GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following letter from M. A. LAWSON, Esq., Director, Government Cinchona Plantations, Parks and Gardens, Nílgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 9th July 1885, No. 28 :—

I have the honor to forward the Administration Report on the Government Cinchona Plantations, Nílgiris—viz., Dodabetta, Naduvatam, Hooker and Wood—for the official year 1884-85.

2. In accordance with the observations made in paragraph 14 of G.O., dated 17th September 1884, No. 1050, Revenue, the number of statements accompanying the "Report" have been reduced from 17 to 9.

3. SEASON AND RAINFALL—(*a*) *Dodabetta.*—Taken altogether the season was not unfavorable for carrying on the general work of the estate. The total amount of rain registered during the year was 61·20 inches, and was spread over 123 days, but of this quantity more than half, or 31·77 inches, fell during the two months of October and November. The early part of the year was unusually dry, and until the end of April, hardly any rain fell. In both May and June 5·0 inches were recorded, but the greater portion of this fell in a very short space of time, during one or two violent thunderstorms. The result of these heavy showers, falling upon the dusty earth, especially on the steeper slopes, was that the water ran off before it had time to sink into the ground beyond a few inches. July, again, was an exceedingly dry month, 1·87 inches only being recorded, and it was not till the end of August that the earth was sufficiently wetted to begin planting. In this month, 6·39 inches were spread over 20 days. The following month of September was very droughty and some of the plants which had been put out in the end of August died in consequence. October and November, however, were, as I have already mentioned, most unusually rainy, and the ground was thoroughly soaked and our failing springs re-established. Some damage was done on the steeper slopes through the earth being washed away; also in one of the ravines, two hundred trees or more were destroyed by some large rocks which were undermined, and on being dislodged from their site, crashed through a portion of the plantation immediately below them. The trees thus destroyed were some of the finest on the estate. After this heavy burst of rain, the weather continued propitious till the end of December, so that all the plants which had been put out were well established, and able to withstand the prolonged drought of the next five months.

(*b*) *Naduvatam.*—The rainfall on this estate for the past year was 92·96 inches, and was spread over 141 days. The earlier months of April and May received 3 and 4 inches respectively, and in June 7·34 inches fell. This saturated the ground, so that the planting, of which a very great deal had to be done, was commenced as early as possible. In July, 19·38 inches of rain fell, but at the same time this rain was accompanied with such violent storms of wind that the whole of the June planting, at least all those portions of it which lay at all exposed to the south-west, were destroyed and

had to be replanted later on in the season. After this the weather continued normal till the end of December. A large portion of the planting was not completed till the end of November, and I greatly feared that the plants would not be sufficiently established before the rains ceased, to be able to withstand the dry weather of the ensuing spring. However, to give them the best chance of prospering, I had them all doubled ferned, and I am glad to be able to report now, after having received our first spring showers, that they have survived, and are beginning to grow. Of the 14·80 inches which were recorded in October, no less than 11·0 inches fell in about thirty hours. Of course such a continuous downpour necessarily caused some wash, but owing to the ground being well covered with weeds, the damage done was comparatively trifling.

(*c*) *Hooker.*—The rainfall recorded on this estate for the past official year was 104·27 inches and was spread over 136 days. The weather throughout the year was favorable for all kinds of work, and great strides were made in the restoration of this plantation. The extensive new plantings and renewals are all doing well.

(*d*) *Wood.*—The total amount of rain which fell on this estate during the past year was 86·06 inches and was spread over 139 days. So far as the season was concerned, nothing further could have been wished for.

4. RECEIPTS AND EXPENDITURE—(*a*) *Receipts.*—The revised estimate of receipts for the past year (*vide* G.O., dated 8th November 1884, No. 1229, Revenue), was Rs. 45,900. The actual amount realized has been Rs. 84,895. The difference between the estimated and actual receipts, viz., Rs. 38,995, has been due partly to a larger quantity of bark being sold by auction in Madras than was originally intended. 81,880 lb. were sold instead of 60,000 lb., partly owing to a larger proportion of the more costly crown as compared with the cheaper red barks being sold than was originally proposed, and partly due to a slight recovery in the prices realized. Statement No. 7 shows the rise and fall in the prices which have been offered for the different kinds of Government barks at the auction sales in Madras since December 1883. The receipts on account of the sale of cinchona seed and plants amounted to Rs. 1,033 as against the estimate of Rs. 700. Again, under Miscellaneous items, Rs. 510 were realized as against the estimate of Rs. 50. This increase under the latter head was due chiefly to a market being found for the stems of the trees which were coppiced the year before on the Dodabetta estate.

(*b*) *Expenditure.*—The budget allotment for the working and other charges of the department was Rs. 91,245 (*vide* G.O., dated 8th November 1884, No. 1229, Revenue, paragraph 8). This included the sum of Rs. 2,100 for the pay for six months for the Government Quinologist. The actual expenditure has been Rs. 87,903 or Rs. 3,342 less than the budget allotment. Certain unexpected charges have, however, been paid out of the allotment, which altogether amounted to Rs. 9,535. But for these, therefore, the savings would have amounted to Rs. 12,877. These unexpected charges were partly those connected with the establishment of the Quinologist's Department, which altogether amounted to Rs. 6,85[illegible], and partly to an old English debt of Rs. 2,681, which had been contracted in the year 1882 for the manufacture of bark into febrifuge.

5. PERMANENT PLANTATION—(*a*) *Dodabetta.*—The trees on this estate, taken altogether, are in a fair condition. Those parts of the plantation, the trees on which I stated in my report of last year to be past their prime, have been coppiced and interplanted. The coppiced stumps have already nearly all of them thrown out shoots, and the inter-planting is also doing well. For fear of denudation of the soil taking place during the heavy spring rains and before the ground would be covered with weeds, I had a number of brushwood revetments made on all the steeper slopes where the trees had been cut down. The following table shows the number of trees which were growing in the "Permanent Plantation" on the 31st of March last to be 633,487 :—

Number of Trees on 31st March 1884.	Number of Trees uprooted.	T[illegible]	Number of rees coppiced.	Number of Trees planted out.	Number of Trees on 31st March 1885.
489,305	200		5,618	150,000	633,487

(*b*) *Naduvatam.*—This estate is improving, but it will be many years before it again arrives at its former state of perfection. The plantings of 1882 and 1883 look remarkably well. This is due to their having been liberally manured. The stumps of the trees which were coppiced the year before last, as also those which were dealt with in a similar manner last year, have thrown up shoots most satisfactorily and I shall therefore continue to coppice small portions of the estate year by year, whenever the trees show signs of having past their prime. The accompanying table professes to show the number of trees growing at the present time on the estate, but it must be pointed out that the table credits the plantation with all the plants put out during the year, whereas the June and July failures ought to be deducted. Unfortunately, owing to gross irregularities which began to take place in the management of the estate about this time, the number of these failures have not been recorded :—

Number of Trees on 31st March 1884.	Number of Trees uprooted.	Number of Trees coppiced.	Number of Trees planted out.	Number of Trees on 31st March 1885.
298,610	5,052	1,837	140,370	432,091

About 400 plants of *Cinchona Carthagena* have now been put out in a plot of ground near the drying sheds. They are growing well and seem to prefer the climate of Naduvatam to that of Dodabetta. Some of the older plants flowered for the first time both at Naduvatam and in Sim's Park at Coonoor.

The single remaining specimen of *Cinchona Santa Fe*, which I reported last year to have been saved from death by Mr. Jamieson, was planted out last January in a plot adjoining the *C. Carthagenas*. It is perfectly healthy and has grown considerably since it was planted out. Besides this specimen, I have a dozen others in the propagating house in the Government Gardens, all or most of which will, I hope, be sufficiently advanced to admit of their being planted out before the end of the season. These dozen are cuttings from the original plant; the largest of them is only about four inches high though nearly two years old. They have been most difficult to raise, and have required the greatest possible care and attention.

