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Proceedings of the Madras Government, Revenue Department, 19th September 1874.

No. 177. Read the following letter from J. R. COCKERELL, Esq., Commissioner of the Nilgiris, to the Secretary to Government, Revenue Department, Ootacamund, dated 17th June 1874, No. 43:—

In G. O., Revenue Department, 11th April 1874, No. 434, upon a Report from Dr. Bidie on the coppicing system as applied to Cinchona, and the views of Mr. Broughton upon the same subject, the Government, in paragraph 4, direct that 6,000 trees shall be coppiced.

2. There are 18,000 crown-bark trees of ten years old on the Neddiwattum and Dodabett plantations which have not been mossed. There were last year 6,000 Succirubra trees at Neddiwattum of eleven years old similarly untouched; but in G. O., 5th September 1873, Revenue Department, No. 952, the Government were pleased to direct, upon a representation from this Office that there were 24,000 untouched trees upon the plantations, that one-fourth of them should be "retained for coppicing," and the remainder should be mossed. Upon the receipt of these instructions 1,800 of the above 6,000 red-bark trees were stripped and mossed. Three-quarters of the 18,000 crown barks would also have been mossed, but labor for the work was not available at the time. There are, therefore, now 18,000 crown barks and 4,200 Succirubra that can be coppiced.

3. But the Government order under reply directs that, in compliance with the recommendation of Dr. Bidie, 6,000 trees shall be coppiced in alternate rows. There are 360 Succirubra and 580 crown-bark trees to the acre. I have the honor to inquire whether alternate rows of the available Succirubra are to be felled, which will give 2,100 trees cut down, and whether I am to make up the number of 6,000 trees by coppicing 4,000 Officinalis in alternate rows. If the coppicing system is to be tried as thus detailed, the experiment will extend over 12 acres of Succirubra and 16 acres of crown bark, and there will be left of trees that can be put under moss 10,000 crown barks. I request definite instructions in order to avoid future misunderstanding, as neither Dr. Bidie nor Mr. Broughton are on the spot to direct the experiment, and it is, therefore, expedient it should be clearly understood what is to be done.

4. The next point on which I solicit a definite order is with regard to the trees the Government desire should be stripped of bark and left unprotected by moss. On this subject Dr. Bidie states, at paragraph 16 of his report, that he examined fifteen trees which had been so treated at Dodabetta, and he found that—

On five	the bark was	renewed	perfectly;
4	„	„	well;
5	„	„	fairly;
1	„	„	imperfectly.

Dr. Bidie does not explain what proportion of bark had been taken from these trees. Four to five square inches was stripped from each. But a tree of ten years old should yield, under the mossing system, at the first harvest of bark no less than 1,000 square inches. Am I to treat the trees on which experiment is to be tried by merely removing a small portion of bark, or by harvesting the bark? In the latter case, some difference may appear in the result. The trees will be more exposed to the pernicious action of sun and air, and it is to be expected some may perish. It is believed by Mr. McIvor and myself that if a large surface of the cambium layer on a trunk is exposed to wind and sun, the cambium will dry and split. If this conjecture proves correct, the injury inflicted will be of the same character as is incurred by a wound to the cambium from a knife. The wood of the trunk will decay at the lacerated points. Mr. Howard, in a letter to the Secretary of State, dated 4th February 1867, writes that the plan of stripping a tree and leaving it to renew was practised with the Cascarillas resecadas barks; "but unless the bark is covered with moss immediately as discovered by Mr. McIvor, the subjacent woody portion suffers serious injury." Dr. Bidie refers to the Cascarillas in paragraph 15 of his report in a manner implying that he is not acquainted with Mr. Howard's opinion. Neither apparently is he aware that Mr. Broughton made an experiment with bark renewed without protection, which he describes at paragraph 17, G. O., 12th April 1867, and which Mr. Broughton found to

corroborate the alleged worthlessness of Cascarillas resecadas. No experiment of any value would be made by merely cutting out a few square inches of bark from each tree.

5. Dr. Bidie states that there are on the Denison, Napier, and Hooker estates, plots of Succirubra of inferior growth, and he suggests their abandonment. No doubt the trees of the spots indicated have been kept down by wind ; but they are making fair growth, and it does not seem worthwhile, now that the expense of raising the trees has been incurred and the land kept clean for some years, to spare the remaining small expenditure needed to bring the trees to a condition when they will keep the land free of weeds themselves and cost nothing. It is not as if Cinchona culture was as costly as the culture of Coffee or Tea on which the annual outlay is 100 Rs. an acre. Last year the whole expenditure connected with the Government Cinchona plantations was only 30 Rs. an acre, and upkeep or the labor connected with the land only costs 11 Rs. per acre a-year.

6. Dr. Bidie recommends that the red bark should be thinned out. He observes that, in his opinion, they are too close together, and probably, as many of them were propagated from cuttings, they "will be found particularly deficient in descending roots." "I should, therefore," he states, "in case of a severe storm feel uneasy regarding the risk to the more crowded portions of the red-bark plantations, as if once the wind were to gain admission by prostrating a few trees the damage might be very serious."

On the Nilgiri Hills the greatest enemy to plantations is wind. Accordingly, it is found that in sholahs the vegetation is close, and nature thus affords a protection from wind. This is so noticeable a feature in a natural grown forest that a clearing made in a large sholah is apt to destroy the wood left standing. An instance may be seen at Divi Sholah where the major part of an extensive forest having been cleared, the rest of the sholah is dying out, and consists of little but bare poles. Similarly with regard to plantations of Australian trees. Experience shows that the nearer the plants are to each other and the greater the mutual protection afforded the better the progress of the plantation. In like manner, planters put up belts of quick-growing trees to protect Tea and Coffee plantings. Mr. McIvor tells me he fears that if thinning, as recommended by Dr. Bidie, is carried out, the wind will get into the plantations and prostrate the trees left ; and this will more certainly result if Dr. Bidie's fears are correct and the trees have merely a superficial hold of the ground. The trees must be thinned out by-and-bye. Mr. McIvor has always had this in view ; but he holds that the proper time to thin is when the more robust trees shall have outtopped the weakly plants, and the wind will not be let in by removing the latter.

7. The Government order desires that the recommendation of Dr. Bidie, that particular attention should be paid to the mortality in *C. Calisaya*, may receive attention. The point has always attracted observation. Mr. McIvor has tried the Calisaya under every condition of exposure and moisture. He believes the cause of its premature decay is that the climate of the Nilgiris is unsuited to its development owing to there being an annual drought of four to five months. The climate required for the Calisaya is a moderately, but at all seasons, moist climate.

8. At paragraph 10 of the Report, Dr. Bidie states that the grey barks yield little or no quinine, and are very poor in other alkaloids ; and he counsels the "grubbing up" of the trees of these species as soon as "they have reached maturity." Dr. Bidie cannot be aware that the cultivation of the grey barks is one of the most interesting experiments proceeding on the plantations. Dr. Howard writes in a letter to the Under-Secretary of State, dated 1st August 1865, on the analysis of certain barks : "In No. 7 we have an illustration of what careful cultivation will do, as the plant *C. micrantha*, which (with its congeners, the grey barks) produces largely and chiefly Cinchonine in its native climate of Huanaco, now produces a very small portion of Cinchonine and a large portion of the allied alkaloid quinidine. This is, then, a hopeful change if time should confirm the observation." Mr. Broughton, in his report in G. O., 26th July 1867, writes, at paragraph 16 : "From the foregoing analysis it appears that although grey barks do not contain quinine, they are among the richest we possess in their yield of alkaloids. I would submit that the results obtained by the Cinchona Commission respecting the efficacy of the alkaloids produced by these plants hardly justify the disregard with which the grey barks have

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hitherto been treated. I would suggest that the cultivation of the beautiful-leaved *C. Peruviana* might be extended with considerable advantage in many cases."

9. Finally, the Government order enjoins, with reference to remarks made by Dr. Bidie, the keeping of accurate returns of the time required for the renewal of bark harvested by the mossing process and of the expense of the process. Accurate records have been kept on both these subjects ever since the formation of the plantations. In a letter to the Commissioner, dated 9th September 1871, No. 75, Mr. McIvor writes that mossing 1,000 Succirubra trees of seven and five years old cost Rs. 160-11-0, or Rs. 3-14-6 per 100, and that mossing 2,000 Officinalis trees at Dodabetta cost Rs. 372, or Rs. 18-12-0 per 100 trees. The cost in the latter case was large, because moss is scarce at Dodabett. These were the first mossings undertaken, and the work was expensive. Now that labor is organised, mossing costs, Mr. McIvor tells me, 1½ Annas per tree of eight years old at Dodabetta, and an Anna at Neddiwattum. This is in round numbers. In his report in G. O., 20th August 1872, No. 1,237, Revenue Department, Mr. McIvor writes : "The cost of *mossing*, removing, and drying the bark from the 1,000 Succirubra trees abovementioned is as follows :—The first removal cost Rs. 41-2-0, and the second removal Rs. 180-11-4, or making a total of Rs. 221-13-4. The quantity of bark obtained being 2,988 lbs. will give the cost per pound of dry bark 1 Anna and 2 Pies, or 3½*d.* per pound as the actual cost of the labor of removing and drying the bark, exclusive of the cost of superintendence. The cost will be somewhat diminished in the succeeding harvest, as the same moss can be applied for an indefinite period of time, as the moss when once put on grows and increases as well as the trees."

The italics are mine. I have underlined the word mossing, because the latter part of the quotation is worded in such a manner that a doubt might arise whether the cost of mossing was included. The passage shows, in fact, the cost of originally mossing and harvesting, for the first time, 1,000 Succirubra trees. Every annual report will be found to contain a table giving, with other information, the aggregate expenditure on mossing.

10. I take the present opportunity to point out two inadvertent inaccuracies of fact in Dr. Bidie's report. At paragraph 14 Dr. Bidie writes that he found ten men could only harvest bark in one hour which when dried would weigh 10 lbs., and that thus the cost was 2 Annas per pound. Dr. Bidie is quite right in his statement in regard to the work done, but his calculation is wrong. The coolies work ten hours per diem on the plantations. At the rate given by Dr. Bidie, they would harvest 100 lbs. of dry bark in the day, and their pay, at 4 Annas each would be Rs. 2-8-0, or 40 Annas. One hundred pounds of dry bark harvested for 40 Anna gives a charge of 4 Annas on 10 lbs., or 5 *Pies* on 1 lb., not of 2 Annas as inferred by Dr. Bidie.

11. At paragraph 28 Dr. Bidie states : "The question as to the period of year at which the trees should be coppiced is one of considerable difficulty, and has yet to be determined by accurate experiment. The trees hitherto coppiced have bled so profusely as almost to forbid a repetition of any such experiment ; but I feel sure the proper season will be found somewhere between October and March when the trees are partially at rest." Dr. Bidie is evidently not aware that the coppicing experiments hitherto made have ranged over all seasons. I annex a list of them :—

In December	1866,	about	50 trees.
„ January	1867,	„	50 „
„ May	1871,	„	240 „
„ June	1873,	„	58 „
„ October	„	„	57 „

Out of the trees coppiced in June 1873, which were all Succirubra, and the finest to be found at Neddiwattum when the experiment was made in compliance with Mr. Broughton's express wishes, one is now dead. These trees were, by Mr. Broughton's desire, coppiced a foot from the ground, and all the shoots on the stools left. I referred to this coppicing in my letter in G. O., 29th May 1873, No. 549, as one which, Mr. Broughton stated to me in person, would, in his opinion, afford a fair test of the value of the coppicing system. The trees coppiced in October 1873 were also coppiced at the request of Mr. Broughton, who desired they should be cut close to the ground leaving no shoots. Twenty-one of these stools have died.

12. At paragraph 18 Dr. Bidie refers to 2,000 Succirubra which were harvested by the mossing process, and which have excited much controversy. Mr. Broughton found (his report in G. O., 29th May 1873, No. 549, paragraph 35) that 85 per cent. of these trees had failed to renew their bark. Dr. Bidie gives the per-centage at 82·5. Mr. McIvor states, and I believe, that none of these trees have completely failed to renew. In order to set the question completely at rest, Mr. McIvor has had measurements made, of which I append a Statement F. It will be seen that in the worst trees the flaws were only 3·26 per cent. in October last year, when Mr. McIvor and I examined the trees in company with Mr. Broughton. A column in the statement exhibits the present measurements. The flaws are now reduced to 1·95 per cent. What is meant by a failure to renew is a question nowhere stated with precision. A speck may be treated as a failure; and there will be specks on most trees, as it is difficult to strip bark without inflicting some trifling wounds on the cambium, and wherever the cambium is cut the bark will only renew on that spot by buckling in. The number of wounds inflicted is in proportion to the want of skill of the laborers employed. The 2,000 trees in question were stripped by common coolies, and Dr. Bidie, I know, devoted his attention when he was drawing up his report to the part of the plot where the workmen commenced. Had he examined the trees throughout, he would have found that the work done improved as it advanced, and that at the close the coolies had attained such skill that the trees were perfectly well stripped. This difficulty will be obviated in the future. The Government, in reviewing the last budget, approved of the employment of a permanent staff of gardeners,—an arrangement which will place at the disposal of the Superintendent sufficient accomplishment in manipulation to ensure nearly faultless stripping.

13. In the Government order under reference there are two letters from Mr. Broughton as well as the report made by Dr. Bidie. It seems of some importance. I should remark on some of Mr. Broughton's statements. Mr. McIvor had combated a fact reported by Mr. Broughton with reference to a certain shoot. He had held the alleged shoot was not a coppice but the stem of a double-stemmed tree, of which one stem had been removed. In paragraph 9 of his letter, No. 61, Mr. Broughton writes: "I have not made so careless an error." But in speaking of the shoot Mr. Broughton described it, in his letter in G. O., 7th February 1871, paragraph 9, as 12 to 15 feet high, and that it was three years old. The plantations will be searched in vain for a coppiced shoot of the dimensions stated under the age of seven years. Coppice on the Government estates has a growth, in the experience of Mr. McIvor, of under 2 feet a-year. The Table C appended shows the size of all the coppiced shoots on the plantations at the present date.

14. The subject of Mr. Broughton's letter, No. 63, is a history of his efforts to introduct the coppicing system on the Government plantations. Mr. Broughton cites the Government orders on the subject, and finally expresses his surprise at a remark of mine to the effect that if he considered Government orders directing coppicing had not been carried out he was the proper officer to call attention to the omission. At paragraph 10 of his letter, No. 61, Mr. Broughton writes: "After repeated representations to Government, I have been able to get but 200 red-bark trees cut down in 1871 and 58 in 1873; also 50 crown-bark trees in 1873, though it is the most obvious plan of cropping." The exact facts regarding coppicing are the following:—The late Commissioner, in his letter in G. O., No. 701, dated 19th April 1871, Revenue Department, supports a recommendation from Mr. Broughton to coppice, and writes, at paragraph 7: "I would, therefore, propose to select a block of 800 Succirubra trees at Neddiwattum of the season of 1862, and in like manner 800 Condaminea trees at Dodabetta; 400 of each variety to be tried on the mossing principle, and 400 on the coppicing principle." The Government sanctioned the proposal, and 240 trees were felled. This limited felling was the result of agreement between Mr. Brooks and Mr. Broughton. These gentlemen on coppicing the trees were disappointed at the outturn of bark, and stopped the experiment. In a letter in G. O., 13th July 1871, No. 1,213, Revenue Department, this is explained by Mr. Broughton. He writes, at paragraph 5: "There are, of course, plenty of trees which might be cut down; but I am of opinion that at least two more years should elapse before cropping can be profitably conducted. The results obtained by the taking of

the bark this Spring support this conclusion." It would thus appear that it was Mr. Broughton who stopped the first experiment in coppicing, undertaken chiefly in deference to his wishes. Notwithstanding this direct interference, Mr. Broughton, in a letter in G. O., 6th December 1872 No. 1,646, Revenue Department, made no allusion to it, and wrote: "In G. O., No. 1,213 July 13th, 1871, the Government, at the recommendation of the Commissioner of the Nilgiris direct that the bark supplied to the manufactory should be obtained by the mossing process. In the Commissioner's letter attached the opinion of the Superintendent of the Plantations is quoted there in paragraph 3: 'It would be more satisfactory to Mr. Broughton and myself if the one-half of the bark required were produced by mossing and the other half by coppicing.' But in spite of this the bark supplied to the manufactory has been obtained by mossing." I need not go into the subsequent history of coppicing, as it is only a year old, and the outcome of the difference of opinion on the subject between Mr. Broughton and Mr. McIvor is the Government order now under reply. It is well, however, to observe that at the end of paragraph 15 of his letter, No. 61, printed in the Government order under reference, Mr. Broughton writes, referring to a letter from Mr. McIvor: "The prophetic portions with reference to coppicing I am unable to corroborate or to contradict." The very same remark may be made in reply to a prophecy of Mr. Broughton to be found in paragraph 15 of his letter, No. 63, in the Government order under report. There Mr. Broughton has no hesitation in condemning mossing and expressing confidence in the good results of coppicing. But Mr. Broughton's confidence is entirely speculative, and he advocates with, as it appears to me, some vehemence a change of system of management of the only Cinchona plantations that have succeeded in the world, except some in Ceylon, though he writes at paragraph 6 of his letter in G. O., 10th July 1873, No. 716, Revenue Department: "I have never advocated coppicing as a constant method of taking crop, as *I possessed no comparative experience of its results*;" (the italics are mine) and though he stopped a coppicing experiment because it failed.

15. I shall now venture to make a few general remarks upon Dr. Bidie's report. Mr. Broughton speaks of coppicing as the most obvious plan of cropping, and Dr. Bidie lays stress on the weak points of the mossing process. With regard to coppicing the only point remaining for investigation, as trees have been coppiced at all seasons of the year and the result in every case has been equally unsuccessful, is whether exposure will be of any benefit; that is to say, whether the coppiced plots have failed from their small size, and whether larger plots would give better results. Mr. Broughton refers to the Balmadies Estate in the Ouchterlony Valley, and states coppicing is being tried there with success on Succirubra. Upon this point the managing proprietor writes to me that the felling on the plantation has been carried out in order to thin the trees. It was done in May 1873, the month in which 58 large trees were felled a Neddiwattum with the concurrence of Mr. Broughton. The felled trees at Balmadies have thrown up shoots of an average height of 3½ feet, though some have grown 6 feet. A similar success has not attended the coppicing at Neddiwattum. This is perhaps attributable to the difference of altitude. Balmadies is 2,000 feet below Neddiwattum, and the climate is more genial. The Succirubra grows best in a moderately warm temperature. I have already reported that the shoots of seven years old on coppiced trees at Neddiwattum are mere wands, and the table appended to which I refer above proves this to demonstration. The bark on these shoots is too thin to be of any value whatsoever.

