. There was a very indifferent market for saplings caused (1) by extensive sale of teak rafters on the Bombay side at a low price; (2) by the villagers not having money to purchase owing to their being unable to effect a sale of their rice.

About 40,000 out of 60,000 saplings in stock were subsequently sold retail and fetched fair prices.

Conservator's report, Board's Proceedings, F. No. 335, 2nd July 1888.

55. The inspection was made in November and December 1887. In his report Mr. Cherry approves of the opening out of compartment lines.

"The oldest trees appeared to average 100 feet in height and 1½ feet in diameter. The 1852 plantation 72 feet height and 1 foot in diameter. The plantations of 1872 and following years seem to show the best growth in proportion to age. The trees do not seem too far apart though the number per acre is less than provided in the working plan." The new plantations are said to be doing very well. As regards the market Mr. Cherry observes that the best demand is for classes 4 and 5, and as all the classes may be attained in ten years growth, he thinks the initial thinnings should be more heavy, every second sapling being taken out.

He disapproves of the arrangement in the working plan of bringing the several years' plantings in each block into one series, and would have preferred to comprise all the plantings of the same year in the several blocks in the same series so as to give them the same annual treatment.

He does not think the thinnings provided sufficiently severe, for, although the number of trees in each block is less than supposed in the working plan, the need for further thinning is apparent.

Administration report, 1888-89.

56. The work done during the year was as follows:—

	Acs.	Cost. Rs.	
Planted	117	4,172	and blanks replaced.
Weeded	4,165	2,899	
Pruned	54	73	
Parasite cleared	80	51	
Thinned	573	420	

All the plantations were fire-traced with Nellikutta block, the cost being Rs. 858. A fire occurred in Amrampolliem in 1862 and overran 60 acres, but, owing to the trees being of large size, very little damage was done.

The mahogany planting in Pannengode failed. Rubbers continued to do well. Experiments with Persian dates and eucalyptus were commenced. The eucalyptus was an utter failure.

The Nilambúr bungalow was completed at a cost of Rs. 12,557, and a cart-road built to it at a cost of Rs. 470.

No progress was made in removal of trees in Nellikutta block. 25,613 saplings were floated. It cannot be ascertained how many were taken out as the form is missing, but the plan was carried out. There was no wholesale demand for saplings and the retail sales were by no means satisfactory. Much of the stock commenced to rot.

Administration report for 1889-90.

57. During this year thinnings were conducted in accordance with the working plan.

The work done during the year was as follows:—

Planting 140 acres cost Rs. 4,468 (total including site clearing).
Casualties in this and the preceding years planting were replaced.

	Acs.	Cost. Rs.
Weeding	1,356	4,481
Pruning	35	42
Thinning	509	503

Site prepared for next year's planting. 3,700 yards of compartment roads were built at a cost of Rs. 164. 20,481 saplings were floated to the depôt.

The demand for saplings was not good, and a considerable quantity of them which had deteriorated were sold as firewood. 22,619 saplings remained in stock. One young tusker and four young cow elephants were captured during the year.

Conservator's report, 25th June 1890.

58. Mr. Peet visited Nilambúr in September 1889. He noted the unequal growth of Aravillykavu, 1852. He comments on the stunted growth of the mahogany planted in 1881 and 1882. He also remarks that no rubber has been got from the India rubber plants. The 1888 plantation was doing very well, but the mahogany there was attacked by borer. He also remarks that part of the new plantations might be treated in coppice and raises the question of payment of kuttikanom, apparently failing to notice that this was the object of these plantations. He also brings to notice that the one successfully grown mahogany is of the broad-leaved species, and suggests that these should be tried in future. He notices the large amount of timber left unsold at the depôt, and suggests timely concession in the matter of price. He comments favourably on the state of the plantations generally.

Administration report, 1890-91.

59. The revised plan of thinnings was introduced in this year, and 33,635 saplings were brought to market.

The work done was as follows:—

Teak planting 100 acres (total) cost Rs. 3,495 with 835 *Swietenia macrophylla*.

	Acs.	Cost. Rs.
Weeding	3,620	3,630
Pruning	148	113
Thinning	431	155

All the plantations in Nellikutta block were successfully protected from fire at a cost of Rs. 922.

The *Swietenia macrophylla* is said to be thriving. One pound of rubber was obtained from 80 of the largest trees in 1886–87, but no tapping was done subsequently; 569 yards of compartment roads were opened in Pokote for Rs. 101. 28,560 saplings were sold and a large number were sold as firewood.

60. Colonel Campbell Walker visited the plantations in November 1890.

Conservator's report, Board's Proceedings, No. 206, 16th May 1891.

The preliminary scheme for thinnings with modifications had been applied with the best results. He points out the faults of the old scheme (1) falsity of the old estimate of number of trees standing; (2) insufficient thinning provided for on good soils.

He draws out a revised plan for five years and suggests the appointment of a special officer to draw up a working plan and final fellings. Attention to be paid to what is to be done subsequently with the planted areas. The Conservator was struck with the improved growth of the plantations.

He recommended the establishment of a pound with special rates of pound fees to put a stop to the grazing of the semi-wild cattle in Aravillykavu. Colonel C. Walker also comments on the new plantations. He points out that the mahogany has failed, and then notes that the treatment must depend on the market which is at present rather uncertain. If it recovers, he advocates coppice under teak standards. He notes that the *Swietenia macrophylla* is growing well and may prove a useful congener with teak. If not, he thinks rosewood and vengai should be tried. The rubbers continue to thrive, but yield nothing like the quantities of rubber expected. He notices the present slack demand for saplings, and suggests trying to open out new markets by shipment in native craft to Ceylon, Tuticorin, Negapatam and Madras. He observes that thinnings under the new scheme will be restricted, and proposes to thin hardly at all in the next year.

Administration report, 1891–92.

61. The settlement of the Nilambúr blocks begun in 1888 was still pending, but judgments in the lower courts were in favour of Government. Thinnings were conducted under the provisions of the new plan. All the plantations in Nellikutta block were successfully protected from fire at a cost of Rs. 1,023.

Work done—

	Acs.	Cost. Rs.
Planted	100	3,557 with blanks replaced.
Weeded	1,939	2,449
Pruned	192	120
Parasite cleared ...	1,460	279
Thinned	431	161

The *Swietenia macrophylla* planted in 1890 showed excellent growth, quite equal to teak. They were exempt from borer, but found a new enemy in sambhur, which nibbled the shoots and barked the trees with their horns. They had to be protected with bamboo thorn fences.

Rubber trees were thriving, but produced no rubber. The introduced bamboos are growing well, 16,206 saplings were cut and collected. Good prices were realized for the saplings, and all the saplings on hand were sold.

Administration report, 1892–93.

62. The thinnings were in accordance with the plan, but in some plantations the number of trees taken out slightly exceeded the number allotted. Plantations 1874 and 1875 of Chatamborai, containing many dead trees, had to be thinned before their turn came round.

Nine sample areas were chosen and measured up in the plantations. All the plantations in Nellikutta forest were successfully protected from fire at a cost of Rs. 1,115.

10

Work done during the year—

	Acs.	Cost. Rs.
Planted	130	4,349
Site prepared and partly planted	100	3,285
Weeded	4,079	3,535
Pruned	238	92
Parasite cleared	931	281
Thinned	455	377

Parasites were cleared in great quantities in the Valuvashery block. All the *Swietenia macrophylla* plants were fenced, which added largely to the cost under the head of 'other charges'. Four miles 500 yards of compartment road were built at a cost of Rs. 288. The number of saplings sold was 17,845 and very large rates were realized.

Administration report, 1893–94.

63. The thinnings were carried out in accordance with the working scheme, but the number to be thinned had to be reduced in proportion to the number found deficient in the actual stock on counting. A re-enumeration of the standing stock was begun and finished at the end of 1894.

All the plantations in Nellikutta forest were successfully protected from fire at a cost of Rs. 916.

The other work done during the year was as follows:—

	Acs.	Cost. Rs.
Planting	100	3,599
Site cleared and partly planted	120	...
Weeding	3,578	3,578
Pruning	445	207
Thinning	282	190

No parasite-clearing was necessary.

The *Swietenia macrophylla* planted with the teak in Eddacode were fenced. 551 yards of compartment road were constructed at a cost of Rs. 129; 22,952 saplings were sold for Rs. 28,244 and 111 logs (wind blown) realized Rs. 2,072.

The rates offered were very good, though slightly lower than in the preceding year.

Conservator's report, 16th December 1893.

64. The plantations were inspected by Mr. Gass in November 1893. He suggested the better marking of the sample areas, which was done in the course of the year. He also gives certain measurements of the trees, but in almost every case the measurements taken are slightly bigger than those now obtained by the working plans officer, which is probably due to the fact that the measurements were not taken at an exact height, so that the girth increments given can hardly be relied on. Mr. Gass was very favourably impressed with the new plantations, and gives figures showing the cost of formation. He makes a few comments on the growth of the rubbers and ipecacuanha, and considers the growth of the introduced bamboos very satisfactory.

Regarding the mahogany he condemns *Swietenia mahogani* as a failure, but considers that the *Swietenia macrophylla* grows well and keeps pace with the teak, and notices that it is less liable to borer. At the same time he notices that the trees in the avenues have been attacked. He gives some interesting figures relative to the one big tree in Chatamborai, and calculates the rate of growth, and gives the number of concentric rings at $2\frac{3}{8}$ per annum. He also estimates the diameter of the heart wood to be 17 inches. He recommends the extension of planting of *Swietenia macrophylla*, but pure, though surrounded by teak, to isolate it from the natural jungle.

He recommends the maps of the plantations being brought up to date, and a consolidated map being prepared for all the plantations round Nilambúr.

He declares the growth in the older plantations to be phenomenal in parts, but generally far from satisfactory, entirely due to want of thinning on proper principles years ago. The thinning should have been early, frequent and moderate. He considers that 60 trees to the acre for the final crop is too many to leave. It would, however, he remarks, be dangerous to reduce it now on account of the probable damage by wind. He also notices the damage done by lightning. In paragraph 46 he states that the age at which the trees are likely to attain their highest commercial value is probably much less than 90 years, and considers this as a subject for enquiry.

He also considers the advisability of a regular working scheme being prepared.

In paragraph 48 he works out the reducing factor for three trees, but appears to take into account the top branches which are unsaleable.

In paragraph 49 he recommends that the new plantations should be worked as clean coppice (except where *Swietenia macrophylla* succeeded), the rotation to be 20 years, and in the following paragraphs he explains his reasons for this treatment. In paragraph 51 he gives the results of his three enumerations of casualties in the 1886 plantation and puts the average at 412 per acre, and calculates that at 10 years there will not be more than 500 to 600 standing.

In paragraph 52 he proposes that a connected history be compiled from the Government orders, special reports and inspection notes, &c. In paragraph 55 he discusses the market rates of teak and natural-grown timber.

In paragraph 60 he advises the erection of a Kalserambi near the plantations of 1893–94, and the remainder of the report deals with the office inspection.

65. This brings the history up to the present year. During the year the usual works of maintenance were undertaken. The thinnings were made in accordance with the working plan, but only a small number of saplings were available. 3,071 saplings were brought to depôt and realized Rs. 15,385, the demand being good; 349 logs (wind-blown) were collected and sold locally for Rs. 12,537, *i.e.*, at a rate of Rs. 1–12–0 per cubic foot. An officer was appointed in October to prepare a working plan which is now complete. During his stay in the district, weeding and pruning were carried out, and the fire-protection operations are still in progress. The results of his survey have confirmed generally the remarks made in Mr. Gass' inspection note, though he considers that Mr. Gass has taken rather an unfavourable view of the old plantations. The growth in them is on the whole very good for a forest composed of a single species, and most of the trees left for the final crop will give first-class timber, straight and sound. At the same time the growth, especially on alluvial, would have undoubtedly benefited by more severe thinnings in the earlier years, allowing for a proper formation of crown, and the trees would have been less tapering. Parts of the plantation are bad, due to bad soil and marsh, and other portions are spoilt by large stumps of teak and other trees being left at the time of planting, which have thrown up large spreading coppice shoots. These ought to have been removed at an early period, as they have destroyed the uniformity of growth so necessary in a plantation composed of an essentially light-loving species. The introductions in the shape of mahoganies and rubbers have by no means benefited the plantations, and, if it is desirable to try such experiments in this locality, it would be better to confine them to a separate experimental garden where they would not interfere with the growth of the planted teak which has proved itself capable of growing pure, and has realized to the full the expectations of the original promoters.

1894–95.

In the appendix are given a few details on special subjects needing comment with a view to collecting experience from former knowledge and avoiding the mistakes made.

NILAMBÚR,
2*nd March* 1895.

(Signed) P. M. LUSHINGTON,
Deputy Conservator of Forests.

APPENDIX TO HISTORY.

APPENDIX A.

THE LEASES AND LAND QUESTION.

1. *The Trikalayur Devasom Lease.*—The Trikalayur pagoda land is held under a karar dated 1840, for such term as Government might wish to retain possession. Rs. 1,000 was paid as mortgage and Rs. 7,000 to be recovered from sums due on kuttikanom payable for the teak and blackwood felled by Government in these forests. The amount recovered up to date is only Rs. 3,771. It has been customary only to recover half of the kuttikanom due instead of the whole according to the terms of the karar and there is no record to show why this has been done. The amounts recovered during the last ten years are small. The conditions of the lease are as follows:—

(1) No interest is to be paid on the Rs. 8,000 advanced.

(2) That one rupee per tree is to be paid on all natural teak trees, blackwood, cedar or poonspar trees (above three borrels thick at the time of the lease) which may be cut by Government. The kuttikanom payable for the above description of trees to be deducted from the Rs. 7,000 advanced.

(3) That after the recovery of Rs. 7,000, one rupee shall be paid as kuttikanom on all such trees cut.

(4) That Government alone has the right to cut in the forests mortgaged, and neither the Nambudripad nor his servants will cut provided that, in the event of trees being required for the repairs of the Trikalayur pogoda, the Nambudripad will notify the number wanted to Sirkar, in which case he will be allowed to cut the required trees. The limit allowed is 100 trees every 20 years.

(5) That kuttikanom at the rate of half a rupee per tree be paid on all saplings under three borrels (at the time of karar) and on all planted teak, when they, on becoming fit for cutting, shall be cut and removed by the Sirkar.

(6) That if the Sirkar shall cut jungle wood, bamboos, &c., they will allow the Nambudripad his right according to the custom of the country.

(7) That minor forest produce including the washing of gold and the digging of elephant pits (provided no damage is caused) be allowed to the Numbudripad.

(8) That the Government may employ the Panyars or Adyars dwelling in the forests at the customary rate of hire.

(9) Permitting the Sirkar to make roads where necessary.

(10) Declares mortgages on parambas 44 to 47 and 49, but not entitling to the growing teak trees and declares the whole to be otherwise clear of rights and that should any disputes occur, he binds himself to settle them.

(11) That the Government may renew the lease every 30 years on payment of a renewal fee of 20 per cent. of the mortgage in acknowledgment of the Nambudripad's jenm title, but that they may transfer the karar rights to any one after offering the reversion first to the Nambudripad.

(12) That he will settle all rights or disputes which occur without recourse to the courts.

The above are the provisions and under them the Government holds title to all the lands included in what is known as the Nilambúr block, the Pannengode, Valuvashery and Pokote blocks, not excepting the small bits of 1853, 1847 and 1848 (Moolathamanoo) to which Colonel Beddome has referred in paragraph 69 of his report. It is true that the Nilambúr Tirumalpad has managed in some way or other to get hold of a small portion of land just opposite his palace, planted with teak, but how this belongs to him is not known. It is true also that he has put in a claim for the above pieces in the court of the Forest Settlement Officer, but the claim was rejected, and although his appeal petition to the District Court mentions this claim yet it was not pressed. The boundaries as given in the karar show that he has no title, though he tried in the Lower Court to base a title on copy of a letter written by the Collector in 1858 which however is not authenticated. This letter refers to a piece of land evidently at that time under forest, whereas the land claimed must have been planted some years previously. The first question raised on this lease was an attempt on the part of the Tirumalpad of Nilambúr to

obtain possession of the portions known as Arevacode Manu and Aravillykavu in exchange for certain portions of outlying forests, but this was not accepted by Government. This is contained in a second karar executed on 28th February 1844. The next question which arose was raised in 1861, and is referred to in a letter from the Collector, No. 78, dated 7th August 1861. It has reference to the case of junglewood and bamboos sold on license fees. The Collector points out that if the Sirkar cut for their own use, it is on payment "of my right according to the usage of the country." This he interprets as varying from 4 annas to Rs. 1–8–0 per tree, but it does not cover the case of produce cut by merchants on license. The Collector suggested that the Nambudripad's claim to half the kuttikanom should be admitted and after some discussion the claim was admitted by Government in their Order of the 23rd November 1861, No. 2208. As the price of timber subsequently rose to Rs. 5 per tree in some cases and thus Rs. 2–8–0 would be payable for such woods as venteak, &c. Colonel Beddome again raised the question in October 1862 as it did not seem right to pay more for such trees than for teak and blackwood. The question was debated for all the leases as well as the question as to whether payment of kuttikanom was to be made on saplings cut in thinnings. After discussion of the various points, the Government ordered as follows (Order, dated 25th July 1865, No. 1723):—

"1. The Government consider that under the terms of the mortgage or lease, the Jenmikar is entitled to kuttikanom at the rate of one rupee per tree for the 17,400 enumerated teak trees then existing 'above three borrels thick' and for the unenumerated blackwood, cedar and poon trees of same size.

"2. For then existing saplings of the same species and for subsequent plantings the Jenmikar was to receive half rupee kuttikanom for each tree that *on becoming fit for cutting*, shall be cut and removed by the Sirkar.

"3. They consider the jenmi to be entitled to 50 per cent. of the net profits on all jungle wood trees sold by Government and 20 per cent. on all sold from cleanings for plantations.

"4. That nothing should be paid on teak saplings cut in thinnings."

To this settlement (except as regards the last condition which was not submitted to them) the Zamorin Raja of Calicut, Trikalayur Nambudripad and Nilambúr Tirumalpad gave their consent (*vide* Collector's letter, No. 57, dated 1st May 1866). The question of kuttikanom on saplings was not referred as it was decided there was no claim and this is the present arrangement on which the kuttikanom is paid.

Nothing further occurred until 1883, when the manager of the Trikalayur devasom preferred a petition to the Collector of Malabar complaining (1) that he had never received any statement showing the number of trees felled nor any account of the setting off against the advance made to him; (2) that the karar had not been renewed in accordance with terms of the karar; (3) that only Rs. 1,000 had been received on kuttikanom up to 1880, the accounts not having been adjusted; (4) he claims to cut certain trees to raise the elephants from out of the pits in the event of their falling in; (5) he states that the cultivation of some of the lands included is being obstructed owing to jungle trees and bamboos overhanging them; (6) that some provision should be made to pay kuttikanom on planted saplings cut in thinnings.

The petition was ridiculous one and made without any real foundation for the complaint. The Collector answers it as follows:—

"*With reference to No.* 1.—He is informed that there is nothing in the lease which makes it incumbent upon Government to furnish him with a statement of fellings. At the same time the District Forest Officer had no objection to his taking a copy of the felling book kept in the District Forest office.

With reference to No. 2.—That Rs. 200, the renewal fee, had been paid in November 1871, and it makes no difference to petitioner whether the deed is formally renewed or not.

With reference to No. 3.—The petitioner is not correct in stating that his accounts had been only adjusted up to 1880. The receipt given by the petitioner himself on the 22nd of March 1883 clearly shows the kuttikanom has been adjusted up to the end of 1881–82, and the amount due for 1882–83 will be paid on receipt of the Conservator's sanction.

With reference to No. 4.—The lease does not provide for any junglewood being supplied to petitioner in connection with elephant pits. [It is interesting to note here that Mr. Ferguson reports that petitioner had not availed himself of the privilege of digging elephant pits for the last 40 years, nor has he up to the present time. In the same letter Mr. Ferguson points out that the Nilambúr Tirumalpad was doing his utmost to establish claims on lands clearly belonging to the Trikalayur devasom by digging pits therein as also in some other cases.]

With reference to No. 5.—No general permission for the cutting of branches of trees and bamboos tops can be given, but when the inconvenience is felt the petitioner will apply to the officer in charge of the forest. [It is interesting to notice that this rule has worked well, but the object of the complaint was to encroach on the Government land in order to build houses, &c., near the cultivation.]

With reference to No. 6.—No answer was given. [The question of payment of kuttikanom on saplings was settled definitely as is shown above in 1866, and Mr. Hadfield informs me that Mr. Galton, who was then Collector, refused to answer this question because petitioner and others were threatening to assert their claims in Court of Law.]

In 1884 negotiations were set on foot to obtain the free hold of these lands in order to constitute them reserved forest by notification under section 4 of the Forest Act. The manager of the devasom actually agreed with Mr. Twigg, then Acting Special Assistant Collector, to surrender all his rights on the following conditions:—

(1) That he is given one-third of the value of all elephants that may be caught by Government, the value to be estimated at the time they are led out of the pandi or craal, no deduction being made for expenses up to that time, or that he is to be given one elephant out of every three captured.

(2) That if gold is washed, 40 per cent. of the gold or its value shall be given to him.

(3) That 40 per cent. of whatever may be realized by the collection of elephant tusks, cardamoms and minor forest produce shall be given to him.

These were approved by the Collector, but some delay having occurred, the written consent of the manager was not obtained and is not likely to be obtained now.

An attempt was subsequently made to reserve these forests under section 33 of the Act and through that section bringing in all the provisions of Chapter II. The power to do so was disputed by the manager and the High Court have ruled that the notification under section 4 of the Act cancels the previous notification under section 33 and that therefore before the notification under section 16 can be published, the prescriptions of section 10 (i) must be complied with as regards the jenm title.

The question of the payment of kuttikanom on saplings was again raised by the Government in 1885, and Mr. Logan's letter of the 23rd August 1885, No. 3968, recorded in Board's Proceedings, No. 2739, F. 537, dated 24th September 1885, gives a very clear account showing that saplings (Malayalam "tei") are not liable to kuttikanom, but that measurables (Malayalam "maram") are liable. At the same time he defines "maram" as a tree above eight borrels thick, that is, about 8 inches in diameter at some 20 feet from the ground. It should be noted here that even this is not quite correct, eight borrels thick signifies not 8 inches diameter (the diameter measurement being unknown in the Malayali system) but 8 inches quarter girth.

2. *The Wandur Nambudri lease.*—This lease was signed on 6th April 1871 and gives title to the whole of what is known as Chatamborai block, in consideration of Rs. 5,000 being assigned to the Nambudripad. The karar assigns to the Government "full power and authority to fell timber from the said hills as well as to exercise every right and liberty over the said hills in the same manner as if they were their own property until the same should be abandoned by them of their own accord."

The only conditions attached are:—

(1) That the stump fee of one rupee per tree shall be paid on every tree of the following six kinds:—Teak, karimaram, benteak, blackwood, akil or cedar and poon which may be felled from the same hills, whether wild or planted by Government, as fit to be measured and for sale.

(2) That the Government shall not be at liberty to transfer their claim to this land, but in case they no longer require the lands shall restore them to the Nambudripad.

One difficulty, which has arisen concerning this karar was the receipt of a letter from the Nambudripad claiming seigniorage on saplings cut in thinnings. To this he is clearly not entitled by the wording of the lease. He also put in a petition laying claims to 50 acres of land outside the limits of the parambas on both sides of the nunja nilams attached to the Chatamborai kalam. He has such a right, but in his petition he tried to extend this right to a second 50 acres outside this by altering the wording of the schedule. This, however, was put a stop to by the Collector (Mr. Dumergue), who answered the petition. This forest was notified in 1885 as a reserved forest under section 25 of the Forest Act.

3. *The Zamorin of Calicut lease.*—This lease was signed on the 10th of November 1841 and gives title to all the land known as the Nellikutta forests. The provisions are:—

(1) To give right to the Sirkar to fell within the limits of this forest those trees that are now standing, as well as those that may hereafter grow or may be planted, so long as the Sirkar may have occasion for, on kuttikanom.

(2) To pay one rupee for every teak, blackwood, poon and akil tree that may be felled by the Sirkar.

(3) That the right according to the usage of the country on every Aynee, irool and other junglewood trees and bamboos, may be given to the Zamorin and that the tusks of every elephant that may be killed or found dead in the forest should be given to him.

(4) That the right to cut trees from the said forest on payment of kuttikanom is reserved to the Sirkar alone.

(5) That all the expenses of planting the available tracts of ground with teak, should be borne by the Sirkar.

(6) That as it is customary to give written permission to dig pits for capturing elephants, to such persons he may deem proper and when they have dug pits, captured and tamed the elephants and brought to him, the usual expenses are paid. Therefore the Government karyastan who manages the said forest, should not prevent the people, who may produce the written permission, from digging pits (except at places through which timber is dragged) and washing for gold. That no more than 20 pits will be permitted to be dug throughout the forest, and that no such permission will be granted at places which may prove injurious to the teak trees or on roads through which timber is dragged.

(7) That when the Sirkar captures elephants, they should also act in the above manner.

(8) That the Sirkar is at liberty to make new roads, independent of those existing, should they find them necessary for the purpose of conveying the timber felled from the forest.

(9) That the right of collecting the minor forest produce consisting of cardamoms, honey, wax, &c., collected by the adyars is valued at the sum of Rs. 11-1-0 and that this together with Rs. 2 the jenmabhogam (the proprietor's share) be paid yearly to the Zamorin and that the labour of the Zamorin's adyars shall be made available for the Government; except at the capture of an elephant by the Zamorin when they shall be sent to take it from the pit. Under the second condition the following provision also occurs "Every tree felled should be brought and placed near the bank of the river and counted over to the Zamorin's karyastan at Vadava Survom Cherical, to whom the person on the part of the Sirkar will grant a pookoowarom (receipt) receiving from him in return a samdom chit (or pass) for the removal of the timber. The amount that may be due to me (Zamorin) according to the pookoowarom at the rate of one rupee per tree should from time to time be made payable to me at the Huzur Treasury."

This condition has never been fulfilled nor its fulfilment demanded by the Zamorin who has accepted without complaint the accounts of Government. As the carrying out of this condition would be irksome both to the Zamorin and Government it would be advisable to get it removed by common consent.

Relating to the third condition it may be noted that the Zamorin was one of the jenmis who consented to the arrangements confirmed in the order of May 1886, viz., that 50 per cent. of the net profit should be paid to him on all junglewood and bamboos sold by Government for profit except in the case of clearings for plantation when 20 per cent. of the net profits should be paid.

Except the claim for saplings sold from the thinnings no difficulty has arisen on this contract.

In 1884 Mr. G. W. Dance, Assistant Collector, commenced negotiations with the Zamorin for the surrender of the following rights:—

(1) To collect elephant tusks.
(2) To capture elephants.
(3) To wash for gold.

These resulted in a second agreement signed on the 15th October 1885 in which the rights were surrendered on the following terms:—

(1) That the Government pay 40 per cent. annually on all profits of gold washing and elephant tusks, an account of these profits to be rendered annually under signature of the Collector.

(2) That the prices of elephants captured will be fixed by the District Forest-officer (sanctioned by Collector) within one month after the animals are removed from the craal—

(*a*) That if such price be agreed to by the Zamorin, one-fourth of it shall be paid to him within two months of removal from the craal.
(*b*) That if such price be not agreed to by the Zamorin, he shall be at liberty within one month to fix other prices, and if the District Forest-officer consents one-fourth will be paid to Zamorin within two months.
(*c*) If the price fixed by Zamorin be not agreed to, the elephant shall be handed over to the Zamorin and pay to the Government three-fourths of the price fixed by him.

The Nellikutta block was consequently notified under section 25 of the Forest Act in March 1886.

4. *Edvana Kovilagam lease.*—This lease was signed on the 20th April 1878. This lease gives title to the land in the blocks known as Amrampolliem plantation and Karumpoya. In return for Rs. 80,000 and an annual jenmabhogam of Rs. 100, full title is given to the Government to cut without kuttikanom any trees on the land and to use the land in any manner it wishes. The sole rights, &c., left to the grantee are:—

(1) The establishment of two depôts with the necessary sheds as approved by the Deputy Conservator and not to exceed 5 acres of land for each depôt, one depôt on the bank of the Karumpoya and the other on the Cherupoya.

(2) To open two paths not exceeding 20 feet in breadth for dragging timber, the one from Mundakadavu to the Karumpoya depôt and the other from Kalamala Thottangal to the Cherupoya depôt and to open two cross roads, one from Karirikolam to the Cherupoya river and the other from Chengarankodukolam to the Karumpoya river for cattle.

(3) To perform the usual ceremonies in the two temples situated on the Ambalakunnoo and Mandakunnoo (lands reserved round the temple 80 feet but no timber to be removed from such lands except with the permission of Government). In addition, control of the timber fellings of the grantee is given to the Deputy Conservator and provision is made for the Deputy Conservator to cut, when required, 10,000 bamboos annually from the grantee's land surrounding at the market price in order to float the timber cut from the lands assigned to Government. In case of the alienation of the grantee's forest the grantee will see that this right is reserved to Government. The sale of the jenm right of the Karumpoya block and the Amrampolliem plantation was ordered by a decree of the Calicut Sub-Court in 1892 and this right was purchased by Government at a cost of Rs. 2,501. Thus the Government has complete control over these two blocks including the jenm right. They were declared reserved forests under section 25 in 1884.

These are all the leases which deal with lands planted with teak or ever likely to be planted, and it will be seen that the only consent required to reserve the whole of these forests is that of the manager of the Trikalayur Devasom. Previously negotiations with the Nilambúr Nambudripad were entered into and he has proved the chief obstructionist in the matter and it is believed over persuaded the Trikalayur Devasom manager just as he was about to come to terms with Mr. Twigg. Any claim on his part on the plantations should therefore be resisted.

As regards the question of kuttikanom on the saplings cut in thinnings, it may be noted that this claim has been settled by the Government but not in a court of law. It is clear that the agreements did not intend any such kuttikanom and once such a claim is admitted, the plantations would have to be abandoned. By the present arrangement allowing about 75 trees per acre come to the size of measurables the Trikalayur Devasom will receive an amount from this source alone equivalent to 12 annas per acre per annum which must be more than he ever obtained from his forests previous to the signing of the lease.

The correspondence shows that frequent attempts are made especially by the Trikalayur Devasom to override the provisions of the karars.

APPENDIX B.

SYLVICULTURAL OPERATIONS.

1. *The preparation of the nursery and raising of seedlings.*—The following are the prescriptions given by Mr. Ferguson in 1874:—

(1) Collect seed from trees with a clear stem free from decay and of vigorous growth; February the best month to collect in.

(2) *Preparation of nursery beds.*—Select good free soil, dig 12 inches deep, removing weeds, roots and stones; when caked, the soil should be reduced to a fine mould and the nursery levelled; line of beds $3\frac{1}{2}$ feet wide and one foot space betwixt each bed and its fellow, then raise an outer edging round each bed 3 to 4 inches high; beds when thus finished will be about $2\frac{1}{2}$ feet wide between the edgings and 120 seers of seed will suffice for 150 feet in length of the above sized beds; sow from 2nd to 15th April; before sowing steep the seed 48 hours in water, then sow and cover with a thin covering of fine soil nearly $3\frac{1}{4}$ inches, then cover with straw to retain the moisture; betwixt the soil and straw a few very small twigs without leaves to prevent the straw from being washed into the soil by water; which if allowed is apt to destroy the young seedlings on its (straw) removal. Water daily copiously, say a common earthen pot of water to each two running feet in length of bed less or more according to free soil or otherwise; in this way the seed will germinate in from 10 to 15 or 20 days or more according to freeness of soil; water less as the plant strengthens but keeping up sufficient moisture till the monsoon sets in from the first to the third week in June, when the plants will be from 4 to 8 inches high and ready for planting out permanently.

These prescriptions are, with slight modifications, adhered to at the present day. The sowing is not begun till the 25th April in order to obtain smaller plants. The soaking on the other hand in for nearly 24 hours longer whilst the seeds are barely covered with soil.

2. *Preparation of site and cost of planting.*—The following is the old prescription of Mr. Ferguson. The site for planting shall be selected and felled in December, allowed to dry till March, fired, then cross cut, piled and burnt off, and after the soil is softened by the rains, line and mark off the pits, the required distance apart; from 6 to 7 feet answers well, the pits dug from 10 to 12 inches square and equal depth and filled in as dug with earth slightly raised around tops.

Memorandum on Planting expenses by Mr. J. Ferguson, Deputy Conservator of Forests, Nilambúr.

Cost per acre of planting natural forests.

	Rs.	A.	P.
Weeding undergrowth preparatory to felling	2	0	0
Felling	5	0	0
Firing the jungle as first felled	0	4	0
Cross cutting remains of first burn	3	8	0
Piling and burning off clear	10	0	0
Lining, marking, pitting and planting out	3	8	0
Weeding and hoeing round the plants	2	8	0
Second weeding	1	4	0
Third weeding	1	4	0
Fourth weeding	1	4	0
Teak seeds, 2 parrahs	0	8	0
Preparing, sowing and watering nursery beds	3	0	0
Contingencies	2	0	0
Total ..	36	0	0

Cost per acre of subsequent maintenance.

	Second year.	Third year.	Fourth year.	Fifth year.	Sixth year.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
First weeding	2 8 0	1 8 0	1 0 0	0 12 0	0 12 0
Second do.	2 8 0	2 4 0	0 12 0	1 4 0	1 4 0
Third do.	2 8 0	2 0 0	1 4 0	1 0 0	...
Fourth do.	2 8 0	...	...	...	...
Pruning	0 4 3	0 8 0	0 8 0	0 12 0	0 12 0
Total ...	10 4 0	6 4 0	4 8 0	3 12 0	2 12 0

The above rates are for plantations formed from old natural forests and should meet all charges on ordinary soil exclusive of superintendence.

If the soil is very fine and has been previously cropped more than once, the cost of felling and burning will be reduced, but the cost of weeding will be increased for the first, second and third years, but as the plants begin to cover the ground the undergrowth decreases considerably.

If the plantations are intended for a first-class timber the thinning should begin from the sixth or seventh year.

The prescriptions hold good in the present day except that clearing is commenced in November and only finished in December. Mr. Hadfield also considers it very necessary to have the pits 18 inches deep to admit of expansion of the tap root. The estimates also hold good in the present day except that only three weedings are considered necessary, but the deeper pitting compensates for this.

3. *Planting.*—Mr. Ferguson's prescription runs as follows:—

The seedlings should be put well down in the pit, taking care the tap root is not twisted and turned up (to prevent which the tap root is shortened to 6 inches as lifted from the bed) when planting the cooly inserts his hand the required depth perpendicularly, taking out the soil and putting the seedlings with the other hand (as above without twisting or turning up the root) putting back the removed soil and pressing it firmly round (without damaging) the plant, and this prevents its being wind-waved before taking root.

Planting should take place after the soil is well saturated with rain; from the 10th to 30th June and 8th July is the best season, as afterwards the seedling's tap root rapidly swells like a carrot and does not throw out fibrous roots nor establish itself either so quickly or so well as before that state of growth.

When the planting cannot be finished by the 8th of July, the small vigorous seedlings which continue to germinate up till August and will even germinate after 12 and 14 months in the beds, should be selected in preference to the larger and more robust with the carroty roots.

Note by the Officiating Inspector.

I am informed by the Conservator of Forests, Southern Division, Bombay, that he has tried transplanting teak seedlings in the nursery before planting out with the best results, and as this plan mitigates the difficulty to which Mr. Ferguson refers with regard to the long carroty roots it appears worthy of trial where circumstances admit. The Conservator of Forests, Southern Division, Bombay, has promised a memorandum on the subject which will be circulated on receipt.

(Signed) T. C. Walker.

Mr. Hadfield considers that these prescriptions might be improved. In the first place he considers it an essential (as must every Forest Officer) not to cut the tap root. He always chooses by preference a small but vigorous plant which is just preparing to shoot and rejects those with a very long tap root. He also considers that it is a very necessary precaution to snip the leaves of the plant all except the terminal pair. If this is not done, the rain splashes the leaves with soil which bends them over so that they frequently adhere to the soil, and thus the plant not being able to right itself, assumes a position very unfavourable to growth. He is not in favour of taking up the plant with its own mud as this adds very considerably to the cost but especially when the weather is dry, he advises to dip the plants in liquid manure before planting. He also considers it necessary to put the plant in well above the collar, in fact to cover the two lower leaves, as the heavy rain in this locality is so apt to carry away the loose soil and wash the plant out if it is not deeply embeded.

4. *Weeding.*—This was first regularly attended to by Mr. Ferguson. Previous to 1862 it must have been neglected for some years as is shown in Colonel Beddome's report where he states that the undergrowth in some of the younger plantations was almost impenetrable. Mr. Ferguson prescribed four weedings for the first two years, three weedings for the next three years, and two for the sixth year. After this period he does not prescribe but has evidently conducted this operation annually over the whole planted area. Mr. Hadfield has been able to reduce the weedings to three in the first two years, and two subsequently, whilst in the older plantations he usually considers once in two years sufficient. This operation must necessarily be left almost entirely to the discretion of the Executive Officer, but it must not be neglected in the young plantations, as the very existence of the young plants is endangered by the rapid growth of creepers. It must not however be forgotten that the operation is one of the chief items in the maintenance charges and that in the older plantations this undergrowth, unless of very rank growth, does not interfere with the actual growth of the trees, in fact, in the laterite and dry soils especially, it is of considerable value in keeping the soil moist. For both financial and cultural reasons therefore it should be considered whether in the older plantations once in five years would not be sufficient for weeding. If this can be done the weeding should immediately precede the thinnings so as to admit of easy access to the trees, but as noted above, this point must be left to the consideration of the Executive Officer who alone is able to judge whether the creeper growth is preventing or aiding the development of the trees.

The total amount spent on weeding from 1874–1883 was Rs. 25,683 or an average of Rs. 2,568 per annum, whilst from 1884–1894 Rs. 23,631 or an average of Rs. 2,363 per annum. There has thus been a slight reduction in the cost in spite of the area added to the plantation.

5. *Pruning.*—This was commenced in 1862 by Mr. Ferguson who in his report for 1871–72 reports that he continued pruning up to 20 or 30 years. The idea that pruning improves the timber has however now been refuted and it is found that pruning only causes knots and detracts from the value of the wood. Mr. Hadfield continued this pruning for two years but after that abandoned it. The only pruning that is now done is in the young plantations. The young teak has a tendency to send out more than one leader and strong lateral shoots and it is found necessary to cut these back but the operation is not required after the third year. The cost from 1874 to 1886 on this operation amounted to Rs. 3,742, or an average of Rs. 312 per annum. But in addition to this £80 was spent in pruning tools bought in England. The total amount spent from 1886–1894 was Rs. 688 or Rs. 86 per annum. A considerable saving is thus effected without detriment to the crop of teak.

6. *Parasite clearing.*—The parasite was noticed for the first time in 1866 and clearing was commenced in the following year. The operation is not an annual one, but from the amounts expended the parasite seems to have been bad from 1890 to 1893. The clearing operation is not a very expensive one, and must be effected wherever the parasite appears or much valuable timber is liable to be destroyed. The amounts spent from 1874 as far as they are traceable are as follows:—

Years.	Amount spent.
	Rs.
1874	137
1877	1,271
1881	90
1884	31
1885	125
1888	51
1890	197
1891	279
1892	281
Total ..	2,462

Previous to 1874 the amount spent cannot be traced.

7. *Thinning.*—The first notice concerning thinning is given in Mr. Macgregor's report of 1860, from which it is evident that the plantations from 1843 to 1852 were most of them thinned twice. The following statement shows the years in which the thinning took place:—

Year of plantation.	Date of first thinning.	Date of second thinning.	Year of plantation.	Date of first thinning.	Date of second thinning.
1843	1852	1859	1852	1858	1859
1844	1852	1858 & 1859	1853	....	....
1845	1855	1858 & 1859	1854	....	....
1846	1855	1858 & 1859	1855	....	....
1847	1858	1859	1856	....	....
1848	1858	1859	1857	....	....
1849	1858	....	1858	....	....
1850	1858	1859	1859	....	....
1851	....	....	1860	....	....

It is however certain that no effective thinning was done in these operations. Only the dominated poles which were actually dying, and which would have thinned themselves out in a few years time, were removed and nothing of any marketable value was taken out. As reported by Mr. Macgregor, out of 1,370,000 plants put down 200,000 were removed by thinning or less than 1 in 6, whereas in a plantation of 10 years' old, it is known that of 1,200 trees planted to the acre, 400 disappear naturally by the end of the period. The want of thinning was insisted on in 1860 by Mr. Macgregor and in 1861 by Captain Morgan (Conservator) the latter specially pointing out the evil effects of overcrowding and apparently some thinning took place as in 1860–61, some receipts from the plantations are shown for the first time and these amounted to Rs. 4,615. In the following year 49,705 saplings were thinned out by Major Babington, some of which were sold in the next year by Mr. Ferguson. It was not however until Mr. Ferguson and Colonel Beddome (Conservator) pointed out the great need of thinning that the operation was at all properly attended to.

The following statement showing the principle on which thinnings were conducted is extracted from Colonel Beddomes report of 1878, paragraph 94:—

"The planting is 6½ feet × 6½ feet which gives 1,040 saplings to the acre. The following statement shows the periods at which the different thinnings take place and the percentage thinned out.

Statement showing the number of seedlings planted per acre, age of successive thinnings, number thinned out and remaining per acre:—

Number of thinnings.	Age in years.	Per cent. of thinned.	Number thinned out.	Number per acre planted.	Number per acre remaining.
	6½′ × 6½′ gives 1,040.				
		PER CENT.			
1	9	29	301	...	739
2	11	25	185	...	544
3	13	25	136	...	408
4	16	25	112	...	296
5	20	20	59	...	237
6	25	20	47	...	180
7	32	20	36	...	144
8	40	20	29	...	115
9	50	20	23	...	92
10	63	20	18	...	74

"The numbers remaining are, of course, never exact, only approximate, and different acres in the same plantation vary to a certain extent. This plan has been carried out up to the 32nd year, but it is very doubtful whether it will be so up to the 63rd year. The growth of late has been so much more rapid than anything we ever expected, that it will probably be advisable to reduce the number to 60 per acre at the age of 45 years; but a forester's eye will tell him what is necessary as the time advances; though it is certain that the last thinnings will be well before 60 years of age."

In the early years under Mr. Ferguson, it is quite certain that this principle could not have been worked up to or the number of saplings extracted would have been enormous. It is however evident that Mr. Ferguson did his work in a very thorough and practical way and that the plantations underwent a great improvement under his system of thinnings; and in spite of difficulties in obtaining efficient contractors, and also in dealing with an obstinate market, his operations were carried out with considerable financial success. The following statement shows

the number of saplings felled and collected, and the cost of floating and revenue realized by the sale of saplings from 1862–63 to the end of 1884–85, the year in which the first regular plan for thinnings was drawn out:—

Official year.	Number of saplings felled.	Number of saplings collected.	Number of saplings floated.	Number of saplings sold.	Cost of floating	Sale proceeds.
					Rs. A. P.	Rs. A. P.
1862–63	...	...	...	...	...	12,044 0 0
1863–64	...	...	...	...	2,294 1 0	1,210 0 0
1864–65	40,000	50,000	12,500	...	1,300 11 9	16,766 0 0
1865–66	35,000	22,000	25,000	...	1,817 2 10	9,307 0 0
1866–67	16,000	...	...	...	606 2 9	15,647 0 0
1867–68	9,600	16,000	...	538	150 8 0	500 0 0
1868–69	20,000	2,000	14,000	...	1,847 9 10	9,515 0 0
1869–70	5,457	...	5,457	...	50 8 6	4,173 14 11
1870–71	...	...	4,075	...	1,195 12 6	5,583 0 0
1871–72	25,000	14,370	8,202	...	1,106 5 3	843 5 9
1872–73	29,000	12,942	11,343	11,229	2,533 4 3	7,378 14 0
1873–74	47,952	39,632	12,414	...	2,500 12 1	11,342 1 8
1874–75	34,745	21,598	10,601	23,772	1,782 2 5	7,067 12 8
1875–76	59,200	21,250	17,566	19,346	2,175 1 1	10,228 5 10
1876–77	53,600	37,043	21,886	17,887	4,965 8 9	13,162 2 8
1877–78	13,772	8,426	36,628	6,666	7,582 10 6	4,534 4 0
1878–79	50,000	20,000	5,714	12,601	2,891 13 8	10,758 0 0
1879–80	73,790	16,950	21,397	19,844	3,417 7 4	20,159 1 8
1880–81	76,430	27,986	32,125	31,963	4,689 0 0	28,172 13 0
1881–82	72,621	37,569	44,858	42,702	4,248 1 0	26,937 3 6
1882–83	83,297	10,921	39,997	35,181	7,715 7 2	33,100 15 3
1883–84	63,712	55,950	36,480	39,719	8,025 12 4	41,901 2 3
1884–85	...	36,952	37,754	36,685	6,151 14 3	*28,583 3 6

* Total cost of floating = Rs. 69,047-11-3. Total sale proceeds = Rs. 3,18,915-11-8.

The table shows that whilst only Rs. 69,000 were spent in floating saplings, the revenue obtained by the sale of saplings amounted to more than three lakhs. As regards the mode of conducting the operations it may be remarked that Mr. Ferguson seems to have inclined to the method of raising his trees in clumps rather than in an even distribution over the whole area.

In October 1885, the Conservator (Colonel Campbell Walker) reported as follows:—

"Altogether the impression left on my mind, after a careful examination, is that the condition of the older plantations is critical; that they must be very carefully watched; and that we must endeavour to get the trees in the younger plantation retained for final crop into a better and more natural condition, and habit of growth before they arrive at their 30th or at latest their 40th year. Another consideration of weight on financial grounds is that the demand for large saplings technically styled 'measurables' is limited where as that for the smaller classes is in excess of the supply, but this alone would not influence us, were it not in accordance with proper forest principles for the treatment of 'high forest' to subordinate everything to the growth of the final crop timber."

The result of these remarks was that he with the assistance of Messrs. Porter and Hadfield drew up (1) a tabular statement showing approximately the number of trees which should be removed and left standing in the plantations from the 11th to the 61st year of growth; these are given in the following table:—

Age.	Number remaining at each period.	Number to be removed during each period.
1 to 11years	† 1,100	300
End of 11th year	800	200
„ 16th „	600	200
„ 21st „	400	150
„ 26th „	250	130
„ 31st „	120	10
„ 36th „	110	10
„ 41st „	100	10
„ 46th „	90	10
„ 51st „	80	10
„ 56th „	70	10
„ 61st „	60	10

† Trees planted per acre (allowing for casualties unreplaced roads and other unplanted places).

(2) A statement showing the number of trees per compartment and per acre in the different blocks. This statement is of little practical value except to show how widely divergent Mr. Ferguson's principles were from his practice.

(3) A preliminary working scheme based on the two preceding statements, the number of trees to be taken out in accordance with the first statement and the compartments to be worked year by year being given in the working scheme as attached.

Preliminary working scheme for thinning the plantations from 1885-86 *to* 1889-90.

Series.	Eddacode, Acres 693·63.			Elanjery, &c., Acres 675·84.				Panyangode, Acres 393·73.			Valuvashery, Acres 584·00.			Chatamborai, Acres 490·10.			Nellikutta, &c., Acres 590·68.				Total.
Year.	Compartment No.	Year.	Acreage.	——	Compartment No.	Year.	Acreage.	Compartment No.	Year.	Acreage.	Compartment No.	Year.	Acreage.	Compartment No.	Year.	Acreage.	——	Compartment No.	Year.	Acreage.	
1885-86.	(8)	1851	147·19	Aravillykava.	(2)	1844	27·35	(3)	1856	79·26	(5)	1868(*a*)	33·94	(1)	1872(*a*)	100·00	Nellikutta ...	(1)	1870	74·23	
	(10)	1860	39·56	Arevacode.	(2)	1848	84·34					1868(*b*)	79·08				Do. ...	(2)	1871	46·00	
				Moolathamanoo.	(1)	1847	34·63														
		Total.	186·75				146·32			79·26			113·02			100·00				120·23	745·58
1886-87.	(7)	1850	49·67	Arevacode ...	(1)	1847	29·29	(2)	1855	100·32	(5)	1868(*c*)	32·38	(1)	1872(*b*)	107·56	Amrampolliem.	(3)	1874	69·03	
	(9)	1857	36·14	Aravillykava	(1)	1842	30·93				(4)	1867(*b*)	77·32				Do. ...	(4)	1875	60·91	
	(2)	1845	28·14	Do.	(4)	1853	34·71														
				Moolathamanoo.	(2)	1848	16·04														
		Total.	113·95				110·97			100·32			109·70			107·56				129·94	672·44
1887-88.	(4)	1847	54·61	Elanjery ...	(1)	1845	33·19	(4)	1863	81·25	(4)	1867(*a*)	41·31	(2)	1873	99·08	Amrampolliem.	(1)	1861-68	87·44	
	(1)	1844	30·65	Do. ...	(2)	1846	65·84				(6)	1869(*a*)	39·36					(2)	1873	42·39	
				Ramalur ...	(2)	1844 / 1850	21·33				(6)	1869(*b*)	14·20								
				Moolathamanoo.	(3)	1853	20·89														
		Total.	85·26				141·25			81·25			94·87			99·08				129·83	631·54
1888-89.	(3)	1846	44·18	Elanjery ...	(3)	1849	89·95	(1)	1854	92·33	(3)	1866(*a*)	32·30	(3)	1874	91·46	Mangaleshery.	(1)			
	(5)	1848	82·15	Do. ...	(5)	1858	42·79				(3)	1866(*b*)	96·34					(2)	1843	...	
	(6)	1849	44·58															(3)	1844	...	
																		(4)			
		Total.	171·51				132·74			92·33			128·64			91·46				61·68	678·36
1889-90.	(11)	1861	86·05	Elanjery ...	(6)	1859	39·84	(5)	1864	40·57	(1)	1864	81·14	(4)	1878	100·00	Amrampolliem.	(5)	1876	149·00	
	(12)	1862	50·11	Do. ...	(4)	1850	66·15				(2)	1865	56·63								
				Aravillykava.	(3)	1852	38·57														
		Total.	136·16				144·56			40·57			137·77			100·00				149·00	708·06
Grand Total ...			693·63				675·84			393·73			584·00			498·10				590·68	3,435·98

NOTE.—For convenience of arrangement the whole plantations have been divided into six circles or series, of which Elanjeri includes the Elanjeri, Aravillykava, Moolathamanoo and Ramalur blocks; and Nellikutta includes the Nellikutta, Amrampolliem, Mangalashery and other small outlying blocks.

In submitting the scheme, Colonel Walker had considerable diffidence and pointed out himself that the figures in the second statement were not accurate. He, however, considered that it was better to have some fixed principle on which to work these thinnings although differences might

be found in practical working. The differences in the practical working of this scheme were soon discovered:—

(1) No consideration was taken of portions which were blank owing to the failure of growth of the teak plantations, unplanted marshes, &c.