I propose grouping together in this part of the estate all the different species and the more strongly marked varieties of cinchona which have been grown in Southern India, in order that those who take an interest in the history of the introduction of the cinchona into this country may have an opportunity of studying the different kinds side by side. Again, because many of the species so freely hybridize, the plants which I propose to establish here have all of them been raised from cuttings which have been taken from the trees originally introduced by Mr. Clements Markham and others.

It will be convenient to mention here that Mr. Jamieson has raised from the seed sent by Mr. T. Thiselton Dyer from Kew about 200 healthy plants of the *Remijia*, which yields the *Cuprea* bark. These I shall, before the end of the season, plant out also at Naduvatam.

(*c*) *Hooker.*—Great advances have been made during the past year in the renovation of this estate. Large tracts have been cleared of the worthless trees which were growing upon it, and replanted. The ground has been deeply tilled, and all the young trees have been manured. The accompanying table shows the amount of planting which has been done during the past year :—

Number of Trees on 31st March 1884.	Number of Trees uprooted.	Number of Trees coppiced.	Number of Trees planted out.	Number of Trees on 31st March 1885.
334,851	2,685	...	223,000	555,166

(*d*) *Wood.*—The condition of this estate I can only characterize as being increasingly miserable. The planting which was done in the early part of the year was disgraceful. That which was carried out during the latter months under different auspices was good, but whether good or bad nearly all the plants have been destroyed by the ravages, which

have been committed by the pestilent sambur. I have ordered at a cost of Rs. 601-11-6 barbed wire, with which to entirely fence the estate, as I have found that trying to shoot the sambur down is of little avail; for as fast as one is shot another takes its place. Mr. Rhodes Morgan, Deputy Conservator of Forests in the Southern Circle, who has spent much time in patiently investigating the habits of these pests, informs me that the sambur is migratory, and that there is a constant stream of them passing at one time of the year from the plains to the hills, and at another time of the year from the hills to the plains. This, if correct, fully explains why there is no apparent decrease in their number notwithstanding the assiduity of the Government shikari.

I append no table to show the number of trees growing upon this estate, as, owing to the evil circumstances which have attended all planting operations, no accurate calculation is possible. I can only hope that next year, after the barbed fence has been put up, I may be able to give a more favorable report.

6. UPKEEP.—The weeding at proper times, deep tilling, the maintenance of the roadways, clearance of drains, &c., have been thoroughly well executed on all of the three first plantations. On the Wood estate much is still required to be done in this respect.

7. MANURE—(*a*) *Dodabetta.*—The whole of the manure collected during the last year had been used for those plots, which have been more recently planted, so that there was none available for the older trees. I have, however, been able to make arrangements by which the stock of manure will for the future be greatly increased, and next season I hope to have enough to enrich a large portion of the older parts of the estate.

(*b*) *Naduvatam.*—This estate is very badly off for manure and measures will have to be adopted to increase the supply.

(*c*) *Hooker* and (*d*) *Wood.*—Both of these estates are fairly well supplied by the cattle which are brought up by the coolies who work upon the plantations.

The proper storing up of manure has hitherto been sadly neglected, the subordinates on the estates having been utterly ignorant of the first principles upon which this branch of agriculture ought to be conducted. I have, therefore, during the past year paid special attention to this subject. Formerly the daily produce of the cattle sheds was thrown out in loose heaps, where half of the valuable ammoniacal salts, according to the season, were either evaporated or washed away. I have now had pits dug eight feet deep and the produce of the cattle sheds well trodden down when it is put in and, whenever necessary, watered. I have also at Naduvatam, Hooker and Wood, where the rainfall is excessive, put a roof of thatch over the pits. By these means I look to being able to turn out in all seasons exactly the sort of manure I wish to have—that is a short well-rotted compost very rich in ammoniacal salts.

8. SILOS.—During the last winter the cattle on the estates fell into a very miserable condition, owing to their not getting a sufficiency of proper food. I have, therefore, put up on the Dodabetta and Wood estates *silos* for the preservation of fodder during the wet season. I have had hitherto no personal experience of *silos*, but it seems to be an established fact that they are most valuable for storing up nutritious food in climates such as obtains on these hills, where herbage is plentiful only at those times when the preservation of it in a dry state would be impossible. I hope I shall be able to report next year that the experiment has proved successful.

9. NURSERIES.—Owing to the small demand there is now on the part of the public for cinchona plants, I have reduced the number of nurseries on all the estates to one a piece. This is ample for the requirements of the plantations and will also suffice to accommodate 100,000 of each of the more commonly grown varieties, should a demand for plants again arise. Last year some 1,000,000 seedlings were thrown away as useless.

There is still a small demand for seed, the varieties which were chiefly sought after last year being *C. succirubra* and *C. pubescens*. A complaint was received a short time ago from a gentleman that an order he had given had not been properly attended to, but upon investigation it turned out to be due to his having been confused by the names *C. pubescens* and *C. robusta*. I therefore give below the nomenclature as understood by this department, with the view of preventing a similar disappointment in the future.

There are two notable species of cinchona, viz. :—

(*a*) *C. succirubra.*
(*b*) *C. officinalis.*

These two species freely hybridize. Some of the hybrids approach more closely to *C. succirubra* while others approach more closely to *C. officinalis.*

C. robusta is the name which has been given by Doctor Trimen to *all* such hybrids.

C. pubescens is the name given on these hills to those hybrids which more closely approach *C. succirubra.* This form thrives best at a moderately low situation and in more sheltered places. It has the light green tender leaf of *C. succirubra* and the same habit of growth, but it is slightly more hardy.

C. magnifolia is the name given to those hybrids which more closely approach *C. officinalis.* This form grows well at high elevations and on exposed and rocky ground. The leaves in its most characteristic form are of a dark, rich glossy green; they are also tough and leathery, which enables it to resist better the evil effect of high winds. In its habit of growth it is similar to *C. succirubra*, but is much more sturdy.

Experiments which I have made on the keeping properties of cinchona seed show that it loses its germinating power if kept several months exposed to the air, but that if the air is excluded, the seed retains its vitality for a considerable time longer.

Perfectly fresh ripe seed ought to be a pale green color, but a short exposure to the air turns this to a dull red. This change is due to the oxidation of the fixed oils which the seed contains in great abundance. This change in color is by no means necessarily indicative of the seed having lost its germinating power.

10. CROP.—The total amount of bark taken from the trees on the estates during the past year was 118,017 lb. Besides this there remained over on 31st March 1884 92,526 lb., making a total of 210,543 lb. as specified in the table given below. Of this quantity 84,880 lb. was disposed of during the year, so that the balance at present in stock is 125,663 lb. :—

Name of Plantation.	Crown Bark.	Red Bark.	Total.
	LB.	LB.	LB.
Dodabetta	99,874	...	99,874
Naduvatam	27,580	45,775	73,355
Hooker	100	14,300	14,400
Wood	900	22,014	22,914
Total ...	128,454	82,089	210,543

11. BUILDINGS AND REPAIRS—*New Works.*—The only new building put up during the year was a set of cooly lines at Naduvatam. These were erected at some distance from the new Bark shed at a cost of Rs. 270-5-7. The smallness of the cost was due to the materials used in building the lines being taken from the old jail which had just before been dismantled.

Repairs.—The usual annual repairs to all the permanent buildings were carried out at a cost of Rs. 1,170-6-2, distributed as follows :—

	RS.	A.	P.	RS.	A.	P.
Naduvatam	431	3	9			
Dodabetta	466	6	2			
Hooker	13	6	6			
Wood	259	5	9			
				1,170	6	2

For want of better accommodation, the cattle shed near the jail at Dodabetta was converted into a store-room for bark. At Wood the Overseer's quarters received repairs

which they sadly needed, and the drying shed was done up. At Naduvatam the old drying and packing shed was pulled down as the centre wall had given way and it was thought best to demolish it to prevent further damage.