16. In regard to coppicing generally in its effects on the trees Dr. Bidie expresses no decided opinion. He advocates the felling of alternate rows of trees, and yet deprecates exposing the plantation to wind which his scheme will effect. Coppicing is put forward as an easier mode of cropping than mossing; but Dr. Bidie says the season for coppicing must be selected with care, otherwise the stools will be subjected to an amount of drought and sun that will probably kill a large per-centage; and he describes the thinning of the shoots which spring from the stools as an operation of delicacy. Upon the latter point there can be no question. Brown of Armston, in his work on Forestry, writes of thinning out coppice shoots: "How can the shoots of trees be expected to succeed so as to form timber which are for a number of years confined in a close

plantation and all at once suddenly exposed, as is the case when they are chosen to stand and all the rest of the shoots which protected them are cut away? We might as well expect a child to grow up to healthy manhood who, from being closely confined in a room, was at once taken out and set down upon a bare moor," page 383. Brown accordingly recommends thinning to be cautiously conducted; but if thinning of Cinchonas is even done cautiously, the stool must year after year be wasting its strength in nourishing shoots which are to disappear in order that finally one shoot may remain for barking purposes. Again, Brown states, page 387, that unless the shoot comes from the point where the roots join the stole, that is to say, from below the surface of the soil, they will partake more of the character of branches than of trees; and at page 381 he writes that unless stoles are well managed, they become spongy and rotten. These quotations imply that coppicing is an operation requiring special skill and care. They imply, further, that, from the nature of things, Cinchona coppice must pay less well than Oak coppice, because the shoots taken away from Oak coppices are saleable, whereas the superfluous shoots of Cinchona stools would be of no use whatever, while their growth would entail the loss of the amount of the energy of the stole spent in producing them. As to coppicing alternate rows I have to remark that out of the 240 trees coppiced in May 1871, 40 were coppiced in alternate rows, and these rows have thrown up shoots so slender as to be worthless at the present moment. The explanation put forward of the present condition of these trees has always been that they have been too much shaded to send up vigorous shoots, and accordingly that they afford no indication of the merits of coppicing. But Dr. Bidie proposes to do the very thing the results of which four years after the initiation of the experiment are referred to apologetically.

17. The next point is the quantity of bark that may be expected from coppice. Thick bark in which the alkaloids have not yet been converted into woody fibre is the bark most valuable to the quinine manufacturer. I will assume that such bark is obtainable from coppice. The annexed diagram drawn to scale has been furnished to me by Mr. McIvor to illustrate the difference between coppiced and mossed trees. Experience shows that at Neddiwattum *C. Succirubra* grows 2½ feet a-year, and increases in circumference of stem 2 inches. The growth of coppice is little more than half this growth, but I will take the coppice as growing as fast as the natural tree. A tree becomes available for cropping in the eighth year of growth. No. 1 in the diagram shows such a tree. If it is cut down it will give, judging by the outturn of the 240 trees coppiced in 1871, 4½ lbs. of bark per tree, including the branch bark. At the end of two years the coppiced shoot will have a growth as at two. At the end of eight years the growth will have reached the original growth, and if the tree is again coppiced it will give another 4½ lbs. of bark. In another eight years a third crop of 4½ lbs. will be available, and the outturn of twenty-four years will have been 13½ lbs. of bark. On the other hand, experience shows that up to the twelfth year from planting, the tree under moss continues healthy and able to afford crops of bark. If the tree is stripped at eight years, the yield is 2¼ lbs. of bark. In six months the remaining 2¼ lbs. can be taken. In two years the renewed bark on the spaces originally decorticated will be available up to line 3 in the diagram, and fresh bark up to line 5; and in two and-a-half years the spaces which were covered with the second half of the natural bark will have accreted a crop of mossed bark which can be harvested, and it will extend to line 3 in the diagram, and the natural bark above it to line 5; and so on successive harvests can be taken up to twelve years at all events. In this mode of cropping the surface yielding bark is yearly increasing. On the coppicing plan, the surface yielding bark remains stationary. It is almost unnecessary to say that mossing up to twelve years must give larger harvests than coppicing. This is shown by results. Nearly 450,000 lbs. of bark have been taken from the Government plantations altogether. Had this bark been obtained by coppicing, 100,000 trees of eight years old would have been necessary. According to the experience derived from the 240 trees coppiced in 1871, this number of trees, at 360 trees per acre, would have entailed the denudation of an area, in round numbers, of 300 acres, and the plantations comprise only 1,000 acres under cultivation altogether, and, as regards the yield of crop, are in their infancy. It appears evident that, if large crops of bark were taken by coppicing, the plantations in a few years would be, so to speak, swept away. That mossed trees are largely superior in yield to coppiced trees is shown by the following facts:—One thousand Succirubra of eight years

old were mossed. They will be twelve years old in September next. In these four years they have given at four harvestings:—

2,980	lbs.	in 1871-72, dry bark.
764	„	in 1872-73, „
1,546	„	in 1873-74, „
770		
6,060	lbs.	

Or in all 6,000 and odd pounds of dry bark. On the other hand, the 240 trees coppiced by my predecessor and Mr. Broughton in May 1871 gave the following results:—200 of the trees were coppiced in one block. They were of the season of 1862-63. The other 40 trees were of the season of 1864-65, and they were coppiced in alternate rows.

The bark obtained from the 240 trees aggregated 720 lbs. of green trunk bark equal to 255 lbs. of dry bark, and 324 lbs. of green branch bark equal to 100 lbs. of dry bark. The whole quantity of dry bark obtained was thus 355 lbs., or 1·48 lbs. from each tree. I have on several occasions stated that these trees have given nothing since. Therefore, the mossed trees have yielded 6 lbs. of dry bark per tree against 1·48 in the case of the coppiced trees, including *the branch* bark, which, of course, has not been taken in the mossed trees. Six pounds each tree of mossed trunk bark have to be set against 1½ lbs. of mixed trunk and branch bark, or four times the quantity of the more valuable bark.

Experience alone can decide whether trees will bear indefinite mossing. At present, all that can be said is that the oldest trees on the plantations, that is to say, trees of twelve years' standing, are in a luxuriant condition, and that if the next cropping was to kill them they would have paid the planter better than if they had been coppiced. It is important to observe that even in the supposition of their death the trees could be replaced by seedlings growing faster than coppice; but I have expressed an opinion in a former report that a mossed tree will, if felled, throw up suckers as well as a coppiced tree. By mossing, therefore, a large crop of bark is gained, and there is no loss to be expected as a set off to the gain. I further stated in a former report that, if mossed trees showed signs of failing, they could be coppiced and the shoots on the stools be left to form trees. These shoots are in many trees of ten years old on the plantations 12 to 15 feet high. I have shown above by figures (paragraph 11) that trees coppiced leaving the shoots have a much better chance of surviving than trees coppiced completely close to the ground.

As to the chances of trees continuing to survive mossing for an indefinite period, it is worthy of notice that Cork trees are stripped for the Cork, and that Cork forests have endured continuous stripping for centuries.

18. There is another objection to coppicing which has been left out of sight. The trees planted as they are close together after a certain time form a dense shade with the result that no weeds grow on the ground. The expense of weeding, therefore, every year as the trees advance in age diminishes and the expense consequently of the upkeep of the plantations. Coppicing, on the other hand, lets in the light, and directly light reaches the ground weeds appear. The result is that coppices must be kept weeded always at an annual expense which the mossing process avoids. Coppiced plantations will thus be more expensive to keep up than plantations under moss.

19. Experience has not shown coppiced bark equals in quality bark taken by mossing. On the Himalayan plantations coppicing is a necessity, because, after a certain age, the Cinchonas are attacked by canker. The bark of this coppice fetched last year, according to a price list in the possession of Mr. McIvor, 4 to 5*d.* per lb.

One-sixth of the quantity sold was trunk bark, and this fetched 11*d.* to 1*s.* 6*d.* a lb.

Mossed trunk bark from the Nilgiri plantations of Succirubra fetched last year 2*s.* 10*d.* per lb. on the average, and mossed Condaminea obtained a price of 5*s.* 9*d.* per lb. Regarding the Himalayan bark Mr. Howard, in an Article on coppicing Cinchona in the issue of the *Gardener's Chronicle* of the 28th March 1874, writes: "It is well that the owners of the Sikhim plantations find the results of their cuttings 'most satisfactory'; but it is important to observe that this satisfaction does not extend to those who would desire from them a supply of material for the extraction of quinine, and that consequently it would be a mistake to recommend this plan for

general adoption. The bark of coppiced Oak is very abundant in tanning material. Certainly, I know that the corresponding bark of the Cinchona, and especially of the *C. Succirubra*, abounds in the astringent principles which are an annoyance to the chemist in the above manufacture." From this passage it would appear that the most eminent English authority on the subject has found by experience that coppiced Cinchona barks are not commercially remunerative.

20. Dr. Bidie threw out a surmise in his report that renewed bark derived its richness in part from the natural bark of the tree left when the first ribands are stripped. Mr. Broughton has made some analysis confirmatory in his opinion of this inference, and the result in his mind is that as he writes in his letter, No. 63, in the order under report, paragraph 15 : "I have no hesitation now in condemning the plan of mossing, whose merits I have throughout endeavored fairly to consider." I venture to doubt whether so broad a question as the question of the transference of organised compounds can be set at rest by a few experiments, even supposing the experiments were of a nature to which no objections could be urged. But in the present case the objections are prominent. Mr. Broughton says, paragraph 10 of his letter, No. 63 : "It was necessary to compare the untouched bark of trees with the remaining untouched bark of trees, part of whose bark had been some months taken and was in process of renewal. But as much of this latter was covered with moss which itself might cause alteration of yield, it was necessary that I should examine the untouched bark above the moss." The obvious objection to Mr. Broughton's mode of procedure is that he did not employ the natural bark under moss. He says he rejected this bark, because being covered with moss it might be affected thereby. Now it could be effected in one of two ways only : the moss might have kept the bark from deteriorating, in which case moss bestows an advantage, and prevents transfer, or it might have deteriorated the bark ; in the latter case, it would have profited the view taken by Mr. Broughton to have adopted it. I conceive there is no escape from one or other of these conclusions, and they vitiate, as I venture to think, the weight to be accorded to the analysis actually undertaken. There is another point for consideration of great importance. The bark above the moss selected by Mr. Broughton could in no case, from the nature of things, give the results of bark lower down the trunk, for the very simple reason that the higher the bark the thinner it must be and the nearer in value to the comparatively worthless branch bark. Mr. Broughton states, at paragraph 12, that he corroborated his experiments by an analysis of bark above the moss on a tree which had only been mossed a short time with the bark of an untouched tree but he does not give the details of this analysis, and state whether the two specimens of bark operated upon were from similar spots on the respective trees, nor does he describe the difference in the results, though he says there was a difference, and the difference did not sustain his hypothesis.

21. The precise mode in which the roots of plants draw nutriment from the earth and distribute it and the effect of leaves in elaborating the sap are subjects comparatively little understood, much less the transfer of its constituents by an organised compound. Eminent authorities, such as Dr. Lindsay, believe there is no such transfer. A stock does not transfer its qualities to a graft and *vice versa*. When the skin in an animal organism is cut, the wound does not heal by transference of the material of the adjoining skin, but becomes covered by a rugose material different from the original skin and not a true skin. The material has larger cells than the true skin, and this appears to be the case with renewed bark in all respects. The renewed bark has larger cells than the natural bark, and they are richer in alkaloids. It is possible that this result may be in part due to excitation in the neighborhood of the wound, and a special action put on at the site to heal the wound. Mr. vanGorkam (quoted in Mr. Howard's Article) found that two *C. Calisayas* grafted on two Pahudianas, that is to say, plants rich in quinine grafted on plants altogether deficient in this alkaloid, kept their alkaloids as if they had grown separately. Moreover, Mr. Howard believes "that the alkaloids are found in the cellular tissue of the bark, commencing more especially with the cambium."

22. That the transfer imported is an obscure question is testified by a quotation found at paragraph 15 of Dr. Bidie's report from the "Nueva Quinologia of Pavon" : "It may not be out of place to mention also here a curious practice by which the inhabitants of Loja flatter themselves they secure economical bark cutting. They cut off the whole of the bark of a small tree, leaving only one broad strip so as not to destroy the tree which gradually replaces its loss ; and the second time of cutting the bark is called Cascarillas resecadas, and esteemed as of superior quality."

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If only a strip of bark remains on the tree, it does not appear how the renewed bark can derive its richness from it, that is to say, that a major part can become rich from the succulence of a minor ; a greater be derived from a smaller. It may be argued the renewing bark takes up part of its improved quality from the cambium and part from the adjoining natural bark. Should this prove the case, and the authorities on the subject be eventually shown to have been under a misapprehension, even then the gross alkaloids obtainable from the tree would still be captured. Given the original strips of natural bark as worth *A*, and the remaining original strips as worth $A - a$, in consequence of a loss of alkaloid due to the bark growing on the original spaces, the $-a$ would be found in the renewed bark, and the mossing process gives, on the whole, a much bulkier bark harvest than a harvest from coppice. Mr. Broughton does not suppose there is an actual loss of alkaloids to the tree by mossing. All he says is, the alkaloids shift under the process from one part to another. But if this happens nothing is lost. I have already intimated that mossed bark fetches a considerably higher price than bark from coppice, and there is, from this circumstance, a further argument against the theory propounded by Mr. Broughton and Dr. Bidie. If the renewing bark under moss drew its rich qualities from the natural bark left on the tree when the latter bark came to be removed, the renewed bark growing on the spaces it covered would operate prejudicially to the renewed bark adjoining, and would draw from it what it had taken from the natural bark. This does not appear to be in accordance with facts. Renewed bark from the spaces first stripped from the trees have been sold, and the renewed bark from the spaces left when the second half of the natural bark was removed. Thus renewed bark from the whole circumference of the tree has been removed. Furthermore, a second crop of renewed bark has been taken from the spaces originally occupied by the first strips of natural bark and sold. These three successive sales have not shown any difference in the price of the renewed bark.

23. The facts are, as Dr. Bidie states in paragraph 26 of his report, the experience respecting coppicing is insufficient. I merely draw attention to the circumstance that such experience as has been gained is adverse to the process.

Mr. Howard in his report, dated 4th February 1867, of an analysis of the fifth remittance of bark writes in favor of mossing. He says : "If decorticated trees are mossed, the operation of mossing may be repeated with advantage, increasing as it would seem for every time of renewal. Not only is the gross per-centage of alkaloids larger in the last decortication, but of this a more considerable per-centage consists of quinine, and that less intimately combined with the yellow coloring matter so as to be more easily purified."

24. Lastly, Mr. Broughton's results do not appear to bear out Mr. Broughton's present opinions with regard to the deterioration produced by transference of the alkaloids ; for in the statement in his letter in G. O., 1st April 1874, No. 408, Revenue Department, it is shown that the outturn of amorphous quinine in 1869-70 was 1 lb. 3 oz. to every 1,000 lbs. of bark treated ; in 1870-71 the outturn was 2 lbs. 7 oz. to every 1,000 lbs.; in 1871-72 it was 2 lbs. 13 oz. to every 1,000 lbs.; and in 1872-73 it was 4 lbs. 4 oz. to every 1,000 lbs. of bark. But in these successive years the proportion "of barks supplied to the manufactory, which were taken from partially decorticated trees," went on progressively increasing, and in 1872-73 the supply consisted entirely of these barks.

25. Dr. Bidie, at paragraph 4 of his report, condemns the crowded state of the plantations on the ground that the uppermost branches only reach the light, the lower ones, from being shaded, dropping off, and that the consequence is the trees grow up with spindly stems. He suggests, therefore, thinning out. But the fact is that the very condition Dr. Bidie condemns is the natural condition. The Cinchona grows on the Andes in dense forests where the crowns only can push up to the light. Accordingly, in its native habitat the tree must be subjected to the same conditions produced artificially on the Nilgiris. I have already stated that as the weakly trees are over-topped by stronger neighbors, it will be the policy of Mr. McIvor to cut them down, and in this awy space will be left for the larger trees.

26. Dr. Bidie recommends coppicing partly on account of the crowding, though he admits crowding to be an advantage so far as that "it excludes the sun." His plan apparently would be to let in as little sun as possible by coppicing every alternate row. But any thinning whatso-

ever would admit light to a greater or smaller extent. With regard to light Mr. Broughton says in his letter in G. O., 12th April 1867, at paragraph 14: "The injurious action of light on the Cinchona bark and alkaloids was clearly pointed out many years ago by Pasteur, a chemist to whom our present knowledge of these alkaloids is largely indebted;" and he proceeds to verify Pasteur's conclusions by remarks on certain analyses of his own. He concludes: "I would submit, the foregoing facts and considerations render it highly probable that the exposure of the living bark to direct sun-light has the effect of diminishing the yield in alkaloids and the value of direct protection" (by moss). Again he writes, at paragraph 16 in his letter in G. O., 26th September 1871, No. 1,686: "In several preceding reports I have abundantly stated my conviction, and their grounds for considering that Cinchona bark has its yield of alkaloids injured by exposure to sun-light. The experimental evidence of this already adduced appears to me to be quite conclusive of the fact, so that further proof is scarcely needed. Further proof appears, however, in the circumstance of which I have been for some time aware, that the bark of the opposite sides of the same tree differs in yield of alkaloids."

Mr. Broughton then gives the following analysis of a tree exposed on all sides:—

	North Side.	South Side.
Total alkaloids	3·18	3·80
Quinine	0·62	1·40
Cinchonidine and Cinchonine	2·56	2·40

and adds: "As the sun has been on the north side of the tree for the last four months, the effect has been that the yield of alkaloids has been diminished 0·68 per cent. This decrease apparently consists of quinine which is commercially the most valuable of the alkaloids. This effect has been produced in spite of its being the most cloudy period of the year."

27. Dr. Bidie, at paragraph 28 of his report, remarks: "One advantage of the coppicing system would be that it would afford an abundant supply of fire-wood for the factory at Neddiwattum,—a matter of great importance, as *jungle-wood is now getting scarce.*" The italics are mine. The facts are as follow:—Mr. Broughton manufactured 345½ lbs. of amorphous quinine according to his statement in his letter in G. O., 1st April 1874, Revenue Department; his outlay for fuel was 119 Rs., or As. 5-4 per lb. It is more than questionable whether, as the distant parts of the plantations come to be coppiced, the coppiced wood will not have to be transported further than jungle-wood. It must also be borne in mind that a Cinchona tree of eight years old cannot, from its small size, yield any considerable quantity of fire-wood.