(2) In some places too many trees were found, but much more often, not nearly the requisite number as by the estimated enumeration.

The following table shows clearly where these differences were found and the actual numbers that were taken out, compartment by compartment:—

Number.	Name and number of lock.		Number and year of compartment.		Area in acres.	Age of compartment.	Year of thinnings.	Contents			Capability			Result of thinnings.	
								As fixed for each period by preliminary working scheme.	As ascertained by enumeration.	Difference.	As fixed for each period by preliminary working scheme.	As actually worked.	Difference.	Number of trees that ought to stand as per preliminary working scheme.	Number of trees actually standing.
1	Aravillykava	I	1	1842	30·93	44	1886-87	2,784	1,294	− 1,490	309	81	− 228	2,475	1,213
2	Do.	,,	2	1844	27·35	41	1885-86	2,735	1,915	− 820	273	429	+ 156	2,462	1,486
3	Do.	,,	3	1852	38·57	37	1889-90	3,900	1,294	− 2,606	390	*Nil.*	...	2,510	*
4	Do.	,,	4	1853	31·71	33	1886-87	3,818	3,686	− 132	347	259	− 88	3,471	3,427
5	Eddacode ...	II	1	1844	30·65	43	1887-88	2,759	2,586	− 173	306	137	− 169	2,453	2,449
6	Do. ...	,,	2	1845	28·14	41	1886-87	2,814	2,889	+ 75	281	373	+ 92	2,533	2,516
7	Do. ...	,,	3	1846	44·78	42	1888-89	4,478	4,483	+ 5	433	452	+ 19	4,045	4,031
8	Do. ...	,,	4	1847	84·61	40	1887-88	5,461	5,335	− 126	546	441	− 105	4,915	4,894
9	Do. ...	,,	5	1848	82·15	40	1888-89	8,215	10,361	+ 2,146	2,161	2,165	+ 4	6,054	8,196
10	Do. ...	,,	6	1849	44·58	...	...	...	...	...	...	...	...	...	...
11	Do. ...	,,	7	1850	49·67	36	1886-87	5,464	9,309	+ 3,845	496	1,964	+ 1,268	4,968	7,545
12	Do. ...	,,	8	1851	147·19	34	1885-86	16,191	18,427	+ 2,236	1,471	5,040	+ 3,569	14,720	13,387
13	Do. ...	,,	9	1857	36·14	29	1886-87	4,337	6,689	+ 2,332	361	1,753	+ 1,392	3,976	4,936
14	Do. ...	,,	10	1830	39·56	25	1885-86	9,890	9,795	− 95	5,142	3,500	− 1,642	4,748	6,295
15	Do. ...	,,	11	1861	86·05	28	1889-90	10,320	13,158	+ 2,838	860	3,882	+ 3,022	9,460	9,276
16	Do. ...	,,	12	1862	50·11	27	1889-90	6,000	7,835	+ 1,835	500	2,375	+ 1,875	5,500	5,460
17	Ramalur ...	III	1	1844	4·93	43	1887-88	443	589	+ 146	49	179	+ 130	394	410
18	Do. ...	,,	2	1850	16·40	37	1887-88	1,640	1,996	+ 356	164	396	+ 232	1,476	1,600
19	Elanjery ...	IV	1	1845	33·19	42	1887-88	2,987	2,889	− 98	332	241	− 91	2,655	2,648
20	Do. ...	,,	2	1846	65·84	41	1887-88	6,584	5,859	− 725	658	*Nil.*	...	5,926	*
21	Do. ...	,,	3	1849	89·95	39	1888-89	8,995	8,899	− 96	900	809	− 91	8,095	8,090
22	Do. ...	,,	4	1850	66·15	39	1889-90	6,600	8,593	+ 1,993	660	2,716	+ 2,056	5,940	5,877
23	Do. ...	,,	5	1858	42·79	30	1888-89	5,134	8,259	+ 3,115	3,099	3,105	+ 6	2,035	5,154
24	Do. ...	,,	6	1859	39·84	30	1889-90	4,800	7,964	+ 3,164	400	3,582	+ 3,182	4,400	4,382
25	Arevacode ...	V	1	1847	29·29	39	1886-87	2,929	3,299	+ 370	293	514	+ 221	2,636	2,785
26	Do. ...	,,	2	1848	84·34	37	1885-86	8,434	11,468	+ 3,034	843	3,600	+ 2,757	7,591	7,868
27	Moolathamanoo	VI	1	1847	34·63	38	1885-86	3,463	3,152	− 311	346	244	− 102	3,117	2,908
28	Do.	,,	2	1848	16·04	38	1886-87	1,604	2,086	+ 402	160	444	+ 284	1,444	1,562
29	Do.	,,	3	1853	20·89	34	1887-88	2,297	2,683	+ 386	209	553	+ 344	2,088	2,130
30	Panneugode ...	VII	1	1854	92·33	34	1888-89	11,033	11,043	+ 10	923	930	+ 7	10,110	10,113
31	Do. ...	,,	2	1855	100·30	31	1886-87	12,038	11,276	− 762	1,003	1,529	+ 526	11,035	9,747
32	Do. ...	,,	3	1856	79·26	29	1885-86	9,511	14,219	+ 4,708	792	5,203	+ 4,411	8,719	9,016
33	Do. ...	,,	4	1863	81·25	24	1887-88	20,312	17,964	− 2,348	10,562	5,304	− 5,258	9,750	12,660
34	Do. ...	,,	5	1864	40·57	25	1889-90	10,250	8,389	− 1,861	5,330	3,435	− 1,895	4,920	4,954
35	Amrampolliem	VIII	1	1861	87·44	26	1887-88	21,860	17,392	− 4,468	11,367	5,060	− 6,307	10,403	12,332
36	Do.	,,	2	1873	42·39	14	1887-88	25,434	18,836	− 6,598	8,478	1,889	− 6,589	16,956	16,947
37	Do.	,,	3	1874	69·03	12	1886-87	55,224	38,909	−16,315	13,806	*Nil.*	...	44,418	*

Number.	Name and number of block.	Number and year of compartment.	Area in acres.	Age of compartment.	Year of thinnings.	Contents			Capability			Result of thinnings.	
						As fixed for each preliminary working scheme.	As ascertained by enumeration.	Difference.	As fixed for each preliminary working scheme.	As actually worked.	Difference.	Number of trees that ought to stand as per preliminary working scheme.	Number of trees actually standing.
38	Amrampolliem	VIII 4	60·91	11	1886–87	48,728	33,654	– 15,074	12,162	Nil.	...	30,546	*
39	Do.	5	149·00	13	1889–90	89,400	88,372	– 1,028	29,800	*	...	59,600	*
40	Valuvashery ...	IX 1	61·14	25	1889–90	20,250	14,972	– 5,278	10,630	5,252	– 5,278	9,720	9,720
41	Do.	" 2	66·63	24	1889–90	14,250	14,609	+ 359	7,410	7,779	+ 369	6,840	6,830
42	Do.	" 3	128·64	22	1888–89	32,160	27,641	– 4,519	16,704	7,711	– 8,993	15,456	19,930
43	Do.	" 4	41·31	20	1887–88	16,528	11,150	– 5,374	6,196	936	– 5,260	10,328	10,214
44	Do.	" ...	77·32	19	1886–87	30,928	22,092	– 8,836	11,598	3,260	– 8,338	19,330	18,832
45	Do.	" 5	33·94	}	(a) 1867	45,208	43,562	– 1,646	16,950	15,490	– 1,460	28,258	23,072
46	Do.	" ...	79·08	17	(b) 1868								
47	Do.	" ...	32·38	}	(c) 1868								
48	Do.	" 6	39·36	18	(a) 1869	12,952	7,556	– 5,396	4,867	Nil.	*	8,095	...
49	Do.	" ...	14·20	}	(b) 1869	21,424	16,222	– 5,202	8,034	2,915	– 5,119	13,390	13,307
50	Nellikutta	X 1	74·23	18	1870	44,533	Nil. *	†	14,846	10,974	– 3,872	29,692	*
51	Do.	" 2	46·00	15	1885–86	27,600	Nil. *	...	9,200	4,134	– 5,066	18,400	*
52	Chatamboral	XI 1	100·00	14	1885–86	60,000	44,512	– 15,488	20,000	10,735	– 9,265	40,000	33,777
53	Do.	" ...	107·56	13	1885–86	64,536	32,238	– 32,298	21,512	5,756	– 15,756	43,024	26,472
54	Do.	" 2	99·08	14	1886–87	59,448	34,576	– 24,872	19,816	Nil.	*	39,632	*
55	Do.	" 3	91·46	14	1887–88	54,876	43,165	– 11,711	18,300	8,850	– 9,450	36,576	34,315
56	Do.	" 4	100·00	14	1889–90	60,000	48,500	– 11,500	20,000	8,440	11,560	40,000	40,000

† This plantation has not been worked in accordance with the working plan.

* Enumeration survey not undertaken.

The following table shows the number of saplings cut under the working plan, the numbe sold, the charges on floating and the receipts by the sale of saplings during the period of fiv years :—

Official year.	Number of saplings cut.	Number of saplings sold.	Cost of floating.	Sale proceeds.
			Rs. A. P.	Rs. A. P.
1885–86	33,539	53,652	10,849 7 3	59,766 8 10
1886–87	15,743	...	*18,782 12 4	1,935 6 2
1887–88	15,111	49,079	2,672 0 9	32,441 12 4
1888–89	24,022	39,739	5,370 14 3	29,693 1 7
1889–90	37,461	39,560	4,442 9 0	26,165 9 10
Total ...	...	...	42,117 11 7	1,50,002 6 9

* This includes Rs. 8,263 spent on the purchase of the depôt site.

The above table shows that at a cost of less than Rs. 34,000 spent on floating saplings, a revenue of 1½ lakhs was obtained. In 1888 Mr. Cherry, the Conservator, criticised this plan a follows :—

"From all I learn the best demand on these plantations is for all the classes (except No. 1) o "teak saplings, the classes Nos. 4 and 5 selling best. All the classes may be attained in te "years' growth and it is a matter for consideration whether it will not be best to increase th "thinnings during the first ten years so as the sooner to open out the growth and the quicker t "get a return on the outlay. I should say every second sapling or 600 to the acre might b "taken out during the first ten years. I notice that the first thinning allowed after ten years i "the working plan only increases the average distance between the trees by about half a foot. "do not think the arrangement in the working plan, of bringing the several years' plantings in eac "block into one series, is a good one, and should have preferred to make a series comprise of al "the plantings of the same year, in the several blocks, so that all the plantings of one year migh "get the same annual treatment. I do not think the thinnings provided in the working plan ar "sufficient and the District Forest officer finds that, on counting the trees, the number per acr "existing is generally much less than the estimate at the time the working plan was prepared "and even less than the proper proportions provided in the working plan and yet the need o "further thinning is apparent."

With regard to this criticism it seems hardly necessary to give the same annual treatment t all the plantings of the same year as the growth in the different blocks is widely divergent.

In November 1890 Colonel Campbell Walker reviewed the results of the previous plan. H noted that it had been applied with the best results and that great benefit had been derived from the regulation of thinnings with due regard to the improvement of the final crop. He als noted that there was a much more definite idea of the state of growth and the constitution of th stock of the plantations at the end of this period.

He shows that the mistakes of the plan were chiefly :—

(1) The inaccurate date upon which it was based.

(2) That too many trees had been provided to be left on the more favourable soils.

With this in view he revised the working plan for the next five years, and the revised working plan is given in detail in Board's Proceedings, Forest No. 206, dated 16th May 1891.

It is not necessary to give the actual plan in detail, but the following table will show how fa this plan could be carried out up to the end of 1893–94.

Number.	Name and number of blocks.		Number of compartment and year of planting.		Area in acres.	Age at commencement of 5 years' period from 1890-91.	Number of trees actually standing at the end of 1889-90.		Number proposed to be thinned during the next 5 years as per Public Works Surveyor.	Number of trees actually thinned.		Number of trees that will remain at the end of 5 years' period.		Number of trees that ought to stand at the end of 5 years' period.	
							Per acre.	Per compartment.		Name of years.	Per compartment.	Per acre.	Per compartment.	Per acre.	Per compartment.
1	Aravillykava	I	1	1842	30·93	48	39	1,213	...	1891-92	...	39	1,213	80	2,474
2	Do.	„	2	1844	27·35	46	54	1,486	...	1890-91	...	54	1,486	80	2,188
3	Do.	„	3	1852	38·57	38	34	1,294	...	...	...	...	...	...	...
4	Do.	„	4	1853	34·71	37	99	3,427	...	1891-92	...	99	3,427	100	3,471
5	Eddacode	II	1	1844	30·65	46	80	2,449	...	1892-93	...	80	2,449	80	2,452
6	Do.	„	2	1845	28·14	45	89	2,516	...	1891-92	...	89	2,516	90	2,532
7	Do.	„	3	1846	44·78	44	90	4,031	449	1893-94	201	85	3,830	90	4,030
8	Do.	„	4	1847	54·61	43	90	4,894	...	1892-93	...	90	4,894	90	4,914
9	Do.	„	5	1848	82·15	42	100	8,196	803	1893-94	447	94	7,749	90	7,383
10	Do.	„	6	1849	44·58	41	89	3,954	...	1893-94	...	89	3,954	90	4,012
11	Do.	„	7	1850	49·67	40	152	7,545	2,578	1891-92	556	141	6,989	100	4,967
12	Do.	„	8	1851	147·19	39	91	13,387	...	1890-91	...	91	13,387	100	14,719
13	Do.	„	9	1857	36·14	33	137	4,936	961	1891-92	345	127	4,591	110	3,975
14	Do.	„	10	1860	39·56	30	159	6,295	1,548	1890-91	1,546	120	4,749	120	4,747
15	Do.	„	11	1861	86·05	29	108	9,276	...	...	...	...	...	...	...
16	Do.	„	12	1862	50·11	28	109	5,460	...	...	...	...	...	...	...
17	Ramalur	III	1	1844	4·93	46	83	410	16	1892-93	16	80	394	80	394
18	Do.	„	2	1850	16·40	40	98	1,600	..	1892-93	...	98	1,600	100	1,640
19	Elanjery	IV	1	1845	33·19	45	80	2,648	...	1892-93	...	80	2,648	90	2,987
20	Do.	„	2	1846	65·84	44	89	5,859	592	1892-93	* 606	79	5,253	90	5,925
21	Do.	„	3	1849	89·95	41	90	8,090	...	1893-94	...	90	8,090	90	8,095
22	Do.	„	4	1850	66·15	40	89	5,877	...	...	...	...	...	...	...
23	Do.	„	5	1858	42·79	32	120	5,154	448	1893-94	448	110	4,706	110	4,706
24	Do.	„	6	1859	39·84	31	110	4,382	...	...	...	...	...	...	...
25	Arevacode	V	1	1847	29·29	43	95	2,785	149	1891-92	...	95	2,785	90	2,636
26	Do.	„	2	1848	84·34	42	93	7,868	276	1890-91	281	90	7,587	90	7,590
27	Moolathamanoo	VI	1	1847	34·63	43	84	2,908	...	1890-91	...	84	2,908	90	3,116
28	Do.	„	2	1848	16·04	42	97	1,562	119	1891-92	37	95	1,525	90	1,443
29	Do.	„	3	1853	20·89	37	102	2,130	41	1892-93	45	100	2,085	100	2,089
30	Pannengode	VII	1	1854	92·33	36	110	10,113	880	1893-94	403	105	9,710	100	9,233
31	Do.	„	2	1855	100·32	35	97	9,747	...	1891-92	...	97	9,747	110	11,035
32	Do.	„	3	1856	79·26	34	114	9,016	298	1890-91	305	110	8,711	110	8,718
33	Do.	„	4	1863	81·25	27	156	12,660	2,910	1892-93	* 2,922	120	9,738	120	9,750
34	Do.	„	5	1864	40·57	26	122	4,954	86	...	...	...	...	...	...
35	Amrampolliem	VIII	1	1861	87·44	29	141	12,332	1,840	1892-93	1,840	120	10,492	120	10,492
36	Do.	„	2	1873	42·39	17	400	16,947	6,350	1892-93	6,350	252	10,597	400	16,956
37	Do.	„	3	1874	69·03	16	564	38,909	11,297	1891-92	11,756	393	27,153	400	27,612
38	Do.	„	4	1875	60·91	15	553	33,654	9,290	1891-92	9,160	402	24,494	600	36,546
39	Do.	„	5	1876	149·00	14	593	88,372	28,772	...	...	...	...	...	...

* The excess found are dead trees removed.

Number.	Name and number of blocks.		Number of compartment and year of planting.		Area in acres.	Age at commencement of 5 years' period from 1890-91.	Number of trees actually standing at the end of 1889-90.		Number proposed to be thinned during the next 5 years as per Public Works Surveyor.	Number of trees actually thinned.		Number of trees that will remain at the end of 5 years' period.		Number of trees that ought to stand at the end of 5 years' period.	
							Per acre.	Per compartment.		Name of years.	Per compartment.	Per acre.	Per compartment.	Per acre.	Per compartment.
40	Valuvashery	IX	1	1864	81·14	26	120	9,720	...	...	...	...	...	...	...
41	Do.	„	2	1865	56·63	25	121	6,830	...	...	...	...	...	250	8,075
42	Do.	„	(a) 3	1866	32·30	24	155	19,930	...	1893-94	...	155	19,930	250	24,085
43	Do.	„	(b)	1866	96·34	24									
44	Do.	„	(a) 4	1867	41·31	23	247	10,214	..	1892-93	...	247	10,214	250	10,327
45	Do.	„	(b)	1867	77·32	23	244	18,832	...	1891-92	...	244	18,832	250	19,330
46	Do.	„	(a) 5	1868	33·94	22	248	28,072	...	1890-91	...	248	28,072	250	19,770
47	Do.	„	(b)	1868	79·08	22									
48	Do.	„	(c)	1868	32·38	22	233	7,556	...	1891-92	...	233	7,556	250	8,095
49	Do.	„	(a) 6	1869	39·36	21	248	13,307	3,213	1892-93	* 3,225	186	10,082	250	13,390
50	Do.	„	(b)	1869	14·20	21									
51	Nellikutta	X	1	1870	74·23	20	452	19,990	...	1890-91	3,900	217	16,090	400	29,692
52	Do.	„	2	1871	46·00	19	510	9,700	...	1890-91	1,564	177	8,136	400	18,400
53	Chatamborai	XI	(a) 1	1872	100·00	18	338	33,777	7,500	1891-92	7,253	265	26,524	400	40,000
54	Do.	„	(b)	1872	107·56	18	246	26,472	8,067	1890-91	7,755	174	18,717	400	43,024
55	Do.	„	2	1873	99·08	17	349	34,586	7,431	1892-93	7,332	275	27,194	400	39,632
56	Do.	„	3	1874	91·46	16	375	34,315	...	1892-93	† 2,273	352	32,042	400	36,584
57	Do.	„	4	1875	100·00	15	401	40,060	...	1892-93	3,989	361	36,071	600	60,000
58	Chaliapuram Mangalashery	XII	1	1844	10·74	46	126	1,358	499	1893-94	499	80	859	80	859
59	Ambalakundi	„	2	1844	1·01	46	99	100	20	1893-94	20	80	80	80	80
60	Pozhai Mangalashery, Puttalath and Chitarakal ...	„	3	1844	8·35	46	221	1,848	1,180	1893-94	1,180	80	668	80	668

* The excess found are dead trees removed.

† There were dead trees removed from these plantations which required no thinning during this rotation.

It will be seen from the table that considerable modifications had to be introduced even in this revised plan.

The results of the four years' working of this scheme are shown in the table below :—

Years.	Number of saplings cut.	Number of saplings sold.	Cost of floating.	Sale proceeds.
			Rs. A. P.	Rs. A. P.
1890-91 ...	15,351	50,235	6,352 12 3	30,072 11 2
1891-92 ...	29,107	31,258	3,439 4 9	24,596 5 2
1892-93 ...	28,658	17,845	3,910 1 5	15,079 11 8
1893-94 ...	3,198	22,952	5,042 13 5	32,049 12 10
Total ...	...	...	18,744 15 10	1,01,798 8 10

and in the current year 3,071 saplings and 349 logs have been sold realising Rs. 27,895.

The above tables show that whatever may have been the character of the thinnings, they have resulted in securing large profits. That much good has been done by these preliminary schemes is evident if it has only resulted in securing a definite plan of working, and a proper uniform distribution of the crop and in obtaining more reliable data on which to base a definite scheme of working the thinnings, whilst if there has been error in making them, it has been on the right side in that there has been under thinning rather than over thinning. This has been pointed by all the Inspecting officers beginning with Mr. Macgregor in 1860 and ending with Mr. Gass in 1894. The last-named officer doubts if this can be remedied in the older plantations as he fears the danger of wind with the high bole—a remedy has, however, been devised in the present working plan, viz., in the second year preceding the thinning to choose the trees to be thinned out and to lop off some of the branches on the tree that impede the growth of its neighbours. In the next year to lop off the greater part of the branches left, so that when the tree is finally felled, it will only make a small hole, the trees round having closed up. Of course this will add to the cost of thinning but, with the coolies trained as they are to parasite clearing and climbing, the cost will not exceed more than 4 annas per tree, a trifle compared with the value of the tree to be cut. It is claimed for this system that by taking away from the weight of the top of the tree, there will be less damage done both to the surrounding trees and to the wood which will be less liable to split. The other defects noticed in thinnings are as follows :—

(1) Insufficient thinning in the early years.

(2) No allowance made for marshes, unplanted spaces, and portions when the teak has failed. The results being that more trees per acre are left than was intended.

(3) No distinction made between the alluvial and dry soils.

(4) The operations distributed over too many localities rendering it difficult to treat each block uniformly and rendering the operation more expensive.

(5) Mr. Cherry's objection that all the plantings of the same year do not get the same treatment.

The first four defects have been remedied in the plan now prepared and in addition a more exact enumeration of the stock has been made. As regards the last, the conditions of soil, &c., vary in each block. If the same treatment were applied, the treatment might in some cases be unsuitable, whereas there is more likelihood to be a similarity of conditions in the same block. Thus it is better to have a uniform treatment for a whole block than for two compartments in separate blocks though they may be of the same age. As for the financial aspect of the thinnings, it may be noted that up to 1878 when Colonel Beddome's report was issued, Rs. 45,114 were spent in producing a revenue of Rs. 1,29,312, and from that date up to the end of 1894 Rs. 98,002 were spent in producing a revenue of Rs. 4,41,413, showing how greatly the value of the thinnings is increasing.

8. *Fire-tracing.*—With the exception of a small fire in Amrampolliem which did little or no harm all the plantations and the Nellikutta block have been successfully protected from fire for the last ten years. It is difficult to say previously to this what was the mode of protection, but it appears that protection was commenced in 1869–70 after a very disastrous fire in Valuvashery which destroyed Rs. 5,400 worth of saplings and damaged the young plantations very seriously. In addition there were two more serious fires in 1879 in Chatamborai and Amrampolliem which again destroyed saplings and spoilt the young growth and Mr. Ferguson estimates the damage done by these two fires at Rs. 15,000 to Rs. 20,000. The system now in force is very thorough and cannot well be improved upon. The cost varies from year to year but usually amounts to about Rs. 800, the chief item being the cost of twelve patrols. This amount is not by any means excessive considering that about 6,000 acres are protected and in the face of the large losses noted above, it would be very unwise to curtail this expenditure. The mode of protection is by a scraped block line of 12–15 feet broad right round each block and all the compartment lines cleared and kept swept. The patrols are employed in keeping the lines swept. The amount spent on this work is about 9 pies per acre including the cost of patrols.

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APPENDIX C.

EXOTIC PLANTATIONS.

The whole of the cost of the experiments made with exotics including mahoganies, rubbers, eucalyptus, date palms, ipecacuanha, &c., are all debited against the plantations, but only two of these (1) the mahogany, and (2) the rubbers need be dealt with as they alone affect the plantations :—

(1) *Mahogany.*—Two or three plants were obtained in 1872, and one of these put down in the Chatamborai block by its vigorous growth has been the cause of this prolonged experiment. It quite overtops the teak growth of that year and is now 5 feet 6 inches girth at 5 feet high. It however has divided into two stems half way up the bole and covers a considerable space somewhat interfering with the growth of the teak. It was not until Mr. Peet's inspection in 1889 that it was discovered that this was not the true mahogany but the *Swietenia macrophylla.* In 1876–77 six more plants were sent from the Government Gardens and both Mr. Ferguson and Colonel Beddome suggested that large quantities of seed should be procured. For the next few years Mr. Ferguson's monthly reports are full of his failures in getting the seed to grow, most being received without vitality owing to bad packing, but apparently in 1878–79 some seedlings were put out which, however, for the most part died off in the ensuing hot weather. In 1879–80, 4,000 seedlings were put out and in the next two or three years these were added to. In 1881 the borer made its appearance and when Mr. Hadfield took charge in 1883–84, he reported very unfavourably on the plants raised. The experiment was, however, continued for two or three years longer but all attempts to raise good trees have been frustrated by the borer and the deer which seem to choose out this tree to rub their horns on and the experiment has been abandoned. The result is a few stunted shrubby trees which have no future before them and which only encumber the ground, so far for the true mahogany (*Swietenia mahogani*). After the discovery was made that the one successful tree was of the *Macrophylla* species, attempts were made to grow this kind. It was planted with teak under the impression that it would form a standard with a teak coppice. The experiment at first met with a certain amount of success in that it grew as quick as teak and for some time at least, was not found out by the borer. After one or two years it was found that the borer (which was discovered by Mr. Hadfield to be the same insect as attacked the brinjal) had an equal liking for this species and also all the trees had to be fenced to keep them from the sambhur. How readily this tree is found out by the deer is shown by the fact that only a few weeks since, the tree nearest the forest bungalow was found skinned by a sambhur. The experiment is at present too new to say definitely that it has not succeeded as this species has a wonderful recuperative power after being attacked by borer and is undoubtedly of very rapid growth. I have been asked therefore specially to consider whether the experiment should be continued.

Before considering any introduction whatever I think the following points should be noticed :—

(1) Is it required for any particular purpose, and, if so, is it likely to fulfil this requirement ?

(2) Is the tree likely to propagate itself freely and not require any special treatment which would add to the expense of propagation ?

(3) Is the introduction likely to produce a valuable timber, and, if so, how would this compare with indigenous species, or answer any special purpose ?

(4) How does the timber compare in value with indigenous timber trees ?

As regards (1) the tree was introduced to be a standard over teak—not much appears to be known as to its appearance when a full grown tree but judging from the one full grown specimen and also the young saplings its foliage is dense and the tree appears to be umbrageous. If this is the case it certainly ought not to dominate teak. As, however, the idea of coppicing the teak has been called in question, it may be considered whether it may not be a suitable congener with teak to grow in high forest as the beech with the oak. For this purpose it seems decidely more fitted as it appears to be almost equal in growth as a rule, and supports shade, whilst, being evergreen, it would shade the ground during the hot season when the teak leaves are off. From this point of view if suitable in other ways it might be grown as an under plant to teak especially on dry soils.

With reference to (2) there is no difficulty in propagation, but the attacks of borer are much against its growing properly and to fence it from sambhur would add considerably to its expense of propagation. It is not known how long the attacks of borer will continue or what effect this will produce on the timber. From this point of view it is therefore defective.

With reference to (3) knowing so little about the timber I referred the question to Mr. Gamble, who has been kind enough to answer me in the following terms :—"As regards "wood, it is quite impossible to tell from young trees and we have no information whatever about "it from Honduras." This question, therefore, cannot be satisfactorily answered, and there is nothing to show that we are not cultivating a useless wood, though the young trees are said to be not inferior as regards timber.

With reference to (4) mahogany is a fancy wood and commanded its high prices in the market owing to fashion and is liable to great fluctuations. Other indigenous woods of the same character are rosewood and white cedar which at times would command just as good a market and so also would, I believe, well figured logs of *Terminalia tomentosa* if better known in England; just as the Andaman 'Padouk' is now attracting attention. On the other hand, Mr. Gamble informs me that mahogany has gone down in price greatly in the English market. Teak from its intrinsic merit will always command a good price being not only a handsome but a really superior wood.

Basing my opinion on the above reasons I must most decidedly declare against continuing the experiment as I think the money would be far better laid out in planting teak which, these plantations prove, grows so well pure. At the same time we have a sufficient number of plants in the plantations and avenues to test the growth of the *Swietenia macrophylla* and should it prove to be a really serviceable timber, the experiment could then be continued. To test the value of the timber I would suggest cutting the one big tree in Chatamborai which already according to Mr. Gass, has a heart wood of 17 inches diameter and sending it to Mr. Brown of Calicut, who, I am sure, would give very practical information as to its value.

2. *Rubber.*—These were first introduced in 1886–87 and by 1879–80 the Ceara and Heavea rubbers are reported to be fairly established. In the following years they were increased in numbers and grew fairly well so that in 1881–82 they were about 30 feet in height and 13 to 18 inches in girth at 5 feet high. There is now a miscellaneous collection of rubber-producing tree growing under the teak plantation of Aravillykava many of which may now be considered as full grown. Tapping was tried first in 1886–87, but the yield was very small not amounting to more than 2 oz. per tree. Again in the current year 100 trees were tapped and 10lb of rubber much mixed with dirt (as it was found that the tapping of the roots succeeded best) were procured, the highest yield being about 6 to 7 oz. per tree. As the 10lb rubber is not worth much more than a similar number of rupees, the experiment must be considered to have failed from a financial point of view, and as tested by the four considerations noticed above substituting 'produce' for 'timber' the failure would be very apparent. In any case these trees are much out of place in a teak plantation and a proposition has been made to cut them out and plant the area with teak.

It is impossible to make out from the accounts what has actually been spent on these experiments, but the cost on exotic plantations between 1878 and 1884, which comprises the early period in which the mahogany and rubbers were tried, amounted to Rs. 4,000, which judging from results would certainly have been better spent in clearing and planting up over 100 acres of teak.

APPENDIX D.

THE EXTENSION OF PLANTING.

The first question to be dealt with is the area available for planting.

(*a*) *Area available.*—As shown in the working scheme there are two areas in the portions already planted which owing to their irregular growth require clean felling and replanting. The area available is 64 acres (in two blocks) all of which is first-class alluvial soil and should produce a splendid plantation.

In addition to this there is in the immediate neighbourhood of Nilambúr an area of about 400 acres which may still be planted with success, though the soil for the most part is not quite first class.

The other areas available are (1) the Karumpoya block, and (2) the Nellikutta block.

The area of the Karumpoya block is 3,567 acres under forest, it was purchased for the special purpose for planting and has the advantage that no kuttikanom is paid and therefore all the receipts from clearings (instead of 80 per cent.) would be credited to Government and there would be no subsequent charges made. This will partly compensate for the increased lead from Calicut, whilst the advantages of having sole control without any of the petty complaints of joint proprietors will be an indirect advantage. This area is specially suitable for planting and a good compact block of not less than 2,500 acres (allowing over 1,000 acres for marsh, hills and places far from rivers, &c.) chiefly of first-class soil could be formed. In Nellikutta block there are 1,700 acres (approximately) still unplanted, of which 1,040 (approximately) would be suitable for planting the soil being excellent. It possesses, however, the disadvantages (1) that we have to pay kuttikanom, (2) that the forest is very unhealthy, (3) that there is a longer lead to Calicut.

The areas available may be summed up thus:—

	ACRES.
(1) In the neighbourhood of Nilambúr	460
(2) Karumpoya	2,500
(3) Nellikutta	1,040
Total ..	4,000

(*b*) *Relative values of timber.*—In Mr. Cherry's last inspection note he has given the following rates obtained for timber during the last five years:—

(1) *Jungle wood*—unsaleable—*vide* end of paragraph 28.

(2) *Inferior kinds*—(including *Terminalia tomentosa, Pterocarpus, marsupium, Xylia dola briformis*, benteak, &c., the ordinary hard woods of other districts, Rs. 0-1-4 per cubic foot, para. 25.

(3) *Blackwood* ... „ 0 14 10 „ } para. 25.
(4) *Teak* ... ... „ 1 7 7 „ }

From the few observations I have been able to make and from information given me by Mr. Hadfield, I learn that, as a rule, the inferior kinds are rather quicker growers than teak, in fact that a tree in 60 years is about the same size as a teak tree in 90 years, the value of these woods may therefore be raised by $\frac{1}{2}$ or in other words value is equivalent to two annas per cubic foot.

As for blackwood the only wood that can at all compare with teak in value, it is a slower grower and a wood that is subject to constant fluctuations of market being rather a fancy wood. Teak, therefore, when mature stands very far superior to any of the others, and in addition as this quality that as a sapling it is a valuable timber and will pay the expenses of extraction and give a handsome surplus (*vide* the remarks under thinnings), whereas none of the others afford saleable wood until they reach an advanced age. As there is practically no limit to the demand for good mature teak, it must be the object of Government to grow such timber as largely as possible.

(*c*) *Comparison of methods of working.*—There are, I think, three methods of working such a forest as Nellikutta.

(1) *By a simple extraction of mature trees as proposed by Colonel Campbell Walker in his report of* 1885.—This has the great advantage of economy as no other work is put in hand, and there are therefore small expenses on establishment. The yield of Nellikutta, the most valuable timber forest, may be estimated as follows:—

It was cut over between 1882 and 1884 and again in 1890–92 and the District Forest officer considers that it will be fit to cut again beginning in 1897. The total net profit derived from these two fellings after deducting working expenses and kuttikanom is Rs. 52,960. This, then, is the net yield of the forest for 15 years. The yield per annum $= \frac{52,960}{15} =$ Rs. 3,531. The area of annum, the forest worked is approximately 1,600 acres, the annual yield per acre is $\frac{3,531}{1,600} =$ Rs. 2–3–4, a very low yield for an acre of teak, but high for an average forest.

On the other hand, taking the results of the last 50 years for the whole forests (except the planted area) the receipts from timber and half of the bamboos = Rs. 4,76,391. Against this we must put charges amounting to Rs. 99,043, charges on establishment amounting to Rs. 73,679, *i.e.*, two-ninths of the establishment employed on the plantation area and one-ninth of the charges of the last 16 years attributed to plantations, but which includes cost of elephants, rest-houses, roads, &c., the full charge amounting to Rs. 1,95,659 from which we get a revenue of Rs. 28,973, half of which, Rs. 14,036, is net profit, the other half, kuttikanom. Dividing this by 50 we get a net annual revenue of Rs. 2,807 only and as the area worked over is approximately 10,000 acres, we only get a possibility of Rs. $\frac{2,8}{10,0}$ or little more than 4 annas per acre.

2. *By a very intensive system of working endeavouring to convert the forest into, as far as possible, a pure teak forest.*—This would entail a system of cutting all mature trees, but in addition, would entail heavy thinnings accompanied by dibbling in teak seeds in the clear spaces. After germination of the seed, weedings and later cleanings (*Fr. nettoiements*) would be necessary. The result would be a great improvement of the forest, but at considerable expense as the thinnings would not be marketable and the cleanings not being concentrated in one place would not be cheap. After seeing a portion of this forest, I estimate that the money spent in this would amount to very nearly as much as is spent on the plantation operations, but owing to the rank undergrowth of bamboo and the inferior which would constitute the first crop, the results would not be half of what is obtained by clean felling and artificial regeneration.

3. *By artificial planting.*—The great advantage of this system is that all the works are concentrated and thus the expense is reduced to minimum and also that a teak crop begins to pay very early owing to the valuable nature of the thinnings. It may be objected that this was not the case with our plantations, but the objection can be very easily answered. In the present case we do not have to consider the value of the land which with accumulated interest was a very high item. Secondly, but little revenue was obtained in the early years from the sale of clearances for plantation, whereas now owing to the increased value of timber the original outlay is completely covered as shown in Mr. Gass' inspection note. Thirdly, originally no revenue was obtained by the early thinnings which were not properly conducted.

The estimates prepared for the new plantations showed conclusively that by cutting 500 saplings per acre at the end of ten years a considerable profit would follow and it is only deferring the realization of this profit for a year or two by cutting only 800 at the end of ten years and 250 at the end of fifteen as proposed in the plan.

The following table shows the cost and production of an acre of teak up to ten years :—

Cost.	Rs. A. P.	Revenue.	Rs.
1st year, including formation	36 0 0	Realized from clearing	36
2nd year, maintenance	9 4 0		
3rd year	6 8 0		
4th year	5 12 0		
5th year	4 4 0		
6th and 10th year	16 8 0		
Total ...	78 4 0		
11th year, maintenance	3 0 0	300 saplings at 8 annas	150
Cost of felling	2 0 0		
Cost of collecting 300	7 8 0		
Floating, &c.	27 0 0		
Total ...	39 8 0		
Grand Total ...	117 12 0	Total ...	186

From this it will be seen that the original outlay even if it be made to include 4 per cent. compound interest will be recovered in ten years. From this time the cost of the plantation is not more than Rs. 3 per annum or Rs. 270 up to 90 years of age when there will remain 40 trees per acre standing, of 80 cubic feet each on an average. The remaining trees cut in thinnings will after deducting expenses, realize not less than Rs. 2,000 whilst the value of the final crop at Rs. 2 per cubic foot = Rs. 6,400. Thus the net revenue per acre per annum will not be less than $\frac{8,400}{90}$ or Rs. 90 per acre per annum.

From every point of view, therefore the superiority of teak timber is manifest, and I conclude that the best way of producing teak is by artificial regeneration and therefore strongly advocate the extension of planting.

The only precaution that need be taken is the overcrowding of the market with saplings and therefore I think each years extension should not exceed 80 acres which at the end of 10 years will put an additional 24,000 saplings in the market, but as the planting is to yield rather more than the present demand, I think the market may be extended by picking out the best saplings only for the Bombay and export market (which will always give the best prices) and selling those of inferior quality at reduced rates and in smaller lots, which I am sure, would open a local market as was shown by the prices obtained when the stock had to be sold retail in 1887 and 1888.

APPENDIX E.

FINANCIAL RESULTS.

The plantation scheme not only includes what is known as the teak plantation proper, but all the forests included in the leases which were bought for teak planting.

The following table is a register of the areas so compared :—

Number.	Name of forest block.	Number of acres planted.	Number of acres not planted.	Total acres in each block.
1	Nilambúr	1,937·56	3,263·00	5,200·56
2	Pannengode	523·23	331·93	905·16
	Valuvashery	709·00	223·20	932·20
	Pokote	235·50	525·75	761·25
3	Kanakutta	*Nil.*	668·61	668·61
4	Chatambudavoi	483·60	215·92	699·52
5	Edambadum	*Nil.*	381·26	381·26
6	Mooriam	*Nil.*	1,765·13	1,765·13
7	Karien	*Nil.*	950·61	950·61
8	Nellikutta	142·48	1,681·65	1,824·13
9	Karumpoya	*Nil.*	3,945·60	3,945·60
10	Amrampolliem	417·75	77·48	495·23
11	Ambracuttamala	22·00	299·75	321·75
12	Ambalakundi	1·01	*Nil.*	1·01
13	Mangalashery (Ernad)	10·74	*Nil.*	10·74
14	Mangalashery (Calicut)	19·58	*Nil.*	19·58
...	Puthulathoo	8·35	*Nil.*	8·35
	Chitarikal			
	Grand Total ...	4,560·80	14,329·89	18,890·69

The following statement shows the Capital account of the teak plantations together with the leased forests from 1840 to the end of June 1894 :—

	Expenditure.	Revenue.	Balance against the plantations.
	Rs.	Rs.	Rs.
From 1840 to end of June 1894 (inclusive of compound interest at 4 per cent.).	21,25,667	18,37,657	2,88,009

In 1878 the Board of Revenue, in reviewing Colonel Beddome's report, found that debt against the plantations was not more than Rs 3,77,827.

In the past sixteen years this debt has been reduced by Rs. 89,818, whilst the expenditure has been largely increased—

(1) By adding 1,000 acres to the plantation which at present yields nothing.

(2) By the capture and upkeep of 25 elephants.

(3) By purchase of a depôt site and several additions in building, acquiring depôt site, &c.

The results therefore are very satisfactory.

The following table shows the abstract of disbursements in the Conolly teak plantations together with the leased forests at Nilambúr from 1840-41 to 1893-94 :—

Years.	Mortgage or moiety of kutti-kanom paid to Jennies.	Paid to sanctioned establishment.	Charges on timber.	Plantations.		Total.
				Floating saplings.	Plantation charges.	
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Brought forward from 1840-41 to April 1862 ...	8,536 2 4	33,582 0 3	...	...	30,256 3 6	72,374 6 1
1862-63	...	3,013 2 4	...	...	3,753 3 5	6,766 5 9
1863-64	...	4,511 10 0	2,072 0 7	2,294 1 0	3,960 3 0	12,837 14 7
1864-65	...	4,426 5 7	3,918 14 6	1,300 11 5	7,693 7 5	16,439 6 11
1865-66	...	4,919 4 2	2,361 5 5	1,817 0 10	7,259 8 0	16,357 2 5
1866-67	...	5,485 5 10	1,819 1 11	606 2 9	5,966 15 1	13,877 9 7
1867-68	...	5,528 15 10	1,044 11 6	150 8 0	7,773 13 4	14,498 0 8
1868-69	...	6,985 4 10	1,573 4 6	1,847 9 10	6,639 5 4	17,045 8 6
1869-70	4,102 15 2	6,316 6 3	1,967 4 9	50 8 6	5,606 0 7	18,043 3 3
1870-71	200 11 7	6,591 5 2	5,488 0 0	1,195 12 6	7,464 10 7	20,940 7 10
1871-72	5,200 0 0	6,820 0 3	3,962 2 6	1,106 5 3	8,823 6 7	25,911 14 7
1872-73	80,000 0 0	9,355 7 9	3,991 10 4	2,533 4 3	10,606 4 11	1,06,396 11 3
1873-74	2,318 8 10	11,942 13 2	2,690 6 6	2,500 12 1	12,490 4 7	31,942 13 2
1874-75	102 0 0	9,270 8 9	2,896 12 7	1,782 2 5	11,625 5 5	25,676 13 2
1875-76	100 0 0	9,107 13 11	6,774 3 0	2,175 1 1	8,891 9 5	27,048 11 5
1876-77	100 0 0	10,123 3 11	5,174 8 7	4,965 8 9	7,603 8 2	27,966 13 5
1877-78	180 0 0	9,655 5 11	370 5 9	7,582 10 6	5,453 1 2	23,271 7 4
1878-79	2,145 8 11	9,830 3 9	4,488 4 9	2,891 13 8	6,377 9 5	25,733 8 6
1879-80	1,094 3 6	9,923 8 3	5,160 4 4	3,417 7 4	12,195 11 5	31,791 8 10
1880-81	348 14 0	10,944 7 9	1,742 11 0	4,689 0 0	9,035 9 1	26,760 9 10
1881-82	1,180 0 0	11,979 0 0	4,493 4 4	4,248 1 0	11,068 0 8	32,968 6 0
1882-83	3,155 1 7	10,271 5 2	2,071 15 1	7,715 7 2	6,150 11 9	29,364 0 0
1883-84	1,462 3 3	12,242 15 1	1,060 8 4	8,025 12 4	7,458 0 7	30,249 7 7
1884-85	100 0 0	12,109 4 0	5,679 13 1	6,151 14 3	5,951 7 6	29,992 6 10
1885-86	3,062 13 10	12,556 12 1	9,170 5 11	10,819 7 3	8,303 10 4	43,043 1 5
1886-87	1,053 4 0	13,911 12 5	4,647 14 11	*18,782 12 4	11,524 9 1	49,320 4 9
1887-88	687 12 8	13,570 6 1	3,677 7 7	2,672 0 9	16,396 9 8	37,004 4 9
1888-89	889 1 6	12,860 7 1	1,090 12 2	5,370 14 3	†22,331 3 11	42,542 6 11
1889-90	511 7 11	14,981 7 6	1,786 2 7	4,442 9 0	16,394 15 2	38,116 10 2
1890-91	550 8 4	9,004 2 10	1,814 14 7	6,352 12 3	15,765 0 11	33,487 6 11
1891-92	1,539 12 2	9,546 1 10	2,545 1 7	3,439 4 9	19,283 1 6	36,353 5 10
1892-93	‡4,385 9 7	11,638 11 11	3,410 3 9	3,910 1 5	§21,590 0 9	44,934 10 8
1893-94	1,073 15 1	8,551 1 0	1,690 3 6	5,042 13 5	16,699 3 9	33,507 4 9
Total ...	1,24,081 0 3	3,31,556 12 8	99,044 11 11	1,29,910 6 4	3,58,422 7 3	10,43,015 6 5

* Includes Rs. 8,263-12-4, the cost of a depôt site.

† Includes Rs. 7,631-6-7, part cost of the District Forest officer's bungalow.

‡ Includes Rs. 2,501, the cost of the purchase of the Jenmi right over Karumpoya and Amrampolliem plantation.

§ Includes the charges for 15 months on the change of the Forest year.

The increase of cost since 1885-86 is attributable to—

(1) The additions made to the plantations.

(2) The cost of the upkeep of captured elephants, which is constantly on the increase.

The following table shows the abstract of receipts in the Conolly teak plantations together with the leased forests at Nilambúr from 1840-41 to 1893-94 :—

Years.	Receipts by sale of			Miscellaneous receipts.	Total receipts.
	Timber.	Bamboos.	Saplings.		
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Brought forward from 1840-41 to April 1862 ...	21,321 0 0	.....	.....	573 0 3	21,894 2 3
1862-63	5,414 0 0	176 0 0	12,044 0 0	88 14 10	17,722 14 10
1863-64	4,279 0 0	1,193 0 0	1,210 0 0	9 0 0	6,691 0 0
1864-65	9,447 0 0	774 0 0	16,776 0 0	162 0 0	27,159 0 0
1865-66	4,585 0 0	720 0 0	9,307 0 0	8 0 0	14,621 0 0
1866-67	10,032 0 0	736 0 0	15,647 0 0	591 0 0	27,006 0 0
1867-68	2,595 0 0	.....	500 0 0	2 0 0	3,097 0 0
1868-69	6,203 0 0	188 0 0	9,515 0 0	.....	15,906 0 0
1869-70	6,029 13 8	297 10 8	4,173 14 11	.....	10,501 7 3
1870-71	9,894 0 0	573 0 0	5,583 0 0	.....	16,050 0 0
1871-72	7,235 14 0	309 12 10	843 5 9	100 0 0	8,489 0 7
1872-73	7,805 9 2	1,703 6 11	7,378 14 11	257 12 0	17,145 10 1
1873-74	12,411 13 3	531 1 4	11,342 1 8	45 7 3	24,312 7 6
1874-75	6,396 8 8	656 12 9	7,067 12 8	127 14 11	14,249 1 0
1875-76	8,552 0 0	1,050 2 10	10,228 5 10	.....	19,830 8 10
1876-77	18,796 12 10	819 11 4	13,162 2 8	433 11 10	33,212 6 8
1877-78	16,799 15 5	1,044 15 0	4,534 4 0	136 0 0	22,515 2 5
1878-79	23,103 2 8	549 0 4	10,758 0 3	737 10 8	35,147 13 11
1879-80	3,830 10 4	626 4 0	20,159 1 8	579 3 3	25,195 3 3
1880-81	34,749 2 0	815 12 4	28,172 13 0	1,155 11 10	64,893 7 2
1881-82	22,224 6 9	743 8 10	26,937 3 6	20 7 0	49,925 10 1
1882-83	22,354 3 8	1,643 0 1	33,100 15 3	1,597 10 6	58,695 13 6
1883-84	13,038 14 1	1,567 3 8	41,901 9 3	894 4 10	57,401 15 10
1884-85	27,749 2 4	755 7 6	28,563 3 6	131 13 7	57,219 10 11
1885-86	18,709 2 2	2,062 0 5	59,766 8 10	601 0 0	81,138 11 5
1886-87	13,901 0 0	1,836 0 6	1,935 6 2	279 1 5	17,951 8 1
1887-88	6,180 13 8	1,012 1 1	32,441 12 4	1,267 4 6	40,901 15 7
1888-89	11,092 0 6	1,670 12 4	29,693 1 7	996 13 0	43,452 11 5
1889-90	8,421 5 0	1,698 6 11	26,165 9 10	1,378 0 2	37,663 5 11
1890-91	7,990 11 4	2,118 2 9	30,072 11 2	747 6 10	40,929 0 1
1891-92	22,524 6 10	1,144 11 9	24,596 5 2	464 0 0	48,729 7 9
1892-93	21,865 1 0	1,553 1 11	15,079 11 8	1,123 8 0	39,621 6 7
1893-94	28,038 7 0	2,270 13 5	32,049 12 10	3,802 0 0	66,161 1 3
Total ...	4,43,571 5 1	32,822 1 6	5,70,726 11 6	18,311 12 8	10,65,431 12 2

The increased receipts under timber since 1876 are due to better working and a better demand, and under saplings, to increasing demand and the increased dimensions of the saplings. The miscellaneous receipts are chiefly derived from the hire of Government elephants.

At the time of Colonel Beddome's report the disbursements were in excess of the receipts by Rs. 1,77,000 nearly. Now the receipts are in excess of the disbursements by Rs. 22,000, showing that the present generation has profited by nearly two lakhs of rupees by this undertaking. As the plantations have not deteriorated in value and as the undertaking has been extended by 1,000 acres, by the capture of 26 elephants and by the addition of large buildings such as the District Forest officers' bungalow and the Kullai depôt, the financial aspect of the plantations must be considered as highly satisfactory.

(Signed) P. M. LUSHINGTON,
Deputy Conservator of Forests.

NILAMBÚR,
2*nd March* 1895.

WORKING SCHEME OF THE NILAMBÚR TEAK PLANTATIONS.

CHAPTER I.

DURATION OF WORKING SCHEME AND EXTENT OF WORKING CIRCLE.

THE working circle includes all the portions of the leased and purchased forests which have been planted with teak which area is known as the 'Nilambúr Teak Plantations.' The plan prescribes that there shall be a clean cutting of teak over a definite area (to be determined hereafter) to begin when the oldest plantation is not less than 95 years of age, *i.e.*, 1939. In the meanwhile the forest is to be worked as high forest with thinnings. The manner in which these thinnings should be conducted is prescribed for the next 25 years, and the actual yield is shown in full for the next 10 years after which the plan may be revised, if necessary. Special working is prescribed to bring two areas of the plantation within the working circle during the next two rotations of thinnings.

Cost of the plan.—The total cost of the plan, which includes the salary of the special Working plans officer from the date of his joining from leave, is Rs. 3,293-12-7. This also includes the enumeration survey made previous to his arrival and a detailed topographical survey which has been conducted under his supervision. The actual work has taken from the 18th October to 20th February, but the work has been delayed by the survey and by the Christmas holidays intervening. During this delay the time has been spent in increasing the number of sample areas so as to obtain more accurate data.

CHAPTER II.

GENERAL DESCRIPTION OF WORKING CIRCLE.