12. General Remarks—*Staff of Subordinate Officers.*—Great changes have been made during the past year in the staff of subordinate officers employed on the estates and in the head office.

(*a*) *Dodabetta.*—In the early part of the year Mr. T. Narrainasawmi Naidu, Assistant Superintendent of this Plantation, and who for the last twenty years has most worthily carried on the work of the different positions which he has occupied, suddenly fell sick of an acute rheumatism, which necessitated his applying for extended leave. Much as I regretted the loss of his valuable services, I felt bound to comply with his request, and I accordingly granted him furlough for two years, and I appointed Mr. E. Collins, who for some time past had been acting on the estate as Sub-Overseer, to officiate in his stead. In December last, however, owing to the suspension of the Head Overseer of Naduvatam, I transferred Mr. E. Collins to Naduvatam to act in his place, and recalled Mr. T. Narrainasawmi Naidu to officiate again in his former post.

(*b*) *Naduvatam.*—I regret to have to report that very grave cases of dishonesty were brought against Mr. Hillier, the Head Overseer of this estate, and that these charges have been established in a Court of Law. Mr. Hillier was convicted and sentenced to two years' imprisonment. Upon investigation little doubt could be entertained but that several of his subordinates had been in collusion with him, especially *Pudmanaba Naidu* the Sub-Overseer, and whom I have in consequence dismissed from the Government service. His post has been filled up by Sashachullum Naidu formerly acting Sub-Overseer at Dodabetta, and his place at Dodabetta has been filled by Mr. A. McDonald.

(*c*) *Hooker.*—The subordinate officers on the estate remain the same as heretofore.

(*d*) *Wood.*—The Sub-Overseer in charge of this estate at the beginning of last year was Mr. Burrows, but I was so much dissatisfied with the character of his work that I caused him to apply for two years' furlough and, in the meantime, I have put into his place Mr. M. Collins, a brother of Mr. E. Collins, and who for some years back had been acting partly as Storekeeper and partly as Assistant Overseer on the Naduvatam estate.

(*e*) *Head Office.*—The Manager of this office was prosecuted at Coimbatore last February for having participated in the Hillier frauds and was convicted by the judge who tried the case. He was, however, set free on an appeal to the High Court at Madras. Nevertheless I dismissed him from Government service and appointed in his place Mr. Donald Campbell, who had previously been Head Accountant in the Collector's office.

These changes necessarily caused a great deal of confusion in the department for a time, but I am glad to be able to report that they are resulting in an accuracy of recording official matters and in an honesty in transacting estate affairs, which did not exist before.

13. Fuel Supply.—In my last year's report, paragraph 80, I stated that the sholas upon which the estates had hitherto been dependent for fuel were nearly exhausted, and that I proposed replanting the old sholas with *Eucalyptus* and *Acacia melanoxylon*. This was in a great part done, but owing to the unseasonableness of the weather immediately after the planting had been effected, nearly the whole of the trees died out. I do not now intend making any provision for a fresh supply of fuel trees as I have recently learned that the Forest Department will be able to give all that is needed by the estate at a reasonable cost close at hand.

14. Labor.—I am happy to say that I have been able, at last, to do away with the system of paying the maistries on the Naduvatam and Hooker estates a commission on the earnings of the coolies employed. The maistries are now paid fixed salaries only. This alteration has been made possible during the last year only on account of the great decrease which has occurred in the demand for labor in the Wynaad.

15. The Quinologist Department.—Mr. Hooper was appointed last summer by the Secretary of State for India to act as Quinologist. He arrived in Madras last October. He commenced work immediately and within a fortnight of his arrival had so far equipped his laboratory that he was able to begin the analyses of the Government barks. Mr. Hooper has submitted a report on the work he has done during the last half-year. It is full of interesting matter and argues the possession of great professional skill and industry on his part. It will be seen from the report that Mr. Hooper has not confined himself to the study of the cinchona barks only, but that he has also investigated the properties of many other products of economic interest.

One of the first things which Mr. Hooper turned his attention to was the manufacture on a small scale of the liquid extract of cinchona as originally devised by Dr. DeVrij of the Hague. A gallon of this preparation was sent to Dr. Cornish, the Surgeon-General, for experimentation, and just before he left for England Dr. Cornish reported in very favorable terms upon its therapeutic and keeping value. In consequence of this report, Government have ordered Mr. Hooper to produce 1,000 lb. weight of this fluid extract with the view of having it still more fully tested. Mr. Hooper will, therefore, as soon as possible, carry out these instructions in the laboratories connected with the Medical Store Department in Madras.

The advantage of the above-mentioned preparation over other kinds of febrifuge is the great economy and simplicity of its production. So simple, indeed, is the method that any druggist and chemist could, so long as he had a bark of a determined alkaloidal value, make the extract without any difficulty in his own shop.

If the liquid extract continues to hold the high reputation which has been given to it by Dr. Cornish, and I see no reason to doubt its doing so, Government will have at last as cheap a febrifuge as can possibly be turned out.

Dr. Cornish in some sense speaks rather disparagingly of the febrifuge which is manufactured by Government in Northern India. He says that it produces nausea. Mr. Hooper has analyzed samples of the Darjeeling febrifuge and regards it not unfavorably as a drug; and the experience of those who have told me that they have administered it to their servants and others, when on tour in feverish parts of the country, leads me to regard it as much better than it is commonly believed to be, though no doubt it may frequently cause disturbance in particular constitutions when given in large doses. Of course, if it were possible, one would desire to administer nothing but the pure alkaloids; but the great cost of manufacturing these forbids their being used on any large scale, and one must therefore be content with placing within reach of the poorer classes a supposed slightly inferior but much cheaper commodity.

At the request of Messrs. Arbuthnot and Co. of Madras, 2,000 lb. of bark were sent to Calicut to be there manufactured into quinine and febrifuge by their expert, Dr. Cleaver. The results, so far as they have gone, are not very satisfactory; and no account has yet been given of the proportionate amount of the alkaloids which have been extracted from the bark. But I do not see why further experience should not be productive of better results. There can, I think, be now little doubt that the cinchona alkaloids can be isolated as well and much more cheaply in India as in any other part of the world.

16. Maps of Estates.—I enclose three maps showing the amount of planting and coppicing which has been done, since the year 1882, on the Dodabetta, Naduvatam and Hooker estates.

Enclosures.

Letter from D. HOOPER, Esq., F.C.S., Government Quinologist, Ootacamund, to the Director, Government Cinchona Plantations, Parks and Gardens, Nilgiris, dated Ootacamund, 6th July 1885.

I have the honor to make the following report on the analytical work conducted in the Government Laboratory for the half-year ending 31st March 1885.

2. I arrived at Madras on the 6th October 1884 and proceeded to Ootacamund. A building had been provided for me, which, after certain adaptations and fixtures made in it, became converted into a moderately efficient laboratory. The chemicals and apparatus which I had used in the special study at The Hague were brought out with me; I was therefore able to commence work about a fortnight after arrival.

3. My appointment was made with a view to advance the practice of cinchona culture at the Government Plantations "by analysing the bark of a very large number of their trees in different stages of their growth, when treated under different systems, and when grown at different altitudes."