28. In soliciting definite instructions, I have thus endeavored to show that Mr. Broughton's advocacy of coppicing is purely speculative, and is in opposition to Mr. Broughton's own experience. I have also endeavored to show that none of the suggestions made by Dr. Bidie accord with the knowledge obtained in the course of the progress of the Cinchona plantations; that if, as Dr. Bidie recommends, alternate rows of trees are coppiced, light and wind will be let in, and both will be deleterious; that the plantations as they exist simulate the natural conditions under which the Cinchona tree grows; that the inferiority of coppiced to mossed bark is demonstrated, and the harvest of the latter is more abundant than the harvest of the former from a similar number of trees; that if mossed trees die under the effects of periodical stripping, they can be replaced faster and better by seedlings than by coppice shoots; that mossing is a cheap and not, as Dr. Bidie reports of it, an expensive system; that stripping trees and leaving them unprotected is not likely to be profitable; that mossing has not as yet fatally injured trees since the trees that have given most harvests of barks are in a present state of luxuriant growth, and that there are no indications of the process being fatal; that analogy does not indicate stripping as destructive as Cork trees have been stripped for centuries without harm; that it is not necessary to coppice in order to ascertain the best season for cutting, because all seasons have been tried; that the question of the transference of alkaloids in bark cannot be considered as affirmatively answered, and that the preponderence of evidence is against transfer that the grey barks are not known, as Dr. Bidie describes them, to be worthless, and, therefore, they should not be grubbed up; that it would be inexpedient, on account of the small expense saved, to abandon certain areas of Cinchona on certain plantations, though Dr. Bidie recommends they should be given up; and, finally, that to coppice with a view to furnish Mr. Broughton's factory with wood would not produce that result.

22nd Year
21st
19th
17th
15th
13th
11th
9th
7th
5th
3rd Year



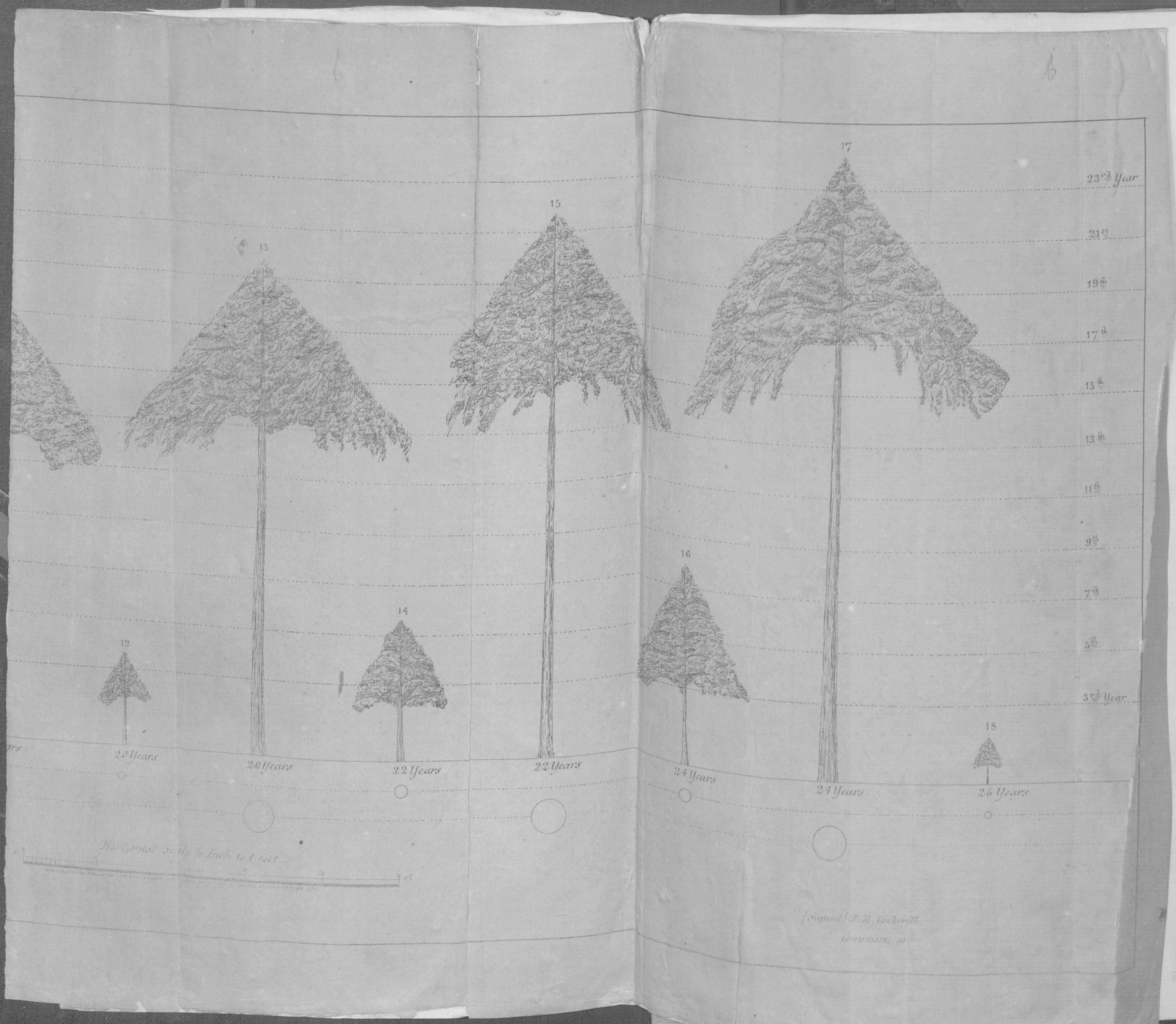


Section of Coppiced Trees.

Section of Massed Trees.

Perpendicular Scale 12 Inch to 1 Foot

Govt Lithe Press Fort St George
Madrs Octr 18th 1854



[Signed] J. R. Cockerill
Commissioner.

Coppicing Experiments in their order, showing the Results.

A.

One hundred *Cinchona Succirubra*, or red-bark trees, 4½ years old, were cut on the Government Plantation at Neddiwattum; 50 trees in December 1866, and 50 trees in January 1867. The suckers found on the stools were left, but were not measured. Fifteen consecutive trees were examined on the 5th June 1874, or 7½ years after coppicing. Three had died. The shoots on the stems of twelve plants varied from 4⅛ to 19¼ feet in height; the average growth being 14 feet 9½ inches, the shoots weak and slender. The number of shoots on each stool varied from 2 to 5. The height of the shoots at the date of coppicing is included in the above measurements.

B.

Two hundred and forty *C. Succirubra*, or red-bark trees, selected by Messrs. Breeks and Broughton on the Government Plantation at Neddiwattum, were coppiced on the 10th May 1871; 200 trees of the planting of 1862-63 were coppiced in one block, and 40 trees of the planting of 1864-65 were coppiced, leaving the standing trees in the rows on each side. All the suckers found on the stools were left. 78 plants had suckers varying from 2 to 8 feet, or an average of 5 feet. 150 plants had suckers 2 feet in height and under or an average of 1 foot. 12 plants had no suckers. The shoots on the 228 plants gave an aggregate measurement in May 1871 of 540 feet.

The shoots on these stools were measured again on the 7th June 1874. Nine plants were found dead. The height of the largest shoot 14 feet 6 inches, and of the smallest 1 foot 1 inch. The shoots on the 231 trees gave an aggregate measurement of 1,774 feet, and the average growth in three years is, therefore, 5 feet 4 inches per tree, or 1 foot 9⅓ inches per tree per annum.

The bark obtained from these plants was 720 lbs. of green trunk bark, equal to 255 lbs. of dry trunk bark, and 324 lbs. of green branch bark, equal to 100 lbs. of dry branch bark; in all 355 lbs., or 1·48 lbs. per tree. The cost of cutting these trees and stripping off the bark was Rs. 15 or 1 Anna per tree.

C.

PARTICULARS of fifty-eight Trees of *Cinchona Succirubra* selected by Mr. Broughton and coppiced on the Government Cinchona Plantation at Neddiwattum on the 30th May 1873, cut at or within a foot from the ground, all the shoots left.

Number.	——	Height of shoots on 30th May 1873.	Height of shoots on 30th May 1874.	Increase after one year's growth.	Remarks.
		FT. IN.	FT. IN.	FT. IN.	
1st Row 1	No sucker....	.....	3 7	3 7	
„ 2	.....	11 2	12 4	1 4	
„ 3	.....	....	....	....	No plant.
„ 4	.....	....	....	....	„
„ 5	.....	....	....	....	Not cut.
„ 6	.....	15 4	16 5	1 1	
„ 7	.....	10 4	11 4	1 0	
„ 8	.....	12 0	12 10	0 10	
„ 9	.....	4 10½	6 5	1 6½	
„ 10	.....	7 0	8 5	1 5	
„ 11	.....	....	....	....	No plant.
„ 12	.....	8 8	11 3	2 7	
„ 13	.....	6 11	....	....	
„ 14	No sucker....	....	2 1	2 1	
„ 15	„	....	2 5	2 5	
„ 16	Sprouting....	....	4 0	4 0	
„ 17	No sucker....	....	3 5	3 5	
„ 18	.....	5 0	6 0	1 0	
„ 19	No sucker....	....	3 6	3 6	
2nd Row 20	.....	12 0	13 2	1 2	
„ 21	.....	7 2	8 4	1 2	
„ 22	Sprouting....	....	3 9	3 9	
„ 23	No sucker....	....	1 8	1 8	
„ 24	.....	8 10	10 7	1 9	
„ 25	.....	9 8	10 4	0 8	
„ 26	.....	4 3	6 9	2 6	
„ 27	.....	....	....	....	Condamenia.
„ 28	.....	12 1	13 0	0 11	
„ 29	.....	7 9	9 6	1 9	
„ 30	.....	8 8	10 11	2 3	
„ 31	.....	10 9	11 10	1 1	
„ 32	No sucker....	....	2 7	2 7	
„ 33	.....	8 3	10 8	2 5	
„ 34	.....	12 8	14 2	1 6	
„ 35	.....	12 1	13 10	1 9	
„ 36	.....	....	....	....	Cut before.
3rd Row 37	.....	8 3	8 8	0 5	
„ 38	.....	2 9	3 2	0 5	
„ 39	No sucker....	....	2 8	2 8	
„ 40	„	....	2 9	2 9	
„ 41	.....	3 10	3 6	....	Top broken by wind.
„ 42	.....	....	....	....	Condamenia.
„ 43	.....	8 9	9 4	0 7	
„ 44	.....	8 4	10 3	1 11	
„ 45	No sucker....	....	1 1	1 1	
„ 46	.....	7 3	6 8	....	Top broken by wind.
„ 47	.....	....	....	....	Condamenia.
„ 48	.....	11 8	13 5	1 9	
„ 49	.....	8 8	10 9	2 1	
„ 50	No sucker....	....	3 3	3 3	
„ 51	.....	5 10	8 8	2 10	

PARTICULARS of fifty-eight Trees of *Cinchona Succirubra* selected by Mr. Broughton, *etc.*—*(Concluded)*.

Number.	——	Height of shoots on 30th May 1873.	Height of shoots on 30th May 1874.	Increase after one year's growth.	Remarks.
		FT. IN.	FT. IN.	FT. IN.	
3rd Row 52	No sucker....	....	3 3	3 3	
4th Row 53	.....	8 7	9 3	0 3	
„ 54	No sucker....	....	2 10	2 10	
„ 55	.....	....	....	....	Dead.
„ 56	.....	12 4	13 6	1 2	
„ 57	.....	....	....	....	Micrantha dead.
„ 58	.....	12 0	13 10	1 10	
„ 59	.....	14 0	15 3	1 3	
„ 60	.....	7 0	8 9	1 9	
„ 61	.....	5 9	6 7	0 10	
„ 62	No sucker....	....	2 7	2 7	
„ 63	.....	9 0	10 2	1 2	
„ 64	.....	8 10	11 10	3 0	
„ 65	.....	10 0	9 7	....	Top broken by wind
„ 66	No sucker....	....	2 10	2 10	
„ 67	.....	8 6	11 2	2 8	

Growth, average 1 foot 11½ inches, maximum 4 feet, minimum 5 inches.
Dry trunk bark 286½ lbs., or lbs. 4·93 per tree.
Cost of coppicing and barking Rs. 7, or 1 Anna and 11 Pies per tree.

D.

PARTICULARS of fifty-three Trees of *Cinchona officinalis* (*C. Condamenia*) selected by Mr. Broughton and coppiced on the Government Cinchona Plantation at Dodabetta on the 2nd June 1873, cut at or within a foot from the ground, all the shoots left.

Number.	Height of Shoots on 2nd June 1873.	Height of Shoots on 2nd June 1874.	Increase after one year's growth.	Remarks.
	FT. IN.	FT. IN.	FT. IN.	
1st Row 1	1 10	2 3	0 5	
„ 2	0 9	2 3	1 6	
„ 3	.....	2 0	2 0	
„ 4	.....	.....	.....	Not sprouted.
„ 5	.....	2 0	2 0	
„ 6	.....	1 6	1 6	
„ 7	.....	2 0	2 0	
„ 8	.....	.....	.....	Dead.
„ 9	.....	1 6	1 6	
2nd Row 10	.....	2 3	2 3	
„ 11	.....	2 0	2 0	
„ 12	.....	2 3	2 3	
„ 13	0 8½	2 0	1 3½	
„ 14	0 9	2 3	1 6	
„ 15	.....	.....	.....	Not sprouted.
„ 16	.....	1 6	1 6	
„ 17	.....	2 0	2 0	
„ 18	.....	1 6	1 6	
„ 19	.....	1 6	1 6	
„ 20	.....	.....	.....	Do.
„ 21	.....	2 0	2 0	

PARTICULARS of fifty-three Trees of *Cinchona officinalis* (*C. Condamenia*) selected by Mr. Broughton, *etc.*,— (*Continued*).

Number.	Height of Shoots on 2nd June 1873.	Height of Shoots on 2nd June 1874.	Increase after one year's growth.	Remarks.
	FT. IN.	FT. IN.	FT. IN.	
3rd Row 22	.....	2 0	2 0	Not cut.
,, 23	.....	.....	.....	
,, 24	.....	1 6	1 6	
,, 25	.....	2 0	2 0	
,, 26	.....	2 0	2 0	
,, 27	.....	1 6	1 6	
,, 28	.....	1 6	1 6	
,, 29	.....	2 3	2 3	
,, 30	.....	1 6	1 6	
4th Row 31	0 7	2 0	1 5	Not sprouted.
,, 32	.....	.....	.....	
,, 33	.....	1 0	1 0	
,, 34	.....	1 6	1 6	
,, 35	.....	2 3	2 3	
,, 36	.....	2 0	2 0	
,, 37	.....	1 6	1 6	
,, 38	.....	.....	.....	Do.
,, 39	.....	1 0	1 0	
5th Row 40	.....	2 0	2 0	
,, 41	.....	1 6	1 6	
,, 42	.....	.....	.....	Do.
,, 43	.....	1 6	1 6	
,, 44	.....	1 0	1 0	
,, 45	0 9	2 3	1 9	
,, 46	.....	2 0	2 0	
,, 47	.....	1 0	1 0	
6th Row 48	.....	1 0	1 0	
49	.....	1 6	1 6	
,, 50	.....	1 0	1 0	
,, 51	.....	1 6	1 6	
,, 52	.....	.....	.....	Do.
,, 53	.....	.....	.....	Do.
,, 54	.....	.....	.....	Do.

Average growth for 1 year, 1 foot 7½ inches; maximum growth, 2 feet 3 inches; minimum growth, 5 inches.

lbs. of dry bark 85⅔, or lb. 1·61 per tree.

Cost of cutting and barking Rupees 4-15-6, or Annas 1½ per tree.

Proceedings of the Madras Government, Revenue Department,
19th September 1874.

E.

PARTICULARS of 57 Trees of *Cinchona Succirubra* coppiced on the Government Cinchona Plantations at Neddiwattum on the 14th October 1873. The plants selected by Mr. Broughton and at that gentleman's request cut close or at most within six inches of the ground.

Number.	Height of Shoots on 30th May 1874.	Remarks.	Number.	Height of Shoots on 30th May 1874.	Remarks.
	IN. FT.			IN. FT.	
1st Row 1	0 3	.....	2nd Row 29	1 1	.....
,, 2	.....	Dead.	,, 30	.....	Dead.
,, 3	1 0	.....	,, 31	1 1	.....
,, 4	1 9	.....	3rd Row 32	.....	Dead.
,, 5	1 3	.....	,, 33	.....	Do.
,, 6	0 10	.....	,, 34	.....	Do.
,, 7	0 8	.....	,, 35	1 7	.....
,, 8	0 10	.....	,, 36	0 3	.....
,, 9	.....	Dead.	,, 37	.....	Dead.
,, 10	.....	Do.	,, 38	.....	Do.
,, 11	0 7	.....	,, 39	1 4	.....
,, 12	0 9	.....	,, 40	0 4	.....
,, 13	1 2	.....	,, 41	0 11	.....
,, 14	0 9	.....	,, 42	.....	Dead.
,, 15	.....	Dead.	,, 43	1 5	.....
2nd Row 16	.....	Do.	,, 44	1 4	.....
,, 17	0 6	.....	4th Row 45	0 9	.....
,, 18	.....	Dead.	,, 46	.....	Alive, not sprouted.
,, 19	.....	Do.	,, 47	0 3	.....
,, 20	1 2	.....	,, 48	.....	Dead.
,, 21	.....	Dead.	,, 49	1 3	.....
,, 22	.....	Do.	,, 50	1 1	.....
,, 23	1 8	.....	,, 51	1 9	.....
,, 24	0 11	.....	,, 52	.....	Dead.
,, 25	.....	Dead.	,, 53	.....	Do.
,, 26	.....	Do.	,, 54	1 2	.....
,, 27	1 2	.....	,, 55	1 0	.....
,, 28	1 1	.....	,, 56	1 2	.....
			,, 57	0 10	.....

Average growth after 7½ months 1 foot 0 inch; maximum 1 foot 9 inches; minimum 0 foot 3 inches.

lbs. of dry trunk bark 264—20, or lbs. 4-64 per tree.

Cost of coppicing and barking the trees Rupees 6, or 1 Anna and 8 Pies per tree.

OOTACAMUND,
15th June 1874.

(Signed) W. G. McIVOR,
Superintendent, Govt. Cinchona Plantations.

F.