1. *Situation.*—The plan has been prepared for what are known as the 'Nilambúr Teak Plantations' which comprise 6 principal blocks grouped together and only separated by the rivers, 2 fair-sized outlying blocks known as Amrampolliem and Nellikutta, and 5 small outlying blocks only a few acres in extent. The plantations lie in the Nilambúr valley surrounded by hills of Sisapara on the south-east, the Wynaad (S.E.) on the north-east, and the Camel's Hump on the north-west side. The plantations all lie in the Nilambúr range of the South Malabar district.

Boundaries.—The principal block of plantations is surrounded on all sides by private forests chiefly belonging to the Nilambúr Raja, except on the east where the Nilambúr block bounds the plantation, and a small part of the northern boundary where the Kanakathu Government Leased Forest is situated. Amrampolliem lies in the centre of private forest and cultivation, whilst Nellikutta adjoins on three sides the Government leased forest and on the fourth, the private forest of the Nilambúr Tirumalpad.

Configuration of the ground.—The plantations are all on plain low-lying land broken up here and there by small hillocks. The rivers known as the Munden Toda, Punnapoya, Chaliarpoya, Kanjerapoya or Iatode, Kurumpoya and Madapoya, all of which are tributaries of the main river, the Karempoya, divide up the several plantations of the main blocks.

2. *Climate.*—The distinguishing characterestic of the Nilambúr climate is its damp heat so favourable to rapid growth. The temperature in shade ranges from 75° to 95°. The average rainfall for the past ten years is 94·5 inches. In 1890 the

rainfall was only 62·80 inches, whilst in 1892 it reached 128·59. There are always showers in April and May which prevent the fire season from being a long one, though it begins early. In June the average is 23·5 inches and in July 28 inches, and these are the real rainy months in which planting is effected, but considerable rain falls up to the beginning of November, when the cool season commences. From then to the end of March there is little or no rain. The following table shows the number of rainy days and the average rainfall in each month for the last ten years:—

January.		February.		March.		April.		May.		June.	
Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.
Nil.	*Nil.*	*Nil.*	*Nil.*	1	0·6	6	2·6	10	4·8	24	23·5

July.		August.		September.		October.		November.		December.	
Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.
28	28·2	21	14·3	15	5·9	15	9·0	8	4·3	2	·6

The prevailing winds are the south-west, from the beginning of March to the end of October, and the north-east, from November to the end of February. Gales, which do considerable damage, occur chiefly in April, May, July and October; but considering the great height of the trees, there has been no great accident to them except in November 1881 when 5,874 saplings were blown down.

3. *Soil.*—The underlying rock is described by Mr. King as gneiss of a quartzo, felspathic or quartzo-hornblendic variety. That this gneiss is disintegrable is shown by the numerous particles of mica, which are seen floating down the rivers. The outcrop of gneiss is not frequent, and where it does occur, the gneiss boulders are usually mixed with a good alluvial soil and the growth is as good as on the alluvial. The growth is generally first class. The hills are, for the most part, however, composed of laterite which in places is decomposed and forms a dry flat penetrable soil. In these parts the growth is good though not so rapid as on alluvial and has been classified, with the inferior alluvial, as second class. In other places the laterite outcrops and forms a solid disintegrable mass of rock which the roots of the teak cannot penetrate, and in places the teak has entirely died out and given place to a natural growth which is usually of Irul (*Xylia dolabriformis*) or of black wood. The growth has been classified as third class or *nil*. In all the alluvial, which is the predominant soil of the plantations, and occupies nearly half of the total area, the growth is luxuriant. Notice must be taken of the parts where the soil is swampy, and produces to a thick growth of coarse grass and reed. In the older plantations there is either a poor straggling growth or nothing at all in such places, but in the young plantations, dating from 1886, the swamps have been partially drained with good result and the young plants are growing fairly, though not so fast as on the drier alluvials. Throughout the plantations there is a thick layer of humus on the alluvial, but very little is formed under the teak on the dry laterite soils. Wherever, however, the teak has given way to thick natural jungle, humus is formed and the soil becomes moister. The soil of the plantations is covered everywhere with a growth of grass and shrubs (chiefly *Helicteres*) and creepers, which, in the more open parts, would choke the growth were it not removed periodically; but wherever the cover is dense, this growth, though it fairly covers the ground, is not thick. It dies down to a great extent in the hot season.

4. *Description of Forest growth.*—The forest consists of pure planted teak for the most part, of magnificent growth on alluvial soils and of fair growth on laterite. The trees owing to the good soil and dense planting have come up with a straight clean bole of great length. In some cases owing to want of judicious thinning in the earlier years, the trees have grown up with very small crowns, but this has been improved of late years. On the laterite soils the growth is much less dense than on the alluvials and the trees are in every way smaller. On the hard laterite, the teak has in parts given place to a growth of natural forests and in the swamps the rank growth of reed and the dampness have in a great measure succeeded in killing off the teak plants. Fringing the plantations on the sides of the various rivers there was a growth of natural bamboo, but many of these seeded in 1881 and after dying off were replaced by the giant bamboo of Burmah (*Cephalostachyum pergracile*) in 1888 and the following years, which has formed splendid clumps though as yet the culms are of no great size. Each year the size is increasing. In some of the plantations notably in Ramalur and Aravillykava the *Swietenia Mahagani* has been planted with the teak but, owing to a borer, the growth is very poor. In some of the younger plantations too, both *Swietenia mahagani* and *Swietenia macrophylla* have been tried, but in no case is the growth as good as the teak and the ravages of insects and the damage done by the deer, which crop the shoots and bark the trees, have rendered the experiment unsuccessful. With the success of the teak planting clearly demonstrated, such experiments are of little use. Two defects are noticeable in the growth of the trees—

(1) A species of gangrene caused by a secretion of lime water which oozes from the stem leaving a brown mark on the bark. This, though rather common, does not cause much damage to the wood, as it is more or less on the outside.

(2) The large number of lateral branchlets which cause knots in the wood. Mr. Hadfield considers that this is due to the early pruning, and this may have something to do with it as to the pruning would very likely cause the sprouting of the dormant buds, but after consideration, I think it must chiefly be attributed to want of crown which lets in the light through the top branches. The want of crown itself is, I think, due to two causes: (1) the growth of the *Loranthus* which used to be very prevalent in some of the plantations; (2) to want of sufficient thinning in the early years. The rate of growth is shown in the appendix.

Speaking generally the trees acquire their principal height development at the end of 35–40 years, and their maximum utility at the end of 90–100 years on alluvial and 40 years later on laterite soils.

The teak in the plantations flowers usually in the beginning of July and the fruit begins to form a fortnight or three weeks later, the ripe seeds are collected in January and February. The leaves begin to fall in the early part of January. The trees are bare towards the 20th January and the new leaves begin to sprout about the 15th February. In the moister parts the leaves are retained longer.

5. *Causes of Injury—(a) Forest fires.*—The first notice of fire in the plantations is found in the Administration Report of 1865–66. Mr. Ferguson writes: "Con-"siderable portions suffered from fires which were more severe than formerly and "the plantations were fire-traced." There is no record to show where this fire occurred, but it may be inferred that in previous years fires had occurred, and this is borne out by the statement of some of the older coolies and an old forest guard.

this is the first notice also concerning protection it is likely that it was only commenced then as in after years' reports are found. There was no fire the next year, but in March 1869 a large fire occurred in Valuvashery, which ran through 40 acres of 1865, 80 of 1866, 105 of 1867 and 70 of 1868. It also damaged 60,000 saplings and destroyed 2,000. The young plantations were all coppiced and good coppice shoots quickly appeared. No further fire occurred until 1874 when a portion of 1864 in the same block was burnt. As, however, the plantation had been recently weeded, the fire was soon extinguished and very little damage resulted. On 4th May 1879, plantations 1872, 1873, 1874 and 1875 in Chatamborai were overrun by fire. According to Mr. Ferguson's report (No. 15, dated 15th May 1879) these young plantations were in fresh leaf and the young leaves were scorched and dried up. Mr. Ferguson states that no doubt much damage was done, but does not state how much. The trees in 1875 (11,780) were coppiced the following

January. On the 20th March 1879 (the same year) a fire also occurred in Amrampolliem plantation in the part that was purchased already planted (supposed to have been planted in 1863). In the words of Mr. Ferguson: "The fire "had overrun up and down stream about 200 yards in each direction as also as far "as the fire-trace on the outerside of the plantation." In addition 3,800 saplings valued at Rs. 2,660 were destroyed. In a report, dated 16th December 1879, Mr. Ferguson estimates the damage done by these fires at Rs. 15,000 to Rs. 20,000 as large spaces had to be cut over. The above are all the fires that have been recorded, and it is certain that subsequent to that date, no fires have entered the plantations with the exception of a small fire in 1888–89 in the Amrampolliem plantation which did no material damage. The results of these fires are not easily discovered. The coppicing was carefully done, and it is only in a few instances and by careful investigation that the coppice shoot is distinguishable from a seedling. It is, however, noticeable and especially in Chatamborai that in places the growth is not as good as it should be, considering the quality of the soil. It is difficult to appreciate the results of the protection, but wherever the green leaves of young plants have been scorched, the growth must have been retarded. Ordinarily the fire season lasts from about 15th February to 1st June though the tracing is commenced in January owing to the danger of the dry teak leaves catching fire.

(*b*) *Grazing of Cattle.*—The whole area of the plantations is closed against grazing and there is ample grazing land outside them. The only part of the plantations in which cattle are not easily excluded is Aravillykava which is near the village of Nilambúr where there is a small herd of cattle which are very difficult to impound, being semi-wild. At present in the advanced stage of growth in these plantations, they cannot do much harm though they would doubtless cause much damage in a young plantation.

(*c*) *Game.*—There are a large number of spotted deer and sambhur in the plantations. They do no damage to the older teak trees and only a little, by trampling, to the young plants. They are, however, very fond of the young mahogany shoots and always seem to choose a mahogany tree to rub their horns against wherever they can find one. As all the mahoganies have to be fenced to prevent these depredations, it adds considerable expense to the planting. Pigs are found in considerable numbers and grub up the arrow-root all over the plantations and also the tubers of the Ceara rubber, but do little material damage. Monkeys are very numerous and many of the larger trees are forked owing to a monkey having bitten off the terminal shoot whilst soft but it is especially in the young plantations where they do a great deal of mischief and measures ought to be taken against them either by shooting or trapping. Shooting is preferable as they would soon be scared away by a few shots.

(*d*) *Creepers and parasites.*—Creepers do considerable damage where weeding is not regularly attended to and especially up to 5 years of age.

In 1866 a destructive parasite (said by Dr. Cleghorn to be a species of *Loranthus*) was first noticed. Considerable sums have been spent in clearing it and it is now under control, though the clearing has to be done annually or at least every other year. The plantations are at present fairly free of it, but it is apparent especially in Chatamborai and Arevacode.

(*e*) *Insects*—(1) *Locusts.*—A species of locust with wings and head of greenish colour and yellow spots, and abdomen with segments of red and black rings, is found in considerable numbers. In places, especially where the growth is thin and stunted, the leaves are stripped by them, but they disappear and re-appear at intervals. On the whole not much damage is done by them.

(2) *Caterpillar.*—A black hairy caterpillar which appears in the early rains is a great scourge as it strips the leaves of whole blocks in some years. In addition its hairs are very irritating and thus it prevents the regular inspections of the plantations. In the months of July and August it appears to let itself down from the trees by a long thread to form its chrysalis in the dead vegetation under the trees. No means have been taken to eradicate them at present, but in our compact blocks, much might be done by raking up the leaves under the specially affected

parts and burning them. If the habits of the imago were better known, something might be done to destroy it by 'sugaring' with a poisoned sugar. As I have not seen specimens, I cannot identify it though, in all probability, it is a tortrix similar to that described in the *Indian Forester* for February 1892. Mr. Hadfield has made a very practicable suggestion to destroy these caterpillars. It appears that most of them descend at the same time and lie about on the ground in large quantities and Mr. Hadfield considers that if he drove his elephants up and down and across the lines of teak, he would destroy nearly the whole of them in a few days, as their attack is confined to one or two blocks. The elephants are not in work at this season and the experiment might well be tried.

(3) *Teak borer.*—This is a caterpillar, probably from its appearance a 'Cossus' and possibly the 'Cossus cœdamba' of Travancore. It attacks saplings of one to three years old, entirely destroying the sapling attacked, which has to be cut back. It enters the soft wood and works down the sapwood. Fortunately it has so far only attacked a few trees and these, backward ones, so it is not of great importance at present. Specimens were sent to Mr. Cotes for indentification, but no reply has been received.

(4) *Mahogany borer.*—This is a well-known caterpillar which forms into a small grey moth which unfortunately is very common. It feeds on various other plants and especially on the brinjal. It has attacked almost every plant of mahogany whether of the large or small leaved variety and has hitherto rendered the introduction of these trees unsuccessful. At present no practicable means have been devised for killing off the moth wholesale.

In addition to the above, wind, flood and lightning must be regarded as causes of injury.

(*a*) *Wind.*—Four large storms doing great damage have occurred: (1) in August 1878, which did especial damage in the 1873 and 1874 plantations of Amrampolliem, and also in the old plantation of that block, but did not much affect the plantations in Nilambúr; (2) in November 1881, which chiefly affected the older plantation of Eddacode; (3) in May 1879 which did most damage to Aravillykava 1844; (4) in August 1884 which also did greatest damage in the Nilambúr plantations. In addition many trees are annually broken off by wind.

(*b*) *Floods.*—Two big floods have occurred in 1865 and 1881. The former especially caused considerable loss, as it swamped two of the plantations, 1864 and 1865 Valuvasheri, soon after the plants were put out.

(*c*) *Lightning.*—Trees are struck here and there throughout the plantations. Not only are the trees struck killed, but those in the immediate vicinity are nearly always affected and thus considerable gaps are made in the plantation.

6. *Chief towns and villages.*—The only town affected by these reserves is Calicut which is 47 miles distant. All the wood is floated to that place whether bought in the plantations or sent to the depôt departmentally. The villages which are useful for supplying labour are Nilambúr (about 1,000 inhabitants), Wandur (1,000), Kappil (1,000) and Amrampolliem (1,000).

Statement of existing rights and privileges.—The only rights admitted by settlement are the two small temples—one in Ramalur and one in Amrampolliem with accompanying rights of way; secondly, rights to all the fields as shown in the accompanying map with the necessary rights of way; thirdly, rights of way to water cattle and bathe in certain parts of the river. As all the plantations have not as yet been declared 'Reserved Forests,' no detailed list is appended, but the appendix of the history shows the rights of the Jenmies in detail.

7. *Demands for produce.*—The teak plantations yield marketable products of three kinds (1) the timber which will be furnished by the final crop and also during the later thinnings. For this, there is a large demand, and there is no doubt that all this first-class timber will sell at a very large rate. The superiority of Malábar teak is so well known that it is probable much of this timber will go into the Bombay, and even into the European markets. At present, however, there is no doubt that the best prices will be given by the Arabs who require it for their ship-building in lengths as long as possible, so that the plantation

teak is specially suited to their requirements. At present really good Malabar teak is selling at Rs. 3–8–0 to Rs. 4 per cubit foot in Calicut, whilst Burmah teak in Bombay only realizes Rs. 2 or a little more. At present the Arabs obtain their supplies from Cochin and Travancore, but the teak they obtain is inferior and there is no doubt that, when the plantation becomes exploitable, the whole of this demand will fall on them. There is nothing to show that there is any limit to the demand for teak of this size and quality, and it is unlikely that the price of this teak as it stands will ever become less than Rs. 2–8–0 to Rs. 3 per cubic foot.

(2) *Teak saplings.*—They are divided into seven classes (1) measurables, (2) superior, small, then first, second, third, fourth and fifth classes. The first two classes are bought by Parsee merchants and Cutch traders. The timber of this class is usually exported to Bhowanagger, where it is used as beams for house building by the more well-to-do people. The price realized for this timber is decided good, averaging Rs. 2 per foot, but it seems doubtful whether there is a very large demand for such timber. The other classes of saplings are bought by the same traders and exported to different parts of Bombay especially Bhowanagger, where there is a constant demand for about 40,000 saplings per annum, which occasionally rises to 60,000, but beyond this there is little or no demand at present. They are cut up and used for the rafters of native houses. The average prices realized for these classes during the last five years are :—

	RS.	A.	P.	
Measurables	5	11	0	per sapling.
Superior, small ...	3	4	0	
First class	2	5	0	
Second class	1	5	0	
Third class	0	12	0	
Fourth class	0	7	0	
Fifth class	0	3	0	

The following table shows the number of saplings sold during the last ten years under the old and revised working plan :—

Year.	Number.	Revenue.
		RS. A. P.
1885-86	53,562	59,766 8 10
1886-87	...	1,935 6 2
1887-88	49,079	32,441 12 4
1888-89	39,739	29,693 1 7
1889-90	39,560	26,165 9 10
1890-91	50,235	30,072 11 2
1891-92	31,258	24,596 5 2
1892-93	17,845	15,079 11 8
1893-94	22,952	32,044 12 10
1894-95	3,071	27,895 3 3

	RS.	
This includes—In 1893–94, 111 logs (1,124 cubic feet) realizing	2,072	sold
In 1894–95, 349 logs (7,076 cubic feet) realizing	12,537	locally,
Total ...	14,609	

showing that there is a good demand for the larger timber taken out in thinnings.

The present market demands special attention to two points :—

(i) That all big timber should be as long as possible, length being the special quality (with good breadth) required by the Arabs.

(ii) That all timber must be cut and exported green and not seasoned or girdled, the reason of this being probably that salt water seasoning is preferable, and girdling destroys the essential oil for which Malabar timber is so celebrated. There is at present no demand for branch wood, so this cannot be taken into consideration in this plan.

(3) *Bamboos.*—Considerable quantities of bamboos are used yearly to float the saplings. At present only the indigenous bamboos are used and these sell at an average of Rs. 10 per hundred in Kallai. These will be replaced by the introduced bamboos from Burmah, when they become fit for cutting, and their large size

should render them very valuable. At present, however, it cannot be stated what price they will realize.

Lines of export.—A main road runs close to the plantations into Calicut, but is not used for carting timber which can be transported by water so much more easily. Each block planted is served by one or more small rivers down which floating is possible from July to October and in some instances later. Floating in the main river below Mombat is easy at all times of the year. There are at present 25 young elephants attached to the district. The great majority of those have been caught locally and are being trained and are now doing all the work required of them in dragging the saplings to the river and some are capable of moving larger logs in the Natural Forest. These will be invaluable when it comes to dragging the large timber in the final exploitations.

The plantations recently put down have been carefully intersected with narrow roads which are very valuable for inspection and will serve as drag roads later. In any future planting, this should be attended to as want of them in places is much felt. In the older compartments this has, to a certain extent, been improved by keeping open the compartment boundary lines as fire lines.

Depôts.—The only regular depôt is at Kallai, a mile from Calicut, but temporary depôts are made in the forest itself and some of the wood is sold straight from the forest depôt. Sales from the plantation are good and should be encouraged as much as possible and it may be found practicable later to abolish the Kallai depôt, though this cannot be done now.

Rest-houses.—The forest bungalow is on a small hill practically in the centre of the large block of plantations and commands a view of the whole of the blocks of Nilambúr, Chatamborai, Valuvasheri and Pannengode. There is a Kalserambi in the Pannengode block at the trijunction of the Chatamborai, Valuvashery and Pannengode blocks. Another is required in the 1894 plantation which is five and-a-half miles from the head-quarters, and this, I understand, has been already budgeted. There are also Kalserambies at Amrampolliem and Nellikutta and, beyond this, no more are necessary for the plantations.

CHAPTER III.

BLOCKS AND COMPARTMENTS.

The working circle is divided by natural features into the following blocks :—

(I) Nilambúr, subdivided locally into—
- (*a*) Eddacode.
- (*b*) Elanjery.
- (*c*) Ramalur and Moolathamanoor.
- (*d*) Arevacode.
- (*e*) Aravilly kava.

(II) Pannengode.
(III) Valuvashery.
(IV) Pokote.
(V) Chatamborai.
(VI) Nellikutta.
(VII) Amrampolliem.
(VIII) Ambracuttamala.
(IX) Ambalakundi.
(X) Mangalashery (Calicut).
(XI) Do. (Ernad).
(XII) Puthulatboo. Chitarikal.

The first five are situated near Nilambúr, the others at some distance in detached blocks, the last five being very small and not belonging to the plantations proper. The blocks are divided into compartments and sub-compartments according to the year of planting. A map has been prepared on an 8-inch scale

showing all the blocks and compartments and the natural features in the working circle except the five small outlying blocks.

The following table shows the areas of the blocks with the areas of the compartments in the block:—

I. *Nilambúr Block*— 5,200·56 acres. Planted 1,937·56 acres.

(a) *Eddacode*—

			Area planted.
Compartment	(1)	1844	28·25
	(2)	1845	28·14
	(3)	1846	44·78
	(4)	1847	54·61
	(5)	1848	82·15
	(6)	1849	44·58
	(7)	1850	49·67
	(8)	1851	147·19
	(9)	1857	36·14
	(10)	1860	39·56
	(11)	1861	86·05
	(12)	1862	50·11
	(13)	1891	120·25
	(14)	1892	160·50
	(15)	1893	124·25
	(16)	1894	142·50
		Total ...	1,238·73

(b) *Elanjery*—

Compartment	(1)	1845	33·19
	(2)	1846	65·84
	(3)	1849	89·95
	(4)	1850	66·15
	(5)	1858	42·79
	(6)	1859	39·84
		Total ...	337·76

(c) *Ramalur and Moolathamanoo*—

Compartment	(1)	1844	4·93
	(2)	1847	34·63
	(3)	1848	20·00
	(4)	1850	16·40
	(5)	1853	20·89
		C and D	19·03 *
		Total ...	115·88

(d) *Aravillykava and Arevacode*—

Compartment	(1)	1842	30·93 (irregular with mahogany and rubbers, &c.)
	(2)	1844	27·35
	(3)	1852	38·57
	(4)	1853	34·71
	(5)	1847	29·29
	(6)	1848	84·34
		Total ...	245·19

* Irregular plantations natural teak (1844), stunted mahogany (1872), planted teak in gaps (1881).

II. *Pannengode Block*— 905·16 acres. Planted 573·23 acres.

Compartment	(1)	1854	92·33
	(2)	1855	100·32
	(3)	1856	79·26
	(4)	1863	81·25
	(5)	1864	40·57
	(6)	1886	107·00
	(7)	1887	72·50
		Total ...	573·23

III. *Valuvashery Block*— 932·20 acres. Planted 709·00 acres.

Compartment	(1)	1864	81·14
	(2)	1865	56·63
	(3)	1866 (*a*)	32·30
		1866 (*b*)	96·34
	(4)	1867 (*a*)	41·31
		1867 (*b*)	77·32
	(5)	1868 (*a*)	33·94
		1868 (*b*)	79·08
		1868 (*c*)	32·38
	(6)	1869 (*a*)	39·36
		1869 (*b*)	14·20
	(7)	1888	125·00
		Total ...	709·00

IV. *Pokote Block*— 761·25 acres. Planted 235·50 acres.

Compartment	(1)	1889	145·25
	(2)	1890	90·25
		Total ...	235·50

V. *Chatamborai*— 699·52 acres. Planted 483·60 acres.

Compartment	(1)	1872	207·56
	(2)	1873	99·08
	(3)	1874	91·46
	(4)	1875	85·50
		Total ...	483·60

VI. *Nellikutta Block*— 1,824·13 acres. Planted 142·48 acres.

Compartment	(1)	1870	74·23
	(2)	1871	68·25
		Total ...	142·48

VII. *Amrampolliem Block*— 495·23 acres. Planted 417·75 acres.

Compartment	(1)	1861–68	87·44 (irregular, purchased).
	(2)	1873	49·00
	(3)	1874	69·03
	(4)	1875	54·00
	(5)	1876 (in 3 blocks) ...	158 28
		Total ...	417·75

VIII. *Miscellaneous outlying Blocks*— 361·43 acres. Planted 61·68 acres.

About 30 years old	61·68

CHAPTER IV.

DETAILED DESCRIPTION OF COMPARTMENTS.

[NOTE.—The arrangement is according to the order of working in thinnings.]

Chatamborai Block V—

Compartment (1) 1872. Area 207·56 acres. A good plantation and very good near the river.

Classified—	ACRES.
First class	72·16
Second class	113·15
Third class	4·50
Swamp third class	17·75
Number of trees	39,300
Average per acre—	
First class	212
Second class	180
Third class	100

Sample acre, second class, contains 295 trees classed as follows :—

	M.	s's.	First.	Second.	Third.	Fourth.
60 final crop	11	30	52	60	55	27

First-class average girth at breast = 28″·77, average c.c. = 10′·33 (deduced).
Second-class average girth at breast = 26″·51, average c.c. = 8′·46, average bole = 41 (measured).

Compartment (2) 1873. Area 99·08 acres. A fair plantation.

Classified—	ACRES.
First class	22·83
Second class	60·00
Third class	13·50
Swamp, third class	2·75
Number of trees	28,936
Average per acre—	
First and second class	330
Third class	100

Sample acre, second class, contains 298 trees classed as follows :—

	M.	s's.	First.	Second.	Third.	Fourth.	Fifth.
73 final crop	4	15	34	56	53	36	27

First-class average girth at breast = 28″·02, average c.c. = 10′·0 (deduced).
Second-class average girth at breast = 25″·21, average c.c. = 7′·65, average bole = 38 (measured).

Compartment (3) 1874. Area 91·46 acres. A poor plantation. On one hil the teak has completely died out.

Classified—	ACRES.
First class	12·50
Second class	29·50
Third class	40·71
Swamp *nil*	1·75
Natural forest *nil*	7·00
Number of trees	30,458
Average per acre—	
First and Second class	460
Third class	250

First-class average girth at breast = 27″·12, average c.c. = 9′·46 (deduced).
Second-class average girth at breast = 25″·15, average c.c. = 7′·98 (deduced

Compartment (4) 1875. Area 85·50. A fair plantation.

Classified—	ACRES.
First class	13·25
Second class	33·00
Third class	35·75
Swamp (bamboos)	3·50
Number of trees	35,972
Average per acre—	
First and second class	500
Third class	360

Sample acre, first class, contains 445 trees classed—

	M.	s s.	First.	Second.	Third.	Fourth.	Fifth.
60 final crop	6	21	33	90	96	92	47

First-class average girth at breast = 26″·22, average c.c. = 9′·44, bole = 45 (measured).
Second-class average girth at breast = 25″·22, average c.c. = 7′·40 (deduced).

The block is well furnished with natural and introduced bamboo.

There are 103·75 acres of natural forest of which about half is fit for planting.

The growth is very uneven, in parts good, in others bad. This may be due especially in 1874 and 1875 to a bad start owing to failures and subsequent fire.

Pokote Block IV—

Compartment (1) 1889. Area 145·25 acres. A good plantation though too young to say what the final crop will be.

Classified—	ACRES.
First class	72·25
Second class	63·75
Third class	2·50
Old nursery planted with mahogany of poor growth	3·00
Swamp *nil*	3·75

Compartment (2) 1890. Area 90·25 acres. Similar to compartment (1).

Classified—	ACRES.
First class	64·05
Second class	23·95
Third class	1·00
Old nursery third class	1·25

Most of the remainder of the block is rocky and not good for planting, being rather far off the river. There are bamboos along the river bank.

Nilambúr Block I.—Aravillykava and Arevacode.—

Compartment (1) 1842 (Aravillykava). Area 30·93 acres. A very irregular plantation, the greater part consisting of large trees of teak with an undergrowth of young teak planted in 1881 with mahoganies and rubber. The young teak which has far outstripped the mahogany was planted as a nurse to the latter.

Classified—	ACRES.
Pure teak, second class	8·18
Exotic, containing 652 big trees of teak ...	22·75
Number of trees (big)	1,176
Average per acre—	
Second class	65
Mixed forest per acre	29

Vide compartment (4) 1853.

Compartment (2) 1844. Area 27·35 acres. A very good plantation. A small portion has an undergrowth of mahogany which has not succeeded.

Classified—	ACRES.
First class	11·25
Second class	8·25
Second class with mahogani	5·50
Third class containing few big trees ...	2·35
Number of trees	1,435
Average per acre—	
First class	68
Second class	48

Sample acre, first class, contains 60 measured trees and 8 measurables (large).
First-class average girth at breast = 53″·64, average c.c. = 40′·68, average bole = 68 (measured).
Second-class average girth at breast = 43″·28, average c.c. = 27′·59 (deduced).

Compartment (3) 1852. Area 38·57 acres. A regular but rather under average bit of plantation.

Classified—	ACRES.
First class	2·50
Second class	35·50
Mahogany	0·57
Number of trees	4,025
Average per acre—	
First and second class	106

First-class average girth at breast = 47″·05, average c.c. = 36′·56 (deduced).
Second-class average girth at breast = 39″·53, average c.c. = 21′·49 (deduced).

Compartment (4) 1853. Area 34·71 acres. An irregular plantation.

Half the area is of pure teak planted in 1853 and the other half of teak mixed with an undergrowth of teak, mahogany and rubber.

Classified—	ACRES.
Second class	17·00
Mixed forest containing 1,036 trees ...	17·71
Number of trees	3,2·10
Average per acre—	
Second class	128
Mixed forest	58

Second-class average girth at breast = 39″·07, average c.c. = 20′·50(deduced).

This compartment with No. 1 requires a special treatment, and if it is intended to treat them as experimental plantations, they must be excluded from the working circle. Owing, however, to the failure of the rubber plants and mahogany, it would be better to class the two compartments as one as far as the pure growth of teak extends and cut clean, the other portion amounting to 40 acres and replant it with teak. This question is discussed elsewhere.

Compartment (5) 1847 (*Arevacode*). Area 29·29 acres. An excellent plantation.

Classified—	ACRES.
First class	23·29
Second class	6·00
Number of trees	2,567
Average per acre—	
First and second class	87

Sample acre, first class, gave 60 for final crop and 112 measurables.
First-class average girth at breast = 49″·85, average c.c. = 41′·83, average bole = 65′ (measured).
Second-class average girth at breast = 41″·87, average c.c. = 32′·11 (deduced).

Compartment (6) 1848. Area 84·34 acres. A good plantation.

Classified—	ACRES.
First class	21·50
Second class	62·84
Number of trees	7,518
Average per acre—	
First and second class	89

First-class average girth at breast = 49″·29, average c.c. = 41′·00
Second-class average girth at breast = 41″·41, average c.c. = 31′·50 } deduced.
The soil in this block is for the most part excellent, and the growth in parts is splendid. The irregularity in the plantations is due to bad planting in the early years.

Pannengode Block II—

Compartment (1) 1854. Area 92·33 acres. An excellent plantation.

Classified—	ACRES.
First class	87·33
Second class	1·50
Swamp with bamboos	3·50
Number of trees	9,233
Average per acre—	
First class	104

Sample acre (first class) contains 108 trees, 60 being measured.
Average girth at breast = 47″·21, average c.c. = 33′·8, average bole = 60′.
For second class the deduced average girth = 38″ 58, average c.c. = 23′·5.

Compartment (2) 1855. Area 100·32 acres. A poor plantation. On two hills the teak has been entirely replaced by a natural growth of irul (*Xylia dolabriformis*).

Classified—	ACRES.
First class	49·32
Second class	22·50
Swamp *nil*	1 50
Natural forest *nil*	27·00
Number of trees	10,054
Average per acre—	
First class	110
Second class	205

First-class average girth at breast = 46″·48, average c.c. = 28′·42
Second-class average girth at breast = 38″·12, average = 22′·78 } deduced.

Compartment (3) 1856. Area 79·26 acres. On the whole good. On one hill teak replaced by irul and the surrounding plantation poor.

Classified—	ACRES.
First class	61·16
Second class	11·00
Third class	2·80
Swamp with bamboos	1·00
Natural forest *nil*	3·30
Number of trees	8,352
Average per acre—	
First class	108
Second class	142
Third class	50

First-class average girth at breast = 45″·75, average c.c. = 27′·29
Second-class average girth at breast = 37″·66, average c.c. = 22′·34 } deduced.

Compartment (4) 1863. Area 81·25 acres. A fair plantation, rather poor on south and east, but good on river side.

	ACRES.
Classified—	
First class	54·50
Second class	25·50
Swamp with bamboos	1·25
Number of trees	9,865
Average per acre—	
First class	110
Second class	150

Sample acre, first class, contains 134 trees classed—
60 final crop, 59 measurables, 11 sup. small, 4 first class.
First-class average girth at breast = 36″·38, average c.c. = 21′·1, average bole = 52′ (measured).
Second-class average girth at breast = 30″·39, average c.c. = 14′·10 (deduced and verified by measurement).

Compartment (5) 1864. Area 4,057 acres. A fair plantation growth very good on alluvial and fair on laterite hill.

	ACRES.
Classified—	
First class	23·00
Second class	16·82
Swamp *nil*	0·75
Number of trees	5,114
Average per acre—	
First class	112
Second class	150

First-class average girth at breast = 35″·50, average c.c. = 18′·98 (deduced and verified).
Second-class average girth at breast = 29″·42, average c.c. =13′·50 (deduced and verified).

Compartment (6) 1886. Area 107·00 acres. A good plantation. Growth, rather poor on south side, but good to splendid in northern half.

	ACRES.
Classified—	
First class	81·25
Second class	15·25
Third class	7·00
Kalserambi and garden	1·75
Swamp *nil*	1·75

Sample acre (alluvial) contains 60 marked poles and 760 marketable saplings. Average height (extreme), = 50′. Average girth at breast = 15″·33.

Compartment (7) 1887. Area 72·50 acres. A good plantation. A band of pure mahogany has not succeeded, the trees being branched and stunted owing to a borer.

	ACRES.
Classified—	
First class	56·75
Second class	3·0
Third class	7·50
Mahogany	5·25

Growth generally similar to compartment (6).
The sappan wood planted in 1870–71 has been cut down and sold for a few rupees and the site planted with teak.

The block has a fringe of introduced bamboo (*Cephalostachyum Pergracilis*) on the water edge and also along the road to the Kalserambi where there are a few broad-leaved mahogany of poor growth.
There are 274 acres of natural forest of which about 100 are fit for planting.

Nellikutta Block VI—

Compartment (1) 1870. Area 74·23 acres. A good plantation.

	ACRES.
Classified—	
First class	9·73
Second class	58·00
Third class	3·25
Swamp	3·25
Number of trees per acre—	
First and second class	160

First-class average girth at breast = 40″·89, average c.c. = 21′·00
Second-class average girth at breast = 34″·46, average c.c. = 14′·50 } deduced.

Compartment (2) 1871. Area 68·25 acres. A very good plantation.

	ACRES.
Classified—	
First class	30·25
Second class	32·75
Third class	2·00
Swamp	1·00
Village site	2·25
Number of trees per acre—	
First and second class	159

Sample acre (first class) gave 159 trees classed as follows :—

	M.	S.S.	First.	Second.	Third.	Fourth.
60 final crop	51	25	14	6	2	1

First-class average girth at breast = 40″·04, average c.c. = 20′·21, average bole = 54′ (measured).
Second-class average girth at breast = 34″·00, average c.c. = 14′·0 (deduced).

The growth in this block is superior to that in the Nilambúr blocks, but in the 1870 plantation there is very little first class. There is a large area available for planting.

Amrampolliem Block VII—

Compartment (1) 1861–68. Area 87·44 acres. An irregular uneven plantation. The southern portion good, but bad on the hill to west of temple.

	ACRES.
Classified—	
First class	53·69
Second class	15·75
Third class	17·50
Temple	0·50
Number of trees	9,614
Average per acre—	
First class	114
Second class	140
Third class	68

Sample ½ acre (first class) gave 57 trees classed as follows :—
30 for final crop, 10 measurables, 9 sup. small, 8 first class.
Sample ½ acre (second class) gave 70 trees classed as follows :—

	M.	S.S.	First.	Second.	Third.	Fourth.
37 for final crop	5	8	6	11	2	1

First class average girth at breast = 33″·74, average c.c. = 15′·18, average bole = 52′ measured.
Second-class average girth at breast = 26″·31, average c.c. = 7′·31, average bole = 37′ measured.
This compartment was purchased already planted, 62 acres were planted about 1861 and the remainder subsequently.

Compartment (2) 1873. Area 49·00 acres. A fair plantation. There are some jack trees and areca palm growing on the site of the old Kalserambi.

	ACRES.
Classified—	
First class	36·50
Second class	2·75
Third class	8·75
Kalserambi site	1·0
Number of trees	9,535
Average per acre—	
First and second class	220
Third class	100

First-class average girth at breast = 26″·36, average c.c. = 8′·0
Second-class average girth at breast = 25″·21, average c.c. = 6′·50 } deduced.

Compartment (3) 1874. Area 69·03 acres. A good plantation though for the most part on a hilly laterite soil, but could bear a good deal of thinning.

			ACRES.
Classified—			
First class			59·28
Second class			5·25
Third class			4·50
Number of trees			23,997
Average per acre—			
First and second class			408
Third class			221
A { First class			26·45
A { Second class			13·25
A { Third class	54·75	15·05	
			10·03
B { First class			
B { Third class	16·28	6·25	
			26·25
C { First class			3·250
C { Second class			8·50
C { Third class			15·75
C { Natural forest *nil*			
C { Swamp *nil*	87·25	4·25	
			59,101

Sample ½ acre on first class gave 123 trees classed as follows :—

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.	Eighth.
30 final crop	2	8	6	24	31	13	6	3

First-class average girth at breast = 25″·61, average c.c. = 6′·93, average bole = 38′ (measured).
Second-class average girth at breast = 24″·80, average c.c. = 5′·50 (deduced).

Compartment (4) 1875. Area 54·00 acres. A fair plantation, but bad on eastern slopes, parts of which have reverted to natural forest.

	ACRES.
Classified—	
First class	43·50
Third class	3·75
Natural forest *nil*	6·75
Number of trees	17,636
Average per acre—	
First class	390
Third class	170

First-class average girth at breast = 25″·61, average c.c. = 7′·0 deduced.

Compartment (5) 1876. Area 158·28 acres. In three blocks. The growth in all the blocks is somewhat indifferent.

	ACRES.
Classified—	
First class	26·45
Second class	13·25
Third class	15·05
Number of trees	23,997
Average per acre—	
First and second class	408
Third class	221

Sample ½ acre on first class gave 123 trees classed as follows :—

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.	Eighth.
30 final crop	2	8	6	24	31	13	6	3

First-class average girth at breast = 25″·61, average c.c. = 6′·93, average bole = 38′ (measured).
Second-class average girth at breast = 24″·80, average c.c. = 5′·50 (deduced).

Sample acre (first class) gave 413 trees classed as follows :—

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.	
Final crop 63 ...	10	18	46	65	90	80	41	= 350.

Sample ½ acre (second class) gave 221 trees classed as follows :—

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.
Final crop 30	1.	11.	13.	17.	48.	49.	52.

First-class average girth at breast 4′·6″ = 25″·58, average c.c. = 7′·75, bole = 40′ (measured).
Second-class average girth at 4′·6″ = 24″·80, average c.c. = 5′·97, bole = 30′ (measured).
The latter sample is rather above the average of second class and the former inferior to first class.

Nearly all the alluvial soils require a severe thinning to improve the growth which is certainly inferior to that of Chatamborai which has plantations of a similar age. In many places the planting has failed entirely and in others nearly so. There is a great dearth of bamboos and the natural kind might, with advantage, be introduced along the river bank, the larger kind would not float so easily in the narrow river. A little over 50 acres remains unplanted.

Valuwashery Block III—

Compartment (1) 1864. Area 81·14 acres. A good plantation with splendid growth in parts.

	ACRES.
Classified—	
First class	48·49
Second class	29·65
Third class	1·75
Swamp *nil*	·85
Number of trees	9,237
Average per acre—	
First and second class	104
Third class	100

Sample acre gave 178 trees classed as follows :—

	M.	s.s.	First.	Second.	Third.	Fourth.	Eighth.
60 final crop	7	45	36	18	6	5	1

This sample though taken in the first class portion is not up to the average of first class being rather typical of second. It was taken in rather a poor portion to contrast with that of 1864 to test the results of fire, 1865 having been burnt when young.
First-class average girth at 4′·6″ = 33″·05, average c.c. = 15′·99 (deduced).
Second-class average girth at 4′·6″ = 29″·42, average c.c. = 11′·77, bole = 47′ measured).

Compartment (2) 1865. Area 56·63 acres. A fair plantation.

	ACRES.
Classified—	
First class	33·28
Second class	21·10
Third class	2·25
Number of trees	6,752
Average per acre—	
First and second class	120
Third class	100

Sample acre, second class, gave 149 trees classed as follows :—

	M.	s.s.	First.	Second.	Third.	Fourth.
60 final crop	11	25	24	20	8	1

First-class average girth at 4′·6″ = 32″·15, average c.c. = 14′·88.
Second-class average girth at 4′·6″ = 27″·92, average c.c. = 10′·00, bole = 43′ (measured).

Compartment (3) 1866. Area 128·64 acres. A fair plantation. In two blocks, the smaller of which is good.

Classified—	ACRES.
First class	65·39
Second class	60·00
Swamp with bamboos	3·25
Number of trees	18,519
Average per acre—	
First and second class	147

Sample acre, first class, gave 172 trees classed as follows:—

	M.	Second.	s.s.	
60 final crop	26	1	16	69 other saplings.

First-class average girth at 4′·6″=31″·28, average c.c.=13′·7, bole=51′ (measured).

Second-class average girth at 4′·6″=27″·92, average c.c.=10′·0 (deduced).

Compartment (4) 1867. Area 118·63 acres. In two blocks of good growth both blocks are on laterite hills and of very even growth throughout, which is decidedly good but not quite up to first class.

Classified—	ACRES.
First class	32·81
Second class	94·32
Swamp *nil*	1·50
Number of trees	24,582
Average per acre—	
First and second class	209

First-class average girth at 4′·6″=30″·41, average c.c.=13′·0 } deduced.
Second-class average girth at 4′·6″=29″·42, average c.c.=11′·77 }

Compartment (5) 1868. Area 145·30 acres. In three blocks of very different growth. In that lying at the north-west corner on the banks of the Chaliar, the growth is superb and equal, if not superior, to any in the plantations. In the other block on the bank of the river the growth is very indifferent and over a large portion has failed the plantation. In the block south of the Cheppa Padom, the growth is good and even, but on laterite soil.

Classified—	ACRES.
First class	37·69
Second class	69·21
Third class	16·25
Swamp *nil*	3·50
Natural forest *nil*	18·75
Number of trees	15,269
Average per acre—	
First class	140
Second class	250
Third class	164

Sample acre, second class, gave 258 trees classed as follows:—

	M.	s.s.	First.	Second.	Third.	Fourth.	Eighths
60 final crop ...	27	69	51	68	7	1	2

First-class average girth at 4′·6″=35″·73, average c.c.=18′·98 (deduced).

Second-class average girth at 4′·6″=28″·78, average c.c.=11′· 8, bole=45′ (measured).

Compartment (6) 1869. Area 53·56 acres. In two blocks both of good growth.

Classified—	ACRES.
First class	22·75
Second class	27·36
Third class	3·25
Number of trees	9,615
Average per acre—	
First and second class	180
Third class	164

First-class average girth at 4′·6″=29″·00, average c.c.=12′·75 }
Second-class average girth at 4′·6″=27″·92, average c.c.=11′·25 } deduced.

Compartment (7) 1888. Area 125·00 acres. A good compartment specially good on south side.

Classified—	ACRES.
First class	67·75
Second class	40·50
Third class	15·50
Swamp *nil*	1·25

will require thinning especially in the alluvial in two years' time.

The block is, on the whole, disappointing as regards growth. There are some splendid portions specially in 1864 and 1868, but much of the growth on alluvial is not as good as it should be. This may be due to fire which has passed over a large part of the block, but this has not been proved. The block is well supplied with bamboos, many of which are of the introduced species.

Nilambúr Block I—Elanjery—

Compartment (1) 1845. Area 33·19 acres. An excellent plantation, all of first class growth.

Classified—	ACRES.
First class	33·19
Number of trees	2,517
Average per acre	76

First-class average girth at breast=48″·82, average c.c.=38′·00 (deduced).

Compartment (2) 1846. Area 65·84 acres in two blocks—a part of the block near Ramalur (1850) is very similar in growth and should be treated with it (area 6·25 acres). The growth is throughout good and very good on the southern portion near *Karumpoya*.

Classified—	ACRES.
First class	24·00
Second class	37·09
Bamboos, forest and ravine	4·75
Number of trees	5,518
Average per acre—	
First and second class	90

Sample ½ acre, second class, gave 42 trees classed—

30 final crop, 10 measurables and 2 coppice.

First-class average girth at breast=48″·46, average c.c.=37′·12 (deduced).

Second-class average girth at breast=40″·21, average c.c.=26′·08, average bole=61′ (measurable).

Compartment (3) 1849. Area 89·95 acres. A good plantation but poor on terite hills, very good at western corner near the *Karumpoya*.

Classified—	ACRES.
First class	26·00
Second class	59·45
Third class	4·50
Number of trees	7,809
Average per acre—	
First and second class	90
Third class	26

First-class average girth at breast =47″·38, average c.c.=33′·11 } deduced.
Second-class average girth at breast=38″·80, average c.c.=24′·00 }

Compartment (4) 1850. Area 66·15 acres. A poor plantation. The plantation is completely gone out on three hills and the greater portion is of rather inferior second-class growth.

Classified—	ACRES.
First class	6·00
Second class	48·00
Third class	3·25
Natural forest *nil*	7·40
Swamp *nil*	1·50
Number of trees	5,434
Average per acre—	
First and second class	98
Third class	30

Sample ½ acre, second class, gave 51 trees classified—

	M.	Dead.	First.	Second.	Third.
30 final crop	4	12	2	2	1

First-class average girth at breast=47″·02, average c.c.=31′·90 (deduced).
Second-class average girth at breast=37″·08, average c.c.=18′·66, bole=53′ (measured).

Compartment (5) 1858. Area 42·79 acres. A good plantation, rather better the bank of the Karumpoya.

Classified—	ACRES.
First class	9·00
Second class	33·79
Number of trees	4,081
Average per acre—	
First and second class	97

Sample acre, second class, gave 113 trees classed—

	M.	S.S.
60 final crop	39	14.

First-class average girth at breast=41″·54, average c.c.=27′·53.
Second-class average girth at breast=36″·73, average c.c.=21′·15, bole=55′.

Compartment (6) 1859. Area 39·84 acres. A good plantation.

Classified—	ACRES.
First class	0·75
Second class	39·09
Number of trees	4,095
Average per acre—	
First and second class	105

First-class average girth at breast=40″·81, average c.c.=27′·00 } deduced.
Second-class average girth at breast=36″·37, average c.c. =20′·50 }

The whole block is planted and is of fair growth though rather behind all the her blocks of similar age on account of the hilly nature of the ground. It is well rnisLed with bamboos.

Nilambúr Block I, Moolathamcoo and Ramalur—

Compartment (1) 1844 *with C. and D.* Area 23·96 acres. A very irregular plantation. 4·93 acres are fairly regular and are classed as second class being planted, it is believed, in 1844. The other two parts consist of old coppice shoots with a few large trees here and there and with an underplanting of young teak put down in 1881. In one place the underplanting is of teak and mahogany put down in 1872, but the teak has outgrown the mahogany which is very stunted and will not give a good result. This compartment needs a special treatment, which will be dealt with later.

Classification—	ACRES.
Large teak, second class	4·93
Large teak with teak (small) underplanted.	16·50
Small teak and mahogany (planted)	2·53

There are 569 large teak trees over the whole area.

Compartment (2) 1847. Area 34·63 acres. An excellent plantation.

Classified—	ACRES.
First class	29·88
Second class	4·75
Number of trees	2,933
Average per acre—	
First and second class	85

Sample acre in the first-class portion, but where the growth is rather inferior,

	M.	ss.	First.	Dead.
gave 102 trees classed; 50 measured	35	13	1	3

First-class average girth at breast=48″·10, average c.c.=30′·61 } deduced.
Second-class average girth at breast=39″·74, average c.c.=22′·52 }
The actual measurements give average girth at breast=41″·76, average c.c. =25′·25, average bole=61.′

Compartment (3) 1848. Area 20·00 acres. An excellent plantation, but small and further reduced by 5·75 acres being unplanted.

Classified—	ACRES.
First class	11·75
Second class	2·50
Bamboo forest	5·75
Number of trees	1,475
Average per acre—	
First and second class	103

First-class average girth at breast = 47″·74, average c.c. =29′·72 }
Second-class average girth at breast=39″·27, average c.c. =22′·27 } deduced.

Compartment (4) 1850. Area 16·40 acres. A good plantation, but with a lot of coppice stumps which rather spoil the growth.

Classified—	ACRES.
First class	1·25
Second class	13·90
Natural forest (unplanted)	1·25
Number of trees	1,486
Average per acre—	
First and second class	98

First-class average girth at breast=47″·02, average c.c. = 29′·00 }
Second-class average girth at breast=38″·33, average c.c.=20′·76 } deduced.

Compartment (5) 1853. Area 20·89 acres. A good plantation all but o second-class growth.

	ACRES.
Classified—	
Second class	20·89
Number of trees	2,015
Average per acre—	
Second class	96

Average girth at breast =39″·07, average c.c. = 22′·00 (deduced).

The whole block is a good plantation, but the areas planted are small.

Nilambúr Block I, Eddacode—

Compartment (13) 1891. Area 120·25 acres. A good plantation on alluvia and gneiss soil. Too young to classify the growth at present.

	ACRES.
Classified—	
Planted with teak	99·75
Swamp planted	12·50
Nursery	1·00
Natural forest	7·00

Compartment (14) 1892. Area 160·50 acres. A good plantation too young to classify. Soil moderate.

	ACRES.
Classified—	
Planted with teak	132·75
Swamp planted	1·25
Natural forest	16·25
Pyya Nilam (demarcated field)	10·25

Miscellaneous Outlying Block VIII—

The date of planting is not known, but the blocks are of about 30 to 40 year old. The trees are badly grown. They will be treated as second class. As there ar five blocks altogether amounting to only 61·68 acres, no treatment is provided fo them, but they can be thinned out at the discretion of the Executive Officer, an esti mate of the total thinnings to be expected being added to the plan.

Nilambúr Block I, Eddacode—

Compartment (1) 1844. Area 28·25 acres. An excellent plantation. Al alluvial except one small piece.

	ACRES.
Classified—	
First class	27·50
Third class	·75
Number of trees	2,375
Average per acre	84

First-class average girth at breast=49″·58, average c.c. =39′·50 (deduced).

Compartment (2) 1845. Area 28·14 acres. A good plantation.

	ACRES.
Classified—	
First class	4·25
Second class	23·89
Number of trees	2,595
Average per acre—	
First class	84
Second class	93

First-class average girth at breast = 49″·02, average c.c.=39′·30 } deduced.
Second-class average girth at breast= 38″·83, average c.c.=23′·35 }

33

Compartment (3) 1846. Area 44·78 acres. An excellent plantation. Nearly all alluvial.

	ACRES.
Classified—	
First class	40·53
Second class	2·00
Third class	2·25
Number of trees	3,582
Average per acre—	
First and second class	81
Third class	60

Sample acre, first class, gave 90 trees, 60 for final crop and 30 measurables.