4. The periodical sales of bark which are now made by public auction at Madras have been accompanied with analyses of the various samples. In November, 18 samples were reported upon, and for the February and March sales four samples were tested. Of these, 16 were crown and 6 red bark. The percentages of sulphate of quinine in the former were —

Natural, average of	5	analyses	...	3·18
Mossed	3	„	...	4·09
Renewed	4	„	...	4·22
Branch	3	„	...	1·60
Root,	one analysis		...	4·40

The percentages of total alkaloids in the Red barks were Natural 5·10, Mossed 6·87, Renewed 6·81, Branch 4·45, 3·07, Root 8·17.

These analyses were printed and circulated amongst the buyers at the sales, and have enabled a reserve price to be placed on the various lots.

5. With reference to paragraph 62 of your last annual report, Dr. W. R. Cornish, the then Surgeon-General, suggested that a liquid preparation might be made of the red bark, which you say does not command a remunerative price in the market, and the preparation might be similar to those of DeVrij, Schacht, Paul and Umney advertised in the British Medical papers. When in Holland I was conversant with the process for making "Cinchona Liquida" of Dr. J. E. DeVrij, the well-known Quinologist, and had made a sample before Dr. Cornish's suggestion arrived. At his request a further supply of a gallon was made, and this was distributed to various dispensaries in the Presidency, in districts where fever was most prevalent. Such good reports on the efficacy of the liquid extract were sent in by the resident medical officers that a much larger supply was called for. Having no appliances in this station for manufacture on a large scale, in accordance with a Government order, I went to Madras to see if this could be done in the Medical Store Department. After an inspection of the laboratories, I reported that such a quantity as a 1,000 lb. could be made, but a continuous manufacture would seriously interfere with the arrangements of the department. This quantity has now been ordered, and as soon as I have analysed a sample of the mixed powder, I will be prepared to go to Madras and superintend the manufacture of the first batch, which, according to Dr. Cornish's request, shall contain 40 grains of alkaloids to the fluid ounce.

6. When samples are taken for analysis from trees in the Government Cinchona Plantations, I have always endeavored to be present, so that observations as to situation, soil and habit of the trees might be noted. Most of my visits have been to Dodabetta where the Crown barks chiefly grow, but I have also been to Naduvatam, the home of the Red barks, and to the estates of Hooker and Wood at Pykara.

I should like it to be understood that all my analytical results are calculated in percentage on the air-dried barks as they are received.

7. The following table comprises 40 analyses showing the alkaloidal value of the principal species of cinchona growing in Government and other estates :—

—	Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.
C. officinalis, Natural	2·71	1·28	·18	·45	·55	5·21
Do. Mossed	3·58	1·39	·16	·34	·60	6·07
Do. Renewed	4·11	·90	·13	·20	·60	5·94
C. Humboltiana (crispa) corky bark	2·24	1·55	trace	·49	·90	5·18
C. officinalis, var. angustifolia, Natural	3·97	1·32	·12	·12	·87	6·40
Do. do. Mossed	5·60	1·41	·33	·04	·97	8·35
Do. do. Renewed	4·91	·89	·38	·19	1·14	7·51
C. magnifolia, Natural	2·73	3·48	..	·70	·59	7·50
Do. Mossed	3·21	2·68	..	·21	·67	6·77
Do. Renewed	3·24	1·40	..	·47	·75	5·86
C. pubescens, Natural	3·32	1·93	..	·25	·50	6·00
C. Pitayensis, 12 years old	2·83	·62	1·31	1·78	·38	6·92
Do. do.	1·86	·51	·89	2·10	·40	5·76
C. Ledgeriana, old tree, narrow leaf, cream-white flower	5·58	1·24	..	·23	·62	7·67
C. Ledgeriana, broad leaf, red flower	2·40	·50	trace	3·17	·91	6·98
Do. narrow leaf, cream-white flower	3·28	·55	trace	1·85	1·14	6·82
Do. from South Wynaad	8·41	·34	·09	·15	·92	9·91
C. morada, 20 months	1·53	1·13	..	1·16	·96	4·78
C. verde, 20 months	1·32	·90	..	1·16	1·19	4·57

8. *C. officinalis.*—The samples of this species were selected from typical trees growing on the Dodabetta plantations. The analysis of the natural bark is the average of eight analyses, made on trees of 22, 19, and 14 years of age, and differing in having broad and narrow leaves. The mossed and renewed are each the average of three analyses made on trees of different ages. As far as these few results go, it appears that, on the whole, the younger trees are superior to the older ones, and the narrow-leaved variety than the broad leaved. The following amounts of quinine were determined in three kinds of crown bark from trees of the same age :—

	Narrow leaf.	Broad leaf.
Natural	2·85	2·95
Mossed	4·03	3·47
Renewed	4·48	3·85

These experiments were repeated on three trees of a younger growth which showed a marked difference in shape of leaf. The trees had been planted in 1869, and coppiced in 1879. The respective barks gave the following percentages of quinine :—

Very Narrow.	Narrow.	Broad.
3·15	2·71	2·44

9. The variety of this species, named *Angustifolia*, some years ago created a widespread interest on account of the extraordinary amount of quinine found in it by Broughton and Howard. The samples were taken from a tree 20 years old ; it was 10 feet high with a circumference of 18 inches. The results of the analysis show its superiority over ordinary crown barks, but in its present condition it appears to have no claim whatever to be a prodigy in cinchona culture.

10. The bark from hybrid trees between *C. officinalis* and *C. succirubra* has received of late a great deal of attention from planters. There are two kinds, named respectively *C. magnifolia* and *C. pubescens*. The first approaches in general appearance the *Officinalis*, and the second very much resembles in growth and shape and size of the leaf the peculiarities of *Succirubra*. But as regards the alkaloidal composition, as far as my analyses have gone, the reverse seems to be the case, for in the alkaloids of the *Magnifolia* bark the cinchonidine predominates as in *Succirubra*, but the *Pubescens* bark forms chiefly quinine, and so exhibits a relation to the *Officinalis*. In the accompanying table, the analyses of the Natural Magnifolia bark is the average of seven analyses made on selected trees at Naduvatam. The chief alkaloids are cinchonidine and quinine, and the totals very often reach as much as 8 per cent. The highest total in a bark, I have met with, was from a hybrid tree grown in the Ouchterlony valley ; it gave on analyses 4·4 per cent. of quinine, the other alkaloids bringing the sum up to 10 per cent. This bark very readily yields more quinine by stripping, mossing and renewing, a fact which is seen in the table where the increase appears to take place at the expense of the cinchonidine. This feature will be observed more distinctly by quoting the analyses of some samples lately received, also grown in the Ouchterlony Valley :—

—	Quinine.	Other Alkaloids.	Total.
Original bark	1·35	5·87	7·22
Once renewed	2·46	4·22	6·68
Twice renewed	3·60	3·99	7·59

11. The analysis of the *Pubescens* was made on a natural tree planted in the year 1865 ; there is a fair amount of total, more than half of which is quinine.

12. The *Pitayensis* bark is characterised by yielding an unusual quantity of the alkaloid quinidine. The first sample is from a tree twelve years old raised from seed brought by Mr. Cross from Pitayo in New Granada ; the second sample had been raised from seeds not from Pitayo, but from a district passed on his return journey. These two varieties will be subjected to further consideration.

13. The analysis of the *Ledgeriana* tree at Naduvatam is fairly representative. The bark, although old, is very thin. This demonstrates from a commercial point of view, that a planter should not only look for a large alkaloid yield, but he should consider a poorer tree producing rapidly a large quantity of bark to be of equal importance to a richer tree producing slowly a very thin bark. The broad and narrow-leaved varieties were from Coonoor and of three years' growth. The cinchonine is so high in each of them that they cannot be regarded as pure types of a Ledger. The Ledger bark from the South Wynaad was an average sample of shavings taken from 21 trees of 5½ years old ; the amount of quinine is equivalent to 11·31 per cent. of the crystallised sulphate ; this is one of the highest results obtained in South India.