Particulars of 100 Trees, part of a plot of 2,000 Trees, giving the Length and average Breadt of the spaces on which the Bark failed to renew.

Nos.	Space barked, measurements.				Surface barked in square inches.	Space failed to renew, October 1873.	Space failed to renew, June 1874.	Remarks.
	Girth at ground.	Girth at middle.	Girth at top.	Height barked.				
	In.	In.	In.	In.				
No. 1	16 1/3	12 3/4	12 1/3	56	779 1/3	3	2 1/3	
„ 2	16	13	11	56 1/3	753 1/3	17 1/3	2 1/4	
„ 3	15	11	10 3/4	53	649 1/4	1 5/12	3	
„ 4	13	10 1/4	9	64	688	8 1/3	3	
„ 5	15 1/3	12 1/4	11 1/4	52 1/3	682 1/3	1 1/4	..	Perfect.
„ 6	16 3/4	13 3/4	11	57	788 1/3	99 1/4	44 1/3	
„ 7	16 1/3	12	10	68	872 2/3	154 1/3	123	
„ 8	16 3/4	13	11 1/3	57	783 3/4	8 5/6	4 1/2	
„ 9	16	13	11 1/3	51	688 1/2	2	..	Perfect.
„ 10	..	..	..	..	..	..	..	Barked 3rd time.
„ 11	..	..	..	..	..	..	..	Do. do.
„ 12	12	9 1/4	8 3/4	55 1/2	555	21	9 1/2	
„ 13	19 1/2	16	14	63	1,039 1/2	41 3/4	26	
„ 14	17 1/4	13 1/2	12	61	874 1/3	129 1/2	92 3/4	
„ 15	18	13 1/2	14	60	910	24 3/4	8 3/4	
„ 16	16	12	10 3/4	72	930	11 1/3	3 1/8	
„ 17	14	10 1/2	9	56	625 1/3	3 1/3	5 1/4	
„ 18	10	9	7 3/4	66	588 1/3	52	3	
„ 19	17	11 1/3	9 3/4	65	828 3/4	4 7/8	1 1/2	
„ 20	19 1/2	15	12	77	1,193 1/3	6	7 1/2	
„ 21	15	12 1/3	11 3/4	64	837 1/3	13	65 1/2	
„ 22	15	10 3/4	10	74	881 5/6	69 1/4	55 1/4	
„ 23	16	11	9 1/3	67	815 1/8	53 3/8	58 3/4	
„ 24	..	..	..	..	..	..	..	Barked 3rd time.
„ 25	..	..	..	..	..	..	..	Do. do.
„ 26	10 1/3	8	8	62	547 2/3	57 3/4	..	Perfect.
„ 27	13 3/4	12 1/3	10 3/4	59	727 2/3	3	142 3/4	
„ 28	13 1/3	11 1/4	10	69	799 1/4	179 1/3	..	Perfect.
„ 29	17 1/2	13 1/4	12	66	940 1/2	1 1/4	10 1/2	
„ 30	15	11	10 1/3	56	681	29 1/4	8 1/2	
„ 31	16 1/3	13 3/4	13 1/2	58	847 1/2	11	3	
„ 32	15 1/2	11 1/3	11 1/4	58	739 1/3	3 1/2	44	
„ 33	15	13 1/3	10 3/4	52	680 1/3	19 1/2	8	
„ 34	18	13	11 1/2	58	821 1/3	6	5 1/4	
„ 35	16 3/4	15	12 1/2	56	826	13 7/8	..	Dead perfect renewal.
„ 36	12	9 3/4	8 3/4	52	528 2/3	82	26	
„ 37	17 3/4	14 3/4	11 3/4	72	1,062	61 3/4	..	Broken by wind.
„ 38	18 3/4	14 1/4	13	73	1,107 1/6	55 1/4	12	
„ 39	16	13 1/2	12 1/2	61	854	32 1/3	4	
„ 40	16	12	10 3/4	60	775	11 1/3	..	Perfect.
„ 41	9	7	7	46	352 2/3	1/4	..	Do.
„ 42	15	13	11	58	754	1 1/8	..	Do.
„ 43	17 1/2	13	11	73	1,009 1/2	1 1/2	..	Do.
„ 44	16	12 1/4	12	56	751 1/2	3 3/4	..	Do.
„ 45	15 1/2	13 1/2	11	70	933 1/3	2	2 3/4	
„ 46	16	13	11 1/2	65	877 1/2	29 3/8	21	
„ 47	18 1/2	14	13	75	1,137 1/2	43	..	Do.
„ 48	17 1/2	13 1/2	12	73	1,046 1/2	1 1/8	..	Do.
„ 49	14	10 1/2	9 3/4	61	696 5/12	..	..	Do.
„ 50	22 1/2	17 3/4	17	74	1,412 3/12	1 7/8	..	Do.

Proceedings of the Madras Government, Revenue Department,
19th September 1874.

Particulars of 100 Trees, part of a plot of 2,000 Trees, giving the Length and average Breadth of the spaces on which the Bark failed to renew.—*(Continued).*

Nos.	Space barked, measurements.				Surface barked in square inches.	Space failed to renew, October 1873.	Space failed to renew, June 1874.	Remarks.
	Girth at ground.	Girth at middle.	Girth at top.	Height barked.				
	In.	In.	In.	In.				
No. 51	21	15	13	75	1,225	7 3/4	3/4	
„ 52	19 1/2	16 3/4	13 1/3	63	1,044 3/4	19 5/12	..	Perfect.
„ 53	18	14	13	70	1,050	3 5/12	36	
„ 54	16 3/4	12 1/4	12 1/3	70	939 1/6	77 1/4	13 3/4	
„ 55	..	..	..	..	..	..	..	Barked 3rd time.
„ 56	..	..	..	..	..	..	..	Do.
„ 57	15	11	10 1/4	67	809 1/2	43	1 1/4	
„ 58	14	12	10 1/2	54	657	5 5/12	4 1/4	
„ 59	14 1/2	10 1/2	9	56	634 2/3	15 1/3	3 3/4	
„ 60	16	13	12	61	833 2/3	12 1/6	..	Perfect.
„ 61	16 1/2	13 1/4	12	73	1,015 1/2	8 1/4	12	
„ 62	18	13	12	65	931 2/3	29 5/12	16 1/3	
„ 63	13	9 1/2	8	53	538 1/6	30 5/12	..	Do.
„ 64	16	12	11	58	754	19	14	
„ 65	19 1/3	13	10	62	878 1/2	1	..	Do.
„ 66	17	13	12 1/2	58	821 2/3	9 5/12	1 1/4	
„ 67	19	14 1/2	13 1/2	59	924 1/2	11	29 1/4	
„ 68	15	10	9 1/2	60	690	37 5/12	17	
„ 69	16 1/2	11	11	72	924	32 1/2	11 3/4	
„ 70	16	12	10 1/3	67	859 1/4	21	1 1/4	
„ 71	16	12	11	66	858	6 1/2	3 1/2	
„ 72	17	12	12	60	820	12 7/8	51	
„ 73	15	12	10	72	888	71	8 1/2	
„ 74	19	14	11	70	926 2/3	9 3/4	21	
„ 75	..	..	..	..	...	..	..	Do.
„ 76	..	..	..	..	..	..	..	Do.
„ 77	15	12	11	58	734 2/3	61 7/12	220	
„ 78	16	12	10 1/3	71	911 1/8	283 7/8	80 3/4	
„ 79	20 1/3	14	12	73	1,131 1/3	116	21	
„ 80	25	19 1/3	16 1/3	62	1,260 2/3	52 1/4	..	Do.
„ 81	22	16	15	74	1,307 1/3	6 1/2	14 3/4	
„ 82	15	11 1/3	10 1/4	61	747 1/4	27 5/8	3/4	
„ 83	23	19	16 1/3	81	1,579 1/2	3	..	Do.
„ 84	18 1/2	13	12 1/3	61	894 2/3	5 5/12	8	
„ 85	20 1/2	11	10 1/3	71	994	36 1/3	4	
„ 86	21	17	15 1/4	74	1,313 1/3	20 3/4	..	Do.
„ 87	16	14	12 1/3	74	1,048 1/3	14 5/12	21 3/4	
„ 88	19	15	14 1/2	73	1,180 1/6	52 1/8	..	Do.
„ 89	..	..	..	..	..	..	..	Barked 3rd time.
„ 90	..	..	..	..	..	..	..	Do.
„ 91	17 1/3	13	12 1/2	52	745 1/3	3/4	..	Perfect.
„ 92	15	12	12 1/3	46	605 2/3	1	..	Do.
„ 93	14	12 1/2	10	61	742 1/6	2 5/12	2 1/4	
„ 94	17	13	11	66	902	14 1/3	16 3/4	
„ 95	13 1/3	11	9 3/4	55	627 11/12	29	..	Do.
„ 96	16 1/2	12	10	69	885 1/3	3/4	..	Do.
„ 97	14	12	11	46	567 1/3	1 1/8	1	
„ 98	16	13	11	48	640	3 1/4	..	Do.
„ 99	16	10	9 1/3	50	591 2/3	..	3 1/3	
„ 100	10	8 1/3	8	27	238 1/3	7	..	Do.

PARTICULARS of 100 Trees, part of a plot of 2,000 Trees giving the Length and average Breadth of the spaces on which the bark failed to renew.—(*Concluded.*)

Nos.	SPACE BARKED, MEASUREMENTS. Girth at ground.	Girth at middle.	Girth at top.	Height barked.	Surface barked in square inches.	Space failed to renew, October 1873.	Space failed to renew, June 1874.	Remarks.
	IN.	IN.	IN.	IN.				
No. 101	14	10½	9	40	446⅔	....	....	Do.
„ 102	17	12	10½	44	579⅓	2	32¼	
„ 103	15½	10¾	9¾	54	648	21	....	Do.
„ 104	10½	8	7	52	442	7¾	....	Do.
„ 105	19	13	14	65	996⅔	¼	1½	
„ 106	17	12	10	61	793	3½	98¾	
„ 107	18½	14	13½	71	1,088⅔	106½	1½	
„ 108	14½	12½	10½	59	737⅓	51⅓	35½	
„ 109	16½	11	10	70	875	7⅓	11¾	
„ 110	18	15	14	69½	1,088¼	36⅔	9¾	
					84,045	2,788	1,639¼	Square inches.
					583⅛	19⅓	11·37	„ feet.
					....	3·26	1·95	Per-centage.

OOTACAMUND,
15th June 1874.

(Signed) W. ROWSON,
Assistant Superintendent.

No. 177-A. MINUTE BY THE HON. J. D. SIM, C.S.I.

THE Government wish the coppicing system tried, but it evidently must be tried so as not to affect injuriously the rival system of mossing; this can only be done by setting aside *blocks* for each experiment. Mr. Cockerell says about 360 Succirubra trees go to the acre, and as we had 6,000 of these when the experiment was ordered, they must have covered an area of about 16 or 17 acres. I would desire the Commissioner to select blocks aggregating 4 acres for coppicing; he will take care that they are of similar quality to the blocks reserved for coppicing and that the "competitive examination" is a fair one.

2. The trial of dispensing with moss never commended itself to my judgment; but a few trees might be tried just to satisfy those who are more sanguine. The bark should, of course, be stripped just as if the tree were going to be subsequently mossed. In some cases also the strip should be left attached to the tree for awhile, so as to afford some protection. I think 100 trees would be ample for such a very dubious experiment.

3. In the rest of his report Mr. Cockerell seems to me to refute most completely and successfully every position taken up by Dr. Bidie and Mr. Broughton. I have always been a strenuous supporter of Mr. McIvor's system of cultivation and harvesting, and therefore may not be an altogether impartial judge in this controversy; but my opinion is as above. The mossing system gives a larger and more valuable supply of bark in the same periods than the coppicing system, and if it is found hereafter that the life of the mossed tree is endangered or shortened by the stripping of the bark, or if any other untoward result is produced, the tree can still be coppiced. We have no such alternative with the coppicing system.

1st July 1874. (Signed) J. D. SIM.

Proceedings of the Madras Government, Revenue Department,
19th September 1874.

No. 177-B. MINUTE BY THE HON. W. ROBINSON, C.S.I.

I THINK the spirit of the first paragraphs of this letter is unsatisfactory, if not obstructive. The Commissioner believes that we are wrong, and he may be right in doing so; but he knows what the Government wants, and it is his business to assist in an accommodating spirit, and *recommend* an experiment which would be conclusive without being carried to an injurious extent in case it fail.

2. I would carry out the experiment of cutting down with view to reproduction in both ways, and not extend it beyond 4 acres which Mr. Sim suggests this season, viz., 2 acres felled and cleared, and 4 acres thinned out in alternate rows. As to the manner of felling, I think the loss on those felled close to the root is conclusive against that system, but I would direct Mr. McIvor to fell—in respect to season and manner—in the way which he (the best judge) believes will give the best prospect of renewal.

1 Acre, C. Succirubra.
1 „ Crown bark.

3. I agree with Mr. Sim as to the experiment in barking without mossing.

4th July 1874. (Signed) W. ROBINSON.

No. 177-C. MINUTE BY HIS EXCELLENCY THE GOVERNOR.

WHAT the Government desire to have is a fair trial as between the mossing and coppicing systems. We cannot personally superintend such trial, nor is it our business to prescribe the details of it; and it appears to me that we ought wholly to trust to the Commissioner to see that the trial is properly and fairly conducted by Mr. McIvor.

7th July 1874. (Signed) HOBART.

No. 177-D. MINUTE BY HIS EXCELLENCY THE COMMANDER-IN-CHIEF.

I HAVE perused with the greatest interest Mr. Cockerell's exhaustive, well-reasoned, and temperate exposition of the actual state of affairs in our Cinchona Plantations and of the comparative merits, as far as means of judging are available, of the coppicing and mossing systems of harvesting the bark.

2. I have searched in vain for any symptoms of obstructiveness or want of candor on the part of the Commissioner in the opening paragraphs of his report as observed in them by the Hon. W. Robinson. I fail to detect anything of the sort, but recognise in them and in the whole document the labor of an honest, intelligent, public officer, assisted doubtless by a subordinate fully master of the difficult subject treated of.

3. It is evident that we are not so entirely without the means of judging of the comparative value of the mossing and coppicing processes as Mr. Broughton would have us believe. As far as we have gone, the experiment would seem to be altogether in favor of the former. As far as we consent to allow the disingenuous manner in which Mr. Broughton has been shown to Shall we consent to allow the disingenuous manner in which Mr. Broughton has been shown to have placed this matter before Government without calling him to account and visiting him with censure, if necessary? I allude to this feature in the case, as he complains to us that the orders of Government relative to coppicing have not been carried out by the Commissioner and Superintendent of Cinchona Plantations, when it is clearly shown that operations were suspended at his own request,—a request urged on account of the very unsatisfactory outturn of bark under that process. Here, I detect something like obstructiveness,—something like extreme want of that straightforward statement of a case which we expect from a public officer in his reports.

4. I have adverted in previous memoranda to the tone this officer adopts towards those who happen to differ with him on public duty, and venture now to suggest that serious notice should be taken of a quality which cannot fail to detract from his usefulness, however valuable his services may otherwise be.

5. In the method of dealing with this question, I would express my entire concurrence with the views expressed by His Excellency the President. We cannot too fully trust the able officers who have officially charge of this experiment in Cinchona culture; and I would dismiss the question by an intimation to the Commissioner that Government expects him to see that a fair but moderate trial be given to the coppicing system, the details of which are left in his hands.

6. We have recorded our thanks to Dr. Bidie for his report. It afforded pleasant reading; but evidently the best thing we can do with it is to disregard all its main recommendations.

7. I think, however, that we can do no less than thank the Commissioner for his very able report and Mr. McIvor for his very carefully recorded statistics concerning Cinchona growth and the results of the various systems adopted for harvesting the bark, as these together have enabled us to avoid so many suggested errors.

8. I suppose this report with diagram will be printed *in extenso*.

OOTACAMUND, 11*th July* 1874. (Signed) F. P. HAINES.

I quite concur.

(Signed) J. D. S.

No. 178. ORDER THEREON, 19th September 1874, No. 1,193.

Miscellaneous.

IN the foregoing letter the Commissioner of the Nilgiris furnishes an exhaustive exposition of the actual state of affairs in the Government plantations and of the comparative merits, as far as means of judging are available, of the coppicing and mossing systems of harvesting the bark.

2. This report is made with reference to the report of Dr. Bidie and the letters from the Government Quinologist reviewed in G. O., 11th April 1874, No. 434, and reasons are advanced for contesting the recommendations of these officers.

3. The Government observe that all that they desire to have is a fair trial between the mossing and coppicing systems, and in modification of paragraph 4 of G. O., 11th April 1874, No. 434, they resolve to leave it to the Commissioner to see that the trial is fairly and properly conducted in a manner that shall leave no room for future question.

(Signed) C. G. MASTER,
Acting Secretary to Government.

Exd. F. R. Bantleman.

Commissioner's Office 13
Ootacamund 14th June 1874.

No. 43

From J. R. Cockerell Esq
Commissioner Nilgiris

To The Secretary to Government
Revenue department
Ootacamund

Sir.

In Government Order, Revenue Department, 11th April 1874, No 434 upon a Report from Dr Bidie on the Coppicing System as applied to Cinchona and the views of Dr Brownlow upon the same subject, the Government in para 4 direct that 6000 trees shall be coppiced.

2. There are 18,000 Crown Bark trees of 10 years old on the Reddiwattum and Dodabetta plantations which have not been mossed. There were last year 6000 Succirubra trees at Reddiwattum of 11 years old similarly untouched, but in Government Order 5th September 1873 Revenue department No 952. the Government were pleased to direct upon

a

Govt. of {1874} Nilgiris.

REVENUE.

To

THE COMMISSIONER,
OF THE NILGIRIS,
&c., &c.

Dated September 1874.

Read.

Encl.

G. O., 10th September 1874, No. 1,193.

SEPTEMBER.
Nos. 177-178.

Mossing and Coppicing Systems of harvesting Cinchona Bark.—Resolving, in modification of paragraph 4 of G. O., 11th April 1874, No. 434, to leave it to the Commissioner, Nilgiris, to see that the trial between the—is conducted in a manner that shall leave no room for future question.

a representation from this Office that there were 24,000 untouched trees upon the plantations; that 1/4th of them should be "retained for coppicing" and the remainder should be mossed. Upon the receipt of these instructions 1800 of the above 6000 Red Bark trees were stripped and mossed. Three quarters of the 18000 Crown barks would also have been mossed but labor for the work was not available at the time. There are therefore now 18000 Crown barks and 4200 Succirubra that can be coppiced.

