could be crossed. I am not inclined, however, to recommend any experiments of this nature, as it would be useless to attempt it without the services of a scientific gardener, thoroughly trained in the art of hybridising, such as Mr. Dominey or Mr. Seden on the establishments of Messrs. Bull and Veitch, and such a man could only be procured on a very high salary, and other expenses connected with any experiments of this nature would be very costly. The experiments would be exceedingly interesting and of great scientific value, but practically perhaps of no value. We have now in cultivation all the finest-known species of the genus, and it is not likely that hybridising would improve the bark, or give us anything better than, or as good as, we now possess; so that we might be spending large sums to get some variations in leaf and flower, or perhaps in some cases sturdier growth.

54. *Analysis of the various Barks.*—I fear that too much reliance may hitherto have been placed on the analysis of the barks of single individuals of one species or variety, grown under unusually favorable conditions; soil, solar influences, shade, moisture, long droughts, exposure to wind, frost, &c., must probably exercise great influences on the bark and yield of alkaloids, and analysis should not be too much relied on, unless taken from a considerable number of trees subject to the varied conditions which they must experience in a plantation.

55. *Sites for Species requiring a Lower Elevation.*—A fine-sheltered shola in the "Silent Valley," elevation about 3,000 feet, has been reserved by the Collector of Malabar at the request of the Conservator, in case it should be required by this department for the growth of "Rubber trees," or any other products. I now recommend that this should be taken up by the Forest Department at Nilambúr, and that a small clearing should be at once made for experiments on the growth of "grey barks" and "yellow barks" at that elevation; if they grow well, there is ample room for opening out a considerable area; it may also be necessary to try "Carthagena" and "Santa Fé" at this lower elevation. A small pucka building should be erected, and the Chinchona budget should furnish the necessary funds; it is also desirable to try some of the rubber trees and the "Ipecacuanha" (Cephaelis) in the same locality.

56. *Renovating Pits.*—Mr. Rowson has much improved the health of the trees in the plantations under his charge (at Neddivattam and Pykara) by the renovating pits (2 feet cube). In many parts of the plantations the trees have a far more vigorous look than they had two years ago; it has been surmised that the lateral roots might be injured by this system, but this is not the case; where the lateral fibrils have been touched, they shoot out again with great vigor through the humus in these pits; in some cases cattle-manure has been put in the pits, but much of this not being available, they have generally been filled up with dead leaves, and decaying vegetation, such as the weeds, cleared off the plantations; they have, I consider, improved the condition of the plantations in a most marked manner.

57. *Perfect Drainage most necessary.*—All the varieties of Chinchona appear to grow much better on slopes than on flats, the tree being most impatient of anything like insufficient sub-soil drainage.

58. *Lichen.*—In wind blown situations the trunks and branches are often much covered with white lichen. Mr. Rowson assures me this in no way affects the health of the trees or bark; it is easily rubbed off.

59. *Diseases and Enemies.*—There is very little sign of canker at Neddivattam, and the Chinchona seems to have few or no insect enemies; sambur and wild animals are, of course, destructive, and fencing is most necessary in some parts if the plantations are to be worked up to their highest possible yield.

60. *Number of Trees in Neddivattam.*—Appendix A is a statement of the number of casualties amongst the trees in Neddivattam Plantation during the last three years (or since Major Walker's report), and the number of trees now existing based on Major Walker's enumeration.

61. Statement showing number of plants in the nurseries at Neddivattam, 28th May 1881 :—

Botanical Names.	Plants in Nurseries and Hot House on 31st March 1880.	Plants raised during 1880-81.	Total.	Plants issued during 1880-81.	Plants planted out permanently during 1880-81.	Balance in Nurseries and Hot House on 31st March 1881.	Remarks.
C. Succirubra	216,000	585,950	801,950	489,950	12,000	300,000	* Received from Dodabetta.
C. officinalis	155,000	378,000	533,000	228,000	105,000	200,000	† 3,383 seedlings have died.
C. Calisaya var. Ledgeriana.	4,400	*1,560	5,960	50	..	†2,027	
C. other varieties	4,000	1,305	5,305	..	2,305	3,000	
C. pubescens	..	20,010	20,010	1,000	8,010	11,000	
Total ..	379,400	986,825	1,366,225	719,000	127,315	516,027	

PYKARA.

The Hooker Chinchona Plantation, Acreage 134·19.

62. *No. I Plot*, 1866, *A.*—Acreage 10·91, about half grass land and half shola land. The grass land chiefly Officinalis, only a few Succirubra; the crown barks have been planted too far apart, but the gaps are to be filled in this season.