14. The samples of *C. morada* and *C. verde* were from young trees grown in the same estate near Calicut. The first was taken from "20 average trees, with a girth of 5½ inches, broad leaf, dark olive green, red midrib, and under surface purple or flesh colored." The second was taken from "20 average trees with a girth of six inches, narrower leaf, color light green, yellowish midrib, and upper surface of the leaf smooth." The analysis and thickness of stem are exceedingly good for such young plants, and these results apparently contradict the unfavorable statements made in certain quarters respecting them.

15. *Complete analysis of a tree.*—In December last a tree of *Cinchona succirubra* growing at Naduvatam was submitted to a thorough examination, in order to discover the distribution of alkaloids in its various parts. The tree was 23 years old and 31 feet high; it had grown in an exposed situation, and had never been barked or mossed. The stem was cut into 11 equal lengths from base to summit. The whole yielded of dry bark—

	LB.	OZ.
Root	2	8
Stem	20	14
Branch	3	2
Twig	1	6
Total ...	27	14
Leaves dried	2	...

A portion of the bark from each length was then examined separately, also samples of the root, branch, twig and leaves.

In the following table the results are recorded; the amount of moisture in each is reduced to the same, so that the whole may be comparable. The first seven are each the mean of two analyses:—

—	Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.	Ash.
Root Bark	·93	·66	·45	2·09	1·17	5·30	3·25
Stem below ground	·73	1·15	trace.	1·39	·94	4·21	3·88
2nd portion of stem	·66	1·04	..	1·52	·75	3·97	3·42
3rd do. do.	·63	·97	..	1·29	·92	3·81	3·42
4th do. do.	·65	·95	..	1·30	·77	3·67	3·35
5th do. do.	·72	1·00	..	1·21	·78	3·71	3·33
6th do. do.	·75	1·01	..	1·11	·73	3·60	3·20
7th do. do.	·78	1·11	..	1·17	·80	3·86	3·16
8th do. do.	·87	1·23	..	1·13	·82	4·05	3·22
9th do. do.	·97	1·32	..	1·30	·60	4·19	3·31
10th do. do.	·98	1·36	..	1·42	·65	4·41	3·56
11th do. do.	1·01	1·37	..	2·28	·51	5·17	3·83
Branch	·95	1·35	..	2·10	·60	5·00	4·86
Twig	·29	·34	..	·34	2·42	3·39	5·61
Leaves	·23		..	·02	·45	·70	5·74

The table shows that the minimum yield in the stem was in that part at which the branches were given off, and that the smaller and thinner bark of the summit and branches contained more than the thicker bark at the base. The ratio between the quinine and cinchonidine remains constant throughout the stem and branches. The root is an exception to this rule as the quinine is in the ascendant, and as usual is rich in quinidine. The whole examination is a proof that trees when neglected and exposed deteriorate very perceptibly in their alkaloidal value; also that in fast-growing cinchonas a maximum yield of alkaloids is reached at a somewhat early period, and unless the yield is encouraged by removal of the natural bark and renewing under shelter, a decrease of the alkaloids takes place.

16. The effect of sun-light and shade upon the amount of quinine in cinchona bark was the subject of an investigation by my predecessor Mr. John Broughton, but to know if these influences were still at work, and if so, to what extent, the following experiment was made. A tree of *C. pubescens* of twenty years' growth was taken at Naduvatam. It was on the margin of a plot, and so situated that its south side was freely exposed to the sun, the north side was protected and shaded by the other trees in its vicinity. A strip of bark from each side was taken, dried and analysed. The percentage composition was as follows:—

	South.	North.
Quinine	2·63	4·00
Cinchonidine	1·81	2·05
Cinchonine	0·28	0·22
Amorphous	0·50	0·50
Total ...	5·22	6·77

17. *Mossing and Renewing.*—The process of "mossing" has now been adopted in the plantations for about twenty years, and has been most valuable in increasing the amount of alkaloids and especially of quinine in cinchona bark. But whether the system is still successful when applied to older trees under cultivation, appeared to be an important subject for inquiry. The following experiments were made upon trees of *C. officinalis* nearly twenty years old from Plot 12, Dodabetta. Early in October last samples were taken for analysis from three individual trees, as natural, mossed and renewed bark in strips. The trees were respectively covered with moss and labelled, and the samples analysed. After six months interval the trees were again visited and samples taken. The renewals had not sufficiently developed to enable them to be tested, they were very thin and adhered closely to the wood. A portion of the bark which had been under moss six months, and further portions of the mossed and renewed barks were separated. The analyses of the six samples are annexed:—

—	Natural Bark.	Mossed six months.	Mossed Bark.	Mossed six months.	Renewed Bark.	Mossed six months.
Quinine	3·32	4·21	3·98	4·22	3·80	4·33
Cinchonidine	1·65	1·88	1·94	1·77	0·84	0·67
Quinidine	0·24	0·21	0·33	0·30	0·31	0·34
Cinchonine and Amorphous	0·66	1·03	0·91	1·04	0·68	1·52
Total ..	5·87	7·33	7·16	7·33	5·63	6·86

It will be seen that the mossing has improved in each case the three varieties of bark, and the improvement has not only been in the total alkaloid but also in quinine. From the analyses of such a small number of trees it would be injudicious to form too strong an opinion; but I think it shows generally (1) that old and original trees still increase their alkaloids by mossing, (2) that mossed barks are increased by further mossing, (3) that renewals continue to improve.

18. The scales which form on the outside of Ledger barks, and which are readily detached when the sample is dry, have been considered by some planters to be the richest portion. From the sample of Ledger received from the Wynaad, I was able to remove sufficient of the scales to analyse. It afforded quinine 3·16, cinchonidine 0·62, quinidine 0·11, cinchonine 0·06, amorphous alkaloids 0·63; total 4·58 per cent. The analysis is very characteristic of this species, but it will be seen that the total alkaloids only amount to about half the quantity found in the entire bark.

19. *The ash of Cinchona bark.*—In every analysis of bark it has been my custom to determine the amount of ash. The average of over 100 estimations of all the kinds of bark that have come under my notice, I find to be 3·50 per cent. As a rule young and branch barks are the highest, and old barks are lowest in their amount of mineral matter.

20. Besides the work of a quinological nature I have to report on the investigation of some other plant products which you have from time to time forwarded to me. The apparatus and chemicals I have at my disposal are not sufficient to make complete researches into these specimens as I think the nature of the work requires. But as there might be some interest in the work already done, the following notes are given.

21. *Waras.*—The resinous and powdery glands covering the pods of *Flemingia congesta* afford a very permanent dye and much resemble in appearance the Kamala of the Pharmacopœias. A proximate analysis of this substance gave the composition as follows:—

Moisture	3·44
Resins	73·10
Matters soluble in water	8·20
Cellulose	9·60
Volatile oil	trace.
Ash	6·03
Total ...	100·37

The coloring principle resides in the resin which is soluble in ether, alcohol, benzol, chloroform and caustic soda solution. When a concentrated ethereal solution was allowed to stand for a day it deposited a mass of granular crystals, similar to those discovered by Doctor Anderson in "Kamala" (glands from the fruit of an Euphorbiaceous plant). When the coloring matter of Waras was examined side by side with that of Kamala by means of a spectroscope, the amount of absorption was identical in each case, all the spectrum was darkened throughout except the red end which alone was visible. A dye-bath was made of the Waras, and pieces of cotton, linen, wool and silk were immersed. The color formed was that of a

bright orange-brown, and the tint obtained was much superior in the animal fabrics as silk and wool, than in the vegetable tissues of cotton and linen. In these respects it resembles the dyeing properties of Kamala. As a commercial undertaking, however, it would not be profitable to collect Warns, as the amount obtained from the plants is so small in proportion compared with the yield of Kamala.