3. But the Government Order under reply directs that in compliance with the recommendation of Dr Bidie, 6000 trees shall be coppiced in alternate rows. There are 860 Succirubra and 680 Crown bark trees to the acre. I have the honor to inquire whether alternate rows of the available Succirubra are to be felled which will give 2100 trees cut down and whether I am to make up the number of 6000 trees by coppicing 4000 officinalis in alternate rows. If the coppicing system is to be tried as thus detailed, the experiment will extend

over

over 12 acres of Succirubra and 16 acres of Crown bark and there will be left of trees that can be put under moss, 10,000 Crown barks. I request definite instructions in order to avoid future misunderstandings as neither Dr Bidie nor Dr Broughton are on the spot to direct the experiment and it is therefore expedient it should be clearly understood what is to be done.

4. The next point on which I solicit a definite order is with regard to the trees the Government desire should be stripped of bark and left unprotected by moss. On this subject Dr Bidie states at para 16 of his report that he examined 15 trees which had been so treated at Dodabetta and he found that on 5 the bark was renewed perfectly

4 " " well

5 " " fairly

1 " " imperfectly

Dr Bidie does not explain what proportion of bark had been taken from these trees. Four to five square inches was stripped

from

from each. But a tree of 10 years old should yield under the notching system at the first harvest of Bark no less than 1000 Square inches Am I to treat the trees on which Experiment is to be tried by merely removing a Small portion of bark or by harvesting the bark? In the latter case Some difference may appear in the result. The trees will be more Exposed to the pernicious action of Sun and air and it is to be expected Some may perish. It is believed by Dr McIvor and myself that if a large Surface of the Cambium layer on a trunk is Exposed to wind and Sun, the Cambium will dry and Split. If this Conjecture proves correct the injury inflicted will be of the Same character as is incurred by a wound to the Cambium from a knife. The wood of the trunk will decay at the lacerated points. Dr Howard in a letter to the Secretary of State dated 4th February 1864 writes that the plan of Stripping a tree and leaving it to renew was practised with the Cascarillas rosecadas Barks "but unless the bark is Covered with moss immediately as discovered

15

by Dr McIvor the Subjacent woody portion Suffers Serious injury." Dr Bidie refers to the Cascarillas in para 15 of his report in a manner implying that he is not acquainted with Dr Howards opinion Neither apparently is he aware that Dr Broughton made an Experiment with bark renewed without protection which he describes at para 14, Government order 14th April 1864 and which Dr Broughton found to Corroborate the alleged worthlessness of Cascarilla rosecadas. No Experiment of any Value would be made by merely cutting out a few Square inches of bark from each tree.

5. Dr Bidie States that there are on the Denison, Napier and Hooker States plots of Succirubra of inferior growth and he Suggests their abandonment. No doubt the trees of the Spots indicated have been kept down by wind but they are making fair growth and it does not seem worthwhile now that the Expense of raising the trees has been incurred and the land kept clean for Some years to Spare the remaining Small Expenditure needed to bring

the

trees to a condition when they will keep the land free of weeds themselves and cost nothing. It is not as if Cinchona culture was as costly as the culture of Coffee or tea on which the annual outlay is 100 Rupees an acre. Last year the whole Expenditure connected with the Government Cinchona plantations was only 30 Rupees an acre and upkeep or the labor connected with the land only costs 11 Rupees per acre a year.

6. Dr Bidie recommends that the Red bark should be thinned out. He observes that in his opinion they are too close together and probably as many of them were for propagated from cuttings they "will be found particularly deficient in descending roots." "I should therefore" he states "in case of a severe storm feel uneasy regarding the risk to the more crowded portions of the Red bark plantations as if once the wind were to gain admission by prostrating a few trees the damage might be very Serious."

In the Biligiri Hills the greatest enemy

to plantations is wind. Accordingly it is found that in Sholahs the vegetation is close and Nature there affords a protection from wind. This is so noticeable a feature in a natural grown forest that a clearing made in a large Sholah is apt to destroy the wood left standing. An instance may be seen at Devi Sholah where the major part of an extensive forest having been cleared the rest of the Sholah is dying out and consists of little but bare poles. Similarly with regard to plantations of australian trees. Experience shows that the nearer the plants are to each other and the greater the mutual protection afforded the better the progress of the plantation. In like manner planters put up belts of quick growing trees to protect tea and Coffee plantings. Dr Dr Ivor tells me he fears that if thinning as recommended by Dr Bidie is carried out, the wind will get into the plantations and prostrate the trees left and this will more certainly result if Dr Bidie's fears are correct and the trees

have

have merely a superficial hold of the ground
The trees must be thinned out by degs. Dr
Dr Door has always had this in view but he
holds that the proper time of thin is when
the more robust trees shall have outtopped
the weakly plants and the wind will not
be let in by removing the latter.

7. The Government order desires that
the recommendation of Dr Bidie that particular
attention should be paid to the mortality in
C. Calisaya may receive attention. The point
has always attracted observation. Dr Dr Door has
tried the Calisaya under every condition of
exposure and moisture. He believes the cause
of its premature decay is that the climate of
the Nilgiris is unsuited to its development
owing to there being an annual drought
of 4 to 5 months. The climate required for
the Calisaya is a moderately, but at all
seasons, moist climate.

8. At para 10 of the Report Dr Bidie
states that the grey barks yield little or no
quinine and are very poor in other alkaloids

and

and he counsels the "grubbing up" of the trees
of these species as soon as "they have reached
maturity" Dr Bidie cannot be aware that
the cultivation of the grey barks is one of the
most interesting experiments proceeding on
the plantations. Dr Howard writes in a letter
to the Under Secretary of State dated 15th
August 1865 on the Analysis of certain barks
"In Boy we have an illustration of what
careful cultivation will do, as the plant C.
Succirantha which (with its congeners the
Gray barks) produces largely and chiefly
Cinchonine in its native climate of Huanaco
now produces a very small portion of
Cinchonine and a large portion of the allied
alkaloid Quinidine. This is then a hopeful
change if time should confirm the observation.
Dr Broughton in his report in Government
Order 26th July 1864 writes at para 16th "From
the foregoing analysis it appears that
although grey barks do not contain quinine
they are among the richest we possess in
their yield of alkaloids. I would submit

that

the results obtained by the Cinchona Commission respecting the efficacy of the alkaloids produced by these plants hardly justify the disregard with which the Peruvian barks have hitherto been treated. I would suggest that the cultivation of the beautiful leaved C. Peruviana might be extended with considerable advantage in many cases."

9. Finally the Government order enjoins with reference to remarks made by Dr Bidie the keeping of accurate returns of the time required for the renewal of bark harvested by the mossing process and of the expense of the process. Accurate records have been kept on both these subjects ever since the formation of the Plantations. In a letter to the Commissioner dated 9th September 1891 No 45 Dr Mc Ivor writes that mossing 1000 Succirubra trees of seven and five years old cost Rs 160-11-0 or Rupees 3-14-6 per 100. and that mossing 2000 Officinalis trees at Dodabetta cost Rupees 342. or Rs 18-12-0

100 trees. The cost in the latter case was large because moss is scarce at Dodabetta. These were the first mossings undertaken and the work was expensive. Now that labor is organised mossing costs; Dr Mc Ivor tells me; 1½ annas per tree of 8 years old at Dodabetta and an anna at Reddimattum. This is in round numbers. In his report in Government order, 20th August 1892 No 1234 Revenue Department Dr Mc Ivor writes "The cost of mossing, removing and drying the bark from the 1000 Succirubra trees above-mentioned is as follows. The first removal cost Rs 41-2-0 and the second removal Rs 180-11-4 making a total of Rs 221-13-4. The quantity of bark obtained being 2988 lbs will give the cost per lb of dry bark annas 1 and pies 2 or 3½d per lb as the actual cost of the labor of removing and drying the bark exclusive of the cost of superintendence. The cost will be somewhat diminished in the succeeding harvest as the same moss can be applied

for an indefinite period of time as the moss when once put on grows and increases as well as the trees."

The italics are mine. I have underlined the word mossing because the latter part of the quotation is worded in such a manner that a doubt might arise whether the cost of mossing was included. The passage shows in fact the cost of originally mossing and harvesting for the first time two successive trees. Every annual report will be found to contain a table giving, with other information, the aggregate expenditure on mossing.

10. I take the present opportunity to point out two inadvertent inaccuracies of fact in Dr Bidie's report. At para 14 Dr Bidie writes that he found 10 men could only harvest bark in one hour which when dried would weigh 10 lbs and that thus the cost was 2 annas per lb. Dr Bidie is quite right in his statement in regard to the work done but his calculation is wrong.

The

The coolies work 10 hours per diem on the Plantations. At the rate given by Dr. Bidie they would harvest 100 lbs of dry bark in the day and their pay at 4 as each would be Rupees 2-8-0 or forty annas. One hundred lbs of dry bark harvested for forty annas gives a charge of 4 annas on 10 lbs or 5 lbs on one lb, not of 2 annas, as inferred by Dr Bidie

11. At para 28 Dr Bidie states "The question as to the period of year at which the trees should be coppiced is one of considerable difficulty and has yet to be determined by accurate experiment. The trees hitherto coppiced have bled so profusely as almost to forbid repetition of any such experiment but I feel sure the proper season will be found somewhere between October and March when the trees are partially at rest." Dr Bidie is evidently not aware that the coppicing experiments hitherto made have ranged over all seasons. I annex a list of them.

In December	1866,	about	50 trees
" January	1864	"	50 "
" May	1861	"	240 "
" June	1868	"	58 "
" October	1863	"	54 "

Out of the trees coppiced in June 1893 which were all Succirubra and the finest to be found at Heddiwatte when the experiment was made in compliance with Dr Broughton's express wishes one is now dead. These trees were, by Dr Broughton's desire, coppiced a foot from the ground and all the shoots on the stools left. I referred to this coppicing in my letter in Government Order 29th May 1893 No 549 as one which Dr Broughton stated to me in person would in his opinion afford a fair test of the value of the coppicing system. The trees coppiced in October 1893 were also coppiced at the request of Dr Broughton who desired they should be cut close to the ground having no shoots. Twenty one of these stools have died.

12. At para 18 Dr Bidie refers to 2000 Succirubra which were harvested by the mossing process and which have excited much controversy. Dr Broughton found (His Report in Government order, 29th May 1893 No 549; para 35) that 85 per cent of

of these trees had failed to renew their bark Dr Bidie gives the percentage at 82·5. Dr Dr Iver states, and I believe, that none of these trees have completely failed to renew. In order to set the question completely at rest, Dr Dr Iver has had measurements made of which I append a Statement F. It will be seen that in the worst trees the flaws were only 3·2 per cent, in October last year, when Dr Dr Iver and I examined the trees in company with Dr Broughton. A column in the statement exhibits the present measurements. The flaws are now reduced to 1·96 per cent. What is meant by a failure to renew is a question no where stated with precision. A speck may be treated as a failure and there will be specks on most trees as it is difficult to strip bark without inflicting some trifling wounds on the Cambium and wherever the Cambium is cut the bark will only renew on that spot by buckling in. The number of wounds inflicted is in proportion to the want of skill of the labourers employed.

The

the 2000 trees in question were stripped by Common Coolies and Dr Bidie's attention when he was drawing up his report to the part of the plot where the workmen commenced. Had he examined the trees throughout he would have found that the work done improved as it advanced and that at the close the coolies had attained such skill that the trees were perfectly well stripped. This difficulty will be obviated in the future. The Government in rescinding the last Budget approved of the employment of a permanent staff of gardeners, an arrangement which will place at the disposal of the Superintendent sufficient accomplishment in manipulation to ensure nearly faultless stripping.

13. In the Government order under reference there are two letters from Dr Broughton as well as the report made by Dr Bidie. It seems of some importance I should remark on

had combated a fact reported by Dr Broughton with reference to a certain shoot. He had held the alleged shoot was not a coppice but the stem of a double stemmed tree of which one stem had been removed. In para 9 of his letter No 61 Dr Broughton writes "I have not made so careless an error." But in speaking of the shoot Dr Broughton described it in his letter in Government order, 4th February 87 para 9 as 12 to 15 feet high and that it was three years old. The plantations will be searched in vain for a coppiced shoot of the dimensions stated, under the age of 4 years. Coppice on the Government states has a growth in the experience of Dr McIvor of under 2 feet a year. The table C appended shows the age of all the coppiced shoots on the plantations at the present date.

14. The subject of Dr Broughton's letter No 63 is a history of his efforts to introduce the coppicing system on the Government plantations. Dr Broughton cites the Government Orders on the subject and finally expresses his surprise at a remark of mine to the effect that

that if he considered Government orders directing coppicing had not been carried out he was the proper officer to call attention to the omission. At para 10 of his letter No 61 Mr Broughton writes "after repeated representations to Government I have been able to get but 200 red bark trees cut down in 1891 and 58 in 1893. Also 60 crown bark trees in 1893 though it is the most obvious plan of coppicing." The exact facts regarding coppicing are the following. The late Commissioner in his letter in Government Order No 901 dated 19th April 1891 Revenue department supports a recommendation from Mr Broughton to coppice and writes at para 7 "I would therefore propose to select a block of 800 Succirubra trees at Neddiwattam of the season of 1892 and in like manner 800 Condaminea trees at Dodabetta - 400 of each variety to be tried on the mossing principle and 400 on the coppicing principle". The Government sanctioned the proposal and 240 trees were felled. This limited

felling was the result of agreement between Mr Brooks and Mr Broughton. These gentlemen on coppicing the trees were disappointed at the out turn of bark and stopped the experiment. In a letter in Govt order 13th July 1893 No 1213, Rev. Deptt this is explained by Mr Broughton. He writes at para 5. "There are of course plenty of trees which might be cut down but I am of opinion that at least 2 more years should elapse before coppicing can be profitably conducted. The results obtained by the taking of the bark this spring support this conclusion." It would thus appear that it was Mr Broughton who stopped the first experiment in coppicing undertaken chiefly in deference to his wishes. Notwithstanding this direct interference Mr Broughton in a letter in Govt order 6th December 1892 No 1646, Revenue Deptt, made no allusion to it and wrote "In Govt order No 1213 July 13, 1891 the Govt at the recommendation of the Commissioner of the Nilgiris direct that the bark supplied to the manufactory should be obtained by the mossing process. In the Commissioner's letter attached the opinion of the Superintendent of the Plantations is quoted there in para 3. "It would be more satisfactory to Mr Broughton and myself if the one half of the bark required were produced by mossing and the other half by coppicing" But in spite of

of this the bark supplied to the manufactory has been obtained by mossing" I need not go into the subsequent history of coppicing as it is only a year old and the outcome of the difference of opinion on the subject between Dr Broughton and Dr de Vos is the Govt order now under reply. It is well however to observe that at the end of para 15 of his letter Do 61 printed in the Govt order under reference Dr Broughton writes referring to a letter from Dr de Vos "The prophetic portions with reference to coppicing I am unable to corroborate or contradict" The very same remark may be made in reply to a prophecy of Dr Broughton to be found in para 15 of his letter Do 63 in the Govt order under report. There Dr Broughton has no hesitation in condemning mossing and expressing confidence in the good results of coppicing. But Dr Broughtons confidence is entirely speculative and he advocates with, as it appears to me, some vehemence - a change of system of management of the only Cinchona plantations that have succeeded in the world except some in Ceylon - though he writes at para 6 of his letter in Govt order 10 July 1878 No 16 Rev: Dept "I have never advocated coppicing as a constant method of taking crop as I possessed no comparative experience of its results" (the italics are mine) and though he stopped a

coppicing experiment because it failed -

15. I shall now venture to make a few general remarks upon Dr Bidie's report. Dr Broughton speaks of coppicing as the most obvious plan of cropping and Dr Bidie lays stress on the weak points of the mossing process. With regard to coppicing the only point remaining for investigation as trees have been coppiced at all seasons of the year and the result in every case has been equally unsuccessful is whether exposure will be of any benefit, that is to say whether the coppiced plots have failed from their small size and whether larger plots would give better results. Dr Broughton refers to the Balmadies estate in the Cuchterlong valley and states coppicing is being tried there with success in succirubra. Upon this point the managing proprietor writes to me that the felling on the plantation has been carried out in order to thin the trees. It was done in May 1879, the months in which 58 large trees were felled at Keddiwetturn with the concurrence

of

of Dr Brandon. She felled trees at Balmadies have thrown up shoots of an average height of 3½ feet though some have grown 6 feet. A similar success has not attended the coppicing at Neddiwuttem. This is perhaps attributable to the difference of altitude. Balmadies is 2000 feet below Neddiwuttem and the climate is more genial. The Succirubra grows best in a moderately warm temperature. I have already reported that the shoots of 4 years old on coppiced trees at Neddiwuttem are mere wands and the table appended to which I refer above proves this to demonstration. The bark on these shoots is too thin to be of any value whatsoever.

16. In regard to coppicing generally in its effects on the trees Dr Bidie Expresses no decided opinion. He advocates the felling of alternate rows of trees and yet deprecates Exposing the plantation to wind which his Scheme will effect. Coppicing is put forward as an easier mode of cropping than mossing but Dr Bidie says the season for

for coppicing must be selected with care otherwise the stools will be subjected to an amount of drought and sun that will probably kill a large percentage and he describes the thinning of the shoots which spring from the stools as an operation of delicacy. Upon the latter point there can be no question. Brown of Arnstoe in his work on Forestry writes of thinning out Coppice shoots "How can the shoots of trees be Expected to succeed so as to form timber which are for a number of years confined in a close plantation and all at once suddenly Exposed as is the case when they are chosen to stand and all the rest of the shoots which protected them are cut away? We might as well Expect a child to grow up to healthy manhood who from being closely confined in a room was at once taken out and set down upon a bare moor" Page 383. Brown accordingly recommends thinning to be cautiously conducted but if thinning of Cinchonas is ever done cautiously the stool

must

must year after year be wasting its strength
in nourishing shoots which are to disappear
in order that finally one shoot may remain
for barking purposes. Again Brown states,
page 384 that unless the shoot comes from
the point where the roots join the stole
that is to say from below the surface of the
soil they will partake more of the character
of branches than of trees and at page 381
he writes that unless stoles are well managed
they become spongy and rotten. These quotations
imply that coppicing is an operation
requiring special skill and care. They imply
further that from the nature of things Cinchona
coppice must pay less well than oak coppice
because the shoots taken away from oak
coppices are saleable, whereas the super-
fluous shoots of Cinchona stools would be
of no use whatever while their growth
would entail the loss of the amount of
the energy of the stole spent in producing
them. As to coppicing alternate rows I
have to remark that out of the 240 trees

coppiced in May 1871, 40 were coppiced in
alternate rows and these rows have thrown
up shoots so slender as to be worthless at
the present moment. The explanation put
forward of the present condition of these trees
has always been that they have been too
much shaded to send up vigorous shoots
and accordingly that they afford no indication
of the merits of coppicing. But Mr Bidie
proposes to do the very thing, the results of
which 4 years after the initiation of the
experiment are referred to apologetically.