The shola land all Succirubra, growth good (about 20 feet high) except a small bit on the upper portion, which is much wind blown and thin from failures, and in which supplies are to be put down this season.

All the plantation has been barked five times.

63. *No. II Plot*, 1866, *B.*—15·09 acres; about one-third grass land planted with Officinalis, about two-thirds shola land planted with Succirubra; growth good or fairly good; in portions there is a yellowish appearance in the foliage which is not noticeable at Neddivattam; it is probably due to the long drought and east wind, and will disappear with the monsoon.

All the plantation has been barked five times.

64. *No. XIII Plot*, 1873.—10·59 acres, all shola land, planted with Officinalis; a few Succirubra put in as supplies; there are about 20 Pitayensis; but 726 plants sent out from Ootacamund as Angustifolia have turned out ordinary Officinalis; growth of trees good, but the plantation is very patchy and the trees far apart caused by the inroads of sambur.

In addition to the 10½ planted acres, there are some 15 or 20 more of abandoned shola cleared in 1873, but now over-grown; it would be a good plan to fence in the plantation and to re-clear and re-plant this portion, and to plant up the vacancies in the 10½-acre plot, but it would be useless without fencing on account of wild animals.

This plantation has not been barked.

65. *No. X Plot*, 1869, *A.*—3·58 acres, grass land, Succirubra and Officinalis in nearly equal proportion; growth not good; soil poor, rocky, and gravelly. Has been barked four times.

66. *No. VII Plot*, 1868, *A.*—18·36 acres, chiefly shola land, good soil, planted with Succirubra; the growth of the trees is good, but the plantation is very patchy from many trees having died out; cause not known; the gaps are to be filled in with Officinalis, but I fear this will not answer unless the plantation is fenced in, as sambur are exceedingly troublesome in this plot, and destroy by most of the young plants put out.

The above trees have all been barked four times.

Some grass land planted with Officinalis very far apart; growth short; pits have been dug for filling in more trees; the soil is good, and it would have shown far better results if it had been planted 4′× 4′ instead of 8′× 8′.

All the trees have been barked four times.

67. *No. III Plot*, 1867, *A*.—14·21 Acres. Two-thirds grass land formerly very stunted Succirubra, only a few feet high, which has last season all been up-rooted, and the ground is now pitted for Officinalis which is to be planted out this season. One-third shola land Succirubra; fine growth and barked three times.

68. *No. XI Plot*, 1869, *B*.—9·35 acres, all shola land, planted originally with Succirubra, growth good, has all been barked four times; there are supplies of Officinalis; some grey barks were dying out, and have been all up-rooted.

Five acres coppiced in June 1879, the stools bled excessively; there are 1,379 failures out of 2,226 stools, but the 847 which succeeded have grown well, and are three to six feet high with one to three stems to each stool.

69. *No. VIII Plot*, 1868, *B*.—23·74 acres, chiefly shola land, planted with Succirubra; the plot is very patchy as very many trees were injured by the hail in 1879 and died out subsequently; growth of remainder good, now pitted for supplies of Officinalis. All barked four times. About two acres of grass land covered with very fair Officinalis; all barked four times.

70. *No. XII Plot*, 1869, *C*.—6·52 acres, about three-fourths shola land and one-fourth grass land, planted almost entirely with Succirubra which nearly all died out after the hail-storm in 1879, and has been up-rooted and the plot re-planted in 1880 with Officinalis, doing well; there is a sprinkling of good old Officinalis (scattered about the plot) which were put down at the same time with the red barks.

71. *No. V Plot*, 1867, *C*.—2·71 acres, chiefly shola land, originally planted with Succirubra which all died out after the hail-storm in 1879; it was afterwards up-rooted and re-planted with Officinalis in 1880 which is doing well.

72. *No. VI Plot*, 1867, *D*.—16·07 acres, all grass land, about two-thirds, formerly very stunted Succirubra which died out after the hail-storm in 1879, was up-rooted and the plot re-planted with Officinalis in 1880 which is doing well; about one-third covered with very good Officinalis which has been barked four times.

73. *No. IX Plot*, 1868, *C*.—16·04 acres, all grass land, about two-thirds covered with fine Officinalis; all barked four times; about one-third, originally covered with stunted Succirubra which mostly died out after the hail-storm in 1879, re-planted in 1880 with Officinalis, doing well; 1,020 old Succirubra still survive, and there are 1,100 old Officinalis.