22. *The leaves of Erythroxylon Coca.*—The uses to which cocaine has been put in surgery by the Faculty has rendered it desirable to test the amount and nature of alkaloid from plants grown in India. Some leaves which had been carefully dried in the shade from trees in Barliyár have on three occasions been analysed by me. The first sample was examined by Truphemé's method; it yielded ·2 per cent. of an alkaloid which gave no characteristic results in physiological action. The second sample was treated according to Castaing's method and gave about the same amount of alkaloid which produced distinct numbness on the tongue, but Dr. Drake-Brockman of the Eye Infirmary, Madras, reported that it produced a smarting when applied to the mucous surface. A third sample had been tested by Dr. Squibb's process which afforded ·50 per cent. crude alkaloid, and ·30 per cent. cocaine hydrochlorate. This had a very marked numbness on the tongue and has been sent to Dr. Brockman who has kindly promised to report upon its value

23. *Moringa Gum.*—The gummy exudation of the Horse-radish tree (*Moringa pterygosperma*) consists chemically of a large quantity of bassorin or insoluble gum with a small proportion of arabin or the soluble kind and a trace of moringa-tannic acid. It swells up to a remarkable extent when steeped in water, gelatinizes with ferric chloride, gives an abundant precipitate with subacetate of lead, and is soluble in caustic alkalies. In these and other respects it resembles the Gum-Hogg of America. Gum-Hogg is derived from an unknown source and imported from the East Indies; it is used in marbling paper for binding books. It seems not improbable that Moringa gum if not identical with it, could be used for the same purpose in the arts.

24. *The funicles of the Black Wattle* (*Acacia melanoxylon*)—are in the shape of pink contorted bands, and were supposed to contain a dye. They were free from starch and tannin and yielded 6 per cent. of moisture and 2 per cent. of ash. Their chief constituent is an albuminous matter similar to the white of an egg. About 30 per cent. is readily extracted by macerating the funicles in water. When this solution is heated, the albumen coagulates and the pink coloring matter is destroyed. Being of no use as a dye, their peculiar office seems to be that of affording nourishment to the seed.

25. *Deposit from the milky secretion of the Jack fruit* (*Artocarpus integrifolia*).—This was a thick white tenacious substance similar to bird-lime, with no marked odour and taste. It contained 20 per cent. water and the residue burnt with a bright flame giving off a sooty smoke. It was insoluble in water, partly so in alcohol, and entirely in benzol. It was a variety of caoutchouc, and as such would be useful as a bird-lime, and a cement for broken articles.

26. I have lately received a large quantity of indigenous gums, and other vegetable substances for examination. These will be tested whenever an opportunity is afforded, and a report forwarded upon them in due course.

(True Copy.)

(Signed) M. A. LAWSON,
Director.

No. 1.

STATEMENT showing the Rainfall at the several Government Cinchona Plantations, Nilgiris, during the Official Year 1884-85.

Months.	DODABETTA.				NADUVATAM.				HOOKER.				WOOD.			
	For 1883-84.		For 1884-85.		For 1883-84.		For 1884-85.		For 1883-84.		For 1884-85.		For 1883-84.		For 1884-85.	
	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.
April 1884.	2·72	9	3·59	7	2·45	9	3·37	6	3·95	9	2·85	8	4·28	9	2·79	8
May ,,	7·58	19	5·05	12	3·78	15	3·85	8	3·85	14	5·76	10	3·91	11	8·59	11
June ,,	3·97	14	5·20	14	15·13	27	7·34	18	11·45	25	5·62	15	11·07	23	5·37	14
July ,,	9·35	24	1·87	12	32·48	30	19·38	28	30·23	27	15·63	24	28·24	28	11·42	25
August ,,	6·47	26	6·39	20	27·76	31	30·03	27	22·95	28	33·67	24	21·30	30	19·80	24
September ,,	2·39	7	3·28	10	5·04	13	9·23	24	3·11	12	10·16	22	2·31	9	6·61	22
October ,,	12·63	23	20·09	19	8·89	24	14·80	15	9·46	23	19·63	15	12·19	22	19·72	16
November ,,	2·95	10	11·68	19	3·43	8	2·58	8	4·19	9	5·07	13	5·66	7	6·43	14
December ,,	2·34	5	3·85	8	3·10	5	1·54	5	2·72	5	4·68	3	3·85	7	4·05	3
January 1885.	1·09	3	..	..	..	..	..	..	..	..	..	..	0·45	2	..	..
February ,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
March ,,	..	..	0·20	2	..	..	0·84	2	..	..	1·20	2	..	..	1·28	2
Total ..	51·49	140	61·20	123	102·06	162	92·96	141	91·91	152	104·27	136	93·26	148	86·06	139

(Signed) M. A. LAWSON,
Director.

OOTACAMUND,
9th July 1885.

No. 2.

Statement showing the Receipts on account of the Government Cinchona Plantations, Nílgiris, for 1884-85.

Particulars.	Sanctioned and Revised Budget Estimate for 1884-85.	Actuals for 1884-85.		
	RS.	RS.	A.	P.
Value of Bark sent Home	...	...		
Do. sold locally	45,000	82,344	2	0
Do. supplied to Bombay Medical Department ...	...	1,007	8	0
Do. supplied to Madras Medical Department ...	150	...		
Sale proceeds of seed and plants	700	1,033	2	0
Miscellaneous	50	510	11	5
Total ...	45,900	84,895	7	5

No. 3.

Statement showing the Expenditure of Office and General for the Official Year ending 1884-85.

Months.	Salaries.			Travelling Allowance.		Contingencies.		
	Pay of the Director.	Pay of the Quinologist.	Office Establishment.	For Director.	For Subordinates.	Service Stamps.	Service Telegram.	I (b) Contingencies.
1	2	3	4	5	6	7	8	9
	RS.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
April 1884.	600	..	151 0 0	..	118 8 0	5 0 0	..	18 5 0
May ,,	639	..	150 12 0	135 0 0	..	..	..	..
June ,,	600	..	151 0 0	..	..	10 0 0	2 0 0	18 15 0
July ,,	600	..	151 0 0	84 0 0	..	..	..	4 3 0
August ,,	600	..	151 0 0	..	143 4 0	..	..	..
September ,,	600	..	151 0 0	59 0 0	140 8 0	5 0 0	3 1 0	35 0 0
October ,,	600	..	151 0 0	438 10 8	..	..	..	..
November ,,	600	676 10 8	151 0 0	..	80 0 0	20 0 0	5 14 0	9 0 0
December ,,	600	350 0 0	151 0 0	..	..	..	..	..
January 1885.	600	350 0 0	151 0 0	199 0 0	..	..	4 0 0	9 12 6
February ,,	600	350 0 0	51 0 0	207 0 0	60 0 0	..	..	..
March ,,	600	350 0 0	51 0 0	..	41 12 6	15 0 0	6 0 0	25 6 9
Total ..	7,239	2,076 10 8	1,611 12 0	1,122 10 8	584 0 6	55 0 0	20 15 0	120 10 3

Months.	Contingencies—(Continued).		Unforeseen Charges.		Carriage of Crop.		Amounts communicated by the Accountant-General.	Total.
	Printing Charges.	Miscellaneous.	Assessment.	Land and Village Cess.	Gunnies.	Carriage of Bark, &c.		
	10	11	12	13	14	15	16	17
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
April 1884.	..	..	..	..	..	..	..	892 13 0
May ,,	..	..	..	..	..	..	..	924 12 0
June ,,	..	..	..	80 15 7	..	..	..	862 14 7
July ,,	..	..	..	..	1,750 8 0	..	..	2,589 11 0
August ,,	..	..	..	..	..	175 0 0	..	1,069 4 0
September ,,	..	..	118 4 0	..	..	..	..	1,111 13 0
October ,,	..	..	..	..	..	..	..	1,189 10 8
November ,,	..	..	..	..	..	100 0 0	..	1,642 8 8
December ,,	..	..	126 0 0	..	..	..	..	1,227 0 0
January 1885.	9 3 0	{ 466 14 7 { 39 7 8	} ..	..	1,426 15 0	..	2,681 6 2	5,937 10 11
February ,,	..	..	..	..	..	..	6,386 12 4	7,654 12 4
March ,,	28 10 2	..	..	161 15 2	..	242 1 0	351 12 5	1,873 10 0
Total ..	37 13 2	506 6 3	244 4 0	242 14 9	3,177 7 0	517 1 0	9,419 14 11	26,976 8 2

Ootacamund,
9th July 1885.