First-class average girth at breast =48″·46, average c.c. = 39′·21, bole= 66′ (measured).

Second-class average girth at breast=38′·48, average c.c. = 19′·53 (deduced).

Compartment (4) 1847. Area 54·61 acres. A fair plantation, hard laterite in parts.

	ACRES.
Classified—	
First class	7·25
Second class	39·86
Third class	2·50
Natural forest	5·00
Number of trees	4,778
Average per acre—	
First class	88
Second class	100
Third class	60

First-class average girth at breast = 47″·90, average c.c. = 37′·12 } deduced.
Second-class average girth at breast = 38″.13, average c.c. = 19′·53 }

Compartment (5) 1848. Area 82·15 acres. An excellent plantation.

	ACRES.
Classified—	
First class	65·40
Second class	15·50
Third class	1·25
Number of trees	7,840
Average per acre—	
First class	90
Second class	121
Third class	60

First-class average girth at breast = 47″·34, average c.c. = 34′·00 } deduced.
Second-class average girth at breast = 37″·78, average c.c. = 18′·25 }

Compartment (6) 1849. Area 44·58 acres. A good plantation with laterite hills.

	ACRES.
Classified—	
First class	23·58
Second class	21·00
Number of trees	3,994
Average per acre—	
First and second class	89

First-class average girth at breast = 46″·78, average c.c. = 33′·11 } deduced.
Second-class average girth at breast = 37″·43, average c.c. = 18′·25 }

Compartment (7) 1850. Area 49·67 acres. An indifferent plantation with high laterite hills.

Classified—	ACRES.
First class	3·00
Second class	37·17
Third class	1·75
Tope with huts *nil*	7·75
Number of trees	4,766
Average per acre—	
First class	95
Second class	117
Third class	60

Sample acre on second class contained 111 trees as follows:—

	M.	S.S.	First.	Second.	Third.
60 Final crop	13.	17.	6.	6.	2.

First-class average girth at breast = 46″·22, average c.c. = 33′·00 (deduced).
Second-class average girth at breast = 34″·03, average c.c. = 14′·86, bole = 49′ (measured).

Compartment (8) 1851. Area 147·19 acres. An indifferent plantation.

Classified—	ACRES.
First class	10·69
Second class	122·50
Third class	11·50
Tope with huts *nil*	2·50
Number of trees	11,674
Average per acre—	
First and second class	82
Third class	60

First-class average girth at breast = 45″·66, average c.c. = 31′·19.
Third-class average girth at breast = 33″·68, average c.c. = 14′·86.

Compartment (9) 1857. Area 36·14 acres. A good plantation of even second class.

Classified—	ACRES.
Second class	36·14
Number of trees	4,148
Average per acre	115

Second-class average girth at breast = 31″·58, average c.c. = 13′·29 (deduced).

Compartment (10) 1860. Area 39·56 acres. An indifferent laterite plantation.

Classified—	ACRES.
Second class	26·00
Third class	13·56
Number of trees	4,610
Average per acre—	
Second class	125
Third class	100

Second-class average girth at breast = 29″·89, average c.c. = 11′·81 (deduced).

34

Compartment (11) 1861. Area 86·05 acres. An indifferent plantation, laterite soil.

Classified—	ACRES.
Second class	57·25
Third class	25·05
Natural forest	3·75
Number of trees	9,157
Average per acre—	
Second class	146
Third class	96

Sample acre, second class, gave 1476 trees classified—

	M.	ss.	First.	Second.	Third.
60 final crop	7.	39.	22.	17.	1.

Second-class average girth at breast = 29″·49, average c.c. = 11′·81, bole = 46′ (measured).

Compartment (12) 1862. Area 50·11 acres. A fair plantation, fairly good on eastern corner.

Classified—	ACRES.
Second class	38·61
Third class	7·25
Natural forest	2·00
Swamp *nil*	2·25
Number of trees	5,133
Average per acre—	
Second class	114
Third class	100

Second-class average girth at breast = 29″·09, average c.c. = 11′·81 (deduced).

Compartments (15) *and* (16) 1893 and 1894. Areas 124·25 and 142·50 acres). Quite young plantations not old enough for classification. Growth good and in parts excellent.

Classified—	ACRES.
In compartment (15)—	
Planted teak	111·75
Mahogany old nursery	2·00
Natural forest	3·00
Unplanted swamp	7·50
In compartment (16)—	
Planted teak	122·25
Mahogany	0·75
Planted swamp	19·50

Abstract of Areas.

Name of block.	Total area.	First class.	Second class.	Third class.	Swamp. Natural forest and vacant areas *nil.*	Irregular plantations.
	ACRES.	ACRES.	ACRES.	ACRES.	ACRES.	ACRES.
Chatamborai	483·60	120·74	235·65	114·96	12·25	...
Pokote	235·50	136·30	87·70	4·75	6·75	...
Aravillykava and Arevacode ...	245·19	58·54	143·27	2·35	0·57	40·46
Pannengode	573·23	413·31	95·57	17·30	47·05	...
Nellikutta	142·48	39·98	90·75	5·25	6·50	...
Amrampolliem	417·75	255·70	69·50	64·30	28·25	...
Valuvashery	769·00	298·56	342·34	39·00	29·10	...
Elanjery	337·76	98·94	217·42	7·75	13·65	...
Moolathamanoo and Ramalur ...	115·88	42·88	46·97	...	7·00	19·03
Eddacode	1,238·73	648·70	453·17	65·86	71·00	...
Outlying blocks	61·68	...	61·68	...	...	...
Total ...	4,560·80	2,113·65	1,844·02	321·52	222·12	59·49

CHAPTER V.

GENERAL PROPOSALS FOR WORKING.

1. *Past management.*—From 1844 up to 1875 there was an annual planting of 100 acres more or less. In 1876 planting was stopped owing to the unfavourable report of the Conservator (Colonel Beddome). No new planting was commenced until 1886 when the Conservator (Colonel Campbell Walker) proposed to plant up 1,000 acres in 10 years to be treated as coppice on a rotation of 10 years with a view to supplying the market with saplings for which the demand seemed to be increasing. These plantations begun in 1886 were concluded in 1894. These are known as the new plantations and as they are not yet of age for felling no treatment has been applied.

As far as can be gathered from the record no treatment was applied to the old plantations till 1863 except that a few dominated and scarcely saleable saplings were extracted. In 1863 Mr. Ferguson began to thin much more heavily, but apparently tried to raise his big trees in groups, a treatment which can well be applied to the spruce, but which is hardly suitable to a tree like the teak, which has naturally a large branching crown and demands a great deal of light. For some years Mr. Ferguson appears to have overstocked the market with his saplings and this in spite of some of the saplings being destroyed by fire. The thinnings under taken by him, however, have had a most salutary effect on the plantations. At the end of 1885 the Conservator (Colonel Campbell Walker) observed the necessity of dealing with these thinnings systematically and with the help of Messrs. Hadfield and Porter a scheme was drawn out for a five years' working. A table was prepared showing the number of trees that should remain at the end of each five years up to 61 years. From each of the blocks one or more compartments was thinned in each year, the whole area being thinned in five years. With the necessary modifications this plan was adhered to.

The results of the thinnings are as follows :—

Year.	Logs.	M.	SS.	First.	Second.	Third.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth
1886-87 ...	...	...	...	...	...	...	...	...	...	...	...
1887-88 ...	...	...	2,709	3,714	5,707	8,859	15,889	10,143	898	629	531
1888-89 ...	...	3,362	2,602	3,709	4,606	12,606	4,481	6,527	912	298	626
1889-90 ...	...	4,792	2,488	3,800	5,885	8,631	3,391	8,927	242	499	905
1890-91 ...	...	3,529	2,409	6,171	10,863	8,650	6,798	9,818	742	864	391

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The chief defects of this scheme were—

(1) That a proper enumeration of trees had not been made.
(2) That the thinnings were too much scattered.
(3) That the differences in soil were not taken into account.
(4) That the early thinnings were insufficient and if the thinnings were increased at this stage, too much light would have been let in.
(5) That the Executive officer was too much tied down by the plan and could not thin sufficiently in some places where thinning was required.

The revised working scheme only rectified the first of these defects and that not altogether, and was applied from 1891 to 1894 with the following results :—

Year.	Logs.	M.	SS.	First.	Second.	Third.	Fourth.	Fifth.	Sixth.	Seventh.	Eighth.
1891-92 ...	...	395	534	2,470	6,045	7,966	7,019	4,824	896	791	268
1892-93 ...	...	512	545	419	1,147	2,657	3,684	8,358	...	302	221
1893-94 ...	111	1,861	1,443	1,726	3,316	5,694	5,579	2,739	...	693	401
1894-95 ...	340	1,806	349	460	453	378	270	11	...	273	771

This plan has yet one more year to run.

The final crop.—From the commencement it was seen that the only treatment which could be applied to the older plantations was high forest, and the question of the regeneration has not been fully considered. Mr. Macgregor's report of 1874 shows that the final crop must be a clean felling, recourse being had to artificial regeneration, whilst Colonel Beddome seems to suggest a selection felling without considering the regeneration.

It is necessary here to consider the proposals of Mr. Macgregor and Colonel Beddome as succinctly as possible.

Mr. Macgregor estimated that the final fellings would be taken at 80 years old and that there would be 50 trees to the acre of 50 cubic feet each, all the other trees being removed in thinnings. This was purely guess work and not based on calculation. Colonel Beddome's plan of selection fellings has many defects, but three are insuperable :—

(1) That if the large trees are cut out and the smaller ones left, large gaps in the plantations would be formed and the sudden letting in of the wind would probably bring down the greater part of the trees left standing.

(2) The inconvenience of cutting over a large straggly area instead of a small compact one.

(3) If it is required to replant the areas under teak, this could only be done after many years when a complete compartment is cleared; otherwise the growth will be irregular and uneven.

All these objections are overcome by the present proposals. Colonel Beddome believed that the trees would reach maturity at 60 to 80 years on alluvial (Mr. Ferguson thinks they will go on growing to 150), but thinks it best to fix the final crop when they obtain a marketable size, *i.e.*, 18 inches—24 inches quarter girth. On laterite he does not venture an opinion, but thinks that the age of maturity will be a good deal longer. He therefore proposed to begin the final fellings at 60 years, *i.e.*, 1904, and carry on the final fellings by selection of the best for another 80 years, not allowing for regeneration of any kind. The treatment proposed for the new plantations was to treat them in coppice on a rotation of 10 years under mahogany standards.

2. *Proposals for future treatment.*—It is proposed for the future to treat both the old and new plantations under the same method, *i.e.*, a system of high forest with a clean felling of the final crop and artificial regeneration. The method to be accompanied by thinnings with a view to the improvement of the final crop. The felling to commence not earlier than the year in which the average girth at breast height will be 6 feet 6 inches. The measurements taken show that the centre girth

will not be less than 4 feet 6 inches. On first class soils the final crop should consist of not less than 40 trees and on second class of not less than 50 per acre.

The age of exploitability.—This has been found out to be 95 years on first class and 140 years on second class soils as worked out in the appendix.

As the oldest plantation is only 50 years at present, no scheme for final fellings has been prepared. It has, however, been ascertained by employing the current rate of growth (the growth in the different blocks of plantation does not materially differ). Pannengode is for its age slightly the most advanced and Amrampolliem is a little behind the others. The final fellings must be spread over a period of at least 50 years.

Determination of final yield.—This has been worked out in the appendix.

The total yield per acre on first class soils is 3,000 cubic feet per acre and on second class 2,000 cubic feet per acre.

The annual yield if spread over 50 years will be 147,910 cubic feet of first class and 73,780 cubic feet of second class timber. According to the present market, this will fetch not less than Rs. 3 per cubic feet standing for first class and Rs. 2 per cubic feet for second class. The total revenue to be derived will therefore be Rs. 4,43,730+Rs. 1,47,560=Rs. 5,91,290, or with the net profit derived from miscellaneous sources such as third class, bamboos, &c., may safely be fixed at 6 lakhs per annum.

The question of the yield of the thinnings will be dealt with under that head and it only remains to discuss the question as to why the new plantations are to be treated in this way instead of by the method of coppice as formerly proposed. In the first place all the reasons which have been advocated on behalf of the state confining its attention to the growing of large timber in preference to small in Europe are applicable here. But apart from these there are local considerations. If a rotation of ten years be applied as proposed, 70,000 saplings at least would be available each year for the next ten years (after cutting is commenced) of the fourth and fifth classes alone. Only 50,000 are required for the market at present, so that this would be flooded at once. After the first rotation the number would certainly increase and we should probably have not less than 100,000 per annum for which there certainly is no prospect of a market at present. Then the classes (fourth and fifth) are not those that are most in favour, which are the second and third. It is true that both these inconveniences could be avoided by increasing the rotation and thereby diminishing the area cut over annually. But apart from this there are other reasons why the number of saplings should not be too largely increased :—

(1) To enable us to obtain a ready sale for all the saplings which will be available from the old plantations especially Chatamborai and Amrampolliem.

(2) If future planting is deemed advisable (every thing seems to show that this is most desirable—*vide* History appendix) we shall be able to thin them with profit and not leave them without this necessary operation on account of not being able to find a sale for the thinnings.

(3) The treatment in coppice bringing in quick returns and a high rate of interest is eminently suitable to private holders and should the Nilambúr Tirumalpad and other individuals, who already possess considerable areas under teak, resort to this mode of treatment, we are at once entering into competition with them and swamping the market between us. The result would be the same as in the gum plantations in the Nilgiri Hills where the fault of not growing really valuable timber has already made itself felt.

Further, the soil would be improved by a treatment in a high forest deteriorated by a treatment in coppice.

3. *Working*—(*a*) *Fellings.*—As stated previously this plan does not treat of the final fellings, but there are two areas previously noticed in the description of compartments which demand a special treatment.

(1) In 1842 and 1853 Aravillykava there is a space of a little over 40 acres of very irregular growth. There are a few large trees and under them is a mixed growth of young teak, stunted mahogany and rubber.

The mahogany is practically of no value, whilst the rubber is quite out of place in the middle of a teak plantation even should it prove itself of any commercial value. The soil occupied is some of the most valuable in the plantations. Experiments are now being conducted in tapping the rubber, and, as far as they have gone, show little prospect of any material revenue being realized. The biggest trees are now nearly 20 years old and each covers the space required for two teak trees of the same age. The yield appears to be from 4 to 6 oz. of rubber which production may perhaps be continued for five or six years (even this is very doubtful) and the result expressed in current coin would compare very unfavourably with the value of two teak trees of the same age. Probably the most paying thing to do would be to fell this area in 1895 clean and to plant it up with teak. In order, however, that the success or failure of the rubber growing may be proved, it is proposed to clean fell at the end of the first rotation in 1900, when very few saplings of small size will be available, and plant up the whole area with teak in 1901. This compartment will then work into the working circle.

(2) 1844 Ramalur including C and D with an area of nearly 24·00 acres is also very irregular. On account of the number of large trees growing from old coppice stumps, the stunted growth of mahogany and the irregular growth of the young teak, the soil does not yield anything like the full production possible and it will be much better to fell clean the whole area in 1896, when the saplings will be much in demand and replant in 1897 with pure teak.

Besides the advantages that will be gained by substituting a regular for an irregular crop the proposal has two principal advantages :—

(1) It will enable us to pay off at an early date the debt accumulated against the plantations.

I estimate that in 1896 when the Ramalur plantation will be cut, besides the saplings and large coppice trees which have not been enumerated, we shall put in the market 570 trees with an average of 40 cubic feet each, *i.e.*, 22,800 cubic feet, which will realize at least Rs. 46,000 and probably more. In the year 1900 we shall put in the market 1,688 big trees, amounting to 70,000 cubic feet, realizing Rs. 1,40,000, and these two sums will go far towards clearing any debt that may exist against the plantations.

(2) We shall gain great experience by these fellings—

(*a*) In seeing the precaution necessary to prevent heart-shake, &c., in felling.

(*b*) In verifying the measurements taken.

(*c*) In testing the market capacity for large timber.

(*b*) *Thinnings.*—As no final fellings are prescribed in this plan and as all the revenue must for the next 40 years depend on thinnings with the exceptions noted above, these are of primary importance and must be dealt with at some length. Under the heading "past treatment" the mode in which these fellings have hitherto been conducted has been succinctly described and this is enlarged in the "history" in the appendix. It will be seen that the last year of Colonel Walker's revised working plan has still to run; the new scheme has, therefore, been prepared to come into operation in 1896. The scheme has been divided into two parts—one dealing with the new plantations, the other with the old. Experience has shown us that a heavier thinning in the earlier years, especially on the alluvial, is necessary, and this can be effected in the new, but were the same treatment applied to the old plantations, it is feared that to omuch light would be let in suddenly and the result would be disastrous.

The Possibility of the forest has not been worked out in cubic feet as the application would not be readily practicable. The forest capital is represented by the number of standards left at a given age and the interest by the number of saplings taken out in thinnings. In the early years it would be difficult and misleading to represent this in cubic feet though it may be possible to do so when all

the saplings have reached the class of measurables. Hitherto, the capital has been represented by 60 trees per acre at 60 years old, the number prescribed by Colonel Beddome and adopted in the two preliminary working plans. It is now found that the exploitable age will not be reached till 95 years and the capital is fixed at 40 standards on first-class and 50 on second-class soils at that age.

The rotation remains fixed for five years and the thinnings have been as far as possible confined to whole blocks to be worked in one year. The following table shows the order of the thinnings with the area worked over :—

Year.	Blocks to be worked.	Area, old.	Area, new.	Total area.
1896	Chatamborai, Aravillykava and Arevacode and Pokote	728·79	235·50	964·29
1897	Pannengode and Nellikutta	536·21	179·50	715·71
1898	Valuvashery and Amrumpolliem	1,001·75	125·00	1,126·75
1899	Elanjery, Ramalur and Moolathamaloc, miscellaneous blocks, and Eddacode, 1891 and 1892.	515·32	280·75	796·07
1900	Eddacode	691·23	266·75	957·98

1. *The new plantations.*—The close planting hitherto adopted is very necessary, favouring as it does, the early height-growth, and producing, without pruning, a clean straight bole. Any additional expense in planting is recovered in the first thinning. The following table shows the number of saplings available per acre on first and second class soils and the age of each compartment at the time of thinnings :—

Name of blocks.	First rotation, 1896-1900.	Second rotation, 1901-1905.	Third rotation, 1906-1910.	Fourth rotation.	Fifth rotation.	Subsequent.
Pokote	7 & 6 / *Nil.*	12 & 11 / 300·200	17 & 16 / 250·150	22 & 21 / 100·150	27 & 26 / 50·100	To reduce to 40 trees on first class and 50 on second class.
Pannengode ...	11 & 10 / 300·200	16 & 15 / 250·150	21 & 20 / 100·150	26 & 25 / 50·100	31 & 30 / 40·50	
Valuvashery	10 / 300·200	15 / 250·150	20 / 100·150	25 / 50·100	30 / 40·50	
Eddacode (1891 and 1892).	8 & 7 / 100 & 50 (from 91) (*nil.* from 92)	13 & 12 / 200 & 150 (from 91) 300 & 200 (from 92)	18 & 17 / 250·150	23 & 22 / 100·150	28 & 27 / 50·100	
* Eddacode (1893 and 1894).	7 & 6 / *Nil.*	12 & 11 / 300·200	17 & 16 / 250·150	22 & 21 / 100·150	27 & 26 / 50·100	

Above the line are the ages of the plantations to be thinned.
Below the line the number of saplings to be taken out (1) on first-class, (2) on second-class.

These proposals are based on the actual enumeration made in Pannengode, 1886. At eight years there were found to be 820 marketable saplings which at ten would probably give 800 as the dying were not included. To compare this with the previous working plan, it may be put in the following form :—

Age.	Number remaining.		Number to be removed.	
	First.	Second.	First.	Second.
10–11 years	800	800	300	200
15–16 years	500	600	250	150
20–21 years	250	450	100	150
25–26 years	150	300	50	100
30–31 years	100	200	40	50
35–36 years	60	150	...	...

After which time the thinnings are virtually completed on first class and only trees that are dying wind-blown or interfering with development of others must be removed, and that, with great care. On second-class soils thinnings may be continued for two or three more rotations, but it is advisable not to prescribe further except that it has been shown by experience that from 40 to 45 years old the number remaining should not exceed 75.

2. *The old plantations.*—I have drawn out the following table showing the number that should remain at various ages on first and second class soils basing it on the experience gained from the older plantations :—

Age.	Number that should remain	
	First.	Second.
At 21 years	210	400
At 26 years	130	250
At 31 years	110	150
At 36 years	90	125
At 41 years	80	100
At 46 years	70	85
At 51 years	60	75

After which thinnings are to be done as prescribed in the former paragraph.

In drawing out the statement of yield for the next two rotations, I have based the calculations on this estimate, but not rigidly adhered to them, as they are purely empirical. Where changes have been made, it has been chiefly with a view to the requirements of a particular compartment or to prevent too many saplings being taken out at a single rotation.

Appended is the statement of yield :—

Thinnings—Yield for the First Rotation.

Compartment number.	Age.	Number of trees per acre.		Allotted number per acre.		Yield per acre.		Total yield.		Quality of thinnings.	Remarks.
		First class.	Second class.	First class.	Second class.	First class.	Second class.				
					Yield for 1896.						
	Yrs.										
Chatamborai, 1872	24	212	180	130	250	82	*Nil.*	First class =	5,000	Chiefly Third and Fourth classes.	
								Second class =	*Nil.*		
Do. 1873	23	330	330	130	250	* 110	80	First class =	2,511	Third, Fourth and Fifth classes.	
								Second class =	4,800		
Do. 1874	22	460	460	210	400	200	† 100	First class =	2,500	First to Fifth classes.	
								Second class =	3,245		
Do. 1875	21	500	500	210	400	* 200	125	First class =	2,650	Third to Fifth classes.	
								Second class =	4,125		
								Total yield for plantations	25,731		
Aravillykava, 1842	54	*Nil.*	65	60	75	*Nil.*	*Nil.*	*Nil*			
Do. 1844	52	68	48	60	75	* 4	*Nil.*	First class =	45	Logs.	
								Second class =	*Nil.*		
Do. 1852	44	106	106	80	100	* 20	† 10	First class =	50	Logs and measurables.	
								Second class =	355		
Do. 1853	43	*Nil.*	128	80	100	*Nil.*	28	First class =	*Nil.*	Measurables.	
								Second class =	476		
Arevacode, 1847	49	87	87	70	85	17	† 6	First class =	395	Logs and measurables.	
								Second class =	36		
Do. 1848	48	89	89	70	85	19	† 7	First class =	408	Logs and measurables.	
								Second class =	439		
								Total yield for plantations	2,204		
Pokote, 1889-90	7 & 6	...	...	...	...	...	...	.....		.....	Too young to be worked.
					Yield for 1897.						
Pannengode, 1854	43	104	104	80	100	24	† 10	First class =	2,095	Logs and measurables.	Of these 86 will be thinned in 1894-95.
								Second class =	15		
Do. 1855	42	110	205	80	100	* 25	* 50	First class =	1,233		
								Second class =	1,125		
Do. 1856	41	108	142	80	100	* 25	42	First class =	1,529		
								Second class =	462		
Do. 1863	34	110	150	90	125	20	† 25	First class =	1,090		
								Second class =	637		
Do. 1864	33	112	150	110	150	† 7	† 13	First class =	161		
								Second class =	218		
								Total yield for plantations ...	8,479		
Pannengode, 1886	11	800	800	500	600	300	200	First class =	24,475	Third, Fourth and Fifth classes.	
								Second class =	3,050		
Do. 1887	10	800	800	500	600	300	200	First class =	17,025		
								Second class =	600		
								Total yield for plantations ...	45,150		
Nellikutta, 1870	27	160	160	130	250	30	*Nil.*	First class =	291	First, Second, Third and Fourth classes.	
								Second class =	...		
Do. 1871	26	159	159	130	250	29	*Nil.*	First class =	877		
								Second class =	...		
								Total yield for plantations ...	1,168		
					Yield for 1898.						
Valuvashery, 1864	34	104	104	90	125	14	...	First class =	684		
								Second class =	...		
Do. 1865	33	120	120	110	150	† 15	...	First class =	499	Second, Third and Fourth classes.	
								Second class =	...		
Do. 1866	32	147	147	110	150	37	† 15	First class =	2,419		
								Second class =	900		
Do. 1867	31	209	209	110	150	* 50	59	First class =	1,440		
								Second class =	5,564		
Do. 1868	30	140	250	110	150	30	* 75	First class =	1,130	Third, Fourth and Fifth classes.	
								Second class =	5,190		
Do. 1869	29	180	180	110	150	* 60	30	First class =	1,365		
								Second class =	826		
								Total yield for plantations ...	20,017		

* The number to be taken has been diminished to equalise it with the thinnings of the next rotation.
† The number to be taken has been increased to equalise it with the thinnings of the next rotation.

Yield for the Second Rotation.

Compartment number.	Age.	Number of trees per acre.		Allotted number per acre.		Yield per acre.		Total yield.	Quality of thinnings.	Remarks.
		First class.	Second class.	First class.	Second class.	First class.	Second class.			
					Yield for 1901.					
	YRS.									
Chatamborai, 1872	29	130	180	110	150	20	30	First class = 1,443 Second class = 3,394	Second and Third classes.	
Do. 1873	28	220	250	110	150	110	* 80	First class = 2,511 Second class = 4,800		
Do. 1874	27	260	360	130	250	130	110	First class = 1,625 Second class = 3,245	Second, Third and Fourth classes.	
Do. 1875	26	300	375	130	250	170	125	First class = 2,252 Second class = 4,125		
								Total yield for plantations ... 23,395		
Aravillykava, 1842	59	...	65	...	75	...	...			
Do. 1844	57	64	48	60	75	4	...	First class = 45 Second class = ...	Logs and measurables.	
Do. 1852	49	86	96	70	85	16	11	First class = 41 Second class = 390		
Do. 1853	48	...	100	...	85	...	15	First class = ... Second class = 255		
Arevacode, 1847	54	70	81	60	75	10	6	First class = 232 Second class = 36		
Do. 1848	53	70	83	60	75	10	7	First class = 215 Second class = 439		
								Total yield for plantations ... 1,653		
Pokote, 1889	12	800	800	500	600	300	200	First class = 21,675 Second class = 12,750	Third, Fourth and Fifth classes.	The cutting of this compartment will be deferred till 1902.
Do. 1890	11	800	800	500	600	300	200	First class = 19,215 Second class = 4,790		
								Total yield for plantations ... 58,430		
					Yield for 1902.					
Pannengode, 1854	48	80	94	70	85	10	9	First class = 873 Second class = 13	Logs and measurables.	
Do. 1855	47	85	155	70	85	15	* 40	First class = 739 Second class = 900		
Do. 1856	46	83	100	70	85	13	15	First class = 795 Second class = 165		
Do. 1863	39	90	125	80	100	10	25	First class = 545 Second class = 637		
Do. 1864	38	105	137	90	125	15	12	First class = 345 Second class = 201		
								Total yield for plantations ... 5,2135		
Pannengode, 1886	16	500	600	250	450	250	150	First class = 20,312 Second class = 2,287	Third, Fourth and Fifth classes.	
Do. 1887	15	500	600	250	450	250	150	First class = 14,187 Second class = 450		
								Total yield for plantations ... 37,236		
Nellikutta, 1870	32	150	160	110	150	20	† 15	First class = 194 Second class = 870		
Do. 1871	31	130	159	110	150	20	† 15	First class = 605 Second class = 491		
								Total yield for plantations ... 2,160		
					Yield for 1903.					
Valuvashery, 1864	39	90	104	80	100	10	4	First class = 488 Second class = 118	Second and Third classes.	
Do. 1865	38	105	120	90	125	15	5	First class = 499 Second class = 105		
Do. 1866	37	110	132	90	125	20	7	First class = 1,307 Second class = 420		
Do. 1867	36	159	150	90	125	* 50	25	First class = 1,140 Second class = 2,358		
Do. 1868	35	110	175	90	125	20	50	First class = 753 Second class = 3,400		
Do. 1869	34	120	150	90	125	30	25	First class = 682 Second class = 689		
								Total yield for plantations ... 12,019		

Yield for the Second Rotation—cont.

Compartment number.	Age.	Number of trees per acre.		Allotted number per acre.		Yield per acre.		Total yield.		Quality of thinnings.	Remarks.
		First class.	Second class.	First class.	Second class.	First class.	Second class.				
	YRS.	*Yield for* 1903—cont.									
Amrampolliem (1861-68), 1864 ...	39	90	115	80	100	10	15	First class =	536	Measurables, First and Second classes.	
								Second class =	236		
Do. 1873 ...	30	150	220	110	150	40	70	First class =	1,460	First, Second and Third classes.	
								Second class =	192		
Do. 1874 ...	29	258	318	130	250	128	68	First class =	7,587		
								Second class =	357		
Do. 1875 ...	28	240	...	130	250	110	...	First class =	4,785		
								Second class =	...		
Do. 1876 ...	27	210	380	130	250	80	130	First class =	5,014		
								Second class =	5,947		
								Total yield for plantations ...	26,114		
Valuvashery, 1888	15	500	600	250	450	250	150	First class =	16,937	Third, Fourth and Fifth classes.	
								Second class =	6,075		
								Total yield for plantations ...	23,012		
		Yield for 1904.									
Elanjery, 1845	59	68	...	60	...	8	...	First class =	265	Logs and measurables.	
								Second class =	...		
Do. 1846	58	75	80	60	75	15	5	First class =	360		
								Second class =	185		
Do. 1849	55	75	80	60	75	15	5	First class =	390		
								Second class =	207		
Do. 1850	54	78	85	60	75	18	10	First class =	108	Measurables and First class.	
								Second class =	480		
Do. 1858	46	80	97	70	85	10	12	First class =	90		
								Second class =	405		
Do. 1859	45	80	100	70	85	10	15	First class =	71		
								Second class =	586		
								Total yield for plantations ...	3,173		
Moolathamanoo and Ramalur, 1844.	60	...	...	...	...	...	...	First class =	149		
								Second class =	...		
Do. 1847.	57	65	75	60	75	5	...	First class =	152	Logs and measurables.	
								Second class =	7		
Do. 1848.	56	73	78	60	75	13	3	First class =	10		
								Second class =	...		
Do. 1850.	54	68	75	60	75	8	...	First class =	...		
								Second class =	208		
Do. 1853.	51	...	85	...	75	...	10	*Nil.*			
								Total yield for plantations ...	526		
Eddacode, 1891	13	700	750	500	600	200	150	First class =	19,950	Third, Fourth and Fifth classes.	
								Second class =	1,875		
Do. 1892	12	800	800	500	600	300	200	First class =	39,825		
								Second class =	250		
								Total yield for plantations ...	61,900		
		Yield for 1905.									
Eddacode, 1844	61	69	...	60	...	9	...	First class =	247	Logs and measurables.	
								Second class =	...		
Do. 1845	60	69	83	60	75	9	8	First class =	38		
								Second class =	191		
Do. 1846	59	66	75	60	75	6	...	First class =	243		
								Second class =	...		
Do. 1847	58	73	85	60	75	13	10	First class =	94		
								Second class =	398		
Do. 1848	57	70	95	60	75	10	20	First class =	654		
								Second class =	310		
Do. 1849	56	69	81	60	75	9	6	First class =	212		
								Second class =	126		
Do. 1850	55	75	95	60	75	15	20	First class =	45	Measurables.	
								Second class =	743		
Do. 1851	54	70	75	60	75	10	...	First class =	106		
								Second class =	...		
Do. 1857	48	...	95	...	75	...	20	First class =	...		
								Second class =	722		
Do. 1860	45	...	100	...	85	...	15	First class =	...	First class	
								Second class =	390		
Do. 1861	44	...	116	...	100	...	16	First class =	...		
								Second class =	916		
Do. 1862	43	...	107	...	100	...	7	First class =	...		
								Second class =	270		
								Total yield for plantations ...	5,705		
Eddacode, 1893	12	800	800	500	600	300	200	First class =	16,761	Third, Fourth and Fifth classes.	
								Second class =	11,174		
Do.	11	800	800	500	600	300	200	First class =	21,261		
								Second class =	14,174		
								Total yield for plantations ...	63,370		

* The number to be taken has been diminished to equalise it with the thinnings of the next rotation.
† The number to be taken has been increased to equalise it with the thinnings of the next rotation.

In dealing with the thinnings in the plantations where the trees are of very large size, it is necessary to mark the trees to be thinned two years at least before the actual thinning takes place and in these two years to arrange for the gradual removal of the top branches. This will enable the canopy to close before the felling of the tree takes place and thus avoid large gaps in the canopy which would admit wind and endanger the growth of these plantations.

It must be recollected that the cutting of thinnings is a sylvicultural operation with a view to the improvement of the final crop. These prescriptions based on previous experience are intended as a guide for the Executive Officer who must use his discretion in performing the operation and not consider himself tied down by the figures given.

Yield of Thinnings.—The financial results of thinnings have been detailed in full in the History appendix.

It is not advisable to estimate the total yield of thinnings to the time of the removal of the final crop as the yield is only secondary and thinnings must only be carried out with a view to the improvement of the final crop, a fixed yield must not, therefore, be aimed at.

The following table shows the estimated value of the annual yield, after deduction for unmarketable saplings:—

First rotation.				Second rotation.			
Classes of saplings.	Number or quantity.	Rate per c.ft. or each sapling.	Amount.	Classes of saplings.	Number or quantity.	Rate per c.ft. or each sapling.	Amon
Yield for 1896.	CUBIC FEET.	RS. A.	RS. A.	*Yield for* 1901.	CUBIC FEET.	RS. A.	RS.
Logs (619)	11,200	2 0	22,400 0	Logs (720)	11,975	2 0	23,9
Measurables	1,560	4 8	7,020 0	Measurables	743	6 4	4,0
First class	360	2 4	810 0	Second class	8,550	1 4	10,6
Second class	600	1 4	750 0	Third class...	8,800	0 12	6,6
Third, Fourth and Fifth classes.	22,052	0 8	11,026 0	Third, Fourth and Fifth classes.	33,960	0 8	16,9
Total ...	...	...	42,006 0	Total ...	...	...	62,8
Yield for 1897.				*Yield for* 1902.			
Logs (1,850)	26,000	2 0	52,000 0	Logs (2,120)	39,150	2 0	78,3
Measurables	4,110	4 8	18,495 0	Measurables	2,676	6 4	16,7
First class	2,215	2 4	4,983 0	Superior small do. ...	1,950	3 4	6,3
Second class	215	1 4	268 0	Third, Fourth and Fifth classes.	54,000	0 8	27,0
Third, Fourth and Fifth classes.	40,000	0 8	20,000 0	Total ...	...	...	1,28,3
Total ...	...	...	95,746 0	*Yield for* 1903.			
Yield for 1898.				Measurables	250	4 8	1,1
Measurables	500	4 8	2,250 0	Superior small do. ...	2,341	3 4	7,0
First class	660	2 4	1,485 0	First class	6,590	2 4	14,8
Second class	5,530	1 4	6,912 0	Second class	14,745	1 4	18,4
Third, Fourth and Fifth classes.	29,420	0 8	14,710 0	Third class	10,030	0 12	7,5
Total ...	...	...	25,357 0	Third, Fourth and Fifth classes.	20,000	0 8	10,0
Yield for 1899.				Total ...	...	...	59,9
Logs (510)	6,250	2 0	12,500 0	*Yield for* 1904.			
Measurables	2,395	4 8	12,127 0	Logs (567)	10,590	2 0	21,1
Superior small do. ...	870	3 4	2,827 0	Measurables	1,215	6 4	7,5
First class	510	2 4	1,147 0	Superior small do.	1,000	3 4	3,2
Second class	100	1 4	125 0	First class	620	2 4	1,3
Third, Fourth and Fifth classes.	35,250	0 8	17,625 0	Third, Fourth and Fifth classes.	56,000	0 8	28,0
Total ...	...	...	46,351 0	Total ...	...	...	61,4
Yield for 1900.				*Yield for* 1905.			
Logs (1,310)	17,900	2 0	35,800 0	Logs (1,080)	1,400	2 0	42,8
Measurables	2,860	4 8	12,870 0	Measurables	21,975	6 4	12,3
First class	640	2 4	1,440 0	Measurables, superior small.	670	3 4	2,1
Second class	3,190	1 4	3,987 0	First class	1,250	2 4	2,8
Third class	600	0 12	450 0	Third, Fourth and Fifth classes.	57,000	0 8	28,5
Total ...	...	...	54,547 0	Total ..	...	...	88,6
Grand Total ...	...	...	2,64,007 0	Grand Total ...	...	...	4,01,2

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4. *Works of Protection*—

(*a*) Protection from fire has been studied in History appendix.
(*b*) Protection from wild animals, insects, &c.—*Vide* Chapter II.

5. *Works of Reproduction and improvement*—

(*a*) Weeding and parasite clearing—*Vide* History appendix.
(*b*) Planting—*Vide* History appendix.

6. *Communications and Buildings.*—As there is good river communication, no roads are required except small inspection paths along the compartment lines.

The only buildings required are a Kalserambi at Eddacode which has already been budgeted for, also if planting is to be taken up in Nellikutta, a new Kalserambi will be required at a cost of Rs. 350. It would also be a great convenience if bath-rooms were added to the existing serambies. These, however, are minor works that can be attended to by the Executive officer.

It is probable that when final fellings are undertaken it may be found necessary to improve the river for floating in a few places, and it is almost certain that a small length of tramway will be advisable but these plans hardly fall within the scope of this report.

CHAPTER VI.

SUGGESTIONS FOR COLLECTING DATA.

1. The stock map can be verified and the classes of growth more accurately measured; this could easily be done, block by block, when the thinnings are being made.

2. The sample areas should be added to, at least one being taken in every compartment. Those now marked should be measured carefully, once in three years at least, and the results carefully recorded.

3. Any enumeration made in future should be according to the classification of the stock map and should classify the saplings according to classes.

4. The trees in the oldest compartments (*i.e.*, all plantations over fifty years of age) are now sufficiently thinned to be able to select trees that will remain till the final crop. When one of these is thinned, such trees may easily be selected and marked and the number of trees to form the final crop carefully counted, compartment by compartment.

5. When the compartments in Moolathamanoo and Aravillykava are cut, the girth measurement of all the trees (*a*) standing, (*b*) after felling, should be carefully recorded and also the volume in such tree with a view to the verification of the measurements recorded in this plan.

(Signed) P. M. LUSHINGTON,
Deputy Conservator of Forests.

NILAMBÚR,
2nd March 1895.

APPENDIX A.

SYSTEM OF MEASUREMENT.

The valuation survey has been effected by two methods :—

(1) By an actual enumeration of the trees.

(2) By the method of sample plots.

(1) The enumeration only shows the actual number of trees standing without classification, hence by itself, it would not be of much value. It was made before the arrival of the Working Plans officer.

(2) The sample plots (ten in number) were chosen and measured by Mr. Rego in May 1892. Each plot is one acre only in extent so that these by themselves, especially as they are not true average acres but generally chosen on alluvial soil, being so small in extent compared with the total area under teak, would not give a correct estimate. They have, however, been added to by the Working Plans officer who has selected 14 additional plots, some of 1 acre, and some of ½ acre, illustrating the growth both on first class and second class soils.

By combining the two methods, a very fairly accurate estimate of the crop has been made in the following way :—In the sample plots 60 trees have been carefully chosen, with a view to the proper distribution of trees over the surface and these represent the 60 trees to stand up to 60 years of age, out of which the final crop of 40 trees per acre on first class and 50 per acre on second class at 95 years will be selected.

Of the 60 trees not less than 14 (except in Pannengodo 1854) and usually more, have been measured as follows :—

(1) Girth at 2 feet from the ground approximately (representing the butt end of the log when the tree is cut).

(2) Girth at breast height. This has been taken at 4 feet 6 inches, a bamboo of the exact length being placed against the tree and the measurement taken exactly above it; some allowance being made for fluting, wherever necessary, by eye appreciation—[These measurements were taken for all of the 60 trees.]

(3) The centre girth.

(4) The top girth.

(5) The length of bole.

The three last have been measured by sending up coolies with ropes, the height of the bole being pointed out by the officer below. The girth at this point is measured on a piece of rope and knotted. Then the cooly proceeds to let down the end of the rope and descends the tree still holding the rope loose until the end can be reached from below. Thus the exact centre of the bole is found and the measurement taken on a second rope. The measurements are then taken by tape when the cooly descends with his three ropes.

The girth at centre is checked by the measurement at 2 feet and at the tip and should there be any great divergence between the mean of these two and the centre girth taken by the cooly he is sent up to verify his measurement. The coolies very soon saw that a check was exercised and took good care that their measurements were correct.

The average bole was thus determined and the centre girth of the remaining trees deduced from the average of the actually measured trees on the acre. In this way it was soon found that there was no invariable ratio of centre girth to girth at breast height except where the height of bole and size of girth were nearly equal in the trees compared. The remaining trees were then enumerated and divided into the different classes of saplings which they represented. Each sample plot has been carefully measured and the area marked on the ground and each tree measured has been numbered with tar which will eventually be replaced by a numbered zinc plate so that the trees can be identified for future measurement.

APPENDIX B.

The results of the measurements taken in the sample plots which can be compared with Mr. Rego's figures are given below :—

The trees measured are marked ×, and fluted trees marked″.

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Measured by P. M. Lushington, 2nd November 1894.

SAMPLE ACRE, ARAVILLYKAVA, 1844. (1) FIRST CLASS.

Number.	G. at 2′.	G. at 4′6″.	G. at C.	Means, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	5·2	4·10	3·6½	3·11½	2·9	75	57·43
2	4·0½	3·8	3·0	.....	.....	68	38·25
″3	5·10	5·6½	3·11	.....	.....	68	65·19
″4	4·0	3·9	3·0	.....	.....	68	38·25
5	3·11	3·6	2·11	.....	.....	68	36·15
×6	5·2	4·8	3·6	3·6½	2·5	71½	54·74
″7	Fluted.	3·10½	3·0	.....	.....	68	38·25
8	4·11	4·5	3·4	.....	.....	68	47·22
9	5·2½	5·0½	3·9	.....	.....	68	59·76
″10	5·5	5·1	3·10	.....	.....	68	62·45
×11	Fluted.	5·8	3·11½	.....	2·7	70½	67·60
″12	5·5	4·11	3·9	.....	.....	68	59·76
13	Fluted.	5·2½	3·10	.....	.....	68	62·45
×14	5·5½	5·0½	3·10½	3·10¾	2·4	80	73·48
15	4·1	3·9¾	3·0	.....	.....	68	38·25
16	Fluted.	4·3½	3·2	.....	.....	68	42·61
×17	Do.	4·4	3·6	.....	2·5	69	52·82
18	5·3	4·9	3·4½	.....	.....	68	47·23
19	4·1½	3·8	3·0	.....	.....	68	38·25
×20	3·11½	3·8½	2·11½	2·11½	1·11½	64	34·03
21	4·9	4·5½	3·4	.....	.....	68	47·22
″22	Fluted.	4·4	3·4	.....	.....	68	47·22
″23	4·9	4·5	3·4	.....	.....	68	47·22
″24	5·5	4·11	3·9	.....	.....	68	59·76
×25	4·1	3·9	2·11½	3·1½	2·2	68	36·16
26	5·3	4·9	3·4½	.....	.....	68	47·23
″27	Fluted.	5·10	4·1	.....	.....	68	70·86
28	3·11½	3·8½	3·0	.....	.....	68	38·25
×29	4·5½	4·0¾	3·0	3·3¾	2·2	69	38·81
30	5·1¾	4·9	3·4½	.....	.....	68	47·23
31	3·10	3·6½	2·11	.....	.....	68	36·15
″32	5·7	5·3½	3·10	.....	.....	68	62·45
33	4·6	4·1¼	3·2	.....	.....	68	42·61
34	4·10¾	4·7	3·4½	.....	.....	68	47·23
×35	4·9	4·6½	3·2	3·3½	1·10	73	45·75
36	4·2½	3·11¼	3·0	.....	.....	68	38·25
37	6·0	5·8	4·0	.....	.....	68	68·00
38	3·9	3·4	2·10	.....	.....	68	34·11
39	4·0¾	3·8½	3·0	.....	.....	68	38·25
40	3·9¾	3·6½	2·11	.....	.....	68	36·15
41	4·4	3·10	3·0	.....	.....	68	38·25
42	4·7½	4·3½	3·2	.....	.....	68	42·61
×″43	4·0	3·8	3·0½	2·10½	1·9	67	37·69
44	3·10	3·8	3·0	.....	.....	68	38·25
45	4·8	4·6	3·4	.....	.....	68	47·22
″46	4·0	3·8¾	3·3½	3·2½	2·4½	59	38·95
×47	Fluted.	4·5	3·4	.....	.....	68	47·22
×″48	Do.	4·8	3·6	.....	2·6	65	49·76
″49	Do.	6·6	4·5	.....	.....	68	82·90
50	5·0½	4·8½	3·4½	.....	.....	68	47·23
51	3·11½	3·7½	2·11	.....	.....	68	36·15
×52	4·5	4·0	2·11½	3·3½	2·1½	60	31·90
53	5·3	4·11¾	3·9	.....	.....	68	59·76
″54	5·6	5·4	3·11	.....	.....	68	65·19
55	4·6¾	4·2	3·2	.....	.....	68	42·61
″56	4·10½	4·6½	3·4	.....	.....	68	47·22
×57	5·1	4·9	3·3	3·11½	2·10	72½	47·86
″58	Fluted.	5·4½	3·11	.....	.....	68	65·19
×″59	5·5½	4·11	3·10	4·1½	2·9½	68	62·45
″60	5·8½	5·7½	4·0	.....	.....	68	68·00

These 60 trees represent the stock from which the 40 trees forming the final crop will be chosen. In addition to them there are 8 trees classed as measurables, the average size of each may well be taken as the smallest of the 60 marked trees.

The total volume of the 60 trees ... ... =	2,939·49 c. ft.
The average bole ... ... =	68 ft.
The average girth at 4′6″ ... ... =	53·64 inches.
The average centre girth ... ... =	40·68 ,,
The average cubical contents per tree ... ... =	48·99 c. ft.
The average annual girth increment, 1 to 50 years ... ... =	1·07 inches.

Measured by P. M. Lushington, 5th November 1894.

SAMPLE ACRE, EDDACODE, 1846. (2) FIRST CLASS, BUT OF INFERIOR.

Number.	G. at 2′.	G. at 4′6″.	G. at C.	Mean, 2 and C.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	5·9	5·3	3·6½	3·11	2·1	84½	64·71
″2	5·9	5·5½	4·0	.....	.....	66	66·00
3	5·6	5·0½	3·10	.....	.....	66	60·61
4	4·10¼	4·3½	3·3	.....	.....	66	43·56
×″5	5·7½	5·2½	3·6½	3·11¼	2·3	67	51·31
×″6	4·9½	4·4	3·4½	3·7½	2·5	67	46·54
″7	5·1½	4·7	3·7	.....	.....	66	52·96
×″8	4·5½	4·1½	3·0½	3·4½	2·4	74	41·64
9	Fluted.	4·11	3·9½	.....	.....	66	58·01
10	4·3	3·10	2·10	.....	.....	66	33·11
11	5·10	4·3¾	3·3	.....	.....	66	43·56
12	3·2¾	2·11	2·4	.....	.....	66	22·45
13	4·9½	4·3	3·3	.....	.....	66	43·56
″14	4·8	4·4½	3·4	.....	.....	66	45·83
15	4·3	4·0	3·0	.....	.....	66	37·12
16	3·8½	3·5	2·7½	.....	.....	66	27·53
17	3·8½	3·5½	2·7½	.....	.....	66	27·53
×18	4·4	3·10½	3·1	3·7½	3·1	53	31·49
×19	4·0¾	3·8½	2·5	2·11	1·9½	69	25·18
20	.....	.....	.....	.....	.....	...	...
21	3·4¾	3·1	2·6	.....	.....	66	25·78
″22	5·0	4·8	3·8	.....	.....	66	55·45
23	6·5	6·0	4·6	.....	.....	66	83·53
×24	4·7	4·3½	3·4	3·5½	2·4	63	43·74
25	4·2¾	3·9½	2·10	.....	.....	66	33·11
″26	4·1½	3·8	2·9	.....	.....	66	31·19
27	4·3½	3·10½	2·10	.....	.....	66	33·11
″28	4·5	4·0	3·0	.....	.....	66	37·12
29	3·5	3·1½	2·6	.....	.....	66	25·78
×30	4·2½	3·11	2·11	3·4½	2·7	60	31·90
″31	4·4½	4·0	3·0	.....	.....	66	37·12
″32	3·8½	3·4½	2·7½	.....	.....	66	27·53
×″33	5·5	5·0	3·8	4·1¾	2·10½	73	61·33
″34	4·1	3·8	2·9	.....	.....	66	31·19
35	3·6	3·2½	2·6½	.....	.....	66	25·79
36	5·3½	4·10½	3·9	.....	.....	66	58·00
37	4·5	4·0¾	3·0	.....	.....	66	37·12
38	3·9½	3·6	2·9	.....	.....	66	31·19
×″39	4·11	4·7	3·6½	3·9½	2·7½	58	44·41
×40	3·4	3·0½	2·3½	2·5	1·6	69	21·84
41	3·7	3·3½	2·7	.....	.....	66	27·52
42	4·3½	3·10½	2·10	.....	.....	66	33·11
43	3·8½	3·5½	2·8	.....	.....	66	29·33
44	3·8	3·2½	2·6½	.....	.....	66	25·79
×45	5·1¾	4·7½	3·7	4·0⅜	2·11	68½	54·97
″46	4·5	4·0½	3·0	.....	.....	66	37·12
″47	4·7½	4·3	3·3	.....	.....	66	43·56
48	4·1½	3·9	2·9	.....	.....	66	31·19
49	4·0½	3·9½	2·9	.....	.....	66	31·19
×″50	4·7	4·1	3·0½	3·4½	2·2½	68	38·26
51	4·7¼	4·1¼	3·1	.....	.....	66	39·21
×52	3·7½	3·2½	2·8	2·9	1·10½	64	28·44
″53	4·0½	3·3¾	2·7	.....	.....	66	27·52
54	4·3	3·3½	2·9	.....	.....	66	31·19
×″55	5·5½	5·0¼	4·0	4·3½	3·1½	53½	53·50
″56	4·5	4·0½	3·0	.....	.....	66	37·12
57	3·6½	3·2	2·6½	.....	.....	66	25·79
58	3·4¼	3·1½	2·6	.....	.....	66	25·78
″59	4·8¾	4·4¾	3·4	.....	.....	66	45·83
60	Fluted.	4·5	3·5	.....	.....	66	48·15

Of the 60 trees reserved to constitute the final crop No. 20 was blown down. The following measurements were recorded:—

	G. at 2′.	G. at 10′.	G. at 20′.	G. at 30′.	G. at 40′.	G. at 50′.	G. at 60′.	G. at 64′	[length of the bole].
No. 20...	5·5½	4·0½	3·8½	3·6½	3·0½	2·8½	2·4		2·4.