The next point is the quantity of
bark that may be expected from coppice. Such
bark in which the alkaloids have not yet
been converted into woody fibre is the bark
most valuable to the Quinine manufacturer.
I will assume that such bark is obtainable
from coppice. The annexed diagram drawn
to scale has been furnished to me by Mr McIvor
to illustrate the difference between coppiced
and massed trees. Experience shows that at
Seddiwuttum C. Succirubra grows 2½ feet a
year

year and increases in circumference of stem
2 inches. The growth of coppice is little
more than half this growth but I will take
the coppice as growing as fast as the natural
tree. A tree becomes available for coppicing
in the eighth year of growth. Box in the
diagram shows such a tree. If it is cut
down it will give, judging by the outturn
of the 240 trees coppiced in 1841, 4 1/2 lbs
of bark per tree including the branch
bark. At the end of 8 years
the coppiced shoot will have a growth
as at 2. At the end of 8 years the growth
will have reached the original growth and
if the tree is again coppiced it will give
another 4 1/2 lbs of bark. In another 8 years
a third crop of 4 1/2 lbs will be available and
the outturn of 24 years will have been
13 1/2 lbs of bark. On the other hand
experience shows that up to the 12th year
from planting, the tree under moss continues
healthy and able to afford crops of bark.
If the tree is stripped at 8 years the yield
is 2 1/4 lbs of bark. In 6 months the remaining

2 1/4

2 1/4 lbs can be taken. In two years the renewed
bark on the spaces originally barticaled will
be available up to line 8 in the diagram and
fresh bark up to line 6 and in 2 1/2 years
the spaces which were covered with the 2nd
half of the natural bark will have accreted
a crop of mossed bark which can be harvested
and it will extend to line 8 in the diagram
and the natural bark above it to line 6 and
6 on successive harvests can be taken up to
12 years at all events. In this mode of
coppicing the surface yielding bark is yearly
increasing. On the coppicing plan the surface
yielding bark remains stationary. It is
almost unnecessary to say that mossing up
to 12 years must give larger harvests than
coppicing. This is shown by results. Nearly
450,000 lbs of bark have been taken from
the Government plantations altogether. Had
this bark been obtained by coppicing 100,000
trees of 8 years old would have been necessary
According to the experience derived from the
240 trees coppiced in 1841. This number of
trees at 360 trees per acre would have re-

Contained

intailed the denudation of an area in round numbers of 300 acres and the plantations comprise only 1000 acres under cultivation altogether and as regards the yield of bark, are in their infancy: It appears evident that if large crops of bark were taken by coppicing the plantations in a few years would be bare speak swept away. That mossed trees are largely superior in yield to coppiced trees is shown by the following facts. One thousand Succirubra of 8 years old were mossed. They will be 12 years old in September next. In their four years they have given at 4 harvest-ings:- 2980 lbs in 1841-42 — Dry bark.
1764 " in 1842-43 — "
1546 " in 1843-44 — "
4403
6060 lbs

Or in all 6000 and odd lbs of dry bark. On the other hand the 240 trees coppiced by my predecessor and Mr Broughton in May 1864 gave the following results. 200 of the trees were coppiced in one block. They were of the season of 1862-63. The other 40 trees were of the season of 1864/65 and they were coppiced in

in alternate rows.

The bark obtained from the 240 trees aggregated 720 lbs of green trunk bark equal to 255 lbs of dry bark and 324 lbs of green branch bark equal to 100 lbs of dry bark. The whole quantity of dry bark obtained was thus 355 lbs or 1.48 lbs from each tree. I have on several occasions stated that these trees have given nothing since. Therefore the mossed trees have yielded 6 lbs of dry bark per tree against 1.48 in the case of the coppiced trees including the branch bark, which of course has not been taken in the mossed trees. Six pounds each tree of mossed trunk bark have to be set against 1½ lbs of mixed trunk and branch bark or 4 times the quantity of the more valuable bark.

Experience alone can decide whether trees will bear indefinite mossing. At present all that can be said is that the oldest trees on the plantations, that is to say trees of 12 years standing, are in a luxuriant condition and that if the next coppicing was to take them they would have paid

the

the planter better than if they had been coppiced. It is important to observe that even in the supposition of their death the trees could be replaced by seedlings growing faster than coppice, but I have expressed an opinion in a former report that a massed tree will if felled throw up suckers as well as a coppiced tree. By massing therefore a large crop of bark is gained and there is no loss to be repeated as a set off to the gain. I further stated in a former report that if massed trees showed signs of failing they could be coppiced and the shoots on the stools be left to form trees. These shoots are in many trees of 10 years old on the plantations 12 to 15 feet high. I have shown above by figures (para 11) that trees coppiced leaving the shoots have a much better chance of surviving than trees coppiced completely close to the ground.

As to the chances of trees continuing to survive massing for an indefinite period it is worthy of notice that cork trees are

stripped for the cork and that cork forests have endured continuous stripping for centuries.

18. There is another objection to coppicing which has been left out of sight. The trees planted as they are close together after a certain time form a dense shade with the result that no weeds grow on the ground. The expense of weeding therefore every year as the trees advance in age diminishes and the expense consequently of the upkeep of the plantations. Coppicing on the other hand lets in the light and directly light reaches the ground weeds appear. The result is that coppices must be kept weeded always at an annual expense which the massing process avoids. Coppiced plantations will thus be more expensive to keep up than plantations under mass.

19. Experience has not shown coppiced bark equals in quality bark taken by massing

mossing. On the Himalayan plantations
cop[illegible]icing is a necessity because after a
certain age the cinchonas are attacked by
canker. The bark of this cop[illegible]icea fetched
last year according to a price list in the
possession of Dr Dr Iver 4 to 5 per lb.
One sixth of the quantity sold was trunk
bark and this fetched 11 to 1-6 a lb.
Dossed trunk bark from the Nilgiris
plantations of Succirubra fetched last
year 2s-10d per lb on the average and
mossed Condamines obtained a price of
5s-9d per lb. Regarding the Himalayan
bark Dr Howard in an article on cop[illegible]icing
cinchonas in the issue of the Gardener's
Chronicle of the 28th March 1874 writes "It
is well that the owners of the Sikkim
plantations find the results of their cuttings
"most satisfactory" but it is important
to observe that this satisfaction does not
extend to those who would desire from them
a supply of material for the extraction of
quinine and that consequently it would
be

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be a mistake to recommend this plan for
general adoption. The bark of cop[illegible]iced
oak is very abundant in tanning material.
Certainly I know that the corresponding bark
of the cinchona and especially of the C.
Succirubra abounds in the astringent co
principles which are an annoyance to the
Chemist in the above manufacture." From
this passage it would appear that the most
Eminent English authority on the subject —
— has found by Experience that
cop[illegible]iced cinchona barks are not commercially
remunerative.

20. Dr Bidie threw out a surmise in
his report that renewed bark derived its
richness in part from the natural bark
of the tree left when the first ribands
are stripped. Dr Broughton has made
some analysis confirmatory in his opinion of
this inference and the result in his mind is
that as he writes in his letter No 63 in the
order under report. para 15 "I have no hesitation
now in condemning the plan of mossing whose

merits

merits I have throughout endeavoured fairly to consider." I venture to doubt whether so broad a question as the question of the transference of organised compounds can be set at rest by a few experiments, even supposing the experiments were of a nature to which no objections could be urged. But in the present case the objections are so prominent. Dr Broughton says, para 10 of his letter No 63 "It was necessary to compare the untouched bark of trees with the remaining untouched bark of trees part of whose barks had been some months taken and was in process of renewal. But as much of this latter was covered with moss which itself might cause an alteration of yield it was necessary that I should examine the untouched bark above the moss" The obvious objection to Dr Broughton's mode of procedure is that he did not employ the natural bark under moss. He says he repeated this bark because being covered with moss it might be affected thereby. Now it could be affected in one of two ways only. The moss might have

kept the bark from deteriorating in which case moss bestows an advantage and prevents transference or it might have deteriorated the bark. In the latter case it would have profited the view taken by Dr Broughton to have adopted it. I conceive there is no escape from one or other of these conclusions and they vitiate, as I venture to think, the weight to be accorded to the analysis actually undertaken. There is another point for consideration of great importance. The bark above the moss selected by Dr Broughton could in no case from the nature of things give the results of bark lower down the trunks for the very simple reason that the higher up the bark the thinner it must be and the nearer in value to the comparatively worthless branch bark. Dr Broughton states at para 12 that he corroborated his experiments by an analysis of bark above the moss on a tree which had only been mossed a short time with the bark

of

of an untouched tree but he does not give the details of this Analysis and states whether the two Specimens of bark operated upon were from similar Spots on the respective trees nor does he describe the difference in the results though he says there was a difference and the difference did not sustain his hypothesis.

21. The precise mode in which the roots of plants draw nutriment from the earth and distribute it and the effect of leaves in elaborating the Sap are subjects comparatively little understood, much less the transfer of its constituents by an organized Compound. Eminent authorities such as Dr Lindsay believe there is no such transfer. A Stock does not transfer its qualities to a graft and vice versâ When the Skin in an animal organism is cut the wound does not heal by transference of the material of the adjoining Skin but becomes covered by a rugose material different from the original

original Skin and not a true Skin. The material has larger cells than the true Skin and this appears to be the case with renewed bark in all respects. The renewed bark has larger cells than the natural bark and they are richer in alkaloids. It is possible that this result may be in part due to excitation in the neighbourhood of the wound and a special action put on at the site to heal the wound. Dr. Van Gorkom (quoted in Dr. Howards article) found that two C. Calisayas grafted on two Calmdianas that is bony plants rich in quinine grafted on plants altogether deficient in this alkaloid, kept their alkaloids as if they had grown separately. Moreover Dr Howard believes "That the alkaloids are found in the Cellular tissue of the bark commencing more especially with the Cambium"

22 That the transfer imported is an obscure question is testified by a quotation found at para 15 of Dr Bidie's

report

report from the "Nueva Quinologia of Ruiz"
"It may not be out of place to mention
also here a curious practice by which the
inhabitants of Loja flatter themselves they
secure economical bark cutting. They cut
off the whole of the bark of a small
tree leaving only one broad strip so as
not to destroy the tree which gradually
replaces its loss and the second time of
cutting the bark is called Cascarillas resecadas
and esteemed as of superior quality." If only
a strip of bark remains on the tree, it
does not appear how the renewed bark
can derive its richness from it, that is to
say, that a major part can become rich
from the succulence of a minor; a greater
be derived from a smaller. It may be
argued the renewing bark takes up
part of its improved quality from the
cambium and part from the adjoining
natural bark. Should this prove the
case and the authorities on the subject
be eventually shown to have been under

a misapprehension even then the gross
alkaloids obtainable from the tree would still
be captured. Given the original strips of
natural bark as worth A and the remaining
original strips as worth A—a, in consequence
of a loss of alkaloid due to the bark grow
-ing on the original spaces the —a would
be found in the renewed bark and the
mossing process gives on the whole a
much bulkier bark harvest than a
harvest from coppice. Dr Broughton
does not suppose there is an actual
loss of alkaloids to the tree, by mossing.
All he says is, the alkaloids shift under
the process from one part to another. But
if this happens nothing is lost. I have
already intimated that mossed bark fetches
a considerably higher price than bark
from coppice and there is from this circum
-stance a further argument against
the theory propounded by Dr Broughton
and Dr Bidie. If the renewing bark
under moss drew its rich qualities from

the

the natural bark left on the tree when the latter bark came to be removed the renewed bark growing on the spaces it covered would operate prejudicially to the renewed bark adjoining and would draw from it what it had taken from the natural bark. This does not appear to be in accordance with facts. Renewed bark from the spaces first stripped from the trees have been sold and the renewed bark from the spaces left when the 2nd half of the natural bark was removed. Thus renewed bark from the whole circumference of the tree has been removed. Furthermore a second crop of renewed bark has been taken from the spaces originally occupied by the first strips of natural bark and sold. These three successive sales have not shown any difference in the price of the renewed bark.

23. The facts are, as Dr Bidie states in para 26 of his report, the experience respecting cop[illegible] is insufficient.

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I merely draw attention to the circumstance that such experience as has been gained is adverse to the process.

Dr Howard in his Report dated 4th February 1864 of an analysis of the 5th Remittance of bark writes in favor of mossing. He says: "If decorticated trees are mossed, the operation of mossing may be repeated with advantage increasing as it would seem, for every time of renewal. Not only is the gross percentage of alkaloids larger in the last decortication but of this a more considerable percentage consists of quinine and that less intimately combined with the yellow colouring matter so as to be more easily purified."

24. Lastly Dr Brenghtons results do not appear to bear out Dr Brenghton's present opinions with regard to the deterioration produced by transference of the alkaloids for in the statement in his letter in Government

Order

order, 1st April 1874 Bk 408 Revenue Depart-
ment it is shown that the outturn of
amorphous quinine in 1869-70 was 1 ℔
3 ℥ to every 1000 ℔ of bark treated, in
1870-71 the outturn was 2 ℔ 1 ℥ to every
1000 ℔, in 1871-72 it was 2 ℔ - 13 ℥ to
every 1000 ℔ and in 1872-73 it was 4 ℔ 4 ℥
to every 1000 ℔ of bark. But in these successive
years the proportion "of barks supplied to
the manufactory which were taken from
partially decorticated trees" went on progres-
sively increasing and in 1872-73 the supply
consisted entirely of these barks.

25. Dr Bidie at para 4 of his Report
condemns the crowded state of the plantations
on the ground that the uppermost branches
only reach the light, and the lower ones from
being shaded dropping off, and that the
consequence is the trees grow up with spindly
stems. He suggests therefore thinning out.
But the fact is that the very condition
Dr Bidie condemns is the natural condition.
The Cinchona grows on the Andes in dense
forests

forests where the crowns only can push up
to the light. Accordingly in its native habitat
the trees must be subjected to the same
condition produced artificially on the Nilgiris.
I have already stated that as the weakly
trees are overtopped by stronger neighbours
it will be the policy of Dr McIvor to cut
them down and in this way space will
be left for the larger trees.

26. Dr Bidie recommends coppicing
partly on account of the crowding though
he admits crowding to be an advantage so
far as that "it excludes the sun." His plan
apparently would be to let in as little sun
as possible by coppicing every alternate
row. But any thinning whatsoever would
admit light to a greater or smaller extent.
With regard to light Dr Broughton says
in his letter in Government order 12 April
1869 at para 14 "The injurious action of
light on the Cinchona bark and alkaloids
was clearly pointed out many years ago
by Pasteur a chemist to whom our present
knowledge of these alkaloids is largely
indebted

indebted" and he proceeds to verify Pasteur's
conclusions by remarks on certain analyses
of his own. He concludes "I would submit
the foregoing facts and considerations render
it highly probable that the exposure of
the living bark to direct sun light has
the effect of diminishing the yield in
alkaloids and the value of direct protection"
(by moss). Again he writes at para 16
in his letter in Government order 26 September
1871 No 1686 "In several preceding reports
I have abundantly stated my convictions
and their grounds for considering that
cinchona bark has its yield of alkaloids
injured by exposure to sunlight. The
experimental evidence of this already
adduced appears to me to be quite conclusive
of the fact, so that further proof is scarcely
needed. Further proof appears however
in the circumstance of which I have been
for sometime aware, that the bark of the
opposite sides of the same tree differs in
yield of alkaloids."

Dr Broughton then gives the following
analysis

of a tree exposed on all sides

	North Side.	South Side
Total alkaloids	3.18	3.80
Quinine	0.62	1.40
Cinchonidine + Cinchonine	2.56	2.40

and adds. "As the sun has been on the North
side of the tree for the last four months the
effect has been that the yield of alkaloids
has been diminished 0.68 per cent. This
decrease apparently consists of quinine
which is commercially the most valuable of
the alkaloids. This effect has been produced
in spite of its being the most cloudy period
of the year."

27. Dr Bidie at para 28 of his report
remarks "one advantage of the coppicing
system would be that it would afford an
abundant supply of firewood for the
factory at Neddiwattum, a matter of great
importance as jungle wood is now getting
scarce. The italics are mine. The facts
are as follows. Dr Broughton manufactured
345½ lbs of amorphous quinine according
to his statement in his letter in Government
order 1st April 1874 Revenue Department
his

outlay for fuel was 11g Rupees. or As 5-4 per lb. It is more than questionable whether as the distant parts of the plantations come to be coppiced, the coppiced wood will not have to be transported further than jungle wood. It must also be borne in mind that a cinchona tree of eight years old cannot from its small size yield any considerable quantity of firewood.

28. In soliciting definite instructions I have thus endeavoured to show that Dr Broughton's advocacy of coppicing is purely speculative and is in opposition to Dr Broughtons own experience. I have also endeavoured to show that none of the suggestions made by Dr Bidie accord with the knowledge obtained in the course of the progress of the Cinchona plantations, that if as Dr Bidie recommends alternate rows of trees are coppiced light and wind will be let in and both will be deleterious, that the plantations as they exist simulate the natural

natural conditions under which the cinchona trees grows, that the inferiority of coppiced to mossed bark is demonstrated and the harvest of the latter is more abundant than the harvest of the former from a similar number of trees, that if mossed trees die under the effects of periodical stripping they can be replaced faster and better by seedlings than by coppice shoots, that mossing is a cheap and not as Dr Bidie reports of it an expensive system, that stripping trees and leaving them unprotected is not likely to be as profitable, that mossing has not as yet fatally injured trees since the trees that have given most harvests of barks are in a present state of luxuriant growth and that there are no indications of the process being fatal, that analogy does not indicate stripping as destructive as cork trees have been stripped for centuries without harm, that it is not necessary to coppice in order to ascertain the

the best season for cutting because all seasons have been tried, that the question of the transference of alkaloids in bark cannot be considered as affirmatively answered and that the preponderance of evidence is against transfer, that the gray barks are not known, as Dr Bidie describes them, to be worthless and therefore they should not be grubbed up, that it would be inexpedient on account of the small expence saved to abandon certain areas of Cinchona on certain plantations though Dr Bidie recommends they should be given up and finally that to coppice with a view to furnish Dr Broughton's factory with wood would not produce that result.

I have the honor to be
Sir
Your most obedt Servt

E. H. Cotterell
Commissioner

Coppicing Experiments in their order showing the results.