(Signed) M. A. LAWSON,
Director.

No. 4.

Statement showing the Expenditure in Detail of the Government Cinchona Plantations, Nílgiris, for 1884-85.

Name of Plantation.	Establishment.	Nurseries.				Upkeep.				
		Propagation.	Labor.	Collection of Seed.	Various.	Working Charges.				Manure.
						Pitting and Planting.	Weeding.	Roads and Bridges.	Various.	
1	2	3	4	5	6	7	8	9	10	11
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Naduvatam	2,629 7 0	542 0 0	755 12 7	357 2 0	2 4 0	4,602 13 4	3,327 13 8	1,162 7 5	2,835 11 1	2,869 10 0
Dodabetta	3,161 3 2	667 12 0	430 0 0	118 12 6	15 0 0	2,354 12 9	2,526 4 0	547 11 3	2,922 12 11	1,847 9 0
Hooker	600 0 0	..	726 9 11	8 0 0	..	4,249 8 1	1,893 6 9	325 1 6	823 8 11	485 6 2
Wood	648 10 8	..	302 13 9	8 0 0	..	647 14 1	877 15 9	159 10 0	957 3 4	1,161 12 3
Total ..	7,039 4 10	1,209 12 0	2,215 4 3	491 14 6	17 4 0	11,855 0 3	8,625 8 2	2,194 14 2	7,539 4 3	6,364 5 5

Name of Plantation.	Collection of Crop.					Repair of Building.	Peons' Clothing.	Firewood Plantation.	Total.
	Barking and Mossing.	Collection of Moss and Grass.	Drying Bark.	Packing Bark.	Various.				
	12	13	14	15	16	17	18	19	20
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Naduvatam	1,033 13 0	71 8 0	718 0 9	45 4 6	2,555 11 3	{ 431 3 9 { * 270 5 7	} 25 0 0	814 7 9	25,050 7 8
Dodabetta	2,306 14 6	1,595 3 6	99 1 0	116 0 6	1,354 11 0	466 6 2	..	..	20,530 2 3
Hooker	241 15 0	21 8 0	0 12 6	..	483 12 9	13 6 6	..	..	9,873 0 1
Wood	258 8 6	..	80 2 6	13 6 6	97 11 7	259 5 9	..	..	5,473 2 8
Total ..	3,841 3 0	1,688 3 6	898 0 9	174 11 6	4,491 14 7	1,440 11 9	25 0 0	814 7 9	60,926 12 8

* New cooly lines.

Ootacamund,
9th July 1885.

(Signed) M. A. LAWSON,
Director.

No. 5.

Statement showing the number of trees barked and the quantity of green bark obtained under various systems of cropping on the Government Cinchona Plantations, Nilgiris, for 1884-85.

Name of Plantation.	Under Stripping and Mossing System.				Coppicing.				Uprooting.	
	Crown.		Red.		Crown.		Red.		Crown.	
	Trees.	lb.	Trees.	lb.	Trees.	lb.	Trees.	lb.	Trees.	lb.
1	2	3	4	5	6	7	8	9	10	11
Dodabetta	27,005	78,066	..	..	5,603	51,615	..	..	200	2,111
					5	58	1,832	28,307	4,913	39,132
										* 58
Naduvatam	..	..	50	246					..	..
Hooker	..	..	..	..	..	..	..	..	..	..
							1,410	15,548	..	* 1,175
Wood	..	..	..	..	..	..				
Total ..	27,005	78,066	50	246	5,608	51,673	3,242	43,855	5,113	42,476

Name of Plantation.	Uprooting (*Continued.*)		Scraping.				Pubescens or Magnifolia, &c.		Total.	
	Red.		Crown.		Red.					
	Trees.	lb.	Trees.	lb.	Trees.	lb.	Trees.	lb.	Trees.	lb.
	12	13	14	15	16	17	18	19	20	21
Dodabetta	..	..	2,042	3,750	..	..	† 64	410	34,914	135,952
Naduvatam	139	1,415	..	..	9,253	40,858	..	..	16,192	111,416
		* 1,342							2,685	33,258
Hooker	2,685	33,180	..	..	..	..	..	..		
		* 78							2,632	30,252
Wood	1,222	12,751	..	..	..	..	..	..		
		* 778							56,423	310,878
Total ..	4,046	49,544	2,042	3,750	9,253	40,858	64	410		

* Fallen trees. † Fifteen coppiced included under this.

No. 6.

Statement showing the Quantity of Seed, &c., sold to the public during 1884-85.

Particulars.	Seed.		Plants.	Seedlings.
	lb.	oz.		
Dodabetta.				
Cinchona Officinalis	40	9	...	...
Do. Magnifolia	15	4	...	...
Do. Uritusinga	...	...	...	...
Naduvatam.				
Cinchona Succirubra	76	10	...	...
Do. Officinalis	..	...	...	...
Do. Pubescens	118	13¾	...	...
Total ...	251	4¾	...	...

Ootacamund,
9th July 1885.

(Signed) M. A. LAWSON,
Director.

No. 7.

Statement showing the Variation in the Prices of Bark sold in Madras.

Name of Plantation.	Description of Bark.	1883-84. December 1883. Per 100 lb. Upset Price.	1883-84. December 1883. Per 100 lb. Price realized.	1883-84. January 1884. Per 100 lb. Upset Price.	1883-84. January 1884. Per 100 lb. Price realized.	1883-84. February 1884. Per 100 lb. Upset Price.	1883-84. February 1884. Per 100 lb. Price realized.	July 1884. Per 100 lb. Upset Price.	July 1884. Per 100 lb. Price realized.	August 1884. Per 100 lb. Upset Price.	August 1884. Per 100 lb. Price realized.	November 1884. Per 100 lb. Upset Price.	November 1884. Per 100 lb. Price realized.	February 1885. Per 100 lb. Upset Price.	February 1885. Per 100 lb. Price realized.	March 1885. Per 100 lb. Upset Price.	March 1885. Per 100 lb. Price realized.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Dodabetta.	Natural Crown ..	192	104	104	95	104	95	104	104	104	Unsold	100	* 94	..	..	100	100
	Do. Scraped Crown ..	233	95	95	84	95	..	..	..	104	50 & 30	..	..	100	126	..	127 & 128
	Mossed ,, ..	265	182	182	136	182	136	182	172	95	95	..	..	110	129 & 131	..	..
	Renewed ,, ..	..	..	..	Bought in	..	..	..	..	182	155 & 150	..	..	115	40 & 42	..	..
	Do. Scraped ,, ..	57	33	33	..	33	..	..	..	..	Unsold.	..	..	40	..	..	..
	Branch ,, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Root ,, ..	..	..	..	..	..	..	..	..	150	Unsold.	..	..	..	..	..	..
Naduvatam.	Natural ,, ..	..	..	..	..	..	..	..	..	..	..	95	* 84	..	..	..	..
	Mossed ,, ..	..	..	..	..	..	..	..	..	..	..	100	* 94	..	..	..	..
	Renewed ,, ..	..	..	..	..	..	..	..	..	..	..	105	115 to 117	..	..	..	..
	Branch ,, ..	..	..	..	..	..	..	..	..	..	..	40	43	..	..	..	..
	Natural Red ..	135	85	85	Bought in	85	64	85	77	..	..	..	..	..	..	..	..
	Mossed ,, ..	170	110	110	90	110	90	171	96	..	..	75	Unsold.	..	..	..	..
	Renewed ,, ..	55	30	30	22	30	35	35	Bought in	..	..	80	Unsold.	..	..	..	..
	Branch ,, ..	..	..	..	..	..	..	..	..	..	..	80	Unsold.	..	..	..	..
Wood.	Natural ,, ..	..	..	..	..	..	..	..	..	..	..	30	Unsold.	..	..	..	..
	Mossed ,, ..	..	..	..	..	..	..	..	..	..	..	30	* 78	..	..	..	..
	Renewed ,, ..	..	..	..	..	..	..	..	..	..	..	90	100	..	..	..	..
	Branch ,, ..	..	..	..	..	..	..	..	..	..	..	100	115	..	..	..	..
	Root ,, ..	..	..	..	..	..	..	..	..	..	..	110	* 20	..	..	..	..
	Natural Crown ..	..	..	..	..	..	..	..	..	..	..	35	..	..	..	..	..
	Mossed ,, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Renewed ,, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Branch ,, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