In addition to the above 59 trees there are 30 trees classed as measurables.

The total volume of the 59 trees	=	2,313·50 c. ft.
The average bole	=	66 ft.
The average girth at 4′6″	=	48″·46
The average centre girth	=	36″·67
The average cubical contents per tree	=	39·21 c. ft.
The average annual girth increment, 1 to 48 years	=	1″·01

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Measured by P. M. Lushington, 2nd November 1894.

SAMPLE ACRE, AREVACODE, 1847. 3 FIRST CLASS.

Number.	G. at 2′.	G. at 4′6″.	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	4·6	4·2½	3·2	.....	.....	65	40·73
×″2	6·10	6 3½	4·5½	4·11¾	3·1½	63	76·82
″3	6·2	5·7¾	4·0	.....	.....	65	65·00
4	4·5½	4·0	3·0	.....	.....	65	36·56
×5	3·9½	3·6¾	3·0½	2·10¾	2·0	65	36·57
6	4·1½	3·8	3·0	.....	.....	65	36·56
7	4·1	3·10	3·0	.....	.....	65	36·56
×8	3·11½	3·8	2·8	2·10½	1·9	64	28·44
″9	4·9	4·5	3·4	.....	.....	65	45·13
10	4·7	4·2	3·2	.....	.....	65	40·73
×11	4·4	3·10¾	2·10	3·2¾	2·1½	70	35·12
″12	4·9	4·5½	3·4	.....	.....	65	45·13
13	3·7	3·8½	3·2	.....	.....	65	40·73
14	3·11¼	3·7½	3·0	.....	.....	65	36·56
15	4·4	4·0¾	3·2	.....	.....	65	40·73
16	5·2	4·8½	3·4½	.....	.....	65	45·14
17	4·2	3·8½	3·0	.....	.....	65	36·56
18	3·10⅜	3·6	2·11	.....	.....	65	34·55
″19	4·6	4·2	3·2	.....	.....	65	40·73
″20	4·7	4·4	3·4	.....	.....	65	45·13
″21	4·3	4·0	3·2	.....	.....	65	40·73
×″22	4·9	4·6	3·2	3·5	2·1	69	43·24
″23	4·1	3·8½	3·0	.....	.....	65	36·56
×24	4·6	4·2¼	3·6	3·6	2·6	69	45·93
″25	4·1	3·9	3·0	.....	.....	65	36·56
×26	4·4¼	4·1⅜	3·2½	3·6	2·7½	50	31·34
″27	5·9	5·2½	3·10	.....	.....	65	59·69
×″28	5·7	5·5	3·9	4·1½	2·7½	68½	60·20
29	3·11¾	3·7½	2·11	.....	.....	65	34·55
″30	5·1	4·10	3·9	.....	.....	65	57·12
31	4·1½	3·8½	3·0	.....	.....	65	36·56
32	4·9¾	4·5½	3·4	.....	.....	65	45·13
×33	3·8	3·5	2·9	2·10¼	2·0½	59	27·88
″34	5·10	5·6	3·11	.....	.....	65	62·31
35	4·1	3·9¾	3·0	.....	.....	65	36·56
×36	4·5½	4·2½	3·5½	3·4	2·2½	69	50·35
37	4·6	4·2¼	3·2	.....	.....	65	40·73
38	4·3½	3·10½	3·0	.....	.....	65	36·56
×39	4·0¾	3·10	3·0½	3·0½	2·0½	67	37·70
40	4·2¾	3·11½	3·0	.....	.....	65	36·56
×41	4·5	4·2½	3·1½	3·5	2·5	63	37·44
42	4·6	4·1½	3·2	.....	.....	65	40·73
″43	4·11½	4·8½	3·4½	.....	.....	65	45·14
44	4·3½	4·0	3·2	.....	.....	65	40·73
×45	3·9	3·5¾	2·10	2·8½	1·8	64	32·11
″46	4·4½	3·11½	3·0	.....	.....	65	36·56
47	Fluted.	3·10½	3·0	.....	.....	65	36·56
48	4·9	4·5½	3·4	.....	.....	65	45·13
×″49	4·8	4·3½	3·5	3·4¼	2·0½	74	53·99
50	4·0¾	3·8½	3·0	.....	.....	65	36·56
″51	4·5	4·1	3·2	.....	.....	65	40·73
52	5·0	4·8	3·4¼	.....	.....	65	45·14
53	4·8	4·3½	3·2	.....	.....	65	40·73
54	4·7½	4·4½	3·4	.....	.....	65	45·13
55	5·5½	5·0½	3·10	.....	.....	65	59·69
×56	4·7¾	4·3¾	2·10½	3·2	1·8½	71	35·63
57	4·0½	3·10⅜	3·0	.....	.....	65	36·56
58	4·1½	3·8¾	3·0	.....	.....	65	36·56
59	3·6	3·2¾	2·9	.....	.....	65	30·72
60	3·9¼	3·6	2·11	.....	.....	65	34·55

In addition to the above there are 110 trees classed as measurables and 2 classed as superior, small.

The total volume of the 60 trees	=	2,510·13 c. ft.
The average bole	=	65 ft.
The average girth at 4′6″	=	49″·85
The average centre girth	=	38″·38
The average cubical contents per tree	=	41·83 c. ft.
The average annual girth increment, 1 to 47 years	=	1″·06

Measured by P. M Lushington, 30th October 1894.

SAMPLE ACRE, PANNENGODE, 1854. 4 FIRST CLASS.

Number.	G. at 2′.	G. at 4′·6″.	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	4·6½	4·3	3·2	.....	.....	60	37·59
2	4·2⅛	3·10½	2·10	.....	.....	60	30·09
×3	4·8	4·4	2·4	3·4⅛	2·1	65½	22·38
4	4·0	3·7	2·5	.....	.....	60	21·90
5	5·0	4·9	3·5	.....	.....	60	43·77
6	4·8¼	4·3	3·2	.....	.....	60	47·59
×7	5·2	4·9½	3·2½	3·8¾	2·3½	63½	40·64
8	4·8½	4·2⅝	3·3	.....	.....	60	39·60
9	4·6⅜	4·2⅝	3·9	.....	.....	60	52·72
10	4·5	4·0½	2·9	.....	.....	60	28·35
11	4·0½	3·9	2·9	.....	.....	60	28·35
12	5·5½	4·11⅛	3·8	.....	.....	60	50·41
13	3·11½	3·8⅜	2·8	.....	.....	60	26·66
14	5·5	5·1¼	3·10	.....	.....	60	55·10
15	4·6½	4·3½	3·1	.....	.....	60	35·64
×16	4·9½	4·5⅛	3·1	3·5¼	2·1	70	41·58
17	5·4⅜	5·1	3·9	.....	.....	60	52·72
18	4·0½	3·9½	3·0	.....	.....	60	33·74
19	3·10¼	3·6	2·7	.....	.....	60	25·02
20	4·8	4·5	3·1	.....	.....	60	35·64
×21	4·7½	4·4	3·2½	3·3¾	3·0	55½	35·52
22	4·3	3·11⅛	3·0	.....	.....	60	37·49
23	4·2	4·0⅜	3·0	.....	.....	60	33·74
24	5·1	4·8	3·6	.....	.....	60	45·93
25	4·10⅜	4·3	3·6	.....	.....	60	45·93
26	4·7½	4·2	3·2	.....	.....	60	37·59
27	3·5⅛	3·2	2·4	.....	.....	60	20·41
28	4·4	4·0	3·3	.....	.....	60	39·60
×29	5·2½	4·8	3·7½	3·7¾	2·10	63	51·69
30	3·11	3·7⅛	2·10	.....	.....	60	30·09
31	3·10⅛	3·6	2·7	.....	.....	60	25·02
32	5·0	4·7⅛	3·3	.....	.....	60	39·60
33	3·5⅛	3·3	2·9	.....	.....	60	28·35
×34	4·11¼	4·6	3·5	3·5⅜	2·10	58	42·31
35	3·8	3·3	2·9	.....	.....	60	28·35
36	3·7	3·4⅛	2·7	.....	.....	60	25·02
37	3·7⅜	3·3¼	2·5	.....	.....	60	21·90
38	6·0	5·5⅛	3·9	.....	.....	60	52·73
39	4·0	3·7⅜	2·9	.....	.....	60	28·35
40	3·5	3·1	2·4	.....	.....	60	20·41
41	4·1	3·10	2·11	.....	.....	60	31·89
42	2·7	2·3	2·2	.....	.....	60	17·60
43	3·1	3·9	2·4	.....	.....	60	20·41
×44	3·4	3·0⅛	2·3	2·4¼	1·9	57½	18·18
45	4·5½	4·2	3·1	.....	.....	60	35·64
46	2·11½	2·7⅜	2·2	.....	.....	60	17·60
47	3·3⅛	3·0	2·6	.....	.....	60	23·43
48	3·5⅝	3·1¼	2·8	.....	.....	60	26·66
49	3·9¾	3·5¼	2·5	.....	.....	60	21·90
50	6·6	5·9	4·0	.....	.....	60	60·00
×51	4·8	4·1¼	2·11	3·4½	2·1	63½	33·76
52	4·5½	4·2	3·0	.....	.....	60	33·74
53	3·5½	3·3	2·10	.....	.....	60	30·09
54	3·7¾	3·3½	2·9	.....	.....	60	28·35
55	3·5	3·2	2·8	.....	.....	60	26·66
×56	5·1	4·9	3·11	3·11⅛	2·10	47	45·06
57	3·9	3·5⅛	2·6	.....	.....	60	23·43
×58	4·0½	3·9	2·8	3·1⅛	2·2	60	26·66
59	3·9	3·3	2·9	.....	.....	60	28·35
60	4·11	4·7½	3·4	.....	.....	60	41·66

In addition to the above 60, there are 48 trees classed as measurables.

The total volume of the 60 trees	=	2,030·59 c. ft.
The average bole	=	60 ft.
The average girth at 4′·6″	=	47″·21
The average centre girth	=	35″·52
The average cubical contents per tree	=	33·8 c. ft.
The average annual girth increment, 1 to 40 years	=	1″·18

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Measured by P. M. Lushington, 5th November 1894.

SAMPLE ACRE, ELANJERY, 1858. 5 SECOND CLASS.

Number.	G. at 2′.	G. at 4′·6″.	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	3·2	2·10½	2·3	.....	.....	55	17·40
×″2	4·0	3·9	2·10	3·0½	2·1	68	34·11
3	4·1¼	3·8¼	2·11	.....	.....	55	29·24
4	4·2	3·11	3·3	.....	.....	55	36·30
×5	3·9¾	3·5¾	2·7½	2·10⅜	1·11	60	25·03
6	4·7	4·3	3·6	.....	.....	55	42·01
″7	3·7½	3·4¼	2·7½	.....	.....	55	22·95
8	4·6½	4·1	3·4	.....	.....	55	38·19
×9	4·0½	3·8½	2·11½	3·2⅜	2·5	55½	29·51
10	3·2½	2·11¼	2·4	.....	.....	55	18·71
×11	3·6	3·2¾	2·9	2·9	2·0	52⅜	24·81
12	3·0½	2·8¾	2·1	.....	.....	55	14·91
13	2·6	2·3½	1·10½	.....	.....	55	11·56
14	3·3½	3·1⅛	2·6	.....	.....	55	21·48
15	2·11¾	2·6¾	2·0	.....	.....	55	13·75
″16	3·9	3·5	2·8	.....	.....	55	24·44
×″17	4·2½	3·8½	2·10	2·10¼	1·6	60	34·61
18	4·4	4·0	3·3	.....	.....	55	36·30
″19	3·6½	3·3	2·7	.....	.....	55	22·94
″20	3·8¼	3·6	2·9	.....	.....	55	25·99
×21	2·11	2·7	2·0½	2·2½	1·6	53	13·26
22	3·1¾	2·9½	2·2	.....	.....	55	16·13
23	3·5½	3·2¼	2·6⅜	.....	.....	55	21·49
″24	3·8½	3·4½	2·7½	.....	.....	55	22·95
×25	3·7½	3·1⅜	2·6	2·6½	1·5½	66	25·78
26	2·8¾	2·5⅜	1·11½	.....	.....	55	12·63
27	2·1¼	1·11¼	1·7	.....	.....	55	8·61
28	3·3½	3·1	2·6	.....	.....	55	21·48
×29	3·3¾	2·11½	2·3½	2·4⅜	1·6	55½	17·57
″30	3·11	3·6	2·9	.....	.....	55	25·99
31	2·8	2·5	1·11½	.....	.....	55	12·63
32	3·1	2·9¾	2·2	.....	.....	55	16·13
×33	3·4	2·11½	2·4½	2·7	1·10	43½	14·81
34	2·4	2·1¼	1·9	.....	.....	55	10·52
35	3·6	3·2	2·6⅜	.....	.....	55	21·49
36	2·1⅜	1·11	1·7	.....	.....	55	8·61
37	3·1⅜	2·11	2·4	.....	.....	55	18·71
″38	2·11⅛	2·8	2·1	.....	.....	55	14·91
×39	2·8½	2·5½	1·11	1·11⅛	1·2	57	13·08
40	3·2½	2·11½	2·4	.....	.....	55	18·71
41	3·0½	2·9½	2·2	.....	.....	55	16·13
42	2·8½	2·5½	1·11	.....	.....	55	12·62
″43	4·6	4·3½	3·6	.....	.....	55	42·10
×″44	2·9½	2·7¼	2·2½	2·4½	2·0	45	13·21
″45	4·0½	3·8½	2·11	.....	.....	55	29·24
46	2·10¼	2·7¼	2·0½	.....	.....	55	13·76
47	4·10	4·6	3·8	.....	.....	55	46·21
48	2·9½	2·6½	2·0	.....	.....	55	13·75
49	3·6½	3·2⅜	2·6½	.....	.....	55	21·49
×50	3·2	2·11	2·5	2·5	1·8	57	20·80
51	2·4	2·0½	1·8½	.....	.....	55	9·55
52	2·11¼	2·8½	2·1	.....	.....	55	14·91
53	3·2½	2·11½	2·4	.....	.....	55	18·71
″54	3·3½	2·11½	2·4	.....	.....	55	18·71
×″55	4·4	3·11⅜	3·3	3·2½	2·1	45	29·70
56	3·1¼	2·9¼	2·2	.....	.....	55	16·13
57	3·1	2·10	2·3	.....	.....	55	17·40
58	4·0	3·7½	2·10	.....	.....	55	27·59
59	3·6½	3·3¼	2·7	2·9½	2·1	47	19·60
60	1·11½	1·8½	1·6	.....	.....	55	7·73

In addition to the above 60 trees, there are 39 classed as measurables and 14 trees classed as superior, small.

The total volume of the 60 trees	=	1,269·16 c. ft.
The average bole	=	55 ft.
The average girth at 4′·6″	=	36″·73
The average centre girth	=	29″·26
The average cubical contents per tree	=	21·15 c. ft.
The average annual girth increment, 1 to 36 years	=	1″·02

Measured by P. M. Lushington, 31st October 1894.

SAMPLE ACRE, PANNENGODE, 1863. (6) FIRST CLASS.

Number.	G. at 2'.	G. at 4'·6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	3·1¼	2·10	2·3	.....	.....	52	16·45
2	3·4¼	3·0½	2·5	.....	.....	52	18·98
"3	3·5½	3·1½	2·6	.....	.....	52	20·31
×4	3·0	2·8	2·1	2·3	1·6	53½	14·51
5	3·5¾	3·1¾	2·6	.....	.....	52	20·31
×6	3·7	3·3	2·7	2·8½	1·10	55	22·94
7	3·6½	3·2¾	2·7	.....	.....	52	21·68
8	3·11½	3·7	2·9	.....	.....	52	24·57
×9	3·4½	3·0⅓	2·3	2·6¾	1·8½	56	17·71
10	3·10	3·4	2·6	.....	.....	52	20·31
11	3·7	3·3¾	2·7	.....	.....	52	21·68
12	1·11¾	1·9¼	1·7	.....	.....	52	8·14
×13	3·7½	3·2½	2·9	2·10¾	2·2	39½	18·66
14	3·7½	3·2⅓	2·4	.....	.....	52	17·69
15	3·8	3·2	2·4	.....	.....	52	17·69
×16	3·0	2·9	2·2	2·4¼	1·8½	48½	14·22
17	2·1	1·10¼	1·8	.....	.....	52	9·02
18	3·9½	3·5	2·6	.....	.....	52	20·31
19	3·4¾	3·0½	2·3	.....	.....	52	16·45
"20	5·0	4·8½	3·2	.....	.....	52	32·58
21	3·9½	3·4⅓	2·8	.....	.....	52	23·10
×"22	4·4	4·0	3·2½	3·5½	2·7	57	35·73
×"23	4·0	3·7¾	2·9	3·1¼	2·2½	52⅓	24·81
24	3·5	3·1	2·6	.....	.....	52	20·31
25	3·8¾	3·6	2·10	.....	.....	52	26·08
26	2·11½	2·6	2·1	.....	.....	52	14·10
×27	2·10¾	2·7½	2·1	2·2⅜	1·6	46½	12·61
28	3·1	2·10	2·3	.....	.....	52	16·45
29	3·1½	2·10	2·6	.....	.....	52	20·31
"30	3·6	3·2½	2·6	.....	.....	52	20·31
"31	4·5½	3·11	3·2	.....	.....	52	32·58
"32	4·4	3·11	3·2	.....	.....	52	32·58
33	3·8½	3·4⅛	2·9	.....	.....	52	24·57
×34	3·1½	2·9¾	2·4	2·5¼	1·9	60½	20·58
35	4·2½	3·9	3·2	.....	.....	52	32·58
36	4·5	4·0	2·7	.....	.....	52	21·68
"37	3·1	2·10½	2·8	.....	.....	52	23·10
38	3·4½	3·0	2·6	.....	.....	52	20·31
39	3·4½	3·0½	2·5	.....	.....	52	18·98
×40	3·7	3·1	2·5½	2·7⅜	1·8½	64	23·37
41	3·1	2·9⅜	2·2	.....	.....	52	15·25
42	2·11½	2·6½	1·7	.....	.....	52	8·14
"43	3·7½	3·4	2·6	.....	.....	52	20·31
"44	3·10½	3·6½	2·7	.....	.....	52	21·68
45	2·11½	2·7½	2·4	.....	.....	52	17·69
×46	3·11½	3·7⅜	3·1	3·3¼	2·7	45½	27·03
47	3·6	3·2	2·4	.....	.....	52	17·69
48	2·8	2·5	2·0	.....	.....	52	13·00
×49	2·11¼	2·7⅛	2·1½	2·3⅝	1·8	43	11·67
×50	4·0	3·8⅜	2·11½	2·11	1·10	57½	30·57
51	3·2¾	2·11	2·5	.....	.....	52	18·98
52	3·9⅜	3·4¾	2·7	.....	.....	52	21·68
×53	3·8¼	3·2½	2·7½	2·11⅛	2·2	50	20·86
54	4·0¾	3·8⅓	2·11	.....	.....	52	27·64
55	3·8½	3·3½	2·9	.....	.....	52	24·57
56	2·10	2·5⅝	2·1	.....	.....	52	14·10
57	4·2⅓	3·8¾	3·1	.....	.....	52	30·88
58	4·2¼	3·11	2·8	.....	.....	52	23·10
"59	5·0	4·7½	3·7	.....	.....	52	41·72
60	3·5½	3·2	2·9	.....	.....	52	24·57

In addition to the above 60 trees, there are 59 classed as measurables, 11 superior, small, and 4 classed as first class saplings.

The total volume of the 60 trees ... ... = 1,269·48 c.ft.
The average bole ... ... = 52 ft.
The average girth at 4'·6" ... ... = 36"·38
The average centre girth ... ... = 30"·32
The average cubical contents per tree ... ... = 21·1 c.ft.
The average annual girth increment, 1 to 31 years ... ... = 1"·17

46.

Measured by P. M. Lushington, 1st November.

SAMPLE ACRE, VALUVASHERY, 1866. (7) FIRST CLASS.

Number.	G. at 2'.	G. at 4'·6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	3·3½	2·11¼	2·3	.....	.....	51	16·13
2	3·3½	2·11¾	1·11	.....	.....	51	11·70
×3	3·1½	2·9½	2·3	2·4	1·6½	54	17·08
4	2·11¾	2·8¼	2·6	.....	.....	51	19·02
5	3·6	3·0¼	2·10	.....	.....	51	25·58
×"6	4·2½	3·9	2·9½	3·0½	1·11	61	28·83
⊙ "7	3·2	2·9½	2·0	.....	.....	51	12·75
8	2·4¼	2·1¼	1·5	.....	.....	51	6·39
9	2·5	2·2¾	1·10	.....	.....	51	10·71
×"10	3·4½	3·1⅓	2·4	2·6¾	1·9	51½	17·52
"11	2·11	2·6	1·10	.....	.....	51	10·71
"12	3·1	2·9	1·11	.....	.....	51	11·70
"13	3·9	3·6½	2·5	.....	.....	51	18·61
14	2·6¾	2·3¾	1·9	.....	.....	51	9·76
×"15	3·1	2·10	2·3	2·3¾	1·7½	57	18·03
16	2·8	2·4¾	1·11	.....	.....	51	11·70
17	2·3¾	2·0½	1·7	.....	.....	51	7·98
×18	2·8½	2·4¼	1·11½	1·11⅝	1·3	56	12·66
19	2·10½	2·6	2·0	.....	.....	51	12·75
×20	2·10	2·8	2·1	2·3½	1·9	56	15·18
21	2·11¼	2·7¼	2·2	.....	.....	51	14·96
22	3·9	3·5¼	2·8	.....	.....	51	22·66
×23	3·5½	3·0¼	2·4½	2·8½	1·11½	52½	17·82
24	3·0	2·8½	2·1	.....	.....	51	13·83
25	3·0⅜	2·8¼	2·0	.....	.....	51	12·75
26	2·10¾	2·6	2·3	.....	.....	51	16·13
×27	4·2¾	3·9½	2·10½	3·4⅛	2·5½	44½	22·32
28	2·9¾	2·5	2·0	.....	.....	51	12·75
"29	3·2	2·8	2·3	.....	.....	51	16·13
×30	4·2	3·9	2·10	2·11¼	1·8½	56	28·09
31	2·1½	1·11½	1·6	.....	.....	51	7·17
×32	2·9¾	2·6½	2·2	2·0¾	1·3½	53	15·55
33	2·7	2·4¼	1·9	.....	.....	51	9·76
34	2·8½	2·4	1·7	.....	.....	51	7·98
35	2·5⅜	2·3	2·0	.....	.....	51	12·75
36	2·10	2·7¾	2·2	.....	.....	51	14·96
37	2·0¾	1·10¼	1·7	.....	.....	51	7·98
38	2·1½	1·11	1·6	.....	.....	51	7·17
39	2·6	2·3	1·10	.....	.....	51	10·71
40	2·2	2·0⅜	1·8	.....	.....	51	8·85
×"41	3·3	3·1	2·9	2·6¼	1·9½	48	22·68
42	2·5	2·3½	1·9	.....	.....	51	9·76
43	2·10½	2·7¾	1·10	.....	.....	51	10·71
×44	2·10	2·6	2·0½	2·1⅝	1·5½	47½	11·88
45	2·4	2·1	1·6	.....	.....	51	7·17
46	2·0⅜	1·10	1·6	.....	.....	51	7·17
"47	3·0	2·11	2·0	.....	.....	51	12·75
48	2·0¼	1·9½	1·5	.....	.....	51	6·39
×49	2·5	2·1⅝	1·8	1·10	1·3	41½	7·19
50	2·7½	2·4¾	1·9	.....	.....	51	9·76
51	2·5½	2·2½	1·8	.....	.....	51	8·85
52	2·9½	2·6½	2·2	.....	.....	51	14·96
×"53	3·7	3·3	2·5	2·9¼	1·11½	48	17·52
54	2·11	2·8½	2·2	.....	.....	51	14·96
55	3·0	2·10¾	2·2	.....	.....	51	14·96
×56	2·6½	2·2¼	1·10	1·10½	1·2	45	9·45
57	2·8¼	2·5	1·10	.....	.....	51	10·71
"58	3·3	3·1	2·5	.....	.....	51	18·61
59	2·4½	2·0⅜	1·9	.....	.....	51	9·76
×60	2·6	2·3¾	1·11½	2·1	1·8	50	11·49

In addition to the above 60 trees there are 16 superior, small, 26 first class, 1 second class, and 69 other classes of saplings, chiefly measurables.

The total volume of the 60 trees ... ... = 812·94 c. ft.
The average bole ... ... = 51 ft.
The average girth at 4'·6" ... ... = 31"·28
The average centre girth ... ... = 24"·33
The average cubical contents per tree ... ... = 15·7 c. ft.
The average annual girth increment, 1 to 28 years ... ... = 1"·12

Measured by P. M. Lushington, 1st November 1894.

SAMPLE ACRE, VALUVASHERY, 1868. (8) SECOND CLASS.

Number.	G. at 2′.	G. at 4′6″.	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·11¾	2·9	2·3	2·5⅜	1·11	43½	13·76
2	2·9	2·4⅜	2·0	.....	.....	45	11·25
3	2·4½	2·1	1·10	.....	.....	45	9·45
4	2·0¾	1·10½	1·8½	.....	.....	45	7·82
5	2·11½	2·7⅜	2·2½	.....	.....	45	13·21
×6	2·2	1·10⅜	1·8½	1·7⅜	1·4	44	7·64
7	2·1½	1·10	1·8	.....	.....	45	7·51
×8	2·5½	2·3	2·0½	1·10¼	1·3	48½	12·13
″9	2·8	2·6	2·2	.....	.....	45	13·20
10	2·3½	1·11½	1·9	.....	.....	45	8·61
11	2·4½	2·3⅜	1·11¼	.....	.....	45	10·33
12	2·7⅜	2·5	2·1½	.....	.....	45	12·21
13	3·1½	2·9	2·4	.....	.....	45	15·31
14	2·6	2·3	1·11¼	.....	.....	45	10·33
×″15	3·10	3·5	2·9	2·10½	1·10½	50½	23·86
16	2·0¼	1·9⅜	1·8	.....	.....	45	7·81
17	2·6	2·3	1·11¼	.....	.....	45	10·33
″18	3·0½	2·8	2·3	.....	.....	45	14·23
×19	2·7¾	2·4½	1·11	2·1⅜	1·7	43	9·87
20	2·11¼	2·7⅜	2·2½	.....	.....	45	13·21
21	2·5½	2·2½	1·10½	.....	.....	45	9·45
22	2·2⅞	1·10½	1·8½	.....	.....	45	7·82
23	3·1⅜	2·9	2·4	.....	.....	45	15·31
×24	2·10	2·5½	2·2	2·3	1·8	44	12·90
25	2·4¼	2·1⅜	1·10	.....	.....	45	9·45
26	2·8	2·5	2·1½	.....	.....	45	12·21
27	2·8¼	2·5¼	2·1½	.....	.....	45	12·21
×28	2·6⅜	2·5	2·1½	2·1⅞	1·9	42	11·40
″29	2·2	2·0½	1·9	.....	.....	45	8·61
×30	2·6⅜	2·3½	1·10	1·10⅞	1·3	49½	10·39
31	2·3½	2·1⅜	1·10	.....	.....	45	9·45
32	3·3	2·11½	2·5½	.....	.....	45	16·43
33	2·4	2·1⅛	1·10	.....	.....	45	9·45
×34	2·5	2·2¼	1·11	2·0	1·7	40½	9·29
35	2·5¾	2·2¼	1·10½	.....	.....	45	9·45
36	2·6½	2·4¼	2·0	.....	.....	45	11·25
×37	2·5½	2·2⅛	1·9⅛	1·10⅜	1·3½	45½	8·70
38	2·9¾	2·6	2·2	.....	.....	45	13·21
39	3·1	2·9½	2·4	.....	.....	45	15·31
40	2·6¼	2·3½	1·11½	.....	.....	45	10·33
41	3·0	2·8	2·3	.....	.....	45	14·23
×42	3·3½	2·11¼	2·5⅛	2·8⅜	2·1½	43½	15·88
43	2·7	2·3½	1·11½	.....	.....	45	10·33
″44	2·11	2·7⅛	2·2½	.....	.....	45	13·21
×45	3·1½	2·9⅜	2·5½	2·3½	1·5½	56	20·44
46	2·6½	2·3	1·11½	.....	.....	45	10·33
47	2·10½	2·5⅜	2·1½	.....	.....	45	12·21
×48	2·9	2·5⅜	2·0½	2·3	1·9	36	9·00
″49	2·8	2·4½	2·0	.....	.....	45	11·25
×50	2·11	2·7⅜	2·0½	2·3½	1·8	46½	11·50
″51	3·0	2·10	2·5	.....	.....	45	16·42
52	2·10½	2·6½	2·2	.....	.....	45	13·20
53	2·1⅜	1·11½	1·9	.....	.....	45	8·61
″54	2·8¼	2·6	2·2	.....	.....	45	13·20
55	2·2½	1·11⅜	1·9	.....	.....	45	8·61
56	2·5⅜	2·3⅜	1·11¼	.....	.....	45	10·33
×57	3·3	2·10½	2·3½	2·6	1·9	51½	16·30
58	2·5	2·1⅜	1·10	.....	.....	45	9·45
59	2·0½	2·6	2·2	.....	.....	45	13·20
60	3·3¼	2·11	2·5½	.....	.....	45	16·43

In addition to the above 60 trees, there are 27 measurables, 69 superior, small, 51 first class, 68 second class, 7 third class, 1 fourth class and 2 classed as eighth class saplings.

The total volume of the 60 trees	= 709·12 c. ft.
The average bole	= 45 ft.
The average girth at 4′6″	= 28″·78
The average centre girth	= 24″·54
The average cubical contents per tree	= 11·8 c. ft.
The average annual girth increment, 1 to 26 years	= 1″·10

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Measured by P. M. Lushington, 6th November 1894.

SAMPLE ACRE, CHATAMBORAI, 1872. (9) SECOND CLASS.

Number.	G. at 2′.	G. at 4′6″.	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	2·7½	2·3⅜	1·10½	.....	.....	41	8·62
2	3·0	2·8	2·1	.....	.....	41	11·12
3	2·4⅜	2·1¾	1·9	.....	.....	41	7·84
×4	2·10⅝	2·6	1·10½	2·2	1·5	54	11·35
×5	2·2⅜	2·0⅜	1·9	1·7⅛	1·1	44	8·42
6	2·11	2·5⅜	1·11½	.....	.....	41	9·42
″7	2·7⅛	2·3½	1·10½	.....	.....	41	8·62
×8	2·9¼	2·4⅞	2·0	2·2⅜	1·7½	39	9·75
9	2·9½	2·5⅜	1·11½	.....	.....	41	9·42
10	1·9⅜	1·6⅜	.....	.....	.....	41	10·25
11	3·1½	2·8⅜	2·1	.....	.....	41	11·12
×12	2·6½	2·2½	1·11	1·11	1·3½	49	11·25
13	2·3½	2·1	1·9	.....	.....	41	7·84
14	2·7½	2·3⅜	1·10½	.....	.....	41	8·62
15	2·10⅜	2·5½	1·11½	.....	.....	41	9·42
16	2·1½	1·10¾	1·7	.....	.....	41	6·42
17	2·4½	2·1	1·9	.....	.....	41	7·84
×18	2·4	2·0¾	1·8	1·9½	1·3	38	6·59
19	2·5	2·2	1·10	.....	.....	41	8·61
20	2·5⅜	2·3½	1·10½	.....	.....	41	8·62
″21	2·5⅜	2·3	1·10½	.....	.....	41	8·62
×″22	2·6	2·2⅜	1·9	1·8⅜	0·11½	53	10·14
23	2·2¼	1·10⅜	1·7	.....	.....	41	6·42
24	2·9⅜	2·6½	2·0	.....	.....	41	10·25
×25	2·10	2·7	1·11	2·1½	1·5	37	8·49
26	2·6⅜	2·3½	1·10½	.....	.....	41	8·62
27	2·7⅜	2·4½	1·11	.....	.....	41	9·41
×28	2·10¾	2·6½	2·0½	2·2½	1·6½	39	9·75
29	2·7¾	2·4½	1·11	.....	.....	41	9·41
30	2·3½	2·0⅜	1·8½	.....	.....	41	7·12
31	2·1½	1·11	1·7	.....	.....	41	6·42
×32	2·6⅜	1·8⅜	1·7	1·7½	1·2½	35	5·48
33	2·1⅜	2·1	1·9	.....	.....	41	7·84
34	2·0⅜	1·9¾	1·7	.....	.....	41	6·42
35	2·4½	2·1⅜	1·9	.....	.....	41	7·84
×″36	2·6	2·4	1·10	1·10	1·2	41	8·61
37	2·3¼	1·11¼	1·7	.....	.....	41	6·42
38	2·2½	1·11¼	1·7	.....	.....	41	6·42
39	1·9½	1·7	1·6	.....	.....	41	5·76
40	2·3½	2·0¼	1·8½	.....	.....	41	7·12
×41	1·9	1·6⅜	1·6½	1·3¾	0·10½	34	4·78
42	2·7¼	2·4	1·11	.....	.....	41	9·41
×43	3·2	2·8⅜	2·3¾	2·7½	2·1	20	9·50
44	2·7½	2·5	1·11½	.....	.....	41	9·42
45	2·7½	2·4½	1·11	.....	.....	41	9·41
×46	2·3½	2·1¼	1·10½	1·10	1·4½	38½	8·09
47	2·3½	2·0	1·8½	.....	.....	41	7·12
48	2·7	2·3	1·10½	.....	.....	41	8·62
49	1·10	1·7½	1·6	.....	.....	41	5·76
50	2·10	2·6½	2·0	.....	.....	41	10·25
×51	2·0½	1·10	1·4	1·6⅝	1·1	32	3·55
52	3·0⅜	2·8½	2·1	.....	.....	41	11·12
53	2·11	2·6¼	2·0	.....	.....	41	10·25
54	1·8¼	1·6	1·4	.....	.....	41	4·55
×55	3·1	2·8½	1·10	2·2	1·3	48	10·08
56	3·2	2·11	2·4	.....	.....	41	13·95
57	2·9	2·5½	1·11½	.....	.....	41	9·42
×58	2·7¼	2·2¾	1·10	2·1	1·6½	41½	8·71
59	2·5½	2·2	1·10	.....	.....	41	8·61
60	2·2	1·10	1·7	.....	.....	41	6·42

In addition to the above 60, there are 11 measurables, 30 superior, small, 52 first class, 60 second class, 55 third class and 27 classed as fourth class saplings.

The total volume of the 60 trees	= 507·72 c. ft.
The average bole	= 41 ft
The average girth at 4′6″	= 26″·51
The average centre girth	= 21″·83
The average cubical contents per tree	= 8·46 c. ft.
The average annual girth increment, 1 to 22 years	= 1″·20

Measured by P. M. Lushington, 31st October 1894.

SAMPLE ACRE, PANNENGODE, 1886. (10)

Number.	G. at 2'.	G. at 4'·6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
1	.....	2·2¼	.....	.....	.....	.....	.....
2	.....	1·6	.....	.....	.....	.....	.....
3	.....	1·5	.....	.....	.....	.....	.....
4	.....	1·9½	.....	.....	.....	.....	.....
5	.....	1·4½	.....	.....	.....	.....	.....
6	.....	1·4½	.....	.....	.....	.....	.....
7	.....	1·5½	.....	.....	.....	.....	.....
8	.....	1·3¾	.....	.....	.....	.....	.....
9	.....	1·1½	.....	.....	.....	.....	.....
10	.....	1·5½	.....	.....	.....	.....	.....
11	.....	1·5½	.....	.....	.....	.....	.....
12	.....	1·7½	.....	.....	.....	.....	.....
13	.....	1·3½	.....	.....	.....	.....	.....
14	.....	1·6½	.....	.....	.....	.....	.....
15	.....	1·9	.....	.....	.....	.....	.....
16	.....	1·0¼	.....	.....	.....	.....	.....
17	.....	0·11¾	.....	.....	.....	.....	.....
18	.....	1·1	.....	.....	.....	.....	.....
19	.....	1·4	.....	.....	.....	.....	.....
20	.....	1·1½	.....	.....	.....	.....	.....
21	.....	1·0	.....	.....	.....	.....	.....
22	.....	1·2½	.....	.....	.....	.....	.....
23	.....	1·2¼	.....	.....	.....	.....	.....
24	.....	1·2¼	.....	.....	.....	.....	.....
25	.....	1·1	.....	.....	.....	.....	.....
26	.....	1·2	.....	.....	.....	.....	.....
27	.....	1·2	.....	.....	.....	.....	.....
28	.....	1·2¼	.....	.....	.....	.....	.....
29	.....	1·3¾	.....	.....	.....	.....	.....
30	.....	1·2¼	.....	.....	.....	.....	.....
31	.....	1·2	.....	.....	.....	.....	.....
32	.....	1·5½	.....	.....	.....	.....	.....
33	.....	1·3¼	.....	.....	.....	.....	.....
34	.....	1·3	.....	.....	.....	.....	.....
35	.....	1·3¾	.....	.....	.....	.....	.....
36	.....	1·3¼	.....	.....	.....	.....	.....
37	.....	1·1½	.....	.....	.....	.....	.....
38	.....	1·4½	.....	.....	.....	.....	.....
39	.....	1·2¾	.....	.....	.....	.....	.....
40	.....	1·2⅝	.....	.....	.....	.....	.....
41	.....	1·2½	.....	.....	.....	.....	.....
42	.....	1·2¾	.....	.....	.....	.....	.....
43	.....	1·1½	.....	.....	.....	.....	.....
44	.....	0·11½	.....	.....	.....	.....	.....
45	.....	1·2½	.....	.....	.....	.....	.....
46	.....	1·1	.....	.....	.....	.....	.....
47	.....	1·8½	.....	.....	.....	.....	.....
48	.....	0·11½	.....	.....	.....	.....	.....
49	.....	1·0	.....	.....	.....	.....	.....
50	.....	1·2½	.....	.....	.....	.....	.....
51	.....	1·1¾	.....	.....	.....	.....	.....
52	.....	1·7¾	.....	.....	.....	.....	.....
53	.....	1·1¾	.....	.....	.....	.....	.....
54	.....	1·2¼	.....	.....	.....	.....	.....
55	.....	1·5½	.....	.....	.....	.....	.....
56	.....	1·5	.....	.....	.....	.....	.....
57	.....	0·11¾	.....	.....	.....	.....	.....
58	.....	1·2½	.....	.....	.....	.....	.....
59	.....	1·2¾	.....	.....	.....	.....	.....
60	.....	1·3½	.....	.....	.....	.....	.....

In addition to the above 60, there were found 760 poles which would be marketable.

The total height of Nos. 1, 2, 4 and 5 were taken giving 55½, 53½, 47 and 47 feet, respectively, or an average of 50 feet for the plantation.

The average girth at 4'·6" ... ... = 15"·33
The average annual girth increment, 1 to 8 years ... ... = 1"·98

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Tabular Statement of Results of (1) *to* (10).

Name and year of compartment.	Age.	Class.	Number of trees per acre.	Number of trees to be reserved from thinnings to constitute final crop.	Number of trees to be removed in thinnings.	Quality of thinnings.	Average bole.	Volume of reserved trees in cubic feet.	Average girth at 4'·6".	Average centre girth.	Average cubical contents.	Average annual girth increment.
	yrs.											
Aravillykava ... 1844	50	First.	63	60	8	Logs	63	2,333·44	53"·64	40"·63	48·99	1"·07
Edlacode ... 1846	48	Do.	89	59	39	Do.	66	2,313·50	48"·46	36"·67	39·21	1"·01
Arevacode ... 1847	47	Do.	172	60	112	Logs and measurables.	65	2,510·13	49"·25	38"·38	41·38	1"·06
Pannengode ... 1854	40	Do.	108	60	48	Do. do. ...	60	2,030·59	47"·21	35"·52	33·80	1"·18
Elanjery ... 1878	36	Second.	113	60	53	Superior, small, and measurables.	55	1,253·16	36"·73	29"·23	21·15	1"·02
Pannengode ... 1863	31	First.	134	60	74	Do. do. ...	52	1,269·43	36"·38	30"·32	21·10	1"·17
Valuvashery ... 1866	28	Do.	172	60	112	Measurables, superior, small, and first class.	51	812·94	31"·28	24"·33	13·70	1"·12
Do. ... 1868	26	Second.	285	60	225	Measurables, superior, small, first and second classes.	45	709·12	28"·78	21"·54	11·80	1"·10
Chatamborai ... 1872	22	Do.	295	60	235	Superior, small, first, second, third and fourth classes.	41	507·72	26"·51	21"·83	8·46	1"·20
Pannengode ... 1886	8	...	820	60	760	Fourth and fifth classes.	*50	...	15"·33	...	...	1"·91

* This is the extreme height.

These are the only samples from which the current rate of growth can be obtained as they are the only samples measured previously by Mr. Rego.

The figures have been compared in the following tables and the following obtained as the current rate of growth :—

Years.	First class.	Second class.	Years.	First class.	Second class.
8	1·413	...	36	...	·468
22	...	·750	40	·729	...
26	...	·738	47	·560	...
28	·870	...	48	·351	...
31	·804	...	50	·624	...

It will be noticed that the growth in the plantation 48 years old is very slow though the soil is certainly first class, this may be due to error in measurement on the part of Mr. Rego. It will be seen generally that the annual girth increment decreases with the age.

Comparison of Measurements.

ARAVILLYKAVA, 1844.

Number.	May 1892, G.a t 5'.	November 1894, G. at 5'.	Number.	May 1892, G. at 5'.	November 1894, G. at 5'.	Number.	May 1892.	November 1894, G. at 5'.
1 ...	4·5	4·10	19 ...	3·7	3·8	37 ...	5·7	5·8
2 ...	3·5	3·8	20 ...	3·7	3·8½	38 ...	3·2	3·4
3 ...	5·5	5·6½	21 ...	4·4	4·5½	40 ...	3·5	3·6½
4 ...	3·6	3·9	25 ...	3·9	3·9	42 ...	4·3	4·3½
5 ...	3·5	3·6	26 ...	4·8	4·9	46 ...	3·7	3·8¾
6 ...	4·7	4·8	28 ...	3·8	3·8½	48 ...	4·6	4·8
7 ...	3·10	3·10½	29 ...	3·11	4·0¾	50 ...	4·7	4·8½
8 ...	4·2	4·5	30 ...	4·6	4·9	51 ...	3·7	3·7¼
9 ...	4·11	5·0¼	31 ...	3·5	3·6½	52 ...	3·10	4·0
10 ...	4·11	5·1	32 ...	5·2	5·3½	53 ...	4·11	4·11¾
13 ...	5·0	5·2½	33 ...	4·0	4·1¼	55 ...	4·2	4·2
14 ...	4·10	5·0½	34 ...	4·6	4·7	56 ...	4·5	4·6½
16 ...	4·3	4·3½	35 ...	4·5	4·6½	.....	...	...
17 ...	4·1	4·4	36 ...	3·11	3·11¼	.....	...	...
						Grand Total ...	168·1	173·3½

Total increment ... ... = 5"·2½
Average increment from May 1892 to November 1894

Comparison of Measurements—continued.

DACODE, 1846.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
...	5·1	5·3	21 ...	3·0	3·1	38 ...	3·6	3·6
...	4·11	5·0½	23 ...	5·9	6·0	40 ...	3·0	3·0¼
...	4·2	4·3½	24 ...	4·3	4·3½	42 ...	3·10	3·10½
...	4·10	4·11	25 ...	3·9	3·9½	43 ...	3·5	3·5½
...	3·7	3·10	27 ...	3·10	3·10½	44 ...	3·2	3·2½
...	2·11	2·11	29 ...	3·1	3·1¼	45 ...	4·7	4·7¾
...	4·2	4·3	30 ...	3·11	3·11	49 ...	3·6	3·9½
...	3·4	3·5	35 ...	3·2	3·2½	57 ...	3·2	3·2
...	3·5	3·6¼	36 ...	4·9	4·10¼	60 ...	4·5	4·5
...	3·10	3·10¼	37 ...	4·0	4·0¾	...	...	...
						Grand Total ...	112·4	114·5½

Total increment ... ... = 2′·1½″
Average increment from May 1892 to November 1894 ... ... = ·879″.
Average annual increment ... ... = ·351″.

Comparison of Measurements—continued.

EVACODE, 1847.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	4·1	4·2½	18 ...	3·3	3·6	44 ...	3·11	4·0
4 ...	3·10	4·0	24 ...	4·1	4·2¼	45 ...	3·5	3·5¾
5 ...	3·5	3·6¾	26 ...	4·0	4·1⅛	47 ...	3·10	3·10½
6 ...	3·6	3·8	29 ...	3·7	3·7½	48 ...	4·5	4·5½
7 ...	3·6	3·10	31 ...	3·8	3 8½	50 ...	3·8	3·8½
8 ...	3·7	3·8	32 ...	4·4	4·5¼	52 ...	4·7	4·8
9 ...	4·2	4·5	33 ...	3·4	3·5	53 ...	4·2	4·3¼
0 ...	4·0	4·2	35 ...	3·8	3·9¾	54 ...	4·4	4·4¼
1 ...	3·9	3·10¾	36 ...	4·2	4·2½	55 ...	4·11	5 0¼
2 ...	4·3	4·5½	37 ...	4·1	4·2¾	56 ...	4·2	4·3¾
3 ...	3·2	3·3½	38 ...	3·10	3·10½	57 ...	3·9	3·10¾
4 ...	3·7	3·7½	39 ...	3·9	3·10	58 ...	3·7	3·8¾
5 ...	3·10	4·0¾	40 ...	3·10	3·11¼	60 ...	3·5	3·6
6 ...	4·6	4·8½	41 ...	4·2	4·2¾	...	...	...
7 ...	3·7	3·8¼	42 ...	4·0	4·1¼	...	...	...
						Grand Total ...	166·8	171·8¼

Total increment ... ... = 5″·0¼″
Average increment from May 1892 to November 1894 ... ... = 1″·401″
Average annual increment ... ... = ·560″

Comparison of Measurements—continued.

ANNENGODE, 1854.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	4·1	4·3	15 ...	4·0	4·3½	32 ...	4·5	4·7½
2 ...	3·9	3·10½	17 ...	4·11	5·1	34 ...	4·5	4·6
3 ...	4·1	4·4	18 ...	3·8	3·9½	36 ...	3·3	3·4½
4 ...	3·4	3·7	19 ...	3·4	3·6	37 ...	3·2	3·3
5 ...	4·6	4·9	20 ...	4·3	4·5	38 ...	5·4	5·5
6 ...	4·2	4·3	21 ...	4·2	4·4	39 ...	3·7	3·7½
7 ...	4·7	4·9½	22 ...	3·9	3·11½	41 ...	3·9	3·10
8 ...	4·0	4·2¾	23 ...	3·11	4·0½	45 ...	4·0	4·2
9 ...	4·1	4·2½	24 ...	4·7	4·8	49 ...	3·4	3·5½
10 ...	3·10	4·0½	26 ...	4·0	4·2	50 ...	5·8	5·9½
11 ...	3·7	3·9	27 ...	3·1	3·2	54 ...	3·3	3·3
12 ...	4·10	4·11½	28 ...	3·11	4·0	55 ...	3·1	3·2
13 ...	3·6	3·8¾	29 ...	4·6	4·8	56 ...	4·8	4·9
14 ...	4·10	5·1⅛	30 ...	3·6	3·7½	...	...	...
						Grand Total ...	164·8	170·10¾

Total increment ... ... = 6″·2¾″
Average increment from May 1892 to November 1894 ... ... = 1″·823
Average annual increment ... ... = ·729″

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Comparison of Measurements—continued.

ELANJERY, 1858.

Number.	May 1892, G at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	2·6	2·10½	27 ...	1·11	1·11½	50 ...	2·10	2·11
3 ...	3·7	3·8¼	28 ...	2·10	3·1	51 ...	2·0	2·0½
4 ...	3·10	3·11	29 ...	2·10	2·11½	52 ...	2·8	2·8l
5 ...	3·4	3·5¾	31 ...	2·4	2·5	53 ...	2·10	2·11½
6 ...	4·3	4·3	32 ...	2·9	2·9½	56 ...	2·9	2·90
8 ...	3·10	4·1	33 ...	2·11	2·11½	57 ...	2·8	2·1
9 ...	3·7	3·8½	34 ...	2·1	2·1¼	58 ...	3·7	3·7
10 ...	2·11	2·11½	35 ...	3·0	3·2	60 ...	1·8	1·8½
11 ...	3·2	3·2¾	39 ...	2·5	2·5½	...	...	...
12 ...	2·7	2·8¾	41 ...	2·7	2·9¼	...	...	...
13 ...	2·2	2·3½	42 ...	2·5	2·5½	...	...	...
14 ...	3·0	3·1½	46 ...	2·7	2·7½	...	...	...
21 ...	2·7	2·7	47 ...	4·5	4·6	...	...	...
23 ...	3·2	3·2½	48 ...	2·5	2·6½	...	...	...
26 ...	2·5	2·5¾	49 ...	3·0	3·2¾	...	...	...
						Grand Total ...	108·5	112·1½

Total increment ... ... = 3′8½″
Average increment from May 1892 to November 1894 ... ... = 1″·171
Average annual increment ... ... = ·468

Comparison of Measurements—continued.

PANNENGODE, 1863.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	2·8	2·10	19 ...	2·9	3·0½	45 ...	2·6	2·7½
2 ...	2·10	3·0½	21 ...	3·3	3·4½	46 ...	3·6	3·7
4 ...	2·6	2·8	24 ...	3·0	3·1	47 ...	3·0	3·2
5 ...	2·11	3·1¾	25 ...	3·5	3·6	48 ...	2·4	2·5
6 ...	3·0	3·3	...			...		
7 ...	3 1	3·2¾	26 ...	2·4	2·6	49 ...	2·6	2·7½
8 ...	3·4	3·7	...			...		
9 ...	2·11	3·0½	27 ...	2·5	2·7½	50 ...	3·6	3·8¾
10 ...	3·1	3·4	28 ...	2·8	2·10	51 ...	2·10	2·11
11 ...	3·2	3·3½	29 ...	2·9	2·10	52 ...	3·2	3·4¾
12 ...	1·8	1·9½	34 ...	2·8	2·9¾	53 ...	3·1	3·2½
13 ...	3·0	3·2½	35 ...	3·6	3·9	55 ...	3·2	3·3½
14 ...	3·0	3·2½	36 ...	3·9	4·0	56 ...	2·4	2·5½
15 ...	2·11	3·2	38 ...	2·11	3·0½	57 ...	3·7	3·8½
16 ...	2·8	2·9	40 ...	2·10	3·1	58 ...	3·9	3·11
17 ...	1·9	1·10¼	41 ...	2·8	2·9¾	60 ...	3·1	3·2
18 ...	3·0	3·5	42 ...	2·5	2·6½	...	...	...
						Grand Total ...	136·1	143·11½

Total increment ... ... = 7′·10½″
Average increment from May 1892 to November 1894 ... ... = 2″·010
Average annual increment ... ... = ·804′

Comparison of Measurements—continued.