74. *No. IV Plot*, 1867, *B*.—7·02 acres, about three-fourths grass land, planted with Officinalis, fair growth (12 feet high), but very patchy from wind, planting, has been pitted for supplies which are to be put down this year; all barked four times.

About one quarter shola land planted with Succirubra and Officinalis, growth good but patchy, the plot being much wind blown, pitted for supplies to be put down this year. All barked four times.

75. *State of the Hooker Plantation*.—The growth here is far inferior to that at Neddivattam, considerable tracts of grass land being planted originally with "Succirubra," which was a perfect failure, only attaining a stunted growth of a few feet; this has lately been nearly all up-rooted, and has been, or is being, replaced with "Officinalis" which grows very fairly on the grass land soil; there are still some tracts where the Succirubra must give place to Officinalis or to Pubescens.

76. *Fencing*.—Plot No. XIII, 1873, must be fenced, and a portion of the shola, which has been abandoned and allowed to revert to rank coarse growth, should be recleared and planted. Fencing is also required in Plot VII, 1868, A.

77. *Coppicing*.—2,226 Succirubra trees in No. XI Plot of 1869, four times previously barked and of good growth, were coppiced in June 1879; 1,379 stools have died, 847 are growing fairly, height three to six feet.

78. *Number of Trees in Hooker Plantation*.—Appendix B is a statement of the number of casualties amongst the trees in the Hooker Plantation during the last three years, and the number of trees now existing based on Major Walker's enumeration.

Pykara.

The Wood Chinchona Plantation, **72·18** *acres.*

79. *No. V Plot*, 1865, *C.*—8·80 acres, all shola land, planted with "Succirubra" and a very few "Officinalis;" trees a good height, often over 20 feet, but not healthy in appearance, and numbers of failures; sub-soil very inferior; sized trees barked six times.

80. *No. II Plot*, 1864.—10·87 acres, all shola land, "Succirubra" and "Officinalis;" growth all poor and spindly; many failures and many blank spaces, and trees still dying out; suffers much from the north-east wind; and the sub-soil bad. All barked five times.

81. *No. VIII Plot*, 1867, *C.*—10·87 acres, all shola land, all "Succirubra;" growth good, over 20 feet high. All barked five times. Five acres 2,500 trees coppiced in June 1879; 885 stools failed to grow, 1,655 have succeeded; growth good, height 4 to 7 feet and very healthy.

82. *No. IX Plot*, 1868.—6·12 acres, all shola land, all planted with "Succirubra," nearly all gone out, except about 100 trees; re-planting has been attempted more than once without success. Soil rocky and bad.

83. *No. VII Plot*, 1867, *B.*—9·62 acres all "Succirubra," except a few "Officinalis," shola land, chiefly a flat; drainage insufficient and sub-soil sour; nearly all the trees gone out. All barked five times.

84. *No. VI Plot*, 1867, *A.*—8·39 acres, all shola land, nearly all "Succirubra;" a portion sheltered on a slope good; the greater portion very poor growth and thin from many failures, and the remaining trees apparently dying out. Sized trees barked five times.

85. *No. I Plot*, 1863.—2·55 acres, all shola land, "Succirubra" and "Officinalis," mixed in equal proportions; very poor growth and thin, more than half died out, and many still dying; soil rocky and poor. Sized trees barked six times.

86. *No. IV Plot*, 1865, *B.*—4·88 acres, lower avenue, all shola land, chiefly "Succirubra" with a few "Officinalis;" growth good in some places but patchy, as there are many blanks; casualties chiefly caused by insufficient drainage on flat portions. Where there is percolation from the channel, sized trees barked six times.

87. *No. III Plot*, 1865, *A.*—10·08 acres, upper avenue, "Succirubra" and "Officinalis;" about half and half, growth in some places fair, but not always healthy; in other parts very poor, and has been much injured by hail; many trees died and many showing signs of dying out; upper portions very much exposed to the south-west monsoon. Sized trees barked six times.

88. *State of the Wood Plantation.*—The lower portion of this plantation exhibits very poor growth (all except Plot No. VIII, 1867, C, about 10 acres, may be pronounced a failure); it should, I think, be up-rooted and abandoned as the money required for its up-keep might be far better spent in keeping up the other plantations.

I would keep up Plots Nos. III and IV, or the avenue down the ravine in which the Pykara falls are situated; and if Government should decide to sell the remainder, I do not think these two plots or any of the land in this ravine should be alienated, as it is much resorted to by the public on account of its beautiful scenery and for its water-falls; the other portion of the Wood Estate is over a saddle and in another ravine.