A

One hundred Chinchona Succirubra or Red Bark trees, 4½ years old, were cut on the Government Plantation at Neddiumttum, 50 trees in December 1866 and 50 trees in January 1867. The suckers found on the stools were left, but were not measured. Fifteen consecutive trees were examined on the 5 June 1874 or 7½ years after coppicing. Three had died. The shoots on the stems of 12 plants varied from 4'6 to 19'4 feet in height, the average growth being 14 feet 9½ inches, the shoots weak and slender. The number of shoots on each stool varied from 2 to 5. The height of the shoots at the date of coppicing is included in the above measurements.

True copy

E. H. Cotterell
Commissioner

B.

Two hundred and forty C. Succirubra or Red Bark trees selected by Messrs. Brukes and Broughton on the Government plantation at Neddivuttum were coppiced on the 10th May 1871. 200 trees of the planting of 1862.63 were coppiced in one block and 40 trees of the planting of 1864-65 were coppiced leaving the Standing trees in the rows on each side. All the Suckers found on the Stools were left. 78 plants had Suckers varying from 2 to 8 feet or an average of 5 feet. 150 plants had Suckers 2 feet in height and under or an average of 1 foot. 12 plants had no Suckers. The Shoots on the 228 plants gave an aggregate measurement in May 1871 of 540 feet.

The Shoots on these Stools were measured again on the 7th June 1874. Nine plants were found dead. The height of the largest Shoot 14 feet, 6 inches, and of the Smallest 1 foot 1 inch. The Shoots on the 231 trees gave an aggregate measurement of 1774 feet and the average growth in three years is therefore 5 feet 4 inches per tree or 1 foot 9⅓ inches per tree per annum.

The Bark obtained from these plants was 721 lbs of green trunk bark, equal to 255

lbs of dry trunk bark, and 324 lbs of green branch bark, equal to 100 lbs of dry branch bark, in all 355 lbs, or 1.48 lbs per tree. The cost of cutting these trees and stripping off the bark was Rupees 15 or 1 anna per tree.

(True copy)

M Connell

Commissioner

Rec'd 19th Sept 74
Ans 15 Nov 74

Rec'd 19th Sept 74

Relative to letter
Government Res
dated 14th June

27 39

C

Particulars of 58 trees of Chinchona Succirubra Selected by Dr. Broughton and Coppiced on the Government Chinchona Plantation at Neddiwuttum on the 30 May 1873 cut at or within a foot from the ground all the Shoots left

No	Height of shoots on 30 May 1873	Height of shoots after one years growth on 30 May 1874	Increase	Remarks	No	Height of shoots on 30 May 1873	Height of shoots after one years growth on 30 May 1874	Increase	Remarks
1	6	7 4	3 7 4 3	No Sucker	35	5	7 4	3	
2	11	2 12	4 1 4		36	12	4 13	4 10 1 4 9	
3	"	"	"	No plant	37	"	"	"	Cut before
4	"	"	"	do	38	8	3 8	8 " 5	
5	"	"	"	Not cut	39	2	9 3	2 " 5	
6	15	4 16	5 1 1		40	"	2	8 2 8	
7	10	4 11	4 1 "		41	"	2	9 2 9	
8	12	" 12	10 " 10		42	3	10 3	6 "	Top broken by wind
9	4	10½ 6	5 1 6½		43	"	"	"	Condamenia
10	7	8	5 1 5		44	8	9 9	4 " 7	
11	"	"	"	No plant	45	8	4 10	3 1 11	
12	8	8 11	3 2 4		46	do		1 1 1 1	
13	6	11	" "		47	7	3 6	8 "	Top broken by wind
14	do	" 2	1 2 1		48	"	"	"	Condamenia
15	do	" 2	5 2 5		49	11	8 13	5 1 9	
16	Sprouting	" 4	" 4 "		50	8	8 10	9 2 1	
17	No Sucker	" 3	5 3 5		51	do	" 3	3 3 3	
18	5	6	1 "		52	5	10 8	8 2 10	
19	do	" 3	6 3 6		53	do	" 3	3 3 3	
20	12	13	2 1 2		54	8	4 9	3 " 3	
21	7	2 8	4 1 2		55	do	2	10 2 10	
22	Sprouting	" 3	9 3 9		56	"	"	"	Dead
23	No Sucker	1	8 1 8		57	12	4 13	6 1 2	
24	8	10 10	4 1 9		58	"	"	"	Micrantha dead
25	9	8 10	4 4 – 8		59	12	13	10 1 10	
26	4	3 6	9 2 6		60	14	15	3 1 3	
27	"	"	"	Condamenia	61	7	" 8	9 1 9	
28	12	1 13	" " 11		62	5	9 6	4 " 10	
29	7	9 9	6 1 9		63	do	" 2	4 2 4	
30	8	8 10	11 2 3		64	9	" 10	2 1 2	
31	10	9 11	10 1 1		65	8	10 11	10 3 "	
32	do	" 2	4 2 4		66	10	" 9	4	Top broken by wind
33	8	3 10	8 2 5		67	do	" 2	10 2 10	
34	12	8 14	2 1 6			8	6 11	2 2 8	

Growth Average ft. 1. 11½ Maximum ft. 4 – " Minimum " – 5 in

Dry trunk bark 286½ lbs or lbs 4. 93 ℔ tree

Cost of coppicing and barking Rs 4 or 1 anna + 11 pice ℔ tree.

D

Particulars of 53 trees of Chinchona Officinalis (C. Condaminea) Selected by Dr. Broughton and Coppiced on the Government Chinchona Plantation at Dodabetta on the 2d June 1873 Cut at or within a Foot from the ground all the Shoots left.

No		Height of Shoots on 2d June 1873	Height of Shoots on 2 June 1874	Increase after one year growth	Remarks
1 Row	1	1 10	2 3	5	
	2	9	2 3	1 6	
	3	2	2		
	4				Not Sprouted
	5	2	2		
	6	1	6 1	6	
	7	2	2		
	8				Dead
	9	1	6 1	6	
3 Row	10	2	3 2	3	
	11	2	2		
	12	3	3 3	3	
	13	6½ 2	1	3½	
	14	9 2	3 1	6	
	15				Not Sprouted
	16	1	6 1	6	
	17	2	2		
	18	1	6 1	6	
	19	1	6 1	6	
	20				Do
	21	2	2		
3 Row	22	2	2		
	23				Not cut
	24	1	6 1	6	
	25	2	2		
	26	2	2		
	27	1	6 1	6	

No		Height of shoots on 2d June 1873	Height of shoots on 2 June 1874	Increase after one year growth	Remarks
3 Row	28	1	6 1	6	
	29	2	3 2	3	
	30	1	6 1	6	
4 Row	31	7 2	1	5	
	32				Not Sprouted
	33	1	1		
	34	1	6 1	6	
	35	2	3 2	3	
	36	2	2		
	37	1	6 1	6	
	38				Do
	39	1	1		
5 Row	40	2	2		
	41	1	6 1	6	
	42				Do
	43	1	6 1	6	
	44	1	1		
	45	9 2	3 1	9	
	46	2	2		
	47	1	1		
6 Row	48	1	1		
	49	1	6 1	6	
	50	1	1		
	51	1	6 1	6	
	52				Do
	53				Do
	54				Do

Average growth for 1 year 1ft 4½ Maximum growth 2ft 3 in. Minimum growth 5 in.

lbs of dry bark 85 2/3 or lbs 1. 61 p. tree.

Cost of Cutting and barking Rs 4. 15. 6 or Annas 1½ p. tree.

E

28

Particulars of 57 trees of Chinchona Succirubra coppiced on the Government Chinchona Plantations at Neddiuttum on the 14 October 1873. The plants selected by Dr. Broughton and at that Gentlemens request Cut Close or at most within 6 inches of the ground.

No		Height of Shoots on 30 May 1874	Remarks
1 Row	1	3	
	2		Dead
	3		
	4	9	
	5	3	
	6	10	
	7	8	
	8	10	
	9		Do
	10		Do
	11	7	
	12	9	
	13	2	
	14	9	
	15		Do
2 Row	16		Do
	17	6	
	18		Do
	19		Do
	20	2	
	21		Do
	22		Do
	23	8	
	24	11	
	25		Do
	26		Do
	27	2	
	28	1	

No		Height of Shoots on 30 May 1874	Remarks
2 Row	29	1	
	30		Dead
	31	1	
3 Row	32		Do
	33		Do
	34		Do
	35	7	
	36	23	
	37		Do
	38		Do
	39	4	
	40	4	
	41	11	
	42		Do
	43	5	
	44	4	
4 Row	45	9	
	46		Alive not Sprouted.
	47	3	
	48		Dead
	49	3	
	50	1	
	51	9	
	52		Do
	53		Do
	54	2	
	55		
	56	2	
	57	10	

Average growth after 7½ Months 1. 7. Maximum 1. 11. Minimum 7 3.

lbs of dry trunk bark 264 – 20 or lbs 4 – 64 per tree.

Cost of Coppicing and barking the trees Rs 6/ or 1 anna 8 pice p tree.

Govt: Gardens. 3
Ootacamund. 3
15 June 1874 3

(sd) D. G. McIvor
Supt: Govt: Chin: Plantns

(True copy) McCulloch
Commissioner

F

Particulars of 100 trees part of a plot of 2000 trees giving the length and average breadth of the Spaces on which the bark failed to renew.

No	Space Barked Measurements				Surface barked in square inches	Space failed to renew October 1873	Space failed to renew June 1874	
	Girth at ground	Girth at middle	Girth at top	Height barked				
1	16½ in	12¾ in	13½ in	56 in	479⅓	3	2½	
2	16 "	13 "	11 "	56½ "	453⅓	1⅞	2¼	
3	15 "	11 "	10¾ "	53 "	649¼	1⅝	3	
4	13 "	10¼ "	9 "	64 "	686	8½	3	Perfect
5	15½ "	12¼ "	11¼ "	52½ "	682½	1¼	"	
6	16¾ "	13¾ "	11 "	54 "	488½	99¼	44½	
7	16½ "	12 "	10 "	68 "	842⅔	154½	103	
8	16¾ "	13 "	11½ "	54 "	683¾	8⅝	4½	
9	16 "	13 "	11½ "	51 "	688½	2	"	Perfect Barked 3rd time
10	"	"	"	"	"	"	"	do do
11	"	"	"	"	"	"	"	
12	12 "	9¼ "	8¾ "	55½ "	555	21	9½	
13	19½ "	16 "	14 "	63 "	1039½	41⅜	26	
14	14½ "	13½ "	12 "	61 "	844⅓	129⅛	92¾	
15	18 "	13½ "	11 "	60 "	910	24¾	8¾	
16	16 "	12 "	10¾ "	42 "	930	11½	3⅛	
17	14 "	10½ "	9 "	56 "	625⅓	3½	5¼	
18	10 "	9 "	7½ "	66 "	588½	52	3	
19	17 "	11½ "	9¾ "	65 "	828¾	4⅞	1½	
20	19½ "	15 "	12 "	44 "	1193½	6	4½	
21	15 "	12½ "	11¾ "	64 "	834⅓	13	65½	
22	15 "	10¾ "	10 "	44 "	881⅚	69½	65¼	
23	16 "	11 "	9½ "	64 "	815⅛	53⅜	58¾	Barked 3rd time
24	"	"	"	"	"	"	"	do do
25	"	"	"	"	"	"	"	Perfect
26	10½ "	8 "	8 "	62 "	524⅔	57¾	"	
24	13¾	12½	10¾	59	724⅓	3	142¾	Perfect
28	13½	11¼	10	69	799½	179½	"	
29	17½	13¼	12	66	940½	¼	10½	
30	15	11	10½	56	681	29¼	8½	
31	16½	13¾	13½	58	845½	11	3	
32	15½	11½	11½	58	739½	3½	44	
33	15	13½	10¾	52	680⅓	19½	8	
34	16	13	11½	58	821⅓	6	5¼	
35	16¾	15	12½	56	826	13⅞		Dead Perfect renewal.
36	12	9¾	8¾	52	528⅔	82	26	

Do	37	17¾	14¾	11¾	42	1062	61¾	"
	38	18¾	14½	13	43	1104½	65¼	12
	39	16	13½	12½	61	854	32½	4
	40	16	12	10¾	60	745	11½	
	41	9	7	7	46	352⅔	1/4	
	42	15	13	11	58	754	1⅛	
	43	14½	13	11	43	1009⅚	1½	
	44	16	12¼	12	56	751½	3⅜	
	45	15½	13½	11	70	933⅛	2	2¾
	46	16	13	11½	65	877½	29⅜	21
	47	18½	14	13	75	1134½	43	
	48	14½	13½	12	43	1046⅓	1⅛	
	49	14	10½	9¾	61	696⅝	"	
	50	22½	14¾	14	44	1412⅞	1⅞	
	51	21	15	15	75	1225	4¾	¾
	52	19½	16¾	13½	63	1044¾	19⅝	
	53	18	14	13	70	1050	3⅝	36
	54	16¾	12¼	12½	70	939⅙	7¼	13¾
	55	"	"	"	"	"	"	"
	56	"	"	"	"	"	"	"
	57	15	11	10½	67	809⅞	43	1¼
	58	14	12	10½	54	667	5⅝	4½
	59	14½	10½	9	56	634⅔	15½	3¾
	60	16	13	12	61	838⅔	12 9/16	"
	61	16½	13½	12	73	1016 11/12	8¼	12
	62	18	13	12	65	931⅔	29⅔	16½
	63	13	9½	8	53	538⅝	30⅝	
	64	16	12	11	68	754	19	14
	65	19½	13	10	62	878⅓	1	"
	66	17	13	12½	58	821⅜	9⅜	1¼
	67	19	14½	13½	59	924⅓	11	29½
	68	15	10	9½	60	690	37⅜	14
	69	16½	11	11	72	924	32½	11¾
	70	16	12	10½	67	859⅝	21	1¼
	71	16	12	11	66	858	6½	8½
	72	17	12	12	60	820	12⅞	57
	73	15	12	10	72	888	71	8½
	74	19	14	11	70	926⅔	9¾	21
	75	"	"	"	"	"	"	"
	76	"	"	"	"	"	"	"
	77	15	12	11	56	734⅔	61⅞	220
	78	16	12	10½	71	911½	283⅞	80¾
	79	20½	14	12	73	1131½	116	21
	80	25	19½	16½	62	1260⅓	52¼	"
	81	22	16	15	74	1307⅓	6½	14¾
	82	15	11½	10¼	61	747¼	27⅞	¾
	83	23	19	16½	81	1579½	3	"

Broken by wind

Perfect

Do

Do

Do

Do

Do

Do

Do

Barked 3rd time

Do

Do

Perfect

Do

Do	84	18½	13	12½	61	894⅔	5⅝	8
	85	20½	11	10½	71	994	36½	4
	86	21	17	15¼	74	1313½	20¾	"
	87	16	14	12½	74	1048⅓	14⅝	21¾
	88	19	15	14½	73	1180⅙	52⅛	"
	89	"	"	"	"	"	"	"
	90	"	"	"	"	"	"	"
	91	17½	13	12½	52	745⅓	¾	"
	92	15	12	12½	46	605⅜	1	"
	93	14	12½	10	61	742⅙	2⅝	21¼
	94	17	13	11	66	902	14⅛	16¾
	95	13½	11	9¾	55	627 11/12	29	
	96	16½	12	10	69	885½	¾	
	97	14	12	11	46	567⅓	1/8	1
	98	16	13	11	48	640	3¼	"
	99	16	10	9½	50	591⅔	"	3½
	100	10	8½	8	27	238½	7	"
	101	14	10½	9	40	446⅔	"	"
	102	17	12	10½	44	579⅓	2	32¼
	103	15½	10¾	9¾	52	648	21	"
	104	10½	8	7	52	442	7¾	"
	105	19	13	14	65	990⅔	¼	1½
	106	17	12	10	61	793	3½	98¾
	107	18½	14	13½	71	1088⅔	106½	1½
	108	14½	12½	10½	59	737½	5½	35½
	109	16½	11	10	70	875	7½	11¾
	110	18	15	14	69½	1088½	36⅜	9¾
						84045	2788	1639¼
						583⅝	19⅓	11.37
						1"	3:26	1.95

Perfect

Do

Barked 3rd time

Do

Perfect

Do

Do

Do

Do

Do

Square Inches

" feet

Per Centage.

(Signed) H. Rowson

Apt Superintendent

Gov't Gardens
Ootacamund
15 June 1874

(True copy)

(sd). H. G. McIvor

Supt: Govt: Chin: Plantns

(True copy)

H. McIvor

Commissioner

Rev 1947/74

Exclusive letter to
Government Dated 14th June

G.O 19th Sept Counter 18/9
Ir 13 A.R. 1874

G.O 11 April/74 No 6064

No 1947
Rev: 1874 Dept
No. 43.
Date— 14th June 1874
Rec 18th

Commissioner's Office,
Ootacamund,

To
The Secretary to Govt
Rev: Dept
Ootacamund

Enclosures. 4

SUBJECT.
Requesting definite instructions on two points with reference to G.O No 434 of 11th April 1874 & submitting certain observations on the reports of Dr Riddle & Dr Brougham therein contained -

Forwarded

177
Cl 4th July/74 R 7th

1876
Papers

44

REVENUE DEPARTMENT.

C No. 1947.

From The Commissioner of the Nalgherries

Dated 17th June 1874.

FOR ORDERS.

The pot mixed the Cinchonicine dyed
been tried - but it evidently
must be tried & as not to af-
fect in price by the rival dye-
-ture of mordant - this can only
be done by setting aside blocks for
said Experiment. Mr Cockburn le
says about 360 Seedlings be trees p
to the Acre - and as he had 6000 of

Where a tree the Experiment are ordered, they must be counted an area of about 16 or 17 acres. I would decide the Comr. to select blocks aggregating 4 acres for cubicing - he will take care that they are of similar quality to the blocks selected for cubicing - & that the "combination" Experiment is a fair one.

The trial of Dickenson with Moss never commanded itself to my judgement - but a few trees might be tried - just to satisfy those who are more sanguine - The bark should, of course, be stripped just as if the tree were going to be subsequently measured - but the stripped strip should be left adhering attached to the tree for a while, so as to afford some protection. I think 100 trees would be enough for such a long Experiment.

In the last of his report Mr Cockerell seems bent to

FOR ORDERS.

REVENUE DEPARTMENT.

MINUTE BY THE HON. J. D. SIM, C.S.I.