VALUVASHERY, 1866.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	2·8	2·11¼	23 ...	2·7	3·0½	40 ...	1·10	2·0½
2 ...	2·8	2·11¾	24 ...	2·6	2·8½	42 ...	2·1	2·3½
3 ...	2·8	2·9½	25 ...	2·6	2·8½	43 ...	2·5	2·7¾
4 ...	2·7	2·8½	26 ...	2·4	2·6	44 ...	2·4	2·6
5 ...	2·11	3·0¾	27 ...	3·6	3·9¼	45 ...	1·11	2·1
8 ...	2·0	2·1¼	28 ...	2·1	2·5	46 ...	1·9	1·10
9 ...	2·0	2·2¾	30 ...	3·5	3·9	48 ...	1·9	1·9½
14 ...	2·1	2·3¾	31 ...	1·9	1·11½	49 ...	2·1	2·1½
16 ...	2·3	2·4¾	32 ...	2·4	2·6½	50 ...	2·3	2·4¾
17 ...	1·11	2·0½	33 ...	2·3	2·4½	51 ...	2·0	2·2½
18 ...	2·2	2·4¼	35 ...	2·1	2·3	52 ...	2·5	2·6½
19 ...	2·4	2·6	36 ...	2·5	2·7¾	57 ...	2·3	2·5
20 ...	2·5	2·8	37 ...	1·9	1·10½	59 ...	2·0	2·0¾
21 ...	2·5	2·7¼	38 ...	1·9	1·11	60 ...	2·2	2·3½
22 ...	3·3	3·5¼	39 ...	2·2	2·3	.....	...	...
						Grand Total ...	101·0	108·11¾

Total increment ... ... = 7′·11¾″
Average increment from May 1892 to November 1894 ... ... = 2″·176
Average annual increment ... ... = ·870″

Comparison of Measurements—continued.

VALUVASHERY, 1868.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	2·7	2·9	22 ...	1·10	1·10½	41 ...	2·6	2·8
2 ...	2·3	2·4½	23 ...	2·7	2·9	42 ...	2·6	2·11½
3 ...	1·11	2·1	24 ...	2·4	2·5½	43 ...	2·2	2·3¼
4 ...	1·9	1·10½	25 ...	2·0	2·1¾	45 ...	2·7	2·9¾
5 ...	2·6	2·7¾	26 ...	2·3	2·5	46 ...	2·1	2·3
6 ...	1·10	1·10½	27 ...	2·4	2·5¾	47 ...	2·4	2·5¾
7 ...	1·9	1·10	28 ...	2·4	2·5	48 ...	2·4	2·5½
8 ...	2·0	2·3	30 ...	2·1	2·3½	50 ...	2·6	2·7¾
10 ...	1·10	1·11½	31 ...	2·0	2·1¾	52 ...	2·4	2·6½
11 ...	2·1	2·2¾	32 ...	2·10	2·11½	53 ...	1·10	1·11¼
12 ...	2·2	2·5	33 ...	2·0	2·1¾	55 ...	1·10	1·11½
13 ...	2·7	2·9	34 ...	2·1	2·2¼	56 ...	2·2	2·3¾
14 ...	2·1	2·3	35 ...	2·1	2·2¼	57 ...	2·9	2·10½
16 ...	1·9	1·9½	36 ...	2·2	2·4½	58 ...	2·1	2·1¾
17 ...	2·2	2·3	37 ...	2·0	2·2½	59 ...	2·4	2·6
19 ...	2·2	2·4½	38 ...	2·4	2·6	60 ...	2·8	2·11
20 ...	2·5	2·7¼	39 ...	2·7	2·9½	.....	...	...
21 ...	2·1	2·2½	40 ...	2·2	2·3¼	.....	...	...
						Grand Total ...	114·11	122·11

Total increment ... ... = 8′·0″
Average increment from May 1892 to November 1894 ... ... = 1″·846
Average annual increment ... ... = ·738″

Comparison of Measurements—continued.

CHATAMBORAI, 1872.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	2·1	2·3½	23 ...	1·10	1·10¾	44 ...	2·2	2·5
2 ...	2·5	2·8	24 ...	2·4	2·6½	45 ...	2·4	2·4½
3 ...	2·0	2·1½	25 ...	2·4	2·7	46 ...	1·11	2·1¼
4 ...	2·4	2·6	26 ...	2·1	2·3¼	47 ...	1·10	2·0
5 ...	1·11	2·0½	27 ...	2·4	2·4½	48 ...	2·2	2·3
6 ...	2·2	2·5½	28 ...	2·4	2·6½	49 ...	1·7	1·7½
7 ...	2·2	2·5½	29 ...	2·3	2·4¼	50 ...	2·4	2·6½
8 ...	2·2	2·4½	30 ...	1·10	2·0½	51 ...	1·8	1·10
9 ...	2·5	2·5½	31 ...	1·8	1·11	52 ...	2·5	2·8½
10 ...	1·6	1·6½	32 ...	1·8	1·8½	53 ...	2·4	2·6¼
11 ...	2·5	2·8½	33 ...	1·10	2·1	54 ...	1·6	1·6
12 ...	2·1	2·2½	34 ...	1·9	1·9½	55 ...	2·4	2·8½
13 ...	2·0	2·1	35 ...	1·11	2·1½	56 ...	2·8	2·11
14 ...	2·2	2·3½	37 ...	1·9	1·11¼	57 ...	2·5	2·5½
15 ...	2·4	2·5½	38 ...	1·11	1·11¼	58 ...	2·1	2·2½
16 ...	1·6	1·10½	39 ...	1·6	1·7	59 ...	1·11	2·3
17 ...	2·0	2·1	40 ...	1·10	2·0½	60 ...	1·10	1·10
18 ...	1·11	2·0½	41 ...	1·6	1·6½	.....	...	...
19 ...	2·1	2·2	42 ...	2·2	2·4	.....	...	...
20 ...	2·3	2·5½	43 ...	2·7	2·8½	Grand Total ...	116·10	125·9

Total increment ... ... = 8′·11″
Average increment from May 1892 to November 1894 ... ... = 1″·877
Average annual increment ... ... = ·750″

Comparison of Measurements—continued.

PANNENGODE, 1886.

Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.	Number.	May 1892, G. at 5′.	November 1894, G. at 5′.
1 ...	1·8	2·2½	21 ...	·10	1·0	41 ...	·10	1·2½
2 ...	1·3	1·6	22 ...	·11	1·2⅛	42 ...	1·0	1·2⅝
3 ...	1·1	1·5	23 ...	·11	1·2½	43 ...	·11	1·1½
4 ...	1·4	1·9½	24 ...	·10	1·2¼	45 ...	1·0	1·2⅝
5 ...	1·0	1·4½	25 ...	·10	1·1	46 ...	·10	1·1
6 ...	1·1	1·4½	26 ...	1·00	1·2	47 ...	1·3	1·6⅛
7 ...	1·1	1·5½	27 ...	·10	1·2	48 ...	·11	·11½
8 ...	1·0	1·5⅜	28 ...	·11	1·2½	49 ...	·8	1·0
9 ...	1·0	1·1⅛	29 ...	1·0	1·3⅛	50 ...	1·0	1·2½
10 ...	1·0	1·5½	30 ...	·10	1·2½	51 ...	·11	1·1½
11 ...	1·3	1·5½	31 ...	·10	1·2	52 ...	1·3	1·7½
12 ...	1·2	1·7½	32 ...	1·1	1·5½	53 ...	1·0	1·1⅝
13 ...	1·3	1·3½	33 ...	1·0	1·3½	54 ...	·11	1·2½
14 ...	1·3	1·6⅛	34 ...	1·0	1·3	55 ...	1·1	1·5⅛
15 ...	1·3	1·9	35 ...	1·0	1·3⅝	56 ...	1·1	1·5
16 ...	·9	1·0½	36 ...	·11	1·3½	57 ...	·11	11⅝
17 ...	·11	·11⅝	37 ...	·10	1·1½	58 ...	·11	1·2½
18 ...	·10	1·1	38 ...	·11	1·2⅛	59 ...	·11	1·2⅝
19 ...	1·0	1·4	39 ...	·11	1·2⅛	60 ...	1·0	1·3⅛
20 ...	·11	1·1½	40 ...	·10	1·2⅛	.....	...	...
						Grand Total ...	58·7	76·3

Total increment ... ... = 17′·8″
Average increment from May 1892 to November 1894 ... ... = 3″·593
Average annual increment ... ... = 1″·437

APPENDIX C.

THE AGE OF EXPLOITABILITY.

To determine the age of exploitability it is necessary to fix a minimum centre girth. The wood most in demand in the market is timber of over one foot quarter-girth. 4′·6″ may therefore

be fixed as the lowest average girth at which the trees should be cut (leaving 6 inches for bark and outerwood). The next question to be solved is what will the girth at breast height be of such a tree.

By a number of measurements taken, it is evident that the ratio $\frac{g}{G}$ (where g expresses the mean girth, and G the girth at breast high) varies both with the height of bole and girth of the tree; but from measurements in the largest plantations I found that a tree of 6′·6″ at base would, as a rule, give the required mean girth of 4′·6″.

To settle the question both as to height of bole and girth at breast height in a plantation ready to cut, I had 30 of the largest trees picked out and measured. These trees if there were 40 to the acre would represent the size of trees in a plantation which had reached or nearly reached the age of exploitability. Appended are the measurements of the 30 trees :—

Number.	Actual girth at 4′·6″.	Allowance for fluting.	Reduced girth at 4′·6″.	Centre girth.	Bole length.	Cubical contents.
1	6′·2″	.....	6′·2″	4′·3″	57′	72·14
2	6′·7″	6″	6′·1″	4′·7″	67′	87·96
3	6′·0⅜″	⅜″	6′·0″	4′·3½″	77′	86·03
4	6′·5⅜″	2⅜″	6′·3½″	4′·3″	71′	80·15
5	6′·3″	3″	6′·0″	4′·5″	69′	84·12
6	6′·7″	7″	6′·0″	5′·8″	74′	62·17
7	6′·5″	3″	6′·2″	4′·6″	62′	78·46
8	8′·8″	1′·6″	7′·2″	5′ 4½″	55′	97·78
9	6′·8″	7″	6′·1″	3′·10″	63′	57·85
10	7′·6″	10″	6′·8″	5′·1″	52′	83·98
11	6′·10″	5″	6′·5″	4′·7″	69′	90·50
12	6′·6½″	2½″	6′·4″	4′·3″	75′	84·66
13	6′·6½″	3½″	6′·3″	4′·5″	76′	92·65
14	6′·9″	3″	6′·6″	4′·3½″	74′	93·66
15	6′·9½″	3½″	6′·6″	4′·1⅜″	73′	76·08
16	6′·6″	5″	6′·1″	4′·0″	70′	70·00
17	6′·6½″	4½″	6′·2″	4′·6″	78′	98·71
18	7′·4″	1′·0″	6′·4″	4′·9″	67′	92·47
19	8′·8″	1′·8″	7′·0″	5′·4″	52′	92·44
20	6′·5″	4″	6′·1″	4′·0″	75′	75·00
21	6′·5″	4½″	6′·0½″	3′·11″	69′	66·15
22	6′·2″	1″	6′·1″	4′·6″	64′	80·99
23	6′·5⅛″	4⅛″	6′·1″	3′·11″	59′	56·56
24	6′·4″	3″	6′·1″	4′·3″	69	77·80
25	6′·7″	3″	6′·4″	4′·2⅛″	64′	69·45
26	6′·11″	8″	6′·3″	4′·2″	78′	84·63
27	6′·3″	2″	6′·1″	4′·4″	67′	78·63
28	7′·2½″	11½″	6′·3″	4′·11″	73′	110·29
29	6′·9″	2″	6′·7″	4′·8″	62′	84·38
30	7′·3″	6″	6′·9″	4′·5″	76′	92·65
		Total ...	188′·10″	132′·3½″	2,037′	2,461·42

Average girth at 4′·6″ ... ... = 6′·3″
Average centre girth ... ... = 4′·4½″
Average bole ... ... = 67′ ft.
Average cubical contents ... ... = 82·04 c. ft.

It will be seen that an average girth of 6′·3″ at breast gives an average centre girth of 4′·4½″ and thus it is proved that a centre girth of 4′·6″ may be expected from a breast girth of 3′·6″, the result being determined not by an individual tree but by a collection of trees.

The only question now to determine is at what age the final crop in the various plantations will reach this girth.

(1) *Avavillykava*, 1844—50 *years old.*—Current rate of growth = ·624 average girth = 53″·64.

G required = 78″ ∴ $50 + \frac{24·36}{·624} = 50 + 39 = 89$ years.

(2) *Arevacode*, 1847—47 *years old.*—Current rate of growth = ·56 average girth = 49″·85.

G required = 78″ ∴ $47 + \frac{28·15}{·56} = 47 + 50 = 97$ years.

(3) *Pannengode*, 1854—40 *years old.*—Current rate of growth = ·729 average girth = 47″·21.

G required = 78″, at 50 years girth = 47·21 + 7·29 = 54·50.

Current rate of growth ·624 ∴ $50 + \frac{23·50}{·624} = 50 + 38 = 88$ years.

(4) *Pannengode*, 1863—31 *years old.*—Current growth = ·804 average girth = 36″·38.

G required = 78″, at 40 years girth = 36·38 + 7·23 = 43·61, at 50 girth = 43·61 + 7·29 = 50·90 ∴ $50 + \frac{27·10}{·624} = 50 + 43 = 93$ years.

(5) *Valuvashery*, 1866—28 *years old.*—Current growth = ·874 average girth = 31″·28.

G. required = 78″, at 31 years girth = 31·28 + 2·62 = 35″·90, at 40 girth = 33·90 + 7·72 = 41″·62, at 50 = 41·62 + 7·29 = 48·91 ∴ $50 + \frac{29·09}{·624} = 50 + 47 = 97$ years.

The average exploitable age therefore is $\frac{97+93+88+97+89}{5} = \frac{464}{5} = 93$ years.

The exploitable age may therefore be placed as 95 years.

It has been assumed that the rate of growth for the next 45 years does not decrease, but without doubt it will do so. This, however, is compensated by the fact that the best 40 or nearly the best will probably be left of the 60 trees to form the final crop. This would raise he average girth at the present time. The above can only be taken as the exploitable age of the first-class crop and for second-class the age will evidently be longer.

The plan does not provide for final fellings but when these are arranged it will be a question whether it will be advisable to allow the crop to stand a much longer period or to put wood of less size into the market.

The exploitable age of second class may roughly be calculated as follows presuming that a centre girth of 4′·6″ is required. Owing to the decreased height of the bole the girth at 4′·6″ required will not be more than 6′·0″ to produce this centre girth. Unfortunately no plantation has been measured which gives the current rate of growth in a plantation of over 36 years old. This, however, may be deduced from the first class as follows:—The rate of growth in first class is $\frac{·858 + ·729}{2} = \frac{1·587}{2} = ·793$ for plantation 36 years old. In second class the corresponding rate of growth is ·468. Supposing that this ratio is constant, the rate of growth to be applied at 50 years = $\frac{468}{793}$ of ·624 = ·368. Adopting this we get:—

(1) *Elanjery*, 1846—48 *years old.*—Current rate of growth ·368 average girth = 40″·21.

G required 72″ ∴ $48 + \frac{31·79}{·368} = 48 + 87 = 135$ years.

(2) *Elanjery*, 1850—44 *years old.*—Average girth = 37·08, at 50 years = 37·08 + 2·81 = 39″·89.

G required 72″ ∴ $50 + \frac{32·11}{·368} = 50 + 88 = 138$ years.

(3) *Eldocode*, 1850—44 *years old.*—Average girth = 34″·03, at 50 years = 34·03 + 2·81 = 36″·84

G required = 72″ ∴ $50 + \frac{35·16}{·368} = 50 + 96 = 146$ years.

(4) *Elanjery*, 1858—36 *years old.*—Average girth = 30″·73, at 50 + 30·73 + 6·55 = 43″·28.

G required = 72″ ∴ $50 + \frac{28·72}{·368} = 50 - 78 = 128$ years.

(5) *Eddacode*, 1861—33 *years old.*—Average girth = 29″·49, at 50 = 29·49 + 7·95 = 37″·44.

G required = 72″ ∴ $50 + \frac{34·55}{·368} = 50 + 94 = 144$ years.

The average exploitable age is therefore $\frac{135+138+146+128+144}{5} = 138$ years. The exploitable age for second-class growth may therefore be placed at 140 years.

APPENDIX D.

YIELD OF FINAL FELLINGS.

Assuming that the fellings are commenced at 95 years old and that 40 trees remain to the acre, the mean girth has been shown to be 4′·6″.

The bole length remains to be fixed. The length in the oldest plantation averages 68 feet; in Eddacode 1846 it is 66 feet; in Arevacode 1847 it is 65 feet; and in Pannengode 1854 60 feet; whilst in the big trees measured it is 67 feet. I do not anticipate any great increase in length as the height growth has nearly stopped, consequently the bole at 95 years age may be fixed at 70 feet.

The volume per acre will be therefore 40 × 88 cubic feet = 3,520 cubic feet or in round figures 3,500 cubic feet per acre on first-class soils.

This is only a little more than stands at present in the oldest plantation which has a volume of 2,938 cubic feet + 8 trees averaging over 30 cubic feet in volume. The 30 selected trees have a volume of 2,461 cubic feet which with 820 the volume of the remaining 10 would yield 3,281 cubic feet per acre.

As regards second class the average girth at 95 years old of the five plantations taken above is 4′·6″ which will give a centre girth of 3′·4½″. The length of bole in Elanjery, 1846 is 61 feet, and in Elanjery, 1858 is 55 feet, but in the plantations of 1850 does not exceed 50 feet. At 95 years I consider the average bole will not exceed 60 feet. This will give a cubic content of 42 cubic feet per tree. Allowing 50 trees to the acre the volume per acre will be 2,100 or in round figures 2,000 cubic feet The present volume per acre is 1,460 cubic feet + 24 trees averaging 12 cubic feet = 1,460 + 288 = 1,748 cubic feet. No account can be taken of third class as in many cases no trees will reach this age and in other cases only a few trees will do so.

The yield of the final crop may thus be estimated :—

2,113 acres × 3,500 cubic feet = 7,395,500 of first-class timber, and

1,844 acres × 2,000 cubic feet = 3,688,000 of second-class timber.

The oldest plantation requires 45 years to reach this age, and the youngest is only one year old. The period over which the fellings should thus be spread is therefore 50 years in order that the youngest may reach the required age of 95.

The annual yield may therefore be estimated at :—

147,910 cubic feet of first-class timber, and

73,760 cubic feet of second-class timber.

APPENDIX E.

Measured by Forester Lasrado, 28th December 1894.

SAMPLE ½ ACRE IN ELANJERY, 1846. SECOND CLASS.

Number.	G. at 2′.	G. at 4′·6″.	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·10	2·7	2·0	...	1·3	54	13·50
2	3·10½	3·6	2·8½	...	...	61	27·12
×3	4·2	3·9	2·11	...	1·10	68	36·15
4	2·8½	2·5½	1·11½	...	...	61	14·00
5	3·8½	3·4	2·7½	...	...	61	25·44
×6	4·0½	3·8½	2·10½	...	1·10	64	32·11
×7	3·4	3·1½	2·4	...	1·8	66	22·45
8	3·1	2·9	2·3	...	...	61	19·30
9	3·6	3·2	2·6	...	...	61	23·82
10	3·2	2·11½	2·4	...	...	61	20·75
×11	4·0	3·9	2·9	...	1·10	66½	31·43
12	3·4	3·0½	2·4½	...	...	61	20·76
×13	3·8	3·5	2·8	...	2·3	66	29·33
×14	...	Fluted.	5·2	3·10	...	2·7	68	62·45
15	4·9	3·1½	3·1	...	...	61	36·24
×16	3·8	3·4	2·7	...	2·0	54	22·52
×17	3·2½	3·0	2·3	...	1·11	48	15·18
18	3·4	3·0½	2·4½	...	...	61	20·76
×19	3·11	3·6	2·11	...	1·10	69	36·68
20	3·0	2·9½	2·3	...	...	61	19·30
×21	4·7	4·2	3·0	...	2·4	64½	36·28
×22	3·4	3·0	2·2	...	1·5	59½	17·45
23	2·7	2·3	1·10	...	...	61	12·31
×24	3·5	3·1½	2·6	...	1·7	57	22·26
25	3·6	3·3	2·7	...	...	61	25·44
×26	4·1	3·8½	2·10	...	2·3	53	30·60
27	3·9	3·5½	2·8½	...	...	61	27·11
×28	4·2	3·11½	3·10	...	2·2	58	29·09

	M.	S. S.	Total.
In addition there are :—	10.	2.	= 12.

NOTE.—Nos. 1, 3, 6, 7, 11, 13, 14, 16, 17, 19, 21, 22, 24, 26, and 28 were measured.

From these—

Average bole ... ... = 61 ft.
Average girth at 4′·6″ ... ... = 40″·21
Average centre girth ... ... = 30″·85
Average cubical contents ... ... = 26·08 c. ft.
Average annual girth increment 1 to 48 years ... ... = 0″·83

Measured by Forester Lasrado, 8th December 1894.

SAMPLE ACRE, MOOLATHAMANOO, 1847. FIRST CLASS.

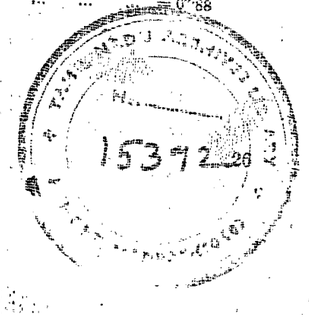
Number.	G. at 2′.	G. at 4′·6″.	G. at C.	Mean 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	5·0	4·7½	3·2	3·7½	2·2½	67½	42·30
2	3·7½	3·4½	2·5½	.....	.....	61	22·27
×3	5·0	4·8	3·3	3·7½	2·2½	73	48·19
×4	3·5½	3·1½	2·4½	2·6⅜	1·7½	63½	21·61
5	4·1	3·8	2·8	.....	.....	61	27·11
×6	3·4½	3·0½	2·6½	2·4½	1·5	58½	21·30
×7	3·6	3·1½	2·4	.....	.....	61	20·75
8	4·3½	3·10	2·9	.....	.....	61	28·83
9	4·0	3·9	2·8	.....	.....	61	27·11
×10	4·10	4·6	3·0	3·6½	2·3	68	38·25
11	3·5	3·1½	2·4	.....	.....	61	20·75
12	4·8	4·4½	3·11	.....	.....	61	32·43
13	3·2½	2·10	2·1½	2·3⅜	1·5½	66	17·91
14	5·1	4·9	3·3½	.....	.....	61	40·27
15	3·2½	2·11½	2·6	2·6¼	1·10	56½	22·06
16	3·8	3·4½	2·5½	.....	.....	61	22·27
17	3·7½	3·5	2·6	.....	.....	61	23·82
18	3·8	3·5½	2·6	.....	.....	61	23·82
19	3·8	3·4	2·5½	.....	.....	61	22·27
×20	3·6	3·3	2·7	2·8½	1·11	60	25·02
×21	3·4	3·0	2·5	2·4½	1·5	57	20·80
22	4·3½	4·0	2·10½	.....	.....	61	30·61
×23	3·10	2·10	2·4½	.....	1·8	53½	18·21
×24	5·6	5·0	3·6½	3·10	2·2	65	52·06
25	4·7	4·4	3·11	.....	.....	61	32·43
26	3·5	3·1½	2·4	.....	.....	61	20·75
27	3·8½	3·6	2·6	.....	.....	61	23·82
28	3·7½	3·4½	2·5½	.....	.....	61	22·27
×30	4·0	3·8	2·8½	2·9	1·8	45	20·01
31	4·10	4·6½	3·0	.....	.....	61	34·31
32	3·4½	3·2	2·1½	.....	.....	61	20·76
×33	3·7½	3·4½	2·7½	2·7½	1·7	65	27·12
34	4·4	3·10½	2·9	.....	.....	61	28·83
×35	3·3½	3·1	2·2	2·5¼	1·8	63	18·48
36	3·2½	2·11	2·1½	.....	.....	61	19·31
37	3·0	2·9	2·2	.....	.....	61	17·89
38	3·9	3·5½	2·6	.....	.....	61	23·82
39	4·10	4·4	2·11	.....	.....	61	32·43
×40	3·10	3·6½	2·5½	2·9	1·8	61	22·27
41	4·0	3·10	2·9	.....	.....	61	28·83
42	3·11½	2·8½	2·2	.....	.....	61	17·89
43	4·5½	4·1½	2·10½	.....	.....	61	30·61
44	3·9½	3·10	2·8	.....	.....	61	19·30
×45	3·4	3·0	2·3½	2·5½	1·7½	54	17·09
46	3·11	3·8	2·8	.....	.....	61	27·11
47	3·4	3·0	2·4	.....	.....	61	20·75
48	2·5	2·2½	1·10	.....	.....	61	12·81
49	2·7	2·4½	2·0	.....	.....	61	15·25
50	3·5	3·1½	2·4	.....	.....	61	20·75

	M.	S. S.	First Class.	Dead.		Total.
In addition to the above 50 trees there are :—	35	13	1	3	=	52

NOTE.—Nos. 1, 3, 4, 6, 10, 12, 15, 20, 21, 23, 24, 30, 33, 35, 40 and 45 were measured.

From these—

Average bole = 61′. The remaining centre girths are deduced from average of the trees measured.
Average girth at 4′·6″ ... ... = 41″·76
Average centre girth ... ... = 30″·68
Average cubical contents ... ... = 25·26 c. ft.
Average annual girth increment, 1 to 47 years ... ... = 0″·88



Measured by Forester Lasrado, 20th December 1894.

SAMPLE ½ ACRE, ELANJERY, 1850. SECOND CLASS.

Number.	G. at 2'.	G. at 4'6".	G. at C.	Mean, 2 and 3.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	4·7	4·3	3·1	.....	1·10	47	27·32
×2	3·0	2·9	2·4	.....	1·7½	50	17·61
3	2·7½	2·3½	1·10	.....	.....	50	10·60
×4	4·1½	3·9	2·7½	.....	2·0	55	22·95
×5	2·10	2·7	2·3	.....	1·6	53½	16·92
6	3·1½	2·9½	2·3	.....	.....	50	15·82
7	3·1	2·10	2·3½	.....	.....	50	15·63
8	4·2½	3·10	2·10	.....	2·3½	53	26·50
×9	4·1½	3·9	2·11½	.....	1·10½	56	29·78
×10	3·1½	2·9½	2·3	.....	.....	50	50·82
11	3·3	2·11	2·4	.....	.....	50	17·01
12	3·6½	3·2	2·6	.....	.....	50	19·53
13	2·9½	2·5½	1·11½	.....	.....	50	11·49
×14	3·6	3·3	2·7	.....	1·7	56	23·35
15	3·10	3·6½	2·8	.....	2·0	45	20·00
16	3·1½	2·10½	2·3½	.....	.....	50	15·83
17	3·9	3·5½	2·8	.....	.....	50	22·22
18	3·2½	2·10½	2·3½	.....	.....	50	15·83
×19	3·1	2·10½	2·3	.....	1·9	50½	15·97
×20	3·0	2·9	2·2	.....	1·6	46	13·49
21	3·4½	3·1½	2·5	.....	.....	50	18·25
×22	2·8	2·5	2·0	.....	1·5	51	12·75
×23	4·0	3·6½	2·8½	.....	.....	60	22·23
23	4·0	3·6	2·8	.....	2·2	50	22·22
×24	4·0	3·5	2·9	.....	1·11½	57½	27·17
×25	3·8½	2·11½	2·4	.....	.....	50	17·01
26	3·3	2·9	2·3	.....	.....	50	15·82
27	3·0	2·9½	2·11	.....	1·9½	47½	25·25
×28	4·1	3·4½	3·0	.....	.....	50	17·02
29	3·4½	3·0	2·5	1·9	1·1	44	8·42
×30	2·8½			.....			

	M.	s.s.	First.	Second.	Third.	Total.
In addition to the above there are:—	4	12	2	2	1 =	21

Average bole ... ... = 50 ft.
Average girth at 4'6" ... ... = 37"·08
Average centre girth ... ... = 20"·03
Average cubical contents ... ... = 18 ·66 c. ft.
Average annual increment, 1 to 44 years ... ... = 0"·84

53

Measured by Forester Lasrado, 22nd January 1895.

SAMPLE ACRE, EDDACODE, 1850. SECOND CLASS.

Number.	G. at 6'.	G. at 4'6".	G. at C.	Mean, 2 and 6.	G. at tip.	Pole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·11	2·7½	2·3	.....	1·8	28	8·85
2	3·3½	3·0	2·4½	.....	.....	49	16·84
3	3·0	2·9	2·3	.....	.....	49	15·50
×4	4·0	3·8½	2·7	.....	1·6	57	23·76
×5	3·0	2·8½	2·4	.....	1·7	44	14·97
6	3·1	2·10	2·3½	.....	.....	49	15·51
7	2·9	2·6	2·0	.....	.....	49	12·25
8	2·2	1·10½	1·7	.....	.....	49	7·67
×9	2·9	2·6	1·11	.....	1·3	47	10·79
×10	3·4	3·1	2·8	.....	2·2	45	20·00
11	2·9½	2·6	2·0	.....	.....	49	12·50
12	2·5½	2·2	1·9	.....	.....	49	9·37
×13	3·11	3·7	2·8½	.....	1·10	55	24·45
14	2·7½	2·4½	1·10	.....	.....	49	10·29
15	3·0	2·9½	2·3	.....	.....	49	15·50
×16	2·8	2·5	2·0	.....	1·2	51	12·75
17	2·9	2·6	2·0	.....	.....	49	12·25
×18	3·6	3·3	2·8	.....	1·10	61	27·10
19	2·6	2·2	1·9	.....	.....	49	9·37
20	3·8	3·4½	2·7½	.....	.....	49	20·44
×21	3·5	3·2	2·2	.....	1·5½	48	14·08
×22	2·1	1·10½	1·7	.....	1·2	33	5·17
23	2·4	2·1	1·8½	.....	.....	49	8·51
×24	2·9½	2·6	2·1	.....	1·6	39	10·57
25	2·6	2·4	1·10	.....	.....	49	10·29
26	3·0	2·9	2·3	.....	.....	49	15·50
×27	3·3	2·11½	2·2	.....	1·8	43	12·61
28	2·6½	2·4	1·10	.....	.....	49	10·29
×29	3·6½	3·3	2·8	.....	1·9	53	23·55
30	2·9	2·6	2·0	.....	.....	49	12·25
×31	2·11	2·7	1·11	.....	1·4	49	11·25
32	2·9	2·7	2·1	.....	.....	49	13·29
33	2·10	2·7	2·1	.....	.....	49	13·29
×34	4·4½	4·1	2·9	.....	1·11½	56	26·46
×35	3·2	2·10	2·4	.....	1·9	51	17·35
36	2·9	2·5½	1·11	.....	.....	49	11·25
×37	3·7	3·3	2·7	.....	2·0	52	21·68
38	2·8	2·4	1·10	.....	.....	49	10·29
×39	2·5	2·2	1·9	.....	1·2	49	9·27
40	2·10	2·6½	2·0	.....	.....	49	12·25
×41	3·10	3·6½	2·8	.....	1·9	59	26·22
×42	2·10	2·7	1·10	.....	1·4	55	11·55
×43	3·2	2·9½	2·3½	.....	1·5	54	17·08
44	3·7	3·2½	2·6	.....	.....	49	19·14
×45	3·5	3·2	2·4	.....	1·8	59	20·07
46	3·6	3·2	2·6	.....	.....	49	19·14
47	2·9	2·5	1·11	.....	.....	49	11·25
×48	3·1	2·9	2·3	.....	1·7½	45	14·23
×49	2·9	2·6	2·0	.....	1·7	46	11·50
×50	3·4	3·0	2·5	.....	1·9½	49	17·88
51	2·10	2·7	2·1	.....	.....	49	13·29
52	4·2	3·10	2·10	.....	.....	49	24·58
×53	3·6½	3·3	2·7½	.....	1·5	53	22·11
54	3·2	2·10½	2·3½	.....	.....	49	15·51
×55	4·0	3·8½	2·9	.....	1·10½	57	26·93
×56	3·8	3·4	2·4½	.....	1·8	49	16·68
57	3·5	3·2	2·6	.....	.....	49	19·14
×58	4·2	3·10	2·10	.....	2·0	49	24·58
59	3·4	3·0	2·1½	.....	.....	49	16·68
×60	3·10½	3·7	2·8½	.....	1·10	56	24·89

	M.	s. s.	First.	Second.	Third.	Total.
In addition to the above 60 trees there are:—	13	17	13	6	2 =	51

Average bole ... ... = 49 ft.
Average girth at 4'6" ... ... = 34"·08
Average centre girth ... ... = 26"·52
Average cubical contents ... ... = 14 ·83 c. ft.
Average annual girth increment, 1 to 44 years ... ... = 0"·77

Measured by Mr. P. M. Lushington, 13th December 1894.

SAMPLE ½ ACRE, AMRAMPOLLIEM, 1860. FIRST CLASS.

Number.	G. at 2'.	G. at 4'·6".	G. at C.	Mean 2 and 6.	G. at Tip.	Bole Length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·11	2·8	2·1	2·1¼	1·3½	52	14·10
2	3·0	2·9	2·1½	.....	.....	52	14·11
×3	3·4	3·0	2·0½	2·4¼	1·4½	60	15·01
4	3·0	3·1¼	2·4	.....	.....	52	17·60
×5	3·11	3·6	2·9	2·9½	1·8	59½	28·12
6	4·2	3·9	2·11	.....	.....	52	27·64
×7	2·10½	2·7½	2·2½	2·1	1·3½	42½	12·47
8	3·2	2·10½	2·2	.....	.....	52	15·25
×9	Fluted.	3·2	2·4½	.....	1·5½	49½	16·85
×10	Do.	3·8	2·7	.....	1·9	50½	22·66
×11	3·6½	3·0½	2·4½	2·7½	1·8	48½	16·51
12	3·1½	2·10½	2·2	.....	.....	52	15·25
×13	2·10½	2·6½	2·2	2·0½	1·3	56½	16·57
14	2·9	2·5	1·11	.....	.....	52	11·93
×15	Fluted.	3·5½	2·7	.....	1·6½	59	24·60
16	3·0	2·7	2·0	.....	.....	52	13·00
×17	2·8½	2·4½	1·10½	1·10½	1·3½	48	10·09
18	2·9½	2·4½	1·10	.....	.....	52	10·92
×19	3·4	3·0	2·4½	2·5½	1·6½	49	16·08
×20	2·6½	2·4½	1·9½	1·11⅛	1·2	53½	10·24
×21	2·10½	2·5½	1·11⅛	2·1	1·2½	58½	13·44
22	2·5½	2·2½	1·7½	.....	.....	52	8·15
×23	2·11	2·7½	1·10	2·0½	1·1½	56	11·76
24	3·2½	2·11⅛	2·3	.....	.....	52	16·45
×25	2·8½	2·4½	1·10½	2·0½	1·0	44	9·25
26	3·3½	3·0	2·3	.....	.....	52	16·45
×27	3·0	2·7½	1·11	2·2½	1·4½	53	12·16
28	3·4	2·10½	2·2	.....	.....	52	15·25
×29	2·5½	2·1½	1·11	2·1½	1·5½	48	11·02
×30	3·4	2·10½	2·1½	2·3½	1·3½	44½	12·03

	M.	s.s.	First.	Total.
In addition to the above 30, there are:—	10	9	8	= 27 saplings.

NOTE.—Nos. 1, 3, 5, 7, 9, 10, 11, 13, 15, 17, 19, 20, 21, 23, 25, 27, 29 and 30 were measured.

From those—

Average bole ... ... = 52 ft.
The remaining centre girths are deduced from the measured trees.
Average girth at 4'·6" ... ... = 33"·74
Average centre girth ... ... = 25"·83
Average cubical contents ... ... = 15 ·18 c. ft.
Average annual girth increment, 1 to 33 years .. .. = 1"·02

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Measured by Forester Lasrado, 14th December 1894.

SAMPLE ½ ACRE, AMRAMPOLLIEM, 1861. SECOND CLASS.

Number.	G. at 2'.	G. at 4'·6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·9	2·5⅜	1·10⅛	.....	1·3½	38	7·99
2	2·11	2·6⅜	1·11½	.....	.....	37	8·50
×3	2·10	2·7	2·2	.....	1·4½	46	13·49
4	3·5	2·11	2·2½	.....	.....	37	10·86
×5	3·9	3·4½	2·5	.....	1·6⅜	43½	15·87
6	1·10	1·7	1·4	.....	.....	37	4·11
×7	2·8	2·4½	1·10	.....	1·0½	46	9·66
8	2·3	1·11½	1·8	.....	.....	37	6·42
×9	1·10½	1·8½	1·4½	.....	0·7	41	4·56
×10	2·9	2·4⅝	1·10⅜	.....	1·2½	34½	7·25
×11	2·6½	2·5½	1·8¼	.....	1·3	39	6·77
12	2·8	2·5	1·11	.....	.....	37	8·49
×13	1·11½	1·8½	1·5	.....	1·1	27½	3·44
14	2·8	2·4	1·10	.....	.....	37	7·77
×15	2·2½	1·11	1·7	.....	1·0	31	4·85
16	2·2	1·9	1·6	.....	.....	37	5·20
×17	1·10	1·8	1·4½	.....	0·11⅛	34	3·78
18	2·8	2·5	1·11	.....	.....	37	8·49
×19	2·5	2·2½	1·7⅜	.....	0·11	43½	6·82
×20	2·1½	1·10½	1·7	.....	1·0	39	6·11
×21	2·2⅜	1·11	1·8⅜	.....	1·1⅜	26	4·51
22	2·1	1·10	1·7	.....	.....	37	5·79
×23	2·0	1·8⅜	1·6¼	.....	1·0⅜	34	4·79
24	1·6½	1·3⅜	1·0	.....	.....	37	2·31
×25	2·0	1·9	1·3½	.....	1·0	33⅜	3·28
26	2·7	2·2½	1·10	.....	.....	37	7·77
×27	2·0	1·9½	1·7⅜	.....	1·2⅜	32½	5·10
28	2·8	2·3⅜	1·9	.....	.....	37	7·08
29	2·4	2·0⅜	1·5	.....	.....	37	7·08
×30	2·4	2·1	1·8	.....	1·2	40	6·94
31	3·4	2·11½	2·3	.....	.....	37	11·70
32	3·2	2·10	2·2	.....	.....	37	10·85
33	2·10	2·5⅜	1·11	.....	.....	37	8·49
34	2·11	2·8	2·1	.....	.....	37	10·03
×35	2·10⅛	2·7	1·11½	.....	1·6⅜	46⅜	10·68
36	2·0⅛	1·9⅜	1·6	.....	.....	37	5·20
37	3·0	2·5⅜	1·11	.....	.....	37	8·49

	M.	s.s.	First.	Second.	Third.	Fourth.	Total.
In addition to the above 37 trees, there are:—	5	8	6	11	2	1	= 33.

NOTE.—Nos. 1, 3, 5, 7, 9, 10, 11, 13, 15, 17, 19, 20, 21, 23, 25, 27, 30 and 35 were measured.

From those—

Average bole ... ... = 37 ft.
Remaining centre girths are deduced from the measured trees.
Average girth at 4'·6" ... ... = 26"·31
Average centre girth ... ... = 21"·09
Average cubical contents ... ... = 7·31 c.ft.
Average annual girth increment, 1 to 33 years ... ... = 0"·79

Measured by Forester Lasrado, 24th January 1895.

SAMPLE ACRE, EDDACODE, 1861. SECOND CLASS.

Number.	G. at 2'.	G. at 4'6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·5⅛	2·2	1·9	.....	1·3	47	8·99
2	2·10	2·7⅛	2·0½	.....	.. ..	46	11·51
×3	2·5⅛	2·3	1·9	.....	1·0½	46	8·80
4	2·5	2·1⅛	1·0½	.....	.....	46	7·99
×5	3·0	2·3⅛	1·11½	.....	1·5½	46½	10·68
×6	3·0½	2·8	1·11	.....	1·6½	45	10·33
7	2·5	2·2	1·9	.....	.....	46	8·80
×8	2·4	2·1½	1·8½	.....	1·2½	43	7·47
×9	2·11	2·6⅛	1·10⅛	.....	1·5	44	9·25
10	2·3½	2·1	1·8½	.....	.....	46	7·99
11	2·5½	2·3	1·9⅛	.....	.....	46	8·81
×12	2·6	2·1⅛	1·8⅛	.....	1·5½	46	7·99
13	3·1	2·10	2·2	.....	.....	46	13·49
×14	3·6	3·2	2·6	.....	1·7	41	16·01
×15	4·0	3·7⅛	2·10	.....	1·8⅛	50	25·08
16	2·8	2·4	1·10	.....	.....	46	9·66
17	2·10	2·6	2·0	.....	.....	46	11·50
18	2·9⅛	2·6⅛	2·0	.....	.....	46	11·50
19	3·0	2·9⅛	2·1⅛	.....	.....	46	12·48
20	3·4	3·1⅛	2·5	.....	.....	46	16·79
×21	2·4⅛	2·2	1·8	.....	1·1	42	7·29
22	2·4	2·0	1·8	.....	.....	46	7·98
×23	3·3⅛	3·0	2·4	.....	1·9	43	14·63
24	2·7	2·4	1·10	.....	.....	46	9·66
25	2·3⅛	2·0	1·8	.....	.....	46	7·98
×26	3·3⅛	2·11⅛	2·3	.....	1·5	44½	14·07
×27	2·11	2·7	1·10½	.....	1·4	46½	9·77
28	2·6½	2·3⅛	1·9¼	.....	.....	46	8·51
29	2·10	2·7⅛	2·0½	.....	.....	46	11·51
×30	3·0	2·9⅛	2·1⅛	.....	1·7	45½	12·34
31	2·6	2·4	1·10	.....	.....	46	9·66
×32	3·6	3·2⅛	2·6	.....	1·7½	50	19·53
×33	2·7	2·3	1·10	.....	1·4	41½	8·71
34	2·2⅛	2·0	1·8	.....	.....	46	7·98
35	2·8	2·4⅛	1·10	.....	.....	46	11·50
×36	3·6	3·2	2·6½	.....	1·8	47	18·36
×37	3·2	2·10½	2·4	.....	1·7⅛	50	17·01
38	2·7	2·4	1·10	.....	.....	46	9·66
×39	2·7⅛	2·5	2·0	.....	1·3	47	11·75
×40	3·6	3·2⅛	2·5	.....	1·6⅛	55	20·67
×41	2·10	2·6	2·0	.....	1·2½	46	11·50
×42	3·4	2·11⅛	2·1	.....	1·4	52½	14·24
43	3·2	2·11	2·3	.....	.....	46	14·55
44	2·9⅛	2·5⅛	1·11	.....	.....	46	10·56
×45	2·9⅛	2·6⅛	1·10	.....	1·4⅛	45	9·45
46	3·2⅛	2·10	2·2	.....	... ..	46	13·49
47	2·5	2·1⅛	1·8⅛	.....	.....	46	7·99
×48	2·6	2·2	1·9	.....	1·3	39	6·77
49	2·9½	2·7	2·0½	.....	.....	46	11·51
50	3·0	2·9	2·1⅛	.....	.....	46	12·48
51	2·6½	2·4	1·10	.....	.....	46	9·66
52	2·4⅛	2·1⅛	1·8½	.....	.....	46	7·99
×53	3·5	3·1½	2·5½	.....	1·10	45	16·43
×54	2·4⅛	2·2	1·8⅛	.....	1·3	46	8·34
×55	2·9⅛	2·6½	2·3	.....	1·9	42½	13·44
56	2·7	2·4⅛	1·9½	.....	.....	46	8·81
×57	3·1	2·9	2·0	.....	1·4	50	12·50
58	3·5½	3·1⅛	2·5	.....	.....	46	16·79
×59	3·5½	3·2	2·0	.....	1·5½	54	13·50
×60	4·0⅛	4·2	3·0	.....	1·11½	45	25·31

	M.	S.S.	First.	Second.	Third.	Total.
In addition to the above there are :—	7	39	22	17	1	= 86.

Average bole ... ... = 46 ft.
Average girth at 4'6" ... ... = 29"·13
Average centre girth ... ... = 24"·10
Average cubical contents ... ... = 11·81 c. ft.
Average annual girth increment, 1 to 33 years ... ... = 0"·89

Measured by Mr. P. M. Lushington, 21st November 1894.

SAMPLE ACRE, VALUVASHERY, 1864. FIRST CLASS.

Number.	G. at 2'.	G. at 4'6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
× 1	3·4	2·11½	2·5	2·7	1·10	52	18·98
2	2·6	2·2¾	1·10	.....	.....	47	9·87
3	3·2⅜	2·9	2·4	.....	.....	47	15·99
"4	2·10	2·6⅜	2·1	.....	.....	47	12·74
× 5	3·4⅜	2·11	2·5	2·6¾	1·9	54	19·71
6	3·2¾	2·9¾	2·4	.....	.....	47	15·99
"7	2·11	2·7	2·2	.....	.....	47	13·78
"8	3·2	2·9	2·4	.....	.....	47	15·99
"9	3·10	3·5½	2·8	.....	.....	47	20·88
×10	2·8	2·6	1·8½	2·0	1·4	53	9·21
"11	3·4	3·0	2·5	.....	.....	47	17·15
"12	3·0	2·9	2·4	.....	.....	47	15·99
×13	2·11½	2·8	2·5	2·4½	1·9½	53	19·34
"14	2·10⅛	2·6	2·1	.....	.....	47	12·74
×15	3·5	2·1⅜	1·9	1·9½	1·2	44½	8·51
16	2·8¾	2·4⅜	1·11½	.....	.....	47	10·80
17	2·2¾	2·0½	1·7½	.....	.....	47	7·36
×18	3·6⅜	3·1⅜	2·4	2·5⅛	1·5	50	17·01
19	2·9⅜	2·6⅜	2·1	.....	.....	47	12·74
×20	2·9½	2·5¾	2·0	2·0	1·2⅜	46	11·50
"21	3·1⅜	2·9	2·4	.....	.....	47	15·99
×22	3·7	3·2	2·6	2·9½	2·0	50	19·53
23	3·3	3·11	2·5	.....	.....	47	17·15
24	2·9⅜	2·6	2·1	.....	.....	47	12·74
×25	2·9	2·5½	2·0	2·1	1·5	50	12·50
"26	2·9⅜	2·6	2·1	.....	.....	47	12·74
×27	2·3½	2·0	1·8	1·8½	1·1	43	7·46
"28	2·8½	2·5½	2·0	.....	.....	47	11·75
29	2·6	2·3½	1·11	.....	.....	47	10·79
×30	2·2½	1·11⅜	1·9	1·7½	1·0	49	9·37
31	2·8	2·4	1·11½	.....	.....	47	10·80
×32	2·2⅜	1·11⅜	1·8	1·7¼	1·1	45	7·81
33	2·10	2·7	2·2	.....	.....	47	13·78
"34	3·2½	2·10	2·4	.....	.....	47	15·99
×35	2·8½	2·5½	1·10	1·10⅜	1·1	54	11·34
36	2·7	2·4	1·11½	.....	.....	47	10·80
"37	2·4	2·2	1·10	.....	.....	47	9·87
×38	2·5½	2·2½	2·0	1·10⅜	1·3	47	11·75
39	2·2	1·11	1·7	.....	.....	47	7·36
×40	2·4	2·2	2·0	1·10½	1·5	47	11·75
"41	3·0½	2·9½	2·4	.....	.....	47	15·99
×42	3·9	3·6	2·9	2·10½	2·0½	50	23·63
43	2·7	2·4	1·11½	.....	.....	47	10·80
44	1·9½	1·6¾	1·5	.....	.....	47	5·89
×45	2·6¾	2·3½	1·10	1·10⅜	1·3	45	5·89
46	2·8	2·6	2·1	.....	.....	47	9·45
47	2·4	2·1	1·9	.....	.....	47	12·74
48	2·5½	2·2½	1·10	.....	.....	47	9·87
49	2·3½	2·0⅜	1·7½	.....	.....	47	7·37
×50	1·9	1·6½	1·5	1·5	1·1	36	4·51
51	2·7	2·3½	1·11	.....	.....	47	10·79
52	Fluted.	2·9½	2·4	.....	.....	47	15·99
53	2·9	2·4¾	1·11½	.....	.....	47	10·80
54	2·1½	1·11	1·7	.....	.....	47	7·36
×55	2·3	2·0	1·6¾	1·9	1·3	47	6·61
56	2·5½	2·2⅜	1·10	.....	.....	47	9·87
57	2·7½	2·4⅜	1·11½	.....	.....	47	10·80
×58	2·11½	2·7⅜	2·1	2·2½	1·5	45	12·20
59	2·7	2·3⅜	1·11	.....	.....	47	10·79
×60	2·6	2·3⅜	2·0	1·11½	1·5	48½	10·87

	M.	S.S.	First.	Second.	Third.	Fourth.	Eighth.	Total.
In addition to the above 60 trees, there are :—	7	45	36	18	6	5	1	= 118

NOTE.—Nos. 1, 5, 10, 13, 15, 18, 20, 22, 25, 27, 30, 32, 35, 38, 40, 42, 45, 50, 55, 58 and 60 were measured.

From these—
Average bole ... ... = 47 ft.
The remaining centre girths are deduced from the average of the trees measured.
Average girth at 4'6" ... ... = 29"·42
Average centre girth ... ... = 24"·30
Average cubical contents ... ... = 12·38 c. ft.
Average annual girth increment, 1 to 30 years ... ... = 0"·98

Measured by Mr. P. M. Lushington, 19th November 1894.

SAMPLE ACRE, VALUVASHERY, 1865. — SECOND CLASS.