89. *Coppicing.*—2,500 Succirubra trees, previously four times barked in Plot No. VIII, 1867, C (the only good growth in this lower portion of the Wood Estate) were coppiced in June 1879; 885 stools have died; 1,655 are growing and very healthy; height 4 to 7 feet.

90. *Number of Trees in the Wood Plantation.*—Appendix C is a statement of the casualties amongst the trees in the Wood Plantation during the last three years; and the number of trees now existing based on Major Walker's enumeration.

Dodabetta Plantation.

Acres 320·47, *elevation over* 7,000 *feet.*

91. Ascending to the plantations from the Government Gardens the first thirteen plots, as follows, are on the slope looking down on to Ootacamund or with a south-west exposure.

92. *No. XXI*, 1868, *A.*—1·61 acres, chiefly grass land with a little shola at the bottom of ravine, all planted with Officinalis 7′ × 7′; ground very steep and soil being gradually washed away; growth in fair condition and not many failures since the renewals were put down four years ago which are doing well; no late renewals, too steep for terracing, average height of the trees 15 feet; 714 trees barked once, 11 trees barked twice.

93. *No. XXVI*, 1869, *B.*—3·22 acres, nearly all grass land, very steep, soil gravelly, and being rapidly washed away, but too steep for terracing; all planted with Officinalis; trees healthy, but very far apart owing to the original wide planting, and many failures; many renewals were put down three years ago, which are doing well, but none since; average height 15 feet; 1,138 trees once barked, remaining trees small.

94. *No. XXV*, 1869, *A.*—4·68 acres, grass land, very steep; remarks the same as for No. XXVI. A portion was terraced in 1880; remainder too steep for terracing; 2,295 trees barked once, 70 trees barked twice.

95. *No. I*, 1863, *A.*—2·32 acres, all shola land, steep, and the soil has been subject to much wash, but the whole plot was terraced in 1880; all planted with Officinalis 8′ × 8′; ~~trees~~ average height 20 feet, not in very good condition; ~~trees~~ very far apart owing to wide planting and subsequent failures; renewals about 10 per cent. put down three years ago, no later renewals; 967 trees barked four times, 161 trees barked once, remainder small and not barked.

96. *No. II*, 1863, *B.*—1·67 acres, all shola land, planted with Officinalis 7′ × 7′; trees healthy; average height 22 feet, but there have been many failures; renewals one to four years of age; 1,221 trees barked five times, 47 trees once.

97. *No. III*, 1863, *C.*—3·57 acres, all shola land, planted with Officinalis; condition fair, but trees very far apart from very wide planting; average height of original trees 22 feet, many renewals one to four years of age; 1,959 trees barked five times, 65 trees once. There are a few "Pahudiana" not growing well; also one "Angustifolia" growing well.

98. *No. VI*, 1864, *B.*—7·28 acres, originally patches of shola dovetailing with grass land, very steep, and soil much washed away, but the whole was terraced in 1880, planted with "Officinalis," except some 50 Succirubra, condition bad; 6,000 seedlings planted out in alternate lines in 1880; 4,969 trees barked four times, 2,146 barked twice, 311 once.

99. *No. V*, 1864, *A.*—4·06 acres, all shola land, steep, terraced in 1880, all planted with Officinalis 8′ × 8′ and 7′ × 7′, condition fair; lately thicker planting has been attempted, 2,500 seedlings being put out in alternate lines doing fairly well; pits have also been dug for further planting; 1,900 trees barked three times, 167 barked once; 400 trees have lately been scraped on the Java principle, some are mossed and some left bare; all are renewing their bark, but those mossed more rapidly.

100. *No. IV*, 1863, *D.*—0·98 acre, all shola land, planted with Officinalis; trees fair growth, but very far apart; 900 late renewals, and now pitted for further planting. 556 trees barked five times, 58 trees once.

101. *No. XVII*, 1867, *A.*—5·62 acres, grass land, planted with Officinalis; condition good, but trees much branched from wide planting, intermediate planting between the old trees last year to an extent of 1,800 seedlings doing well; a small area where the ground is level nearly all gone out from frost; 2,853 trees barked twice, 830 trees once.

102. *No. XX*, 1867, *D.*—4·92 acres, grass land, Officinalis; condition fair, average height 14 feet; very few failures; original planting 6′×6′; 2,572 barked twice, 644 trees once; 5 trees coppiced in June 1880 as dying; no re-growth.