THE Government wish the coppicing system tried, but it evidently must be tried so as not to affect injuriously the rival system of mossing; this can only be done by setting aside *blocks* for each experiment. Mr. Cockerell says about 360 Succirubra trees go to the acre, and as we had 6,000 of these when the experiment was ordered, they must have covered an area of about 16 or 17 acres. I would desire the Commissioner to select blocks aggregating 4 acres for coppicing; he will take care that they are of similar quality to the blocks reserved for coppicing and that the "competitive examination" is a fair one.

2. The trial of dispensing with moss never commended itself to my judgment; but a few trees might be tried just to satisfy those who are more sanguine. The bark should, of course, be stripped just as if the tree were going to be subsequently mossed. In some cases also the strip should be left attached to the tree for awhile, so as to afford some protection. I think 100 trees would be ample for such a very dubious experiment.

3. In the rest of his report Mr. Cockerell seems to me to refute most completely and successfully every position taken up by Dr. Bidie and Mr. Broughton. I have always been a strenuous supporter of Mr. McIvor's system of cultivation and harvesting, and therefore may not be an altogether impartial judge in this controversy; but my opinion is as above. The mossing system gives a larger and more valuable supply of bark in the same periods than the coppicing system, and if it is found hereafter that the life of the mossed tree is endangered or shortened by the stripping of the bark, or if any other untoward result is produced, the tree can still be coppiced. We have no such alternative with the coppicing system.

(Signed) J. D. SIM.

1st *July* 1874.

Proof for approval

27

Minute by the Hon. J. D. Sim, C.S.I.

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(Signed) J. D. SIM.

[1st *July* 1874.

J. D.

The mossing system
puts a barrier & more
& almost insuperable obstacle
in the same period than
the coppicing system, and
if, it is found hereafter
that the life of the mossed
tree is endangered or shortened
- ened by the stripping of
the bark or if any other
untoward result is shown
- hereafter, the tree can still
be coppiced. The loss +

J. D.

+ to be the alternative with the Coppicing system -

REVENUE DEPARTMENT.

MINUTE BY HIS EXCELLENCY THE GOVERNOR.

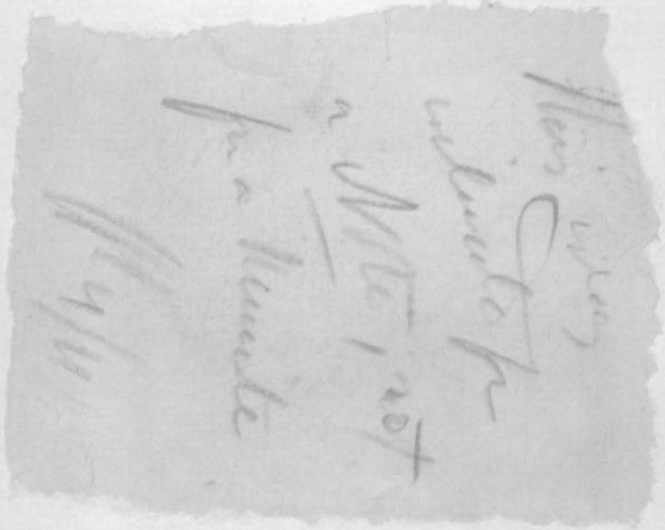
WHAT the Government desire to have is a fair trial as between the mossing and coppicing systems. We cannot personally superintend such trial, nor is it our business to prescribe the details of it; and it appears to me that we ought wholly to trust to the Commissioner to see that the trial is properly and fairly conducted by Mr. McIvor.

7th July 1874. (Signed) HOBART.

MINUTE BY HIS EXCELLENCY THE GOVERNOR.

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7th July 1874. (Signed) HOBART.



177.6

Minute by the Hon. W. ROBINSON, C.S.I.

I think the spirit of the first paragraphs of this letter is unsatisfactory, if not obstructive. The Commissioner believes that we are wrong, and he may be right in doing so; but he knows what the Government wants, and it is his business to assist in an accommodating spirit, and *recommend* an experiment which would be conclusive without being carried to an injurious extent in case it fail.

2. I would carry out the experiment of cutting down with view to reproduction in both ways, and not extend it beyond 4 acres which Mr. Sim suggests this season, viz., 2 acres felled and cleared, and 4 acres thinned out in alternate rows. As to the manner of felling, I think the loss on those felled close to the root is conclusive against that system, but I would direct Mr. McIvor to fell—in respect to season and manner—in the way which he (the best judge) believes will give the best prospect of renewal.

1 Acre, C. Succirubra.
1 „ Crown bark.

3. I agree with Mr. Sim as to the experiment in barking without mossing.

4th July 1874. (Signed) W. ROBINSON.

Proof for approval

51

MINUTE BY THE HON. W. ROBINSON, C.S.I.

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From the Commissioners of the Calgary
Dy 17 June 1874 No 194

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the first paras of this letter
[illegible]
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obstructive. He [illegible] does not
that we are wrong and he
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Government wants and
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in an accommodating
spirit & recommend any
experiment, which would
be conducive without being
carried to an injurious
extent in case it fails.
[illegible]
"[illegible]".

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down with view to reproduction
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extent

extend it beyond 4 acres
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the way which he (the best
judge) believes will
give the best prospect
of renewal

I agree with Mr Linn
as to the expediency in
leaving it without passing

4(7 JMR.

1 Acre. C. Lumber
1 " — Crown bark.

REVENUE DEPARTMENT.

MINUTE BY HIS EXCELLENCY THE COMMANDER-IN-CHIEF.

I HAVE perused with the greatest interest Mr. Cockerell's exhaustive, well-reasoned, and temperate exposition of the actual state of affairs in our Cinchona Plantations and of the comparative merits, as far as means of judging are available, of the coppicing and mossing systems of harvesting the bark.

2. I have searched in vain for any symptoms of obstructiveness or want of candor on the part of the Commissioner in the opening paragraphs of his report as observed in them by the Hon. W. Robinson. I fail to detect anything of the sort, but recognise in them and in the whole document the labor of an honest, intelligent, public officer, assisted doubtless by a subordinate fully master of the difficult subject treated of.

3. It is evident that we are not so entirely without the means of judging of the comparative value of the mossing and coppicing processes as Mr. Broughton would have us believe. As far as we have gone, the experiment would seem to be altogether in favor of the former. Shall we consent to allow the disingenuous manner in which Mr. Broughton has been shown to have placed this matter before Government without calling him to account and visiting him with censure, if necessary? I allude to this feature in the case, as he complains to us that the orders of Government relative to coppicing have not been carried out by the Commissioner and Superintendent of Cinchona Plantations, when it is clearly shown that operations were suspended at his own request,—a request urged on account of the very unsatisfactory outturn of bark under that process. Here, I detect something like obstructiveness,—something like extreme want of that straightforward statement of a case which we expect from a public officer in his reports.

4. I have adverted in previous memoranda to the tone this officer adopts towards those who happen to differ with him on public duty, and venture now to suggest that serious notice should be taken of a quality which cannot fail to detract from his usefulness, however valuable his services may otherwise be.

5. In the method of dealing with this question, I would express my entire concurrence with the views expressed by His Excellency the President. We cannot too fully trust the able officers who have officially charge of this experiment in Cinchona culture; and I would dismiss the question by an intimation to the Commissioner that Government expects him to see that a fair but moderate trial be given to the coppicing system, the details of which are left in his hands.

6. We have recorded our thanks to Dr. Bidie for his report. It afforded pleasant reading; but evidently the best thing we can do with it is to disregard all its main recommendations.

7. I think, however, that we can do no less than thank the Commissioner for his very able report and Mr. McIvor for his very carefully recorded statistics concerning Cinchona growth and the results of the various systems adopted for harvesting the bark, as these together have enabled us to avoid so many suggested errors.

8. I suppose this report with diagram will be printed *in extenso*.

OOTACAMUND, 11*th July* 1874. (Signed) F. P. HAINES.

I quite concur.

(Signed) J. D. S.

Proof for approval

55

2-11-74

Minute by His Excellency the Commander-in-Chief.

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Ootacamund, 11*th July* 1874. (Signed) **F. P. HAINES.**

I quite concur.

(Signed) **J. D. S.**

B.G. No 1193 S 14 Sept 1887

3

56

(4)

Chinchona

Supplying & Cultivating

I have perused with the greatest interest Mr Cathcarts exhaustive well reasoned and temperate exposition of the actual state of affairs in our Chinchona Plantations and of the adequate compensations & remedies, as far as means of judging are available to the Cultivating & Vending systems & recommending the Govt.

I have watched with pain for many symptoms of obstructiveness or resentment of Cathcarts on the part of the Contractors in the opposing Agency of this Department [illegible]

the

shall we content to
allow the disingenuous
manner in which
Gov. Broughton has been
shown to have played
this matter before Exch.
without calling him
to account and trick
him with the censure of
misleading? Secondly to
this feature in the case
as the two planters to test
the orders of Govt. relative
to Coffee-trees have not
been considered by the
Com.rs such duty as Christ.
Plantations - When it
is clearly shown that
operations were suspended
at his request - his
request urged as accom.
of the very mandates pending
return of Bark inquiry
that

---

them by the Hon.ble
W Robinson - I fail
to detect any thing to
the Govt, but Corresp.ce
in them and in the
whole Document
the labours of the most
intelligent Public Offic.r
employed doubtless by
a subordinate fully
master of the difficult
subject treated of -

It is evident that the
am not to entirely with
the means of rendering
of the Cinchona Plants
of the Inspecting & Coffee-ing
Powers and Gov.t Brought
should have been
and as far as we have
done the Government would
seem to be altogether in
favour of the former -

that

that process - and
do not something like
obstructiveness something
like extreme want of
that straightforward
statement of a case which
we expect from a public
officer in his official communications
I have adverted to the
tone this officer adopts
towards those who have
public duties and functions
now to suggest that serious
attention should be taken of
a quality which cannot
fail to detract from his
usefulness, however valuable
his services may otherwise
be -

In the method of dealing
with this question I should
express my entire concurrence
with the views expressed
by Mr Secy. The Resident.
We cannot too fully
trust the able officers
who have officially
charge of these interests
in China however cultured
and learned discussion of
the Question by an
intimation to the
Govt that we expect
him to see that proper
moderate heed be
given to the opinions
of those details of which
are left in his hands -

We have recorded our
thanks to Dr Bidie for his
report - It is afforded
pleasant reading, but
evidently the best thing
we can do with it is
to dismiss it and all its
enormous

Recommendations -

I think however that we can do no less than thank the Com^rs for his very [illegible] report and Mr. Gen Irvin for his very carefully worded & [illegible] Summary of Charleston Forts & the results of the various Systems adopted for sharpening the bucks, & have them marked as the arrick to Enemy suggested Errors -

I shall have this report & the diagram will be printed in Extenso -

[signature]

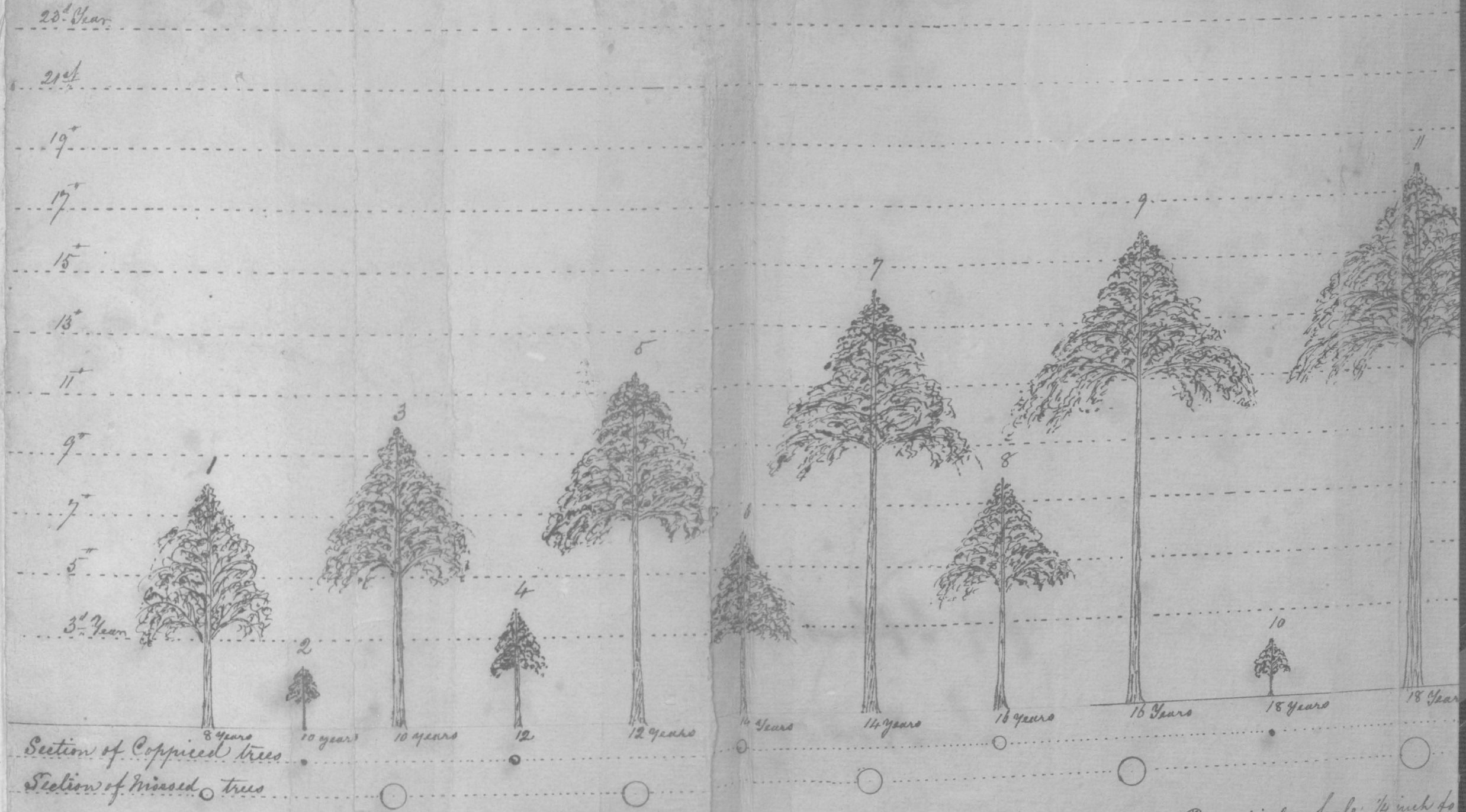
Sent to Chas [illegible]

[signature]

Macammond
11-7-74

G.O. 19th Septembr 1874
No. 1193

177 D.
G. O. No. 1193 & 19th Sepr 1874


25 Year
21st
19
17
15
13
11
9
7
5
3d Year
1
2
3
4
5
6
7
8
9
10
11
8 years
10 years
10 years
12
12 years
14 years
14 years
16 years
16 years
18 years
18 Year
Section of Coppiced trees
Section of Massed trees
Perpendicular Scale - ¼ inch to
ft 0
4
0
5

23 d ½ Year

21 A ½

19 F

17 F

15 F

13 F

11 F

9 F

7 F

5 F

3 Year

13

15

17

12

14

16

18

20 Years

20 Years

22 Years

24 Years

24 Years

26 Years

Horizontal Scale - ⅛ inch to 1 foot

E. M. Cochrell
Commissioner

Rec. 1947/74

Robert 1190

Op19 September/74

ob. 11 1193

Sr Bt: 1791

Revenue Department.

61

No.

Proceedings of the Madras Government.

Under date the September 1874

Read the following

letter from the Commr. of

the Neilgherries.

Requesting definite instructions on two points with reference to G.O. No. 434 of 11th April 1874 and submitting certain observations on the reports of Dr. Bidie and Mr. Broughton therein contained

H.C. 17th June 1874 No. 43.

Subject to

In the foregoing letter the Commissioner of the Nilgiris furnishes an exhaustive exposition of the actual state of affairs in the Government plantations and of the comparative merits, as far as means of judging

are

G.O.

Will adopt the alterations suggested by Mr. Sim

W.C.

re available, of the coppicing and mopsing systems of harvesting the bark.

2. This report is made with reference to the report of Dr. Bidie and the letters from the Govt. Quinologist reviewed in G.O. 11th April 1874 No 434 and reasons are advanced for contesting the recommendations of these officers.

3. [The Government do not wish to prolong a controversy for the final decision of which they still consider there are not sufficient materials.] What they desire to have is a fair trial between the mopsing and coppicing systems + no modification of para 4 of

+ the Govt. desire that all

I would omit as but for our knowledge of what Dr. Brandis & Bidie have said there would have been no controversy

Sd. D.Dt.

Is the number of trees to be operated on or selected?

Sd

I would leave this point in the hands of the Conservators as laid down in the draft

Sd

I object to this scheme. We must either leave it to the Commr. or give him specific instructions. Mr. Broughton is not a botanist at present and should be kept to his own work - which is not an unacceptable

of G.O. 11th April 1874 No 434 they resolve to leave it to the Commissioner to see that the trial is fairly and properly conducted in a manner that shall leave no room for future questions.

4. In framing a plan of operations the Commissioner will consult the Govt. Quinologist and when submitting it for the information of Govt. will state how far it meets with the concurrence of that officer.

Sd

I agree with Mr. Brandis as regards the last para. Mr. Broughton has practical knowledge in cutting + barking + in that has a better - the knowledge + Forest Laboratory

Sd

Revenue Department

No. 1193.

Proceedings of the Madras Government

Under date the 19th September 1874

Read the following

letter from the Commr.

of the Nellgherries.

Requesting definite instructions on two points with reference to G.O. No. 434 of 11th April 1874 and submitting certain observations on the reports of Drs. Bidie and Mr. Broughton therein contained ——— M.C. 17th June 1874 No. 43.

In the foregoing letter the Commissioner of the Nilgiris furnishes an exhaustive exposition of the actual state of affairs in the Government plantations and of the comparative merits as far as means of judging

are

available of the coppicing and mopsing systems of harvesting the bark.

2. This report is made with reference to the report of Dr. Bidie and the letters from the Govt. Quinologist reviewed in G.O. 11th April 1874 No. 434 and reasons are advanced for contesting the recommendations of these Officers.

3. The Government observe that all that they desire to have is a fair trial between the mopsing and coppicing systems and in modification of para 4 of G.O. 11th April 1874 No. 434 they resolve to leave it to the Commissioner to see that the trial is fairly and properly conducted in a manner that shall leave no room for future question.

Lts Pass orders

3 The Commissioner of Neilgherries
1 " Govt Botanist Dr. Bidie } Dis 14th/10/1874
2 " Govt Quinologist
14 " Board of Revenue

1777-178