Number.	G. at 2'.	G. at 4'6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
× 1	2·5	2·3	1·10½	1·11¼	1·5½	43	9·04
2	2·5½	2·2½	1·9½	.....	.....	43	8·23
3	3·1½	2·9½	2·4	.....	.....	43	14·63
4	2·8½	2·5½	2·0	.....	.....	43	10·75
× 5	2·4	2·1½	1·10	1·10½	1·5	38	7·98
6	2·7½	2·4	1·11½	.....	.....	43	9·88
7	3·1	2·10½	2·4	.....	.....	43	14·63
8	2·9½	2·5½	2·0	.....	.....	43	10·75
9	3·2	2·10¼	2·4	.....	.....	43	14·63
×10	2·1½	2·0	1·7	1·7½	1·2	47	7·36
11	2·4½	2·3½	1·11	.....	.....	43	9·87
12	2·5	2·2½	1·9½	.....	.....	43	8·23
×13	2·2½	2·1	1·8½	1·8½	1·2	47½	8·25
×14	3·4½	3·1½	2·7½	2·7½	1·10	48	20·03
×15	3·0	1·9½	1·6½	1·7	1·2	45	6·33
16	3·3	3·11	2·5	.....	.....	43	15·69
17	2·3½	2·1½	1·9	.....	.....	43	8·23
×18	2·6¼	2·3½	1·10½	1·10⅝	1·3	45	9·46
19	2·8	2·5	2·0	.....	.....	43	10·75
×20	2·11½	2·9½	2·3	2·2½	1·6	52	15·25
21	2·8½	2·6	2·1	.....	.....	43	11·66
×22	2·10¾	2·8½	2·4½	2·4	1·7	39	13·27
23	2·5⅝	2·3½	1·11	.....	.....	43	9·87
24	2·7½	2·6¼	2·1	.....	.....	43	11·66
×25	2·5	2·2½	1·9	1·8½	1·0	41½	7·94
26	2·9	2·6½	2·1	.....	.....	43	11·66
×27	2·4½	2·1½	1·4	1·10⅛	1·4	45½	5·05
28	2·8	2·6	2·1	.....	.....	43	11·66
29	2·5⅝	2·2	1·3½	.....	.....	43	8·23
×30	2·8¼	2·5	2·0	2·0½	1·4	52	13·00
31	2·8½	2·6½	2·1	.....	.....	43	11·66
×32	2·5¾	2·1¼	1·10	2·0¾	1·7	41	8·61
33	3·1	2·10½	2·4	.....	.....	43	14·63
34	2·10½	2·7⅝	2·2	.....	.....	43	12·61
×35	3·1½	2·9⅝	2·6	2·6½	2·0	41	16·01
36	2·4¼	2·2	1·9½	.....	.....	43	8·23
37	2·1½	1·11	1·7	.....	.....	43	6·73
×38	2·4	2·0⅜	1·10	1·11¼	1·7	31	6·51
39	2·6¼	2·2⅝	1·9½	.....	.....	43	8·23
×40	1·10½	1·8¼	1·6	1·5⅝	1·1	33	4·64
41	2·3½	2·1¼	1·9	.....	.....	43	8·23
42	2·6¼	2·3½	1·11	.....	.....	43	9·87
43	2·8	2·4⅜	1·11⅛	.....	.....	43	9·88
44	2·9¼	2·6	2·1	.....	.....	43	11·66
×45	2·3⅜	2·0⅜	1·7	1·8⅜	1·2	42	6·58
46	2·4⅜	2·2	1·9½	.....	.....	43	8·23
47	2·3½	2·0½	1·7⅞	.....	.....	43	6·74
48	2·7½	2·4½	1·11⅛	.....	.....	43	9·88
49	2·8⅜	2·5½	2·0	.....	.....	43	10·75
×50	2·6¼	2·3½	2·0	1·11⅛	1·5	44	11·00
51	2·3⅜	2·1	1·9	.....	.....	43	8·23
52	2·7⅜	2·7	2·2	.....	.....	43	12·61
53	2·7	2·4	1·11½	.....	.....	43	9·88
54	2·4½	2·2	1·9½	.....	.....	43	8·23
55	2·6⅜	2·4⅜	1·11⅛	.....	.....	43	9·88
56	2·1½	1·11⅝	1·7⅛	.....	.....	43	6·74
57	2·4⅜	2·1½	1·9	.....	.....	43	8·23
×58	2·3	2·0	1·7	1·8¼	1·1½	40	7·67
59	1·11½	1·9⅜	1·6½	.....	.....	43	6·05
60	2·4⅜	2·2⅜	1·9⅜	.....	.....	43	8·23

	M.	s.s.	First.	Second.	Third.	Fourth.	Total.
In addition to the above 60 trees there are :—	11	25	24	20	8	1	= 89.

NOTE.—Nos. 1, 5, 10, 13, 14, 15, 18, 20, 22, 25, 27, 30, 32, 35, 38, 40, 45, 50 and 58 were measured.

From these—

Average bole ... ... = 43 ft.
The remaining centre girths are deduced from the averages of the trees measured.
Average girth at 4'6" ... ... = 27"·92
Average centre girth ... ... = 23"·65
Average cubical contents ... ... = 10·69 c. ft.
Average annual girth increment, 1 to 29 years ... ... = 0"·96

Measured by Forester Lesrak, 5th February 1895.

SAMPLE ACRE, NELLIKUTA, 1871. — FIRST CLA

Number.	G. at 2'.	G. at 4'6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
× 1	3·0½	3·2	2·0	.....	1·3	59	14·75
× 2	3·11	3·7½	2·10	.....	2·0	48	24·08
3	3·9	3·5½	2·5	.....	.....	54	19·71
4	3·11	3·7	2·7	.....	.....	54	22·51
× 5	3·0	2·9	2·0	.....	1·4½	58½	14·62
6	4·2	3·11½	2·10½	.....	.....	54	27·10
× 7	3·10	3·6½	2·3	.....	1·9	61	19·30
8	3·7½	3·3½	2·3	.....	.....	54	17·08
9	3·8	3·4½	2·4	.....	.....	54	18·37
×10	4·1	3·9	2·11	.....	2·1	50	26·58
×11	3·4	3·11½	2·11½	.....	1·6	56	15·20
12	3·9½	3·5½	2·5	.....	.....	51	19·71
×13	3·2½	2·11	2·1	.....	1·4	56	15·19
×14	3·3	2·11⅜	2·1⅝	.....	1·7⅛	58	15·74
×15	3·10½	3·6½	2·7	.....	1·11½	53½	22·31
16	3·4½	3·1	2·3	.....	.....	54	15·84
17	3·2	2·10½	2·1⅝	.....	.....	54	14·65
×18	3·5½	3·2	2·4	.....	1·10	61½	20·92
19	4·1	3·10	2·10	.....	.....	54	27·09
20	3·0	2·9	2·1	.....	.....	54	14·64
×21	4·1	3·9½	3·1	.....	2·2	57	33·86
22	3·10	3·6½	2·6	.....	.....	54	21·09
23	4·9	4·6	3·5	.....	.....	54	39·33
×24	4·4	4·0	3·1⅛	.....	2·1⅜	58	34·47
25	3·0	2·9½	2·1	.....	.....	54	14·64
×26	3·2	2·11	2·2⅝	.....	1·9	49	14·58
×27	4·3	4·0	2·9	.....	1·8½	51	24·10
28	3·6	3·2	2·2⅜	.....	.....	54	15·85
×29	3·1	2·9½	2·2½	.....	1·10	45	13·21
30	2·11	2·7⅝	1·11	.....	.....	54	12·39
×31	4·1	3·10½	2·3	.....	1·10	53	19·34
32	2·9	2·6	1·10	.....	.....	54	11·34
33	3·2	2·11	2·1⅜	.....	.....	54	14·65
×34	3·8	3·5	2·7	.....	1·10	60	25·02
35	3·1	2·10½	2·1	.....	.....	54	14·64
36	3·4	3·1	2·2	.....	.....	54	15·84
×37	2·10	2·7½	1·11	.....	1·4	52	11·93
×38	2·8	2·5	1·9	.....	.....	54	10·38
×39	3·0	2·10	2·0	.....	1·3	52	13·00
40	4·2½	3·11½	2·10	.....	1·11½	53½	26·60
41	3·1	2·10½	2·3	.....	.....	54	15·84
42	3·6	3·3½	2·3	.....	.....	54	17·08
×43	3·6	3·2	2·3	.....	1·8½	50	15·82
44	3·10	3·6½	2·6	.....	1·11	55	21·35
×45	3·10⅜	3·6½	2·6	.....	.....	54	21·09
46	5·3	4·11	3·11½	.....	2·8	56	50·57
×47	3·0	2·10	2·1¼	.....	.....	54	14·65
48	3·9	3·6	2·9	.....	1·10	57	26·04
×49	3·11	3·8½	2·8	.....	.....	54	23·08
50	4·0	3·9½	2·10	.....	1·11	61	30·60
×51	3·2	2·11	2·1½	.....	.....	54	14·65
52	4·1½	3·11	2·11	.....	2·1	58½	31·10
×53	3·2	2·11	2·1¼	.....	.....	54	14·65
54	4·2	3·11	2·0	.....	2·1	47	22·21
55	3·8	3·5½	2·5	.....	.....	54	19·71
×56	3·7	3·3	2·6	.....	.....	54	17·08
57	3·6	3·2	2·0	.....	1·5½	55	18·75
58	4·0	3·8	2·8	.....	.....	54	23·02
×59	3·7	3·3	2·2	.....	1·7	53	16·55
×60	4·0	3·9	2·8½	.....	2·0	55	24·35

	M.	s.s.	First.	Second.	Third.	Fourth.	Total.
In addition to the above 60 trees there, are :—	51	25	14	6	2	1	= 99 saplings.

NOTE.—Nos. 1, 2, 5, 7, 10, 11, 13, 14, 15, 18, 21, 24, 26, 27, 29, 31, 34, 37, 39, 40, 43, 44, 46, 48, 50, 52, 54, 57, 59 and 60 were measured.

From these—

Average bole ... ... = 54 ft.
Average girth at 4'6" ... ... = 40"·04
Average girth at centre ... ... = 28"·98
Average cubical contents ... ... = 20·31 c. ft.
Average annual girth increment, 1 to 23 years ... ... = 1"·74

Measured by Mr. P. M. Lushington, 30th September 1894.

Sample acre, Chittagong, 1873. — Close lattice. Second class.

Number.	G. at 2'.	G. at 4'-6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
× 1	2·11¼	2·7¼	2·3	2·1¼	1·4	35	12·02
2	1·11¼	1·8½	1·6	.....	.....	38	5·34
3	1·4	1·2½	1·0	.....	.....	38	2·97
4	2·2¼	1·11½	1·8½	.....	.....	38	6·03
× 5	2·1	1·7½	1·3½	1·7	1·1	33½	4·45
6	1·10½	1·8½	1·6	.....	.....	38	5·34
7	2·0½	1·10½	1·7	.....	.....	36	5·20
8	2·4½	2·1½	1·10	.....	.....	38	7·28
9	2·3½	1·11½	1·8	.....	.....	38	6·80
×10	2·0	1·8½	1·5	1·6½	1·3	38	5·95
11	2·0	1·8½	1·5	.....	.....	38	5·95
12	2·0½	2·0	1·8	.....	.....	38	7·27
×13	1·8½	1·3½	1·3	1·2½	0·10	28	2·58
14	1·6½	1·4	1·2	.....	.....	38	3·23
×15	3·3	2·11	2·1	2·1½	1·0	44	11·03
16	1·8½	1·6½	1·4	.....	.....	38	4·23
17	2·3½	2·0½	1·9	.....	.....	38	7·27
×18	2·3½	2·0½	1·8	1·8½	1·2	37	6·42
19	2·5	2·2½	1·10	.....	.....	38	7·28
×20	2·5	2·2	1·10	1·11½	1·6	34	7·14
21	3·2½	2·10	2·4	.....	.....	38	13·03
×22	2·6½	2·1½	1·8	1·8½	1·1	30½	6·34
23	2·11	2·7	2·1	.....	.....	38	10·20
24	2·4½	2·2	1·10	.....	.....	38	7·28
×25	2·3½	1·11½	1·10	1·10½	1·6	34	6·54
26	1·7½	1·5½	1·3	.....	.....	38	3·23
27	2·3½	1·10½	1·8	1·8½	1·3	30½	5·29
28	2·5½	2·2	1·10	.....	.....	38	7·28
29	2·11	2·7	2·1	.....	.....	38	10·20
×30	2·0½	2·0½	1·11	1·9½	1·2	35	8·23
31	2·3½	2·1	1·9	.....	.....	38	7·28
32	2·1½	1·10½	1·8	1·8½	1·3	30½	5·29
33	2·1½	1·10½	1·8	.....	.....	38	7·28
34	1·9	1·5½	1·2	.....	.....	38	3·23
×35	2·3	2·0	1·9	1·9	1·3	46½	8·99
36	2·9½	2·7	2·1	.....	.....	38	10·30
37	2·2	1·10½	1·8	.....	.....	38	6·59
38	1·9½	1·7½	1·5	1·5½	1·1	32	4·01
39	2·1½	1·10	1·8	.....	.....	38	6·59
×40	2·7½	2·4½	2·1½	1·10½	1·2	51	11·71
41	3·10	3·6½	3·3	.....	.....	38	21·37
42	2·3½	1·11½	1·8½	.....	.....	38	6·80
43	1·9½	1·6½	1·4	.....	.....	38	4·24
44	2·3½	2·0½	1·9	.....	.....	38	7·27
45	2·5	2·3	2·0	1·8½	1·0	41	7·11
46	2·7	2·0	1·10½	.....	.....	38	7·00
47	2·0	1·9½	1·7	.....	.....	38	5·95
48	2·0	2·3	2·0	.....	.....	38	11·11
49	2·4½	2·1	1·9½	.....	.....	38	7·28
×50	1·11½	1·8	1·5	1·7¼	1·2	34½	4·32
51	2·5½	2·1½	1·9½	.....	.....	38	7·28
52	1·11	1·8½	1·6	.....	.....	38	5·34
53	1·10	1·7½	1·5	.....	.....	38	4·76
54	2·6	2·3	1·10½	.....	.....	38	7·99
55	2·6	2·2½	1·11	1·10	1·2	40	9·18
56	2·6½	2·3	1·10½	.....	.....	38	7·99
57	2·2	1·11½	1·8½	.....	.....	38	6·80
×58	2·2½	1·11⅝	1·7⅞	1·7⅞	1·2	32	5·01
59	2·4½	2·1½	1·9½	.....	.....	38	7·28
×60	2·7½	2·3½	1·11	1·9½	1·0	36½	10·67
61	1·10½	1·7½	1·5	.....	.....	38	4·76
62	2·7½	2·4	2·1	.....	.....	38	8·72
63	2·10	2·5	2·1	.....	.....	38	9·73
64	3·3	2·11	2·5	.....	.....	38	13·87
×65	2·10½	2·6½	1·11	1·9½	0·9	53	12·16
66	2·4	2·0½	1·9	.....	.....	38	7·27
67	1·11½	1·8½	1·6	.....	.....	38	5·34
68	3·0	2·7	2·1	.....	.....	38	10·30
69	2·4½	2·1½	1·9½	.....	.....	38	7·28
×70	3·1½	2·10	2·4	2·3½	1·6	46	15·65
71	2·5½	2·2½	1·10	.....	.....	38	7·28
72	2·7½	2·3	1·10½	.....	.....	38	7·99
73	2·6	2·2½	1·10	1·11	1·4	37	7·77

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.	Total.
In addition to the above 73, there are:—	4	15	34	56	53	36	27	= 225 saplings.

Note.—Nos. 1, 5, 10, 13, 15, 18, 20, 22, 25, 27, 30, 32, 35, 38, 40, 45, 50, 58, 60, 65, 70 and 73 were measured.

From these—

Average bole	= 38 ft.
Average girth at 4'·6"	= 25"·21
Average centre girth	= 21"·33
Average cubical contents	= 7·65 c. ft
Average annual increment, 1 to 21 years	= 1"·20

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Measured by Forester Lasrado, 14th December 1894.

Sample ½ acre Ambrampoliem, 1874. — First class.

Number.	G. at 2'.	G. at 4'. 6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·5	2·1	1·8½	.....	1·2	43	7·47
2	2·7¼	2·5	1·10	.....	.....	38	7·98
×3	2·9	2·6	1·11½	.....	1·4	37	8·50
×4	2·5	2·3½	1·9½	.....	1·3½	33	7·28
5	2·3	2·0	1·7	.....	.....	33	5·95
×6	2·6	2·3	1·11	.....	1·3½	28	6·42
7	2·1	1·11	1·7	.....	.....	33	5·95
×8	2·7	2·3½	1·9½	.....	0·11	42½	8·14
9	2·5	2·2½	1·9	.....	.....	38	7·27
×10	2·0	1·9	1·6	.....	1·2	37	5·20
11	2·5½	2·2½	1·9	.....	.....	38	7·27
×12	3·4½	2·11	2·3	.....	1·6	43	13·60
13	3·0	2·9	2·1	.....	.....	38	10·30
×14	2·1	1·10	1·6½	.....	1·1	31½	4·43
×15	2·9	2·4½	1·8½	.....	1·2½	39	6·78
×16	2·4	2·0	1·7	.....	1·0½	44½	6·97
×17	3·1	2·9½	2·0	.....	1·5	40½	10·12
18	2·4	2·1	1·8	.....	.....	38	6·59
×19	2·4	2·0½	1·6	.....	1·1	34	4·78
20	2·6½	2·2	1·9	.....	.....	38	7·27
×21	1·11	1·8½	1·5	.....	1·0	43½	5·45
22	2·4	2·1	1·8	.....	.....	38	6·59
×23	2·1½	1·11½	1·8	.....	1·1	39	6·77
24	2·2½	1·11½	1·7	.....	.....	38	5·95
×25	2·1	1·10	1·5	.....	1·1	35	4·39
26	2·2½	2·0	1·7	.....	.....	38	5·95
27	2·2	1·11	1·8	.....	1·1½	40	6·94
28	2·2	1·11½	1·7	.....	.....	38	5·95
×29	1·10½	1·7½	1·5	.....	0·11½	37½	4·70
×30	2·4	2·1½	1·8	.....	1·8	40	6·94

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.	Eighth.	Total.
In addition to the above 30, there are:—	2	8	6	24	31	13	6	3	= 93 saplings.

Note.—Nos. 1, 3, 4, 6, 8, 10, 12, 14, 16, 17, 19, 21, 23, 25, 27, 29, and 30 were measured.

From these—

Average bole	= 38 ft.
Average girth at 4'·6	= 25"·61
Average centre girth	= 20"·36
Average cubical contents	= 6·93 c. ft.
Average annual girth increment, 1 to 20 years	= 1"·28

Measured by Mr. P. M. Lushington, 20th November 1894.

SAMPLE ACRE, CHATAMBORAI, 1875. *Alluvial*, FIRST CLASS.

Number.	G. at 2'.	G. at 4'. 6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·11⅝	2·7⅝	2·1⅛	2·0⅝	1·2	63	17·10
2	2·8½	2·5⅛	1·11	.....	.....	45	10·33
3	3·3	2·9½	2·3	.....	.....	45	14·23
4	2·4⅜	2·2¼	1·10	.....	.....	45	9·45
×5	2·9½	2·5	1·10	1·10⅜	1·1	53½	11·23
6	3·4½	3·0½	2·6	.....	.....	45	17·57
7	2·4½	2·1⅝	1·9½	.....	.....	45	8·62
×8	4·0	3·8	2·8	2·8½	1·5	60	26·66
9	2·10⅛	2·5	1·11	.....	.....	45	10·33
×10	2·4	2·0½	1·7	1·7½	0·11	49	7·67
11	2·5	2·1⅜	1·9½	.....	.....	45	8·62
12	2·8	2·5	1·11	.....	.....	45	10·33
×13	2·8½	2·3⅛	1·11	2·1¼	1·6	35	8·03
14	2·11½	2·8¼	2·2	.....	.....	45	13·20
×15	1·11⅝	1·9¼	1·6	1·6⅝	1·1	46½	6·53
16	2·2½	1·11	1·8½	.....	.....	45	7·83
17	2·2	1·11	1·8½	.....	.....	45	7·82
×18	2·6½	2·1	1·7⅜	1·10⅜	1·3	44	6·89
19	2·6¾	2·4½	1·11	.....	.....	45	10·33
×20	2·7	2·3½	1·10	1·10½	1·2	52	10·92
21	2·1	1·10¼	1·8	.....	.....	45	7·81
×22	2·10	2·5⅜	2·0	2·0⅛	1·3½	52	13·00
23	2·7⅛	2·4½	1·11	.....	.....	45	10·33
24	2·4	2·1½	1·9⅜	.....	.....	45	8·63
×25	2·7¼	2·3½	1·8	1·10⅜	1·2	48	8·33
26	2·4½	2·0½	1·9	.....	.....	45	8·61
×27	2·0	1·9½	1·6	1·5½	0·11	46½	6·53
28	2·3½	2·0¼	1·9	.....	.....	45	8·61
29	2·0¼	1·9½	1·6½	.....	.....	45	9·33
×30	2·1½	1·10⅜	1·7	1·6⅝	1·0	38½	6·03
31	2·4½	2·2	1·10	.....	.....	45	9·45
×32	2·10	2·7⅛	2·0	1·11⅛	1·1	54	13·50
33	2·4⅜	2·1¼	1·9⅛	.....	.....	45	8·62
34	2·6¼	2·3	1·10⅛	.....	.....	45	9·46
×35	3·0	2·8¼	2·0	2·1½	1·3	55½	15·87
36	2·4½	2·1	1·9⅛	.....	.....	45	8·62
37	2·4¼	2·0⅛	1·9	.....	.....	45	8·61
×38	1·5⅜	1·3½	1·9	1·4½	0·9½	25	1·56
39	2·3¼	2·0¼	1·9	.....	.....	45	8·61
×40	1·11	1·8½	1·6	1·5½	1·0	40	5·02
41	1·11½	1·9½	1·7	.....	.....	45	7·05
42	2·1	1·10½	1·8	.....	.....	45	7·81
43	2·2½	1·11¼	1·8½	.....	.....	45	7·82
44	2·1½	2·1½	1·9½	.....	.....	45	8·32
×45	2·6¼	2·3¾	2·0	1·11⅞	1·5½	33½	8·37
46	2·6½	2·3	1·10⅜	.....	.....	45	9·16
47	2·5½	2·4	1·11	.....	.....	45	10·33
48	2·1	1·10	1·8	.....	.....	45	7·81
49	2·11	2·8	2·2	.....	.....	45	13·20
×50	2·2¾	1·11½	1·7	1·7⅝	1·0	49	7·67
51	2·7½	2·4½	1·11	.....	.....	45	10·33
52	2·7½	2·4½	1·11	.....	.....	45	10·33
53	2·11½	2·6½	2·0	.....	.....	45	11·25
54	2·4	2·0⅜	1·9	.....	.....	45	8·61
×55	2·8	2·4½	2·0	2·1	1·6	40	10·60
56	2·2½	1·11	1·8½	.....	.....	45	7·82
57	2·3½	2·1¼	1·9½	.....	.....	45	8·32
×58	1·9½	1·6½	1·4⅝	1·4½	1·0	36	4·05
59	2·1½	1·10	1·8	.....	.....	45	7·81
×60	1·11⅛	1·9¼	1·8½	1·7½	1·3	34	5·90

	M.	S.	First.	Second.	Third.	Fourth.	Fifth.	Total.
In addition to the above 60, there are:—	6	21	33	50	93	92	47	= 385 saplings.

NOTE.—Nos. 1, 5, 8, 10, 12, 15, 18, 20, 22, 25, 27, 30, 32, 35, 38, 40, 45, 50, 55, 58 and 60 were measured.

From these—

Average bole ... ... = 45′·47
The remaining centre girths are deduced from the averages of the trees measured.
Average girth at 4′·6″ ... ... = 23″·22
Average centre girth ... ... = 21″·73
Average cubical contents ... ... = 9·44 c. ft.
Average annual girth increment, 1 to 19 years ... ... = 1″·38

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Measured by Forester Lasrado, 14th December 1894.

SAMPLE ½ ACRE, AMBAMPOLIEM, 1876. SECOND CLASS.

Number.	G. at 2'.	G. at 4'. 6".	G. at C.	Mean, 2 and 6.	G. at tip.	Bole length.	Cubical contents.
1	2	3	4	5	6	7	8
×1	2·0	1·9⅛	1·7⅛	.....	1·0½	30	4·70
×2	2·3½	2·1	1·8½	.....	1·2	32	5·56
3	2·5⅛	2·2	1·9½	.....	.....	30	5·74
×4	2·5	2·1⅛	1·9	.....	1·2	33½	7·36
×5	2·9	2·5	2·0	.....	1·4½	31	7·75
6	2·7⅜	2·3⅛	1·10	.....	.....	30	6·30
7	2·4	2·0¼	1·8	.....	.....	30	5·20
×8	2·9	2·5½	2·2	.....	1·11	33	9·68
×9	2·9	2·6	2·0⅛	.....	1·10	32	8·00
10	2·0	1·9¼	1·7	.....	.....	30	4·70
×11	2·1	1·10⅛	1·8	.....	1·1	37	6·42
12	2·1½	1·10	1·7¼	.....	.....	30	4·70
13	2·1	1·10	1·7⅜	.....	.....	30	4·70
×14	2·5	2·2⅛	1·11	.....	1·5	28	5·96
×15	2·7½	2·4	1·11⅛	.....	1·8	25	5·74
×16	2·2½	1·11	1·7⅛	.....	1·1	28	4·39
×17	2·5	2·1	1·10	.....	1·6½	26	5·46
18	2·0	1·9⅜	1·7	.....	.....	30	4·70
19	2·0½	1·9¼	1·7	.....	.....	30	4·70
×20	2·3	2·0	1·10	.....	1·7½	24	5·04
21	2·1	1·9	1·7	.....	.....	30	4·70
×22	3·1	2·10	2·5	.....	1·10⅜	28½	10·40
×23	2·10	2·5	2·1⅛	.....	1·8	38½	9·09
24	1·11	1·8	1·6	.....	.....	30	4·21
×25	2·2	1·10	1·7	.....	1·2½	38	5·95
26	2·11	1·8½	1·6	.....	.....	30	4·21
×27	2·2	1·11	1·8½	.....	1·0⅛	27½	5·26
×28	2·5	2·2	1·8½	.....	1·2	37½	6·51
×29	2·6¼	2·4	2·1½	.....	1·7⅛	26	7·05
30	2·3	1·11½	1·8	.....	.....	30	5·20

	M.	S.	First.	Second.	Third.	Fourth.	Fifth.	Total.
In addition to the above 30, there are:—	1	11	18	27	48	49	52	= 191.

NOTE.—Nos. 1, 2, 4, 5, 8, 9, 11, 14, 15, 16, 17, 20, 22, 23, 27, 28, and 29 were measured.

From these—

Average bole ... ... = 30′
Average girth at 4′·6″ ... ... = 24″·20
Average centre girth ... ... = 21″·36
Average cubical contents ... ... = 5·97 c. ft.
Average annual girth increment, 1 to 15 years ... ... = 1″·37.

Measured by Mr. F. M. Luckington, 13th December 1894.

SAMPLE ACRE, AMBAMPOLLIAM, 1876. FIRST CLASS.

Number.	G. at 3'.	G. at 4'-6".	G. at C.	Mean basal G.	Girth at C.	Bole in girths.	Cubic contents.
	2	3	4	5	6	7	8
1	3 0½	2 10½	2 1½	2 8½	1 5½	43	5 52
2	2 6½	2 3½	2 0½	.....	.....	40	4 [illegible]
3	1 11½	1 9½	1 7½	.....	.....	40	3 [illegible]
× 4	2 2½	1 11	1 9½	1 7	0 11½	37	3 50
5	2 0½	1 9	1 6	.....	.....	40	3 62
6	1 11½	1 8½	1 6	.....	.....	40	3 01
× 7	2 6	2 3	1 10½	1 10½	1 3	38	4 28
8	2 3½	2 2	1 9	.....	.....	40	3 66
9	2 7½	2 2½	1 9½	.....	.....	40	3 65
×10	1 10	1 7½	1 5½	1 5	1 0	44½	5 58
11	2 8	2 4½	1 9½	.....	.....	40	3 66
12	2 2	1 11½	1 7	.....	.....	40	3 [illegible]
×13	3 4	2 11½	2 6	2 4½	1 5	55	21 [illegible]
14	2 7	2 4½	1 9½	.....	.....	40	3 [illegible]
×15	3 6½	3 3	2 5	2 7½	1 8½	47	11 15
×16	2 5	2 2	1 9½	1 11½	1 4	33	4 [illegible]
17	3 3	3 0	2 6	.....	.....	40	5 [illegible]
18	3 0½	2 9½	2 3	.....	.....	40	5 [illegible]
19	2 7½	2 5	2 1½	.....	.....	41	3 66
×20	2 4	2 1½	1 9½	1 10½	1 1	28	3 25
21	2 11	2 8	2 3	.....	.....	40	11 73
22	2 2	1 11½	1 7	.....	.....	40	4 26
23	1 7½	1 5½	1 2	.....	.....	40	3 40
24	2 1	1 9½	1 6	.....	.....	40	5 62
25	2 8½	2 5½	1 10½	.....	.....	40	7 66
×26	1 10½	1 8	1 4½	1 7½	0 11	32	3 55
27	1 11½	1 8½	1 5	.....	.....	40	5 01
28	1 10	1 7½	1 5	.....	.....	40	5 01
29	2 0½	1 9½	1 6	.....	.....	40	5 62
30	1 7½	1 4½	1 2	.....	.....	40	3 50
×31	2 0½	1 8½	1 6	1 6½	1 0	34	4 73
×32	2 1½	1 10½	1 6½	1 7½	1 0½	33	4 54
33	2 3½	2 0	1 7	.....	.....	40	6 25
34	2 1½	1 9½	1 6	.....	.....	40	5 62
×35	1 9	1 6½	1 3	1 4½	1 0	35	3 31
36	2 8½	2 6	2 1	.....	.....	40	6 25
37	2 5	2 2	1 10	.....	.....	40	6 01
×38	2 5½	2 1½	1 11	1 10½	1 2	36	10 17
39	2 11	2 8½	2 1	.....	.....	40	10 85
×40	2 1½	1 10½	1 8½	1 7½	1 2	34	6 [illegible]
41	2 5½	2 2½	1 10½	.....	.....	40	10 [illegible]
42	2 5½	2 2½	1 10½	.....	.....	40	10 [illegible]
43	2 2½	2 0	1 7	.....	.....	40	6 26
44	2 3½	2 0½	1 7½	.....	.....	40	6 26
×45	2 10	2 6½	2 1	2 3½	1 7	40	10 85
46	2 9	2 5½	2 0½	.....	.....	40	10 60
×47	2 6	2 3	1 9½	1 11	1 4	41	7 85
48	2 1	1 10½	1 6	.....	.....	40	5 62
49	2 4	2 1½	1 8	.....	.....	40	6 04
×50	2 6	2 2½	1 8½	1 9½	1 1	48	8 01
51	2 7½	2 4½	2 0	.....	.....	40	6 [illegible]
52	2 4½	2 1½	1 8	.....	.....	40	5 [illegible]
×53	2 3½	2 0½	1 9½	1 10½	1 1½	42	6 [illegible]
54	1 10½	1 7½	1 4½	.....	.....	30	3 [illegible]
55	2 7	2 4½	1 10½	.....	.....	40	7 [illegible]
56	2 5	2 2½	1 8½	.....	.....	40	5 [illegible]
×57	2 4½	2 1½	1 7½	1 8½	1 1	41	6 [illegible]
58	2 1	2 1	1 6	.....	.....	40	6 12
59	2 4	2 0½	1 7	.....	.....	40	6 26
×60	2 8½	2 5½	2 0½	1 9½	1 3	35	4 82
61	2 3	1 11½	1 7	.....	.....	40	6 26
62	3 0	2 8½	2 2	.....	.....	40	11 73
×63	2 8	2 5½	1 11	2 0	1 4½	46½	11 67

	M.	s.s.	First.	Second.	Third.	Fourth.	Fifth.	Total.
In addition to the above 63 trees there are:—	10	8	46	65	90	80	41	= 350.

NOTE—Nos. 1, 4, 7, 10, 13, 15, 16, 20, 26, 31, 32, 35, 38, 40, 45, 47, 50, 53, 57, 60 and 63 were measured.

From these—

Average bole	... ...	= 40 ft.
Average girth at 4'6"	... ...	= 25"·58.
Average centre girth	... ...	= 22"·87.
Average cubical contents	... ...	= 7·75 c. ft.
Average annual girth increment, 1 to 18 years	... ...	= 1"·42

The foregoing tables are sample areas measured off, marked and numbered now for the first time and will be useful in checking the current rate of growth in subsequent years.

They have been utilized in the foregoing appendices and also in the detailed description of compartments from which the relative growth in the various compartments can be plainly judged.

Appended is the result of these measurements in tabular form:—

Tabular Statement of Results.

FIRST CLASS.

Name and year of compartment.		Age.	Number of trees per acre.	Number of trees to be reserved from which to constitute final crop.	Number to be removed in thinnings.	Quality of thinnings.	Volume of reserved trees.	Average bole.	Average girth at 4'6".	Average centre girth.	Average cubic contents.	Average annual girth increment.
		YRS.						FT.	INCHES	INCHES	C. FT.	INCHES
Moolathamanoo ...	1847	47	102	50	52	...	1,262·86	61	41·76	30·68	25·75	0·88
Ammampolliom ...	1861	33	×114	60	× 54	...	×911·20	52	33·74	25·83	15·18	1·03
Valuvashery ...	1864	30	178	60	118	...	742·87	47	29·42	24·30	12·38	0·68
Nellikutta ...	1871	23	159	60	99	...	1,212·66	54	40·04	28·93	20·21	1·74
Ammampolliem ...	1874	20	×246	60	×186	...	×415·80	38	25·61	20·36	6·93	1·25
Chatamborai ...	1875	19	445	60	385	...	568·66	45	26·22	21·73	9·44	1·38
Ammampoliem ...	1876	18	413	63	350	...	483·53	40	25·58	22·87	7·75	1·42

SECOND CLASS.

Name and year of compartment.		Age.	Number of trees per acre.	Number of trees to be reserved from which to constitute final crop.	Number to be removed in thinnings.	Quality of thinnings.	Volume of reserved trees.	Average bole.	Average girth at 4'6".	Average centre girth.	Average cubical contents.	Average annual girth increment.
		YRS.						FT.	INCHES	INCHES	C. FT.	INCHES
Elanjery ...	1846	48	× 89	56	× 24	...	1,460·66	61	40·21	30·85	26 08	0·83
Do. ...	1850	44	×102	60	× 42	...	1,120·00	50	37·08	29·03	18·66	0·84
Eddacode ...	1850	44	111	60	51	...	941·91	49	34·03	26·52	14·86	0·77
Do. ...	1861	33	146	60	86	...	708·70	46	29·49	24 10	11·81	0·89
Ammampolliem ...	1861	33	×140	74	× 66	...	541·04	37	26·31	21·09	7·21	0·79
Valuvashery ...	1865	29	149	60	89	...	660·40	43	27·02	23·06	10·00	0·96
Chatamborai ...	1873	21	298	73	225	...	559·13	38	25·21	21·23	7·65	1·20
Ammampolliem ...	1876	18	×442	60	×382	...	358·76	30	24·80	21·36	5·97	1·37

× ¼ Acre actually measured.

APPENDIX F.

The following tables give the annual average girth increment (not current) on First and Second class soils:—

FIRST CLASS.

Block and compartment.		Years.	Average annual girth increment.
			INCHES.
Parangode	1896	1–8	1·91
Ammampolliem	1876	1–18	1·42
Chatamborai	1875	1–19	1·38
Ammampolliem	1874	1–20	1·28
Nellikutta	1871	1–23	1·74
Valuvashery	1866	1–28	1·12
Do.	1864	1–30	0·98
Panangode	1863	1–31	1·17
Ammampolliem	1861	1–33	1·02
Panangode	1854	1–40	1·18
Moolathamanoo	1847	1–47	0·88
Aravacode	1847	1–47	1·06
Eddacode	1846	1–48	1·01
Aravillykava	1844	1–50	1·07

SECOND CLASS.

Block and compartment.		Years.	Average annual girth increment.
			INCHES.
Amrampolliem	1876	1-18	1·37
Chatamborai	1873	1-21	1·20
Do.	1872	1-22	1·20
Valuvashery	1868	1-26	1·10
Do.	1865	1-29	0·96
Amrampolliem	1861	1-33	0·79
Eddacode	1861	1-33	0·89
Elanjery	1858	1-36	1·02
Eddacode	1850	1-44	0·77
Elanjery	1850	1-44	0·84
Do.	1846	1-48	0·83

(Signed) P. M. LUSHINGTON,
Deputy Conservator of Forests.

NILAMBÚR,
2*nd March* 1895.

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NILAMBÚR VALLEY FOREST WORKING SCHEME.

INTRODUCTION.

THE time occupied on the working plan is roughly one month, the month of March. A few statistics were collected previous to that date during the time occupied in compiling the report on the teak plantations.

The establishment employed on the plan has been only one Forester (in addition to the special officer) Mr. Lasrado, and coolies have had to be employed for cutting and marking out the sample areas.

The total cost of the plan is Rs. 801.

The intense heat during the month, coupled with the fact that this month is the most feverish month in the year in the Nilambúr valley, has rendered the work much more difficult than it would otherwise have been. The only survey made of the blocks under report is a boundary survey, but this is sufficiently accurate for the present working scheme which should only be regarded as preliminary.

Before any definite working plan is prepared for these forests, the general wishes of Government with respect to them must be declared.

Hitherto they have been worked as part of the plantation scheme, the whole enterprise being regarded from a purely commercial point of view. The supply of teak from the plantations does not benefit the neighbourhood directly, as none of the teak is consumed locally. Saplings are exported to the Bombay Presidency, whilst any large teak is at once snapped up by the Arabs for boat-building. Indirectly the neighbourhood benefits considerably both by the money spent on labour in the plantations and the business which is created by the sale of teak. The forests outside the plantations are more nearly connected with the local supply of timber. Though much of the timber is exported, some of it is used in Calicut and it is likely that the demand upon them will increase as the private forests become more and more worked out. I have ascertained by local enquiry that the demand upon these is far greater than on the Government forest, (1) because the private owners having no expense on establishment can afford to sell slightly cheaper, and (2) because the facilities for fraud are so great in private forests and merchants remove more than they are entitled to.

Nothing is done to maintain the growth in these private forests: the cutting is carelessly done, so that the regrowth is inferior, the forests are annually burnt which stops reproduction, whilst the practice of kumeri cultivation in the Nilambúr valley is speedily leading to the devastation of the natural forest. To a certain extent, however, owners are imitating Government in planting teak, though not to any large extent.

The treatment of the Government forest has not been a great improvement on that of private owners—a treatment of so-called selection felling which has resulted in the cutting out of most of the best species and leaving all unmarketable trees. Unaccompanied by improvement fellings this treatment has left upon our hands blocks for the most part worked out, nearly all the trees of marketable size being of species of little value. In two of the blocks (Nellikutta and Karumpoya) where there has been some attempt at improvement in the shape of fire-protection and the removal of some of the less valuable trees, there is some natural regeneration of valuable species as is shown by the sample areas measured; in the other blocks where no such protective measures have been attempted, there is little or no reproduction of valuable species except of Irul and a few Benteak—the former species apparently readily reproducing itself in spite of constant fires.

All this points to a more careful method of treatment being introduced; but before deciding on such a course, it is necessary to introduce another consideration.

The superiority of teak over the other valuable timbers of the district both in the price realized when mature and in the fact that it produces saleable timber at a very early age has been clearly demonstrated in the plantation report. In the same report it is shown how soon the original outlay is recouped and how profitable is this investment. Already there is a considerable area of planted teak, and proposals for doubling (nearly) the quantity of plantation have been made. After careful consideration I am convinced that this is, in the long run, the cheapest and best way of supplying the timber needs of the district where the area of forest under Government is so small compared with the area belonging to private owners. If these proposals are acceded to, we shall have an area under teak which at the end of 50 years will give a continuous supply, greatly exceeding the present demand and capable of meeting much of the local need, though there is to a certain extent a local prejudice against using teak in private houses as it is the timber employed in temples. With this large supply of really first-class timber I believe that the demand for other timbers will be very much reduced and that the demand on the forest outside the plantations will be so small that Government would not be justified in any large outlay in trying to introduce a more intensive system of working in these forests. Under these circumstances the plan now prepared is with a view merely to the upkeep of these forests without attempting any great improvement, which will necessitate the expenditure of large sums of money, which, as far as one can see at present, will be better laid out in the gradual planting up of the two blocks of Karumpoya and Nellikutta. The Karumpoya and Nellikutta blocks may, however, be included in the working circle, provision being made to revise the coupes at the end of each rotation so as to cut over the quantity required for planting just before planting takes place. Should planting be found inadvisable, these two blocks and any others found to be specially suitable for growing teak should be eliminated from the working circle and the whole plan will need remodelling.

CHAPTER I.—SUMMARY OF FACTS ON WHICH THE PROPOSALS ARE BASED.

Head I.—Description of the tract dealt with.

Sub-head (a)—Name and situation.

The forests dealt with in the plan may be termed the "Nilambúr valley forests." They comprise seven detached blocks lying in the Nilambúr valley in an elliptical form, the Nilambúr bungalow being one of the foci. Three blocks belong to the Amrampolliem and four to the Nilambúr range.

Sub-head (b)—Configuration of the ground.

The forests comprised are for the most part plain forests, though the northern portion of the Nilambúr block runs up into the lower spurs of the Camel's Hump range of hills and the northern portion of Nellikutta into the outlying spurs of the Nilgiri range (Amrampolliem forest). In no place do the forests rise to a height of more than 600 to 800 feet.

Sub-head (c)—Underlying rock and soil.

The underlying rock is gneiss, and the alluvial soils resulting from its decomposition are very rich and fertile. In places, however, especially in the Nilambúr blocks, the gneiss outcrops and forms slab rock which is bare of vegetation or with a few stunted trees. In other parts, notably in Kariem and Nellikutta and parts of Nilambúr, low laterite hills are super-imposed on the gneissic sub-stratum. These form dry unfertile soils, but seem specially favourable to the growth of irul (*Xylia dolabriformis*), which is sometimes associated with benteak. Such hills are usually entirely devoid of teak.

Sub-head (d)—Climate.

Damp heat is the distinguishing characteristic of the climate: the temperature in shade ranges between 75° and 90°. The average rainfall in the valley for the past

ten years is 94·5 inches, but the blocks of Kariem-Muriem, Nellikutta, Karumpoya lying under the Nilgiri hills evidently have a much greater rainfall in October and November. I have night after night watched these forests getting heavy showers of rain, whilst none has fallen in Nilambúr.

In spite of the heavy rainfall these forests get exceedingly dry in the early part of February, though there are still heavy dews at night. The fire season is an early one, but does not last long as there are usually heavy showers at the end of March and the beginning of April.

Sub-head (e)—Agricultural customs and wants of the population.

The system of kumeri cultivation is prevalent in the valley, but is not practised in these forests as there is ample private forest in the vicinity in which this practice is unrestricted. I noticed parts of the Nilambúr block which had suffered from this pernicious practice some years back, and am informed that the Nilambúr range had to warn and oust some hill men (Maliahs) from this block during this year. As the valley is so thinly populated and abounds in private forest, the Government forests have no burden to bear in the shape of supplying small wood or grazing.

Head II.—The Composition and Condition of the Forests.

Sub-head (a)—Distribution and area.

The map given in the appendix shows the distribution of the forests in the valley. Subjoined is a statement of area exclusive of the paddy flats lying in them:—

Name of block.	Acs.
1. Nilambúr	3,263
2. Pokote	525
3. Kanakut	668
4. Erambadam	581
5. Muriem, 1 765 / Kariem, 950 }	2,715
6. Nellikutta	1,607
7. Karumpoya	3,657
Total ...	13,016

Boundary survey, showing the position of the paddy flats, the principal paths, rivers and streams, was made in 1878–80 and the maps published on a scale of 8 inches = 1 mile for each block. No detailed survey has been made and at present this is unnecessary.

Sub-head (b)—Boundaries.

The only demarcation made was the original one consisting of the planting of small survey stones with small cairns in places. In many places these stones are missing (either buried or hidden in bamboo clumps) and as the forests are, in places, contiguous to private forest, this boundary should be repaired and a line kept cut and cleared which will serve as demarcation line, inspection path and fire line. Any missing stones should be replaced, and as the revenue survey is about to work in these parts, the boundaries might be checked by them. Large cairns are objectionable as elephants pull them down, but a line with boards placed at intervals would be effective. In many places such boundary is unnecessary owing either to the boundary being a natural or to its being already kept open as a fire line as in Nellikutta and Karumpoya.

Sub-head (c)—Legal position.

Nilambúr, Pokote, Kanakut and Erambadam are held under a lease from the Trikalayur devasom respecting his rights for minor produce, elephant-capturing, &c., and the right to cultivate the paddy flats.

The terms of this lease have been dealt with in full in the plantation report and it only needs to state shortly that Rs. 200 are paid as renewal fee once in 30 years and kuttikanom at a rate of Re. 1 per tree on teak and blackwood, 50 per cent. of the net profits on all other timber sold, and 20 per cent. on the net profits made from clearings for plantations.

Kariem-Muriem is held on a similar lease, but part with the Trikalayur devasom and part with the Nilambúr Tirumalpad. These two jenmis are engaged now in settling which portion belongs to each.

Nellikutta is held on a similar lease from the Zamorin of Calicut. As the jenmi's consent has been obtained, this has been declared a reserved forest under section 25.

The Government is the jenmi in the case of Karumpoya, the jenmi title having been purchased in public auction under a court decree. This also has been declared a reserved forest under section 25.

Sub-head (d)—Rights.

The rights held in the forests are unimportant, except the jenmi rights which give title to the Kuttikanom as noted above, to rights of minor produce, elephant catching and gold washing (which are rarely used) and to the cultivation of the paddy flats with attendant rights of way.

Sub-head (e)—Composition and condition of the crop.

The soil is good in all the blocks, except in parts of Nilambur, and is especially good in Karumpoya and Nellikutta. The trees produced are, for the most part, when grown from seedlings, straight and with fine bole, but the greater portion of the more valuable species are grown from coppice and, as no care has been taken of the timber when young, such stems are often bent and twisted and in cases where fire has not been kept out the trees are hollow. By far the most common tree in the older growth is the Poomardu (*Terminalia paniculata*) which has in many cases grown to a very large size owing to there being little or no demand for such trees. The prevailing trees which are marketable are teak and benteak (*Lagerstræmia Microcarpa*) with a sprinkling of Karamardu (*Terminalia Tomentosa*), vengai (*Pterocarpus Marsupium*), Nirbenteak (*Lagerstræmia Regina*) in the Karumpoya block and in Nellikutta teak, benteak and irul (*Xylia dolabriformis*). In the other blocks there is very little teak or rosewood left and the prevailing species are benteak and irul with patches of Karamardu and a few nirbenteak trees. In Karumpoya and Nellikutta there is a fair regeneration of teak, benteak and irul the blocks having been protected from fire for several years, in the other blocks except in Kanakut, where the reproduction of benteak and irul is good, there is very little reproduction except from high coppice stools and irul from seed. This latter species seems to be able to reproduce itself from seed in spite of fires.

The following observations on the growth of the principal trees may be noted here:—

1. *Teak.*—(The observations have been chiefly made from plantations.) Is essentially a light lover in all stages of its growth. It shoots up to a height of 50 feet in 8 years on suitable soils and increases rapidly in bulk in the early years. The growth in bulk decreases gradually with the age, but it is a decidedly fast grower up to 50 and is expected to reach an exploitable age on good soils in 95 years. The seed germinates with difficulty, except under artificial treatment, but the tree reproduces well from coppice.

2. *Benteak.*—Is a light foliaged tree and essentially a light lover and cannot support shade at any stage of its growth. It grows rapidly in height in its early years and up to 20 to 25 years the growth in bulk is very rapid. Subsequently the growth is slower though still fast and it reaches an exploitable age soon after 50 years. This tree reproduces itself easily from seed and coppices well even from a high stool. It has a tendency to buttress at the base even when grown from seed. It appears especially to favour the low-lying alluvial soils where it grows with teak, but is also found, though in less quantities, on the low-lying laterite hills where its chief congener is irul.

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3. *Blackwood.*—Is not found in large quantities in these forests, though there is a small sprinkling throughout the blocks. It is a somewhat light-leafed tree, though the foliage is occasionally dense. It is a very slow grower even when young and does not reach an exploitable age under 150 years. It reproduces from seed, coppice and root shoots.

4. *Karamardu.*—A dense-foliaged tree. When young it appears to grow somewhat slowly in height but rapidly in bulk. Subsequently it shoots up to a great height, but its bulk growth diminishes. It appears to be a light lover, but to be able to support a certain amount of shade especially when young. From the observations made the growth seems to be fairly fast throughout, but the growth is more even than in the case of benteak. It arrives at an exploitable age at about 60 years. This tree appears to favour a low-lying-moist soil and as pointed out by Mr. Eber Hardie (subsequently confirmed by my own observation) it is nearly always to be found in a fringe round the low-lying swamps. It reproduces from seed and coppice, though seedlings are not common.

5. *Irul*—is a dense foliaged tree and a shade lover. It grows slowly in height, but rapidly in bulk when young. Subsequently its growth in bulk appears to be fairly fast, though I have seen very few trees over 7 feet in girth. It gives a very serviceable log of even dimensions almost throughout its full length, though, as a rule, the bole is shorter than the other forest trees. It reproduces very freely from seed and forms dense forest especially on the laterite hills which are avoided by other species except benteak; hence it is often found growing pure. The exploitable age is difficult to determine as the rings are indistinct, but it is believed to be about 60 years.

6. *Vengai and Nirbenteak*—are less common than the foregoing species, and no reliable observations on their growth were possible. According to Mr. Gamble, the growth of Nirbenteak is somewhat similar to that of benteak.

Head III.—System and management.

Sub-head (a) Past and present systems of management.

These forests when taken over were for the most part of little value except for teak planting. For many years the woods with the exception of teak were not worked at all, but gradually the value of the wood increased and from 1862 there was a fair demand and merchants were allowed to cut what and where they pleased paying so much per candy; in places this was combined with a departmental working, only the marketable trees being selected for felling. From 1876 onwards the demand has considerably increased, but though in the departmental cuttings the various blocks have been worked in a definite rotation, yet trees in any block have been cut by merchants whenever application was made, provided the price offered was sufficiently good. No attempt has been made to take out the less valuable timbers except in Nellikutta block, where a contractor undertook to cut Poomardu at As. 8 per log, but even at this low rate he failed after the first year's working. From this it will be seen that there has been no system or regular working applied up to the present date.

Sub-head (b) Special works of improvement undertaken.

No special works of improvement have been undertaken in these blocks as most of the money spent in these forests is devoted to the artificial reproduction of teak. Two of the blocks, however, Nellikutta and Karumpoya, have been successfully protected from fire for over ten years.

In Nellikutta (area 1,824 acres) which has been protected since 1883 the total cost has been Rs. 1,336 and in Karumpoya (area 3,955 acres) which has been protected since 1884, the cost has amounted to Rs. 1,630.

Undoubtedly this expenditure has vastly improved the reproduction and the difference in these and the unprotected blocks (with the exception of Kanakut which may have escaped fire more often than the others) is most marked.

Sub-head (c) Past revenue and expenditure.

It is very difficult to separate the items of revenue and expenditure in each block, but the total returns of timber which have been taken from these blocks including parts cleared for planting are as follows:—

		Rs.	
Revenue	...	4,43,571	from 1844 to 1894.
Expenditure	...	99,044	
Balance	...	3,44,527	

This, however, does not include either the expenditure incurred on establishment, nor the upkeep of elephants, nor the Kuttikanom paid to the jenmis, nor any of the depôt expenditure.

In the appendix to the history of the plantations I have tried to calculate the annual net yield per acre after proportionate deductions and found it came to about As. 4 per acre per annum, but that for the Nellikutta block alone it amounted to Rs. 2–3–4 per acre per annum. The charges on timber too do not include the charges on site clearing (though the revenue is great) as such expenditure has been debited to plantations and not to timber works.

HEAD IV.—UTILIZATION OF PRODUCTS.

Sub-head (a) Marketable Products.

The chief marketable product from these forests is wood of large dimensions and only a few of the better species are regularly marketable, whilst the bamboos required to float them are readily sold. From enquiries made in Calicut, I find that the wood most in demand chiefly for house building purposes is irul and after this benteak and karamardu. The low selling prices and the good qualities of these woods for this purpose make them much sought after. Nearly all the teak at present is exported together with a good deal of these woods. I have tried in Calicut to obtain an idea of the amount of wood consumed locally, but owing to the reluctance on the part of the native dealers to disclose their figures I can obtain no reliable statistics.

The following is the yield in the various blocks from 1885–86:—

Name of wood.	Karumpoya.		Nilambur.		Pokote.		Kanakut.		Nellikutta.		Erambadam.		Murien.	
	Logs.	C. ft. per log.	Logs.	C. ft. per log.	Logs.	C. ft. per log.	Logs.	C. ft. per log.	Logs.	C. ft. per log.	Logs.	C. ft. per log.	Logs.	C. ft. per log.
Teak	38	24	21	..	42	..	*Nil.*	..	921	42	*Nil.*	..	225	40
Blackwood ..	1	11	139	4	79	..	105	..	44	41	116	..	176	29
Benteak	336	40	695	6	98	..	275	..	321	54	117	..	704	35
Karamardu ..	205	46	117	..	25	..	22	..	797	56	43	..	141	34
Irul	187	22	485	11	*Nil.*	..	72	26	1	13	112	20	..	..
Nirbenteak ..	12	5	20	10	*Nil.*	..	*Nil.*	..	*Nil.*	..	*Nil.*	..	64	38
Vengai	..	..	2	28	..	..	..	..	173	62	..	..	21	31
Junglewood ..	803	8	223	..	*Nil.*	..	101	25	1,286	43	228	19	39	40

Kariem has been worked in the current year about 650 logs being taken out, but the actual results are not yet known. Murien has been heavily worked in the two preceding years which accounts for the large amounts shown.

Sub-head (b) Lines of export.

All the timber is floated down to Calicut by the Karumpoya river and the various tributaries of this river. The only block not well supplied with a floating river is Murien and dragging for nearly 4 miles has to be effected from this block. No use is made of carts.

Sub-head (c) Markets.

The only market at present for the material is Calicut, but I learn that there are ge timber markets at Olavakode and Angadipuram at present supplied from private ests, but which may afterwards turn their attention to the blocks under report.

Sub-head (d) Mode of extraction and cost.

The trees after being felled are dragged to the river bank and there tied on rafts d floated to bamboos. Hitherto work has been conducted both departmentally and direct sale.

It is not easy to guage from the accounts the actual cost of extraction, but includ- all expenses of establishment, &c., the average cost per candy for wood brought into licut seems to be from Rs. 5 to Rs. 5–8–0 per candy of 13 cubic feet.

The inferior woods are occasionally extracted by the consumers.

Sub-head (e) Net value of the produce.

Jungle wood realises little or no net value. Inferior woods (benteak, irul, &c.,) ch from Rs. 7 to Rs. 8 per candy and thus ordinarily Rs. 2 per candy may be put wn as the net price realised; this gives about As. 2–6 per c. ft., but the average lised for the past 10 years as shown in Mr. Cherry's Inspection Note is only as . 1–8 per c. ft.

Blackwood realises As.14–10 net per c. ft., and teak Rs. 1–7–7. When the traction of inferior woods is left to contractors the prices offered are from Rs. 3–8–0 Rs. 5 per candy for inferior woods, the extraction being done at a cheaper rate, but is is not all net profit as the cost of establishment is not included and 50 per cent. s to go to Kuttikanom. Thus the difference between the two methods of working es not appear to be very great.

The net value of bamboos when cut departmentally is Rs. 4 to Rs. 4–8–0 per ndred, when sold on seigniorage Rs. 3 per hundred is levied.

HEAD V.—MISCELLANEOUS FACTS.—ESTABLISHMENTS, &c.

These points having been recently noticed by the Conservator in his inspection te have not been studied, but if a more systematic method of working is to be troduced for some of these forests which lie in the Amrampolliem range and if arumpoya is to be planted which block also belongs to that range it certainly seems advisable to reduce the establishment and do away with what must shortly become important range.

CHAPTER II.

HEAD I.—FUTURE MANAGEMENT DISCUSSED AND PRESCRIBED—BASIS OF PROPOSALS.

Sub-head (a) working circles.

From the foregoing statement under "distribution and area," it will be seen that e area under treatment consists of 13,000 acres (in round figures). Of this area it s been proposed to plant up with teak in the next 45 years the two blocks of arumpoya (5,650 acres) and Nellikutta (1,600 acres). It is not likely that the whole these blocks will be suitable for teak planting and I have roughly estimated the area for planting in Nellikutta as 1,040 acres and in Karumpoya 2,500 acres. Plant- g, however, will be a slow process and there is no reason why these areas should not included in the working circle, the area required for planting being eliminated from a working circle at the commencement of each period when the working scheme will revised.

Sub-head (b) Sub-division of the working circle.

As the forest is to be worked by the selection method and the forest is so irre- lar in its composition, no minute sub-division into compartments of homogeneous owth could be made.

The whole area is divided into twelve coupes which are by no means equal in size, but a rough attempt has been made to add to the area when the growth is evidently indifferent and where the growth is particularly good to curtail the area of the coupe. A detailed description of the coupes has been added to the appendix. At the same time an attempt has been made as far as possible to make the boundaries of the coupes coincide with natural features.

Appended is an abstract showing the composition of the coupes and their approximate area, with remarks as to their selection :—

Arrangement of coupes.

Coupe number.	Composition.	Area.	Remarks.
		Acs.	
I.	Part of Karumpoya block	918	Coupe, although containing good forest, has been made large so as to admit of a sufficient extent for planting in the next twelve years after which it will fall outside the working circle.
II.	Do.	531	Smaller than average owing to good growth.
III.	Do.	1,015	A large coupe as part of the eastern side contains very few good trees being rocky.
IV.	Do.	1,195	A large coupe as part of the western portion contains few trees.
V.	Part of Nellikutta block	877	Hilly ground at the north-east corner; not very productive.
VI.	Do.	730	Small, being of good growth.
VII.	Kanakat block, 668 acres .. } Erambadam ,, 581 ,, .. }	1,249	Considerable portions with dense bamboo growth unproductive.
VIII.	Nilambur block (Part) 798 acres } (Velachapally). } Pokote block .. .. 525 ,, }	1,323	Large portions in both blocks hilly and unproductive on account of bamboo growth.
IX.	Nilambar block (Part) (Eddacode).	2,465	Half of this is slab-rock and hill with nothing but scrub forest quite unproductive. The remainder is inferior and much cut over.
X.	Muriem block (Part)	900	Worked during the past three years ; about 650 logs being taken per year.
XI.	Do. do.	863	
XII.	Kariem block	950	

Sub-head (c) Analysis of the crop.

No accurate analysis of the crop has been attempted as such a process would require a long time and be very costly.

Sample areas have, however, been taken in all the blocks and the actual results are given in the appendix. The samples taken act as useful guides to see what can be taken out without danger to the standing crop, but being so small as compared with the total area of the block the growth in which is so diverse they cannot be said to be truly representative and do not afford accurate data for calculating the possibility.

Generally speaking all the trees (except teak in certain blocks) over 5′ 3″ in girth may be cut without infringing the possibility.

In coupes I, II and IV.—According to the sample taken and on 800 acres in *coupe III*, three trees per acre may be reckoned upon, the sample only shows tea, benteak and nirbenteak but, karamardu and vengai will also be found though in less numbers.

In coupes V and VI.—The actual enumeration showed only five exploitable trees on 10 acres but the other classes are very well represented and I think at least one exploitable tree per acre may be reckoned on.

In coupe VII.—Four trees of irul and one of benteak per acre were found of exploitable size. To be on the safe side, I would say that three irul and one benteak could be taken from the 800 acres really productive.

In coupe VIII.—One tree of benteak and one of irul may be counted on over each 2 acres on one tree per acre, the trees being equally divided between these two species with a few karamardu.

I estimate that about 400 acres are unproductive.

Coupe IX.—One tree of irul or benteak may be counted on for 1,000 acres of the area with a few karamardu.

Coupes X–XII.—One tree per acre, chiefly benteak and irul, but with some karamardu, may be reckoned on.

It will be seen that the analysis is by no means an elaborate one, being little better than an eye estimate made by a general inspection of the forest guided by some small areas on which an actual enumeration has been made. All these areas show that, except in the case of coupes X—XII which have only recently been opened out, all the classes below I and II, which are considered exploitable, are well represented.

HEAD II.—METHOD OF TREATMENT.

Sub-head (a)—Object sought to be obtained.

The object sought to be obtained by the working-plan is to keep up the production of the better class trees which are useful for local requirements especially for building purposes. Such material is not productive of large profits and so the cost of production must be kept as low as possible. As teak will be produced in sufficient quantities by artificial means, there is no need to favour this species. Under ordinary protection the natural reproduction of irul and benteak is so good that nothing more than protection from fire is required. At the same time it is sought by systematizing the fellings to acquire gradually a more accurate estimate of the standing crop and by so doing natural reproduction will not be so much interfered with as by the haphazard fellings conducted hitherto.

Sub-head (b)—Method of treatment adopted.

The only method possible to adopt is the method of selection fellings. This should be accompanied by improvement fellings were it not that they would be so expensive that the cost of them would not be justified. The only improvement felling that can be done will be, in case demand arises, for poomardu. Should such a demand arise, the felling of this tree should be confined to one block and when that block is well felled over, reproduction of the better kinds of trees should be stimulated by broad cast sowing accompanied by a rough weeding of the young saplings produced on the places cleared.

A treatment in regular high forest would be too expensive a method to apply, as there is so little demand for any but special trees whilst any other treatment is quite out of the question.

Sub-head (c)—The exploitable age.

From measurements made of specimens of benteak it was found that, as regards benteak, the following were the ages of the various classes selected :—

	Under 9″.	Fourth class, 9″ to 1′ 3″.	Third class, 1′ 3″ to 1′ 9″.	Second class, 1′ 9″ to 2′ 0″.	First class, above 2′ 0″.
	5 to 15 years*	15 to 26	26 to 45	45 to 53	Over 53 years.

* No small saplings were enumerated.

From which it is seen that benteak reaches an exploitable age at about 50 years of age.

As for karamardu the specimen could not be so accurately measured for each class, the rings being so irregular but it was found that exploitability was reached a few years later.

As regards irul the actual age of the trees could not be determined, as the rings are so indistinct, but judging from places where the growth appears to have originated about the same time, I judge that it reaches exploitability at about the same age as karamardu.

These then are the ages of the principal species and, to be on the safe side, I have adopted a rotation of 60 years divided into five periods of 12 years each which may be said to correspond to the classes as follows :—

	First period.	Second period.	Third period.	Fourth period.	Fifth period.
Saplings	Fourth class.	Smaller, third class.	Larger, third class.	Second and first class.	

Head III.—The Fellings.

Sub-head (a)—The general working scheme.

It is proposed to exploit the following species, irul, benteak, karamardu, vengai and nirbenteak on a full revolution of 60 years, the length that is required for the growth of these species, and this revolution is divided into five periods of 12 years, sufficient time to enable the trees of each class to attain the size of the class above them. The limitation imposed is that no tree of less girth than 5′ 6″ shall be cut. The classes below second class are well represented in every sample area taken and the only class that is not really well represented is the class of exploitable trees so that there is no danger in exploiting all that exceeds this limit of girth in the first period and it is probable that in the second period the number of exploitable trees will be found to be increased. Teak and blackwood require a longer rotation and must be worked merely according to cultural rules. As the plantations will supply all classes of the smaller kinds of timber it will be advisable only to cut these trees when quite mature. The executive officer should decide whether a tree is capable of remaining sound for another twelve years whenever one is met with in the coupe under working and, if not, it should be cut whatever its size may be. Thus a few trees of very large size will be produced which will afford timber useful for special purposes that cannot be produced by the plantations.

Bamboos may be cut as required, as there is no demand except for floating and the supply is very large.

The possibility cannot, with the present data, be calculated in cubic feet or the actual number of trees, as no enumeration was possible, but it has been shown in the preceding paragraphs that for the first period at any rate working is prescribed within the possibility of the forest.

Sub-head (b)—Period for which fellings are prescribed.

The plan provides for annual coupes for a period of 12 years commencing 1895–96 before the end of which period the plan should be revised.

Sub-head (c)—Areas to be felled annually.

The following is the order prescribed for fellings :—

1895–96	Coupe	I	... Karumpoya.
1896–97	Do.	II	... Do.
1897–98	Do.	III	... Do.
1898–99	Do.	IV	... Do.
1899–1900 ...	Do.	V	... Nellikutta.
1900–01	Do.	VI	... Do.
1901–02	Do.	VII	... Kanakut and Erambadam.
1902–03	Do.	VIII	... Nilambur (Velachapally) and Pokote.
1903–04	Do.	IX	... Nilambur (Eddacode).
1904–05	Do.	X	... Muriem.
1905–06	Do.	XI	... Do.
1906–07	Do.	XII	... Kariem.

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Coupe I, being required for planting purposes, will be done away with at the end of the period. In 1895–96 all the large marketable timber should be taken out, as there will be no return to the coupe. In the second period coupe II after being cut over will disappear for planting, and as the coupe is a small one, it will probably be found advisable to take off sub-coupe IV-A at present attached to coupe IV, as there is a dearth of exploitable trees in that coupe.

In coupe I in the first period the results in wood will not only be the principal fellings, but will also include year by year the produce cut off the site required for planting.

Should any demand for jungle woods occur, they should be confined to coupe I, until that block is completely cleared, and then to coupe II and so on, in the successive order of coupes; the advantage of this will be the reduction of expenditure on site clearing for planting.

After the blocks required for planting are cleared, the removal of these woods in the other blocks will be very beneficial but such removal should be followed by cultural operations, such as broad cast sowing and weeding, as by the concentration of these fellings these operations will not be so costly.

Sub-head (d)—Nature and mode of executing the fellings.

The trees will be felled according to the principle of selection fellings subject to the condition that no tree under 5′ 6″ in girth shall be cut. The stools should be cut as low as possible to the ground, as most of the reproduction is from coppice, and the high stools so frequently to be found at present are very objectionable.

The cutting may be done either departmentally or by contractors, provided that in the latter case the cutting is confined to the coupe under exploitation, and that the contractors are compelled to cut as low as possible. Trees to be felled should be previously marked by the ranger.

As already noted it is expected at the end of the first period that the number of exploitable trees will be increased and that there will be a fair distribution of the age classes. The systematizing of the fellings will probably produce a more regular crop of young growth.

Sub-head (e)—Tabular Statement of fellings.

Nothing need be added to the information already given under the "arrangement of coupes," "analysis of crops," and "areas to be felled annually."

Head IV.—Supplementary Regulations.

Sub-head (a)—Cleanings, thinnings, &c.

It will be too costly to carry out any such improvement fellings until the demand for jungle woods which now dominate the forest has increased or until the forest begins to show a better net revenue. When the forest has been cleared of jungle wood, such operations can be attended to, provided the necessity for them is apparent and the operations can be concentrated.

Sub-head (b)—Grazing and other rights.

Require no consideration.

Sub-head (c)—Sowing, planting, &c.

The only remarks necessary are that, should planting be approved of, coupe I will be the first piece of forest to be undertaken. There is excellent planting ground in this coupe. The areas planted annually should be carefully marked off and should be in a single block each year, the blocks running from east to west.

Sub-head (d)—Improvements common to the whole area.

1. *Demarcation.*—As pointed out above although the area has been surveyed and small stones placed, the line is only to be discerned with considerable difficulty owing to its being overgrown and the stones covered up. The objection to more substantial

cairns being erected is that they would be knocked down by wild elephants and this is a serious consideration, but there is no such objection to a cut line with a few boards nailed to the trees. The fact that kumeri cultivation, which has extended to the very borders in several places, if not encroached on to the forest, shows how necessary a better demarcation has become. Moreover, I doubt if any magistrate would convict, suppose any forest case were reported, the difficulty of knowing the boundary line being a good excuse for the offender. These remarks do not apply to Karumpoya and Nellikutta where the demarcation line is regularly kept clear and annually fire traced. The demarcation of the other blocks besides its use as a demarcation line will make a good fire line and inspection path.

The approximate length of line to be demarcated in the various blocks, exclusive of the portions demarcated by a natural boundary, are as follows :—

	Miles.
Kariem Muriem	8½
Erambadam	3
Kanakut	2
Pokote	4¼
Nilambur	4½
Total ...	22¾

The line cut should not be less than 12 feet broad and should not exceed a cost of Rs. 20 per mile, the cost in parts will be heavy owing to the large amount of bamboo forest.

The total cost should not exceed Rs. 450 and the work should be carried out as soon as possible.

No reclearing will be required, as this will be fire traced and thus cleared annually.

2. *Fire Protection.*—This is an essential to ensure natural reproduction in these forests.

Nellikutta has been successfully protected for the last 11 years at a cost of Rs. 1,336 or an average of Rs. 121 per annum. Karumpoya has been protected for ten years at a cost of Rs. 1,630, or an average of Rs. 163 per annum. The cost of protection has been considerably increased by the lines being scraped and not burnt. As these blocks are to be planted, it will be advisable to continue this careful system of protection, as the burning of lines does not seem to be well understood in the district.

Fire protection should gradually be extended to the other blocks. In 1895–96 Kariem Muriem, which is now under process of regeneration, should be brought under protection, in 1896–97 Erambadam and Kanakut and in 1897–98 Nilambur and Pokote. With small guide lines swept, the lines should be burnt clean which will not be very difficult, as there is very little grass but a good spread of fallen leaves and this protection should not cost more than Rs. 5 per mile. There is already a watcher in charge for most blocks and I do not consider any further watchers necessary, but he should be given two or three coolies to assist him in sweeping the line during the season when the fall of leaf is particularly heavy. Thus the expense of protection will be reduced to a minimum.

HEAD V.—MISCELLANEOUS.

The cost of the working plan is as follows :—

	Rs.
Pay and travelling allowance of special officer for one month	682
Do. do. of forester assisting	26
Erection of sheds	21
Marking and measuring sample areas	72
Total ...	801

Financial Results.

To give an accurate statement of financial results would necessitate a long enquiry into the establishment employed and the payment of the various items of kuttikanom and rates paid under the various systems of working. This would add considerably to the cost of the plan and even then a not very reliable estimate could be framed as it is by no means certain how many trees will be found exploitable during the first period.

For budget purposes, the estimate of revenue may be based on the figures given under the heading of "Analysis of crop." Each tree felled may be estimated at three candies and each candy to produce Rs. 4 net exclusive of the cost of establishment and kuttikanom. To this must be added the proceeds of site clearing.

Concluding Remarks.

It is very necessary that during the first period a careful account should be kept of the revenue and expenditure and number of trees felled coupe by coupe and in places where the coupe consists of more than one block the results of each block should be kept separately; and, if the results are kept in the reserve book as provided in revised code, paragraph 73, with the other notes there prescribed, accurate data will be furnished for the revision of this plan towards the end of the first period. In the same way it will be advisable to keep the results from site clearing distinct from the selection felling.

(Signed) P. M. LUSHINGTON,
Deputy Conservator.

APPENDIX I.

A map (1 mile=1 inch scale) showing the position of blocks and coupes in the Nilambur valley accompanies also the plantation report. The coupes have been also marked off in the 8-inch maps and the maps returned to the District Forest-officer, South Malabar.

APPENDIX II.

DESCRIPTION OF COUPES.

COUPE I.—Situated in the north-east of the Karumpoya block.

Boundaries—North.—Shenkarakode padam and the Amarampolliem forest.
East.—Amarampolliem forest.
South.—Karumpoya river.
West.—Foot-path from old timber depôt to Shenkarakode padam.

Soil.—Moist alluvial almost throughout.

Composition of crop.—Irregular. Splendid growth of trees of inferior species for the most part, but with teak and karamardu in patches, the latter especially at the northern portion; also benteak and some vengai. Reproduction fair.

COUPE II.—Situated west of coupe I.

Boundaries—North.—Kalian Tode and Amarampolliem block.
East.—Foot-path from old timber depôt to Shenkarakode padam.
South and west.—Cherupoya river.

Soil.—Chiefly moist alluvial, but with a few laterite hills.

Composition of crop.—There is an especially good growth of benteak in parts of this block, and karamardu and vengai are also to be found.

COUPE III.—Situated south of coupe I.

Boundaries—North.—Karumpoya river.
East.—Amarampolliem forest.
South.—Cherupoya.
West.—Well known right of way.

Soil.—Alluvial with laterite hills on south-west running into gneissic hills on north-east.
Composition of crop.—Chiefly benteak, karamardu and irul with some teak.

COUPE IV.—In two portions.

Sub-coupe IV (a)—Situated south of coupe II.

Boundaries—North.—Karumpoya river.
East.—Right of way.
South and west.—The Cherupoya river.

Soil.—Good alluvial.
Growth.—Fair, but without many good trees. Chiefly benteak and karamardu.

Sub-coupe IV (b)—Situated south of sub-coupe IV (*a*) and coupe III.

Boundaries—North.—Cherupoya river.
East.—Amarampolliem reserve.
South and west.—Sherungar Tode.

Soil.—Good alluvial.
Growth.—Similar to sub-coupe IV (*a*), but much cut over and in parts unproductive owing to bamboo growth.

COUPE V.—Situated west of the Nellikutta block.

Boundaries—North.—The Nellikutta reserve boundary.
East.—A cut line from the north boundary to a point on the main interior fire line as mapped, then this fire line.
South.—The Ponnam Poya river.
West.—The Athi Tode.

Soil.—Good alluvial near the river, but with laterite hills and especially to the north where the ground is very much broken.
Growth.—Good with teak, benteak, irul and karamardu, especially near the swamps, especially productive in the southern portion.

COUPE VI.—Situated east of coupe V.

Boundaries—North.—The northern boundary of the reserve.
East and south.—The Ponnam Poya.
West.—The interior fire line and cut line.

Soil.—Hilly and broken at the northern side, but running into good alluvial at the south.
Growth.—Fair except to the north. Prevailing trees benteak, karamardu and irul.

COUPE VII.—Situated in two blocks—Erambedam and Kunakut.

Soil.—Alluvial with low laterite hills.

Kunakut has in places, especially on the north-east, a very fine growth of benteak of all classes; beyond the Netti Tode this species forming nearly pure forest. The hills on the west have a good growth of irul and on the south there is a sprinkling of karamardu, but much is unproductive owing to the dense growth of bamboos.

COUPE VIII.—Situated in two blocks—Pekote and Velachapally (the portion of the Nilambur block north of the Kuranji Tode)

Soil.—For the most part consists of laterite hills with some alluvial in the valleys.

Growth.—In Pekote the growth is chiefly irul, but not of large size, with a few big trees of benteak and karamardu, especially in the northern portion. In Velachapally there is a horse-shoe-shaped hill and the western ridge contains a fine growth of irul and benteak, the growth on the eastern ridge being inferior. In the alluvial valley there is a good deal of karamardu, but most of the big trees have been cut out.

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COUPE IX.—Situated in the Nilambur block (Eddacode) south of the Kuranji Tode.

Soil.—Inferior with laterite hills running into gneissic slab rock, some alluvial in places.

Growth.—Very inferior, the block has been much cut over and all the best parts chosen for teak planting. On the eastern side there is some irul and benteak and on the south irul and badly grown karamardu. All the central and northern portion contains a scrub growth and is quite unproductive.

COUPE X.—Situated on the northern half of the Muriem block, the southern boundary being a cut line as mapped.

Soil.—Alluvial with laterite hills.

Growth.—Good but with very little re-growth. The principal species are benteak, teak, blackwood and karamardu.

COUPE XI.—Situated on the south half of the Muriem block.

Soil and Growth.—Similar to coupe X, but with less teak and rosewood and a greater proportion of karamardu and irul.

COUPE XII.—Situation.—the Kariem block.

Soil.—Alluvial running into a high laterite hill on the east.

Growth.—Moderate with little re-growth except irul. The principal species are benteak, karamardu and irul and the coupe is almost devoid of teak.

APPENDIX III.

VALUATION SURVEYS.

The classes enumerated were as follows:—

	First class.	Second class.	Third class.	Fourth class.	Fifth class.
	Diameter, above 2 feet ..	1' 9" to 2' 0"	1'3" to 1' 9"	9" to 1' 3"	Saplings below 9"

The measurement was done by coolies instructed in the work who measured the diameters with calipers under the direct supervision of Forester Lasrado and myself who both kept the account.

The following are the results:—

Coupe I—Soil sandy alluvial; area 10 acres.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.
Teak	* 7	11	34	27	67
Benteak	10	3	10	9	32
Nirbenteak	..	1	..	..	..
Blackwood	..	..	..	7	35
Irul	..	..	..	..	36

* 1 Hollow.

Coupe V—Soil alluvial; canopy light; area 10 acres.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.
Teak	..	..	21	46	142
Blackwood	..	1	2	3	12
Karamardu	2	1	4	..	1
Benteak	..	1	13	13	23
Nirbenteak	..	..	3	8	..

with 188 large Poonarda (*Terminalia Paniculata*) trees.

Coupe III.—Situated south of coupe I.

Boundaries—North.—Karumpoya river.
East.—Amarampolliem forest.
South.—Cherupoya.
West.—Well known right of way.

Soil.—Alluvial with laterite hills on south-west running into gneissic hills on north-east.
Composition of crop.—Chiefly benteak, karamardu and irul with some teak.

Coupe IV.—In two portions.

Sub-coupe IV (a)—Situated south of coupe II.

Boundaries—North.—Karumpoya river.
East.—Right of way.
South and west.—The Cherupoya river.

Soil.—Good alluvial.
Growth.—Fair, but without many good trees. Chiefly benteak and karamardu.

Sub-coupe IV (b)—Situated south of sub-coupe IV (*a*) and coupe III.

Boundaries—North.—Cherupoya river.
East.—Amarampolliem reserve.
South and west.—Shorungar Tode.

Soil.—Good alluvial.
Growth.—Similar to sub-coupe IV (*a*), but much cut over and in parts unproductive owing to aboo growth.

Coupe V.—Situated west of the Nellikutta block.

Boundaries—North.—The Nellikutta reserve boundary.
East.—A cut line from the north boundary to a point on the main interior fire line as mapped, then this fire line.
South.—The Ponnam Poya river.
West.—The Athi Tode.

Soil.—Good alluvial near the river, but with laterite hills and especially to the north where ground is very much broken.
Growth.—Good with teak, benteak, irul and karamardu, especially near the swamps, especially oductive in the southern portion.

Coupe VI.—Situated east of coupe V.

Boundaries—North.—The northern boundary of the reserve.
East and south.—The Ponnam Poya.
West.—The interior fire line and cut line.

Soil.—Hilly and broken at the northern side, but running into good alluvial at the south.
Growth.—Fair except to the north. Prevailing trees benteak, karamardu and irul.

Coupe VII.—Situated in two blocks—Erambodam and Kanakut.

Soil.—Alluvial with low laterite hills.
Kanakut has in places, especially on the north-east, a very fine growth of benteak of all ages; beyond the Netti Tode this species forming nearly pure forest. The hills on the west ave a good growth of irul and on the south there is a sprinkling of karamardu, but much is unproductive owing to the dense growth of bamboos.

oupe VIII.—Situated in two blocks—Pokote and Velachapally (the portion of the Nilambur block north of the Kuranji Tode).

Soil.—For the most part consists of laterite hills with some alluvial in the valleys.
Growth.—In Pokote the growth is chiefly irul, but not of large size, with a few big trees of enteak and karamardu, especially in the northern portion. In Velachapally there is a horse-hoe-shaped hill and the western ridge contains a fine growth of irul and benteak, the growth on he eastern ridge being inferior. In the alluvial valley there is a good deal of karamardu, but most of the big trees have been cut out.

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Soil.—Inferior with laterite hills running into gneissic slab rock, some alluvial in places.
Growth.—Very inferior, the block has been much cut over and all the best parts chosen for teak planting. On the eastern side there is some irul and benteak and on the south irul and badly grown karamardu. All the central and northern portion contains a scrub growth and is quite unproductive.

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Soil.—Alluvial with laterite hills.
Growth.—Good but with very little re-growth. The principal species are benteak, teak, blackwood and karamardu.

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Soil and Growth.—Similar to coupe X, but with less teak and rosewood and a greater proportion of karamardu and irul.

Coupe XII.—Situation.—the Kariem block.

Soil.—Alluvial running into a high laterite hill on the east.
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Diameter, above 2 feet ..	1' 9" to 2' 0"	1'3" to 1' 9"	9" to 1' 3"	Saplings below 9"	

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Nirbenteak	..	1	..	..	..
Blackwood	..	..	..	7	35
Irul	..	..	..	..	36

* 1 Hollow.

Coupe V—Soil alluvial; canopy light; area 10 acres.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.
Teak	..	..	21	46	142
Blackwood	..	1	2	3	12
Karamardu	2	1	4	..	1
Benteak	..	1	13	13	23
Nirbenteak	..	..	3	8	..

with 188 large Poomarda (*Terminalia Paniculata*) trees.

Coupe VII (a)—Soil laterite burnt; area 4·8 acres.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.
Irul	5	18	92	35	9
Benteak	1	2	8	4	..

with 33 large Poomardu trees.

Coupe VIII (a)—Soil varied; linear survey 56 chains × 1½ chains; area 8·4 acres.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.
Benteak	2	4	16	8	4
Karamardu	..	..	..	1	3
Irul	..	6	47	115	112
Blackwood	..	..	..	2	1

with 100 large Poomardu trees.

Coupe IX—Two samples—soil alluvial; seems to have been under cultivation some years back; area 1 acre.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.	—
Irul	..	..	4	23	27	Measured by Ranger Monisse.
Benteak	..	1	2	9	2	
Karamardu	..	..	4	9	..	
Blackwood	..	..	..	..	2	

with 15 large Poomardu trees.

Soil rocky and covered with bamboos twenty chains by one-and-half chains; area 3 acres.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.	—
Irul	3	2	16	22	53	Measured by Ranger Monisse.
Blackwood	..	..	1	2	3	

with 22 large Poomardu trees.

Coupe XII—Two samples—soil good, soft laterite at the base of Kariem Hill; area ·84 acre

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.
Irul	..	..	7	26	10
Benteak	1	..	3	8	2

with 9 large Poomardu trees.

Soil moist alluvial; area ½ acre.

Name of trees.	First class.	Second class.	Third class.	Fourth class.	Fifth class.	—
Karamardu	..	1	2	4	6	(2 forked) Measured by Forester Lasrado.
Benteak	..	..	1	1	..	
Irul	..	..	3	1	..	
Nirbenteak	..	..	2	2	..	

with 3 Poomardu trees.

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APPENDIX IV.

Rate of Growth.

Benteak (*Lagerstræmia Microcarpa*) in Nellikutta block.

Two specimens specially cut.

No. 1 *specimen* cut from a seedling.

Girth at 5′=7′ 6″.

Sample cut at 7′ high and girth measured outside the bark = 7′ 3″. Growth irregular. Rings in white wood specially so and hard to enumerate. For the first 20 years growth very fast, then slower up to 30, and beyond that very slow.

Diameters of heartwood 1′ 11½″ and 1′ 9½″ in mean = 1′ 10½″.

The rings measured on 10 inches of radius from centre where the lines were distinct gave—

First class.	Second class.	Third class.	Fourth class.	Fifth class.	Sixth class.	Seventh class.	Eighth class.	Ninth class.	Tenth class.
2	2	3½	5½	4	3	5	6	11	11

The tree had evidently received a shock about the 9th year from which it gradually recovered.

Wood generally sound, but beginning to deteriorate at the heart.

Thickness of sapwood about 3″.

Total number of rings 71, probable age of the tree.

No. 2 *specimen*.—A beautiful specimen cut from a seedling.

Girth at 5′ = 6′ 6″.

Sample cut at 10′ high where girth = 5′ 11″.

Growth regular and rings very distinct.

Fast growth up to 30 years of age and slower subsequently.

Diameters of heartwood 1′ 7″, 1′ 10″ and 2′ 0″ mean = 1′ 10″ nearly.

The rings counted on 9 inches radius were—

First class.	Second class.	Third class.	Fourth class.	Fifth class.	Sixth class.	Seventh class.	Eighth class.	Ninth class.	Remarks.
2½	3½	4½	4	4	4½	4	6	7	(Partly white wood).

and 15 rings were found on 2½″ of white wood.

The wood throughout of excellent quality.

Total number of rings 55, probable age of the tree.

[Note.—Mr. Gamble gives 6 to 8 rings per inch of radius.]

Observations made on karamardu and irul were not sufficiently accurate to record, but the general rate of growth has been given under the composition and condition of the crop in the body of the report.

Read—the following Proceedings of the Board of Revenue (Land Revenue), Forest No. 258, dated 10th June 1896 :—

Read—again Proceedings of the Board of Revenue (Land Revenue), Forest Mis. No. 1576, dated 23rd October 1895.

ABSTRACT.—Communicating to the Superintendent, Revenue Survey, for report, paragraph 3 of Southern Circle Conservator's letter suggesting that the re-drawing of the stock-map of the Nilambúr plantations may be more accurately done in the Survey Office, Madras, and that the services of a special draftsman be engaged for the purpose at the cost of the Forest Department.

Read—again Proceedings of the Board of Revenue (Land Revenue), Forest Mis. No. 1713, dated 12th November 1895.

ABSTRACT.—Informing the Superintendent, Madras Survey, that the stock-map of the Nilambúr teak plantations was sent to him as an enclosure to Board's Proceedings, Forest Mis. No. 1576, dated 23rd October 1895.

Read—again Proceedings of the Board of Revenue (Land Revenue), Forest Mis. No. 642, dated 1st May 1896.

ABSTRACT.—Forwarding to the Conservator of Forests, Southern Circle, for verification and correction by Mr. P. M. Lushington, the original and the proof copies of the stock-maps of the Nilambúr teak plantations.

Read—again Proceedings of the Board of Revenue (Land Revenue), Forest Mis. No. 781, dated 3rd June 1896.

ABSTRACT.—Returning to the Superintendent, Madras Survey, with reference to his letter, No. 37-B, dated 20th April 1896, the corrected proof copy of the stock map of the Nilambúr teak plantations, and requesting him to add a footnote to the map.

Read—also the following letter from J. W. CHERRY, Esq., Conservator of Forests, Southern Circle, to the Secretary to the Commissioners of Land Revenue, dated Coimbatore, 8th June 1895, No. 947 :—

[*Reference.*—Board's Proceedings, Forest Mis. No. 1130, dated 3rd September 1894.]

In accordance with orders, Mr. P. M. Lushington has completed a Report and Working scheme for the Nilambúr plantations.

These I received from Mr. Hooper on the conclusion of my privilege leave and I have now the honour to submit them with the following remarks.

2. Mr. Lushington has compiled a valuable report of the past history of the plantations, together with extensive tables of measurements and growths, &c., affording data for guidance and comparisons, and leading up to proposals which he submits for the future treatment.

3. The plantations were started in 1844 with the object of supplying the place of the natural teak which was rapidly disappearing ; and the experiment was so successful that the gradual extension of the planting has been since carried on from year to year.

The occurrence of fires, of which there is not a very complete record, must have injured and retarded the earlier growths ; and up to 1862 there was a general concord of opinion that the weeding and thinning had been neglected.

This neglect was gradually remedied ; and, with the exception of a small fire in 1889, the last recorded fire occurred in 1879.

In 1874 Mr. MacGregor advised thinnings so as to leave—

After	10	years	...	...	...	...	...	...	...	
„	20	„	...	...	...	...	...	...	750	trees.
„	30	„	...	...	...	...	...	...	500	„
„	80	„	...	...	...	...	...	...	150	„
			...	...	...	...	...	...	50	„

and he then estimated that the annual yield would be 70 acres at 50 trees per acre, at 50 cubic feet a tree, equal to 175,000 cubic feet of teak, valued at Re. 1-8-0 a cubic foot less As. 11 for floating to market.

From 1877 the disadvantage of discontinuing the printing of the District Forest-officers' reports in the Forest Annual Administration Report was made apparent.

In 1878 Colonel Beddome submitted his report and his proposals for future management. Some erroneous conclusions then arrived at have been pointed out by Mr. Lushington.

In 1885 it was decided to add 1,000 acres at the rate of 100 acres a year and to experiment with teak coppice under Mahogany standards 50 feet apart.

Colonel Walker's preliminary plan of thinnings was introduced.

In 1890 the plan of thinnings was revised and the experiments of mahogany (together with the macrophylla variety) as standards were considered to be a failure, because of the injury done to these trees by the borer.

Some regret is expressed at the waste of time and money over the experimental introduction of exotics into the plantations, which it is thought should have been confined to a separate and distinct area.

4. The conclusions generally to be gathered from the past history are, that the growth of the teak on the whole has been decidedly good and very promising from a financial point of view.

5. Mr. Lushington's appendices to his report are very useful.

Appendix A contains an abstract of the terms of each area leased for the purpose of planting, together with the correspondence and disposal of the several questions arising therefrom.

6. Appendix B contains notes on the method and cost of the planting and on the after-treatment of the growths. The conclusions here arrived at are, that the thinnings in the earlier years were insufficient and that the same scale of thinnings should not be applied to the alluvial and dry soils alike.

7. Appendix C contains a chapter on the exotic experiments. I agree with Mr. Lushington in his views discouraging the continuance of mahogany until the quality of the wood has been tested.

As regards the rubber also, the results of the experiment are not such as to justify planting on any large scale at present.

8. Appendix D contains his views on the extensions of the present plantations.

This is an important matter in connection with the working scheme and must depend, also to some extent, on the possible future yield from the natural forests in the vicinity of the plantations.

9. Mr. Lushington shows that the extraction of timber from the natural forests during past years has only yielded a net revenue of four annas per acre per annum from an area of about 10,000 acres.

It is true that more intense working would doubtless yield a higher profit, and, in fact, it is shown that for the Nellikutta portion of 1,600 acres, which has been more intensely worked and on a larger scale, the net result obtained was as high as Rs. 2-3-4 per acre per annum.

But this even is very far short of the high net yield of Rs. 90 per acre per annum which is expected from the plantations ; and leaves the comparison overwhelmingly in favour of artificial planting.

10. Out of the area of 14,000 odd acres which may be said to be available for extension of the present plantations, Mr. Lushington has selecteda bout 4,000 acres, which he proposes to plant up, at the rate of 80 acres a year for the next 50 years.

11. I am of opinion that the market is likely to absorb all the large teak we can grow, and that, should we cheapen the wood by increasing the supply, this would be an advantage than otherwise and, at the same time, we shall always have sufficient command of the market to avoid pecuniary loss.

12. I concur therefore in Mr. Lushington's proposals to go on extending our plantations at the rate he suggests, and, as I think the Karumpoya block is the one pre-eminently suited for the purpose, I propose that the extensions be first undertaken in that locality.

13. Appendix E gives the financial results of the past operations on the plantations and the leased natural forests together.

These show that the actual expenditure has been Rs. 10,43,015 and the actual revenue Rs. 10,65,431, or, in other words, that the *actual* expenditure has already been covered by the receipts.

14. With compound interest at 4 per cent. added to both heads, the figures respectively will be Rs. 21,25,667 and Rs. 18,37,657, showing a debit against the plantations at present of Rs.2,88,000. but as this debit is being constantly reduced (in 1878 it was reported to be Rs. 3,77,827), it is safe to assume that, before the final crop stage is reached, there will be nothing to deduct from the value of the stock standing on the ground; and this value will be very great and is calculated, in the working scheme, to yield a revenue of six lakhs a year.

15. It has been found impossible to separate the figures of cost and yield of the plantations proper from those of the natural leased forests, and this is to be regretted.

16. The working scheme applies to all the areas that have been planted with teak up to date with special provisions for *replanting* the two small areas, amounting to 64 acres within the plantations, that are referred to in Appendix D of the history.

17. Ninety-five years is fixed as the exploitable age (age of maximum utility), so that the first final crop fellings will take place in 1939.

In the meantime the scale of thinnings is prescribed for the next 25 years and the expected yield from thinnings is shown for the next 10 years.

18. If it is decided that the extension of the plantations should continue in the manner suggested under Appendix D, it may be necessary to show on the working plan map now submitted the areas to be so planted and to attach to this working scheme briefly the necessary provisions for so planting; but I would advise that a separate working circle and scheme should be prepared for planting the Karumpoya 4,000 acres (which is the area I suggest to be next planted up), so that there may be no delay in passing the present working scheme, and because, for the Karumpoya block, there will be no confusion of Kuttikanam accounts, and because it will then be possible to keep the Karumpoya planting accounts quite distinct from those of the rest of the forest.

At the same time there would be no great difficulty in combining the Karumpoya portion to be planted with the provisions of the present working scheme.

19. Mr. Lushington's remarks on the teak growth at Nilambúr show, that, while it is magnificent on alluvial soils, the laterite and water-logged soils must be avoided. On alluvial the principal height development is reached after about 35 to 40 years and the maximum utility after about 90 to 100 years, while on laterite soils it is some 40 years later.

20. It is unfortunate that no useful measurements have been recorded in past years of the earlier growths but it may be fairly presumed that the greater experience and better attention brought to bear on the later plantings have produced in comparison better results.

21. I concur in Mr. Lushington's remarks about the demand of the market.

In my last inspection notes I expressed my views on the question of growing large timber in preference to saplings, and I consider that the plan of working these plantations as high forest with thinnings and a clear felling of the mature crop to follow is the correct one.

22. How the areas are to be felled and whether the felled areas should again be planted up, are matters that need not be considered for the next 44 years (*i.e.*, when the first fellings are to take place); but I feel convinced that, as regards re-planting, it will then be found advisable to decide in favour of.

23. I am a little doubtful whether the stock map which is on the 8 inch scale, can be reduced to a 4 inch scale without confusing the details.

This would be a matter for the Survey office to advise upon.

If it can be done it would be an advantage in the matter of convenience and portability.

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I also note that it should be explained on the map that the blocks are not shown in their *relative* positions, and that the five small outlying blocks (giving their names and areas) referred to in the opening paragraph of chapter III have not been surveyed nor shown on the map.

24. I would have preferred each of the areas described in chapter III as "Subdivisions of blocks" to be treated as blocks proper; but as the "compartment" is the area of first importance in a working scheme, the arrangement of the blocks proposed need not be interfered with.

25. I would suggest that the blocks, sub-divisions, compartments and the year of planting should be more clearly shown on the stock map.

The colouring also, to distinguish the areas of first, second and third class plantations, should be more pronounced.

26. Mr. Lushington's proposals for the future treatment of the plantations as detailed in his chapter V have my approval.

The point of these proposals, with which we are most concerned at present is that the exploitable age has to be extended from 60 years (which was the period hitherto estimated) to 95 years for first class soils—at which age it is calculated from the measured rate of growth that we shall obtain an average centre girth of 4 feet 6 inches (breast height 6 feet 6 inches) most suitable for the market.

The age of exploitability has been worked out as 95 years for first class and 140 years for second class soils, while the final crop on the former will consist of 40 trees and on the latter 50 trees per acre.

27. I have the honour to request that the report and working scheme and map, together with the useful appendices, may be printed with these notes; and I would suggest that proof copies may be submitted to Mr. Lushington for correction before being published, as there are some minor errors in the manuscript which should be set right.

The printed report will require to be paragraphed and the improvements to the map carried out in the manner I have indicated.

28. Mr. Lushington's figures and notes have been collected and prepared without any special employment of establishment. He was assisted by a forester (Mr. Lasrado) lent to him by the District Forest-officer and a clerk (Itti Mathu) lent to him by the Collector.

I placed the services of Mr. Holder (a Surveyor) and Abboy Naidu (a draftsman) both on the temporary sanctioned scale at his disposal.

He desires in the covering letter to his report to acknowledge the great kindness and help which he received from District Forest-officer Mr. G. Hadfield.

Read—the following letter from J. W. CHERRY, Esq., Conservator of Forests, Southern Circle, to the Secretary to the Commissioners of Land Revenue, dated Coimbatore, 10th August 1895, Cur. No. 609 :—

[*Reference.*—Letter No. A., dated 26th April 1895, from P. M. Lushington, Esq., Deputy Conservator of Forests on special duty.]

Orders not having yet been passed on the proposals for the future working of the Nilambúr plantations, forwarded with my No. 947, dated 8th June 1895, I propose to assume that those proposals will be accepted, and to forward, therefore, with my approval before going on long leave, Mr. Lushington's proposals for roughly working the natural forests in the near neighbourhood of Nilambúr.

2. In the plantation proposals, it was recommended that the plantations should be extended and it was suggested that the Karumpoya block was the one best suited for the extended planting.

3. Mr. Lushington has on these lines drawn up his rough plan, which he calls the "Nilambúr valley forest working scheme," and in which he arranges for a simple working under selection fellings of about 13,000 acres of forests, without attempting any great and expensive improvements; and for revising the coupes after each period so as to cut over, just before regular planting is to take place, the area required for planting in the Karumpoya and Nellikutta blocks, these being found to be the best suited blocks for the regular plantation extensions which it has already been proposed to make at the rate of about 80 acres a year.

4. The rough plan assumes 60 years as an exploitable age for the principal trees of value (other than teak and blackwood), and divides this rotation into five periods of 12 years each, for the first of which periods the areas to be exploited annually are arranged.

The selected trees to be cut are not to be less than 5 feet 6 inches in girth, and it is especially provided that in the case of teak and blackwood, only those trees are to be cut which are not likely to remain sound during the succeeding twelve years' period, while all unsound trees of these two classes are to be cut whatever their size may be.

Attention is also to be given to improvement fellings so soon as there is a better demand for the "jungle woods" which at present dominate the forest.

5. Some remarks are added regarding cattle grazing, demarcation, fire-protection, and the careful recording of results, in which I concur.

6. I forward, with Mr. Lushington's report, the one-mile-to-the-inch map (showing the position of blocks and coupes) which he submits as Appendix I to his report.

Read—letter from E. D. M. HOOPER, Esq., Acting Conservator of Forests, Southern Circle, dated Coimbatore, 11th January 1896, Cur. No. 2286.

Abstract.—Returning, duly corrected by Mr. P. M. Lushington, proof copies of the Report, Working scheme, &c., of the Nilambúr teak plantations.

Resolution—Forest No. 258, dated 10th June 1896.

With the first of the letters read above, the Conservator of Forests, Southern Circle, submits, with his remarks, the Report and Working scheme of the Nilambúr teak plantations drawn up by Mr. P. M. Lushington, Deputy Conservator of Forests, in compliance with the orders appointing him for this special duty.

2. The papers have been detained in the Board's office pending the printing of the Report and Working scheme and the reduction of the stock-map to the 4-inch scale as suggested by the Conservator. Opportunity has also been taken to have the improvements and corrections to the map and to the report, suggested by the Conservator in paragraphs 23, 25 and 27 of his letter, carried out by Mr. Lushington. Printed copies of the map are, however, not yet ready; but the scale of the map has been reduced as desired by the Conservator; and a proof copy of the reduced map, verified and corrected by Mr. Lushington, has been forwarded to the Survey office for final printing. The Board does not wish to delay the issue of orders on the papers any further.

3. The plantations were at first started in 1844, but no attempts at systematic thinning were commenced until the year 1885. In that year the then Conservator (Colonel Campbell Walker) drew up, in conjunction with Messrs. Porter and Hadfield, a rough preliminary scheme to last for five years for regulating thinnings.* This scheme was in operation until the year 1890–91, when it was revised by the same officer so as to last for another five years ending with 1895–96 (Inspection Report in Board's Proceedings, Forest No. 206, dated 16th May 1891). Colonel Campbell Walker then suggested that, before

* *Vide* Inspection report in Board's Proceedings, No. $\frac{3233}{F.\ 659}$, dated 30th November 1885 (paragraph 6).

the termination of the period covered by the revised scheme, a special officer or officers should be deputed to draw up, from the experience gained by the working of the preliminary schemes, a regular Working plan to provide not only for the thinnings but for final fellings; and in accordance with this suggestion, which was subsequently supported by Mr. H. A. Gass, Acting Conservator, in his inspection report embodied in Board's Proceedings, Forest No. 253, dated 14th April 1894, Mr. P. M. Lushington was appointed to prepare the Working plan in question.

4. Mr. Lushington's Report and Working scheme have been carefully prepared. He has collected much useful information and added to the Working scheme a complete report of the past history of the plantations. He does not, however, make provision in the scheme for final fellings, as the period for such fellings is estimated by him to be still too far off. It was hitherto anticipated that the trees would attain maturity after 60 years, so that the first planting, viz., that of 1814, was expected to be felled in the year 1904. Mr. Lushington, after a careful calculation, disproves this theory and fixes the exploitable age at 95 years for first-class soils and 140 years for second-class soils. At this age he estimates that the trees will attain an average centre girth measurement of 4 feet 6 inches, which is the measurement most in demand in the market.

5. According to Mr. Lushington's proposals, therefore, the final fellings will not commence until the year 1939, when the first planting will have reached its 95th year. In the interval Mr. Lushington provides for thinnings and estimates the annual average yield therefrom at Rs. 52,801 during the first five years and Rs. 80,247 during the next five years. Mr. Lushington's proposals for future treatment have the approval of the Conservator, and the Board resolves to accept them. It is presumed that the formal approval of the Collector of Malabar has been obtained for the Working scheme, as required by section 90 of the Forest Code.

6. The subsidiary proposals made by Mr. Lushington regarding the continuance or otherwise of the experiments on exotic plantations and the extension of the present teak plantations, which are referred to by the Conservator in paragraphs 7 and 12, respectively, of his covering letter, also commend themselves to the Board. It will be noted that the financial results of the past operations in connection with the plantations are encouraging, as pointed out in paragraphs 13 and 14 of the Conservator's letter.

7. Mr. Lushington's proposals for working the natural forests in the vicinity of Nilambúr, or as he styles them, the "Nilambúr valley forests," submitted by the Conservator with his second letter read above, are approved. On the basis of the proposals made by Mr. Lushington, and with reference to paragraph 18 of the Conservator's first letter, a scheme should now be drawn up without delay for planting the Karumpoya and Nellikutta blocks.

8. In conclusion, the Board desires to place on record its appreciation of the satisfactory manner in which Mr. P. M. Lushington has discharged the duties entrusted to him and notes with pleasure that officer's acknowledgment of the able assistance he received from Mr. Hadfield.

Order—Mis. No. 3507, Revenue, dated 1st September 1896.

Recorded.

2. The Government concurs with the Board in paragraph 8 of its Proceedings.

(True Extract.)

(Signed) A. T. ARUNDEL,
Ag. Secretary to Government.