* Accepted after sale.

(Signed) M. A. LAWSON,
Director.

Ootacamund,
9th July 1885.

No 8.

A.—STATEMENT showing the Total Yield of the Government Cinchona Plantations, Nílgiris, for the Official Year 1884-85.

1	2	3 BARK.													4	5 PROPAGATION.		
		a Under-stripping and Mossing system.			*b* Uprooting.			*c* Coppicing.			*d* Scraping.			Total quantity of Green Bark collected during the Year.	Quantity when dry.	Seed.	*a*	*b*	*c*
Name of Plantation.	Species of Produce.	No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.				Plants.	Seedlings.	Rooted cuttings.
				LB.			LB.			LB.			LB.			LB.	NO.	NO.	NO.
Dodabetta	Cinchona Bark	7	27,056	78,366	3	200	2,111	8	5,618	51,725	3	2,042	3,750	135,952	58,803	$116\frac{8}{8}$	240,500	400,000	..
Naduvatam ..	Do.	1	50	246	3	5,052	41,947	4	1,837	28,365	3	9,253	40,858	111,416	38,700	217	194,719	32,500	6,500
Hooker	Do.	..	..	..	2	2,685	33,258	..	..	..	..	..	..	53,258	8,800	..	523,000	121,800	..
Wood	Do.	..	..	..	1	1,222	14,704	4	1,410	15,548	..	..	..	30,252	11,714	..	99,823	..	..
	Total ..	8	27,106	78,612	9	9,159	92,020	16	8,865	95,638	6	11,295	44,608	310,878	118,017	$333\frac{8}{8}$	1,058,042	554,300	6,500
	Add last Balance on 31st March 1884	..	..	..	..	..	..	..	..	..	..	..	..	..	92,526	..	..	..	..
		..	..	..	..	..	..	..	..	..	..	..	..	..	210,543	..	..	..	..

B.—STATEMENT showing the disposal of Bark and other Produce collected in the Government Cinchona Plantations during the Official Year 1884-85.

1	2	3 BARK.								4 SEED.			5 PROPAGATED PLANTS AND SEEDLINGS.						
		a Supplied to Dr. Cleaver.		*b* Sold in the Country.		*c* Supplied to the Medical Department, &c.		*d* Total.		*a*	*b*	*c*	*a* Plants.		*b* Seedlings.		*c* Rooted Cuttings.		
Name of Plantation.	Name of Species.	Bales.	Quantity.	Bales.	Quantity.	Bales.	Quantity.	Bales.	Quantity.	Sold to the Public.	Used for Nurseries.	Total.	Sold to Public.	Permanently put up in the Plantations.	Sold to Public.	Transplanted.	Transplanted to Nurseries.		Remarks.
		NO.	LB.	NO.	LB.	NO.	LB.	NO.	LB.	LB.	LB.	LB.							
Dodabetta ..	Cinchona Bark ..	5	500	615	61,500	5	500	625	62,500	$55\frac{13}{16}$	4	$59\frac{13}{16}$	..	150,000	..	3,000	..		
Naduvatam ..	Do.	5	500	195	19,480	5	500	205	20,480	$195\frac{21}{64}$	14	$209\frac{21}{64}$	..	140,370	..	32,500	6,500		
Hooker	Do.	..	..	..	..	..	..	..	..	..	2	2	..	223,000	..	121,800	..		
Wood	Do.	10	1,000	9	900	..	..	19	1,900	..	..	..	..	45,165	..	..	..		
	Total ..	20	2,000	819	81,880	10	1,000	849	84,880	$251\frac{19}{64}$	20	$271\frac{19}{64}$	..	558,535	..	157,300	6,500		
	Add balance on 31st March 1885	..	..	..	..	..	..	..	125,663	..	..	..	..	..	..	..	..		
		..	..	..	..	..	..	..	210,543	..	..	..	..	..	..	..	..		

OOTACAMUND,
9th July 1885.

(Signed) M. A. LAWSON,
Director.

No. 9.

Statement showing the Receipts and Expenditure of the Government Cinchona Plantations, Nílgiris, during 1884-85.

Name of Plantation.	Receipts.		Expenditure.					
			A. Conservancy and Works.		B. Establishment.		Budget Estimate.	Grand Total.
	Budget Estimate.	Total.	Budget Estimate.	Total.	Budget Estimate.	Total.		
	Rs.	Rs. A. P.	Rs.	Rs. A. P.	Rs.	Rs. A. P.	Rs.	Rs. A. P.
Office and General.	45,900	84,895 7 5	6,350	13,601 9 8	15,112	13,374 14 6	21,462	26,976 8 2
Naduvatam ..	..	..	25,196	22,421 0 8	2,916	2,629 7 0	28,112	25,050 7 8
Dodabetta ..	..	..	23,325	17,368 15 1	3,516	3,161 3 2	26,841	20,530 2 3
Hooker	..	..	7,750	9,273 0 1	600	600 0 0	8,350	9,873 0 1
Wood	..	..	5,640	4,824 8 0	840	648 10 8	6,480	5,473 2 8
Total ..	45,900	84,895 7 5	68,261	67,489 1 6	22,984	20,414 3 4	91,245	87,903 4 10

Ootacamund,
9th July 1885.

(Signed) M. A. LAWSON,
Director.

Read—the following memorandum from the Joint Secretary to Government, Public Works Department, to the Secretary to Government, Revenue Department, dated Ootacamund, 27th July 1885, No. 379-E :—

In reply to memorandum from the Revenue Department, No. 408, dated 17th July 1885, the undersigned has the honor to state that the expenditure incurred from the Provincial Public Works Budget in 1884-85 on account of cinchona buildings in the Nílgiri division was as follows :—

	Rs.	A.	P.
Drying shed and bark store for cinchona plantation at Naduvatam	1,558	14	8
Repairing doors of the new store shed at Naduvatam ...	43	9	0
Total	1,602	7	8

(Signed) J. O. HASTED, Col., R.E.,
Joint Secy. to Govt., P.W.D.

Read—the following letter from Major A. C. SMITH, R.E., Executive Engineer, Nílgiri Division, to the Chief Engineer, Public Works Department, dated Ootacamund, 20th August 1885, No. 1429 :—

In returning herewith your endorsement, No. 472-E, of 17th instant, I have the honor to report that the cinchona buildings at Naduvatam therein referred to were completed in August 1884, and the required completion report with certificate were submitted to the Chief Secretary to Government on the 26th September 1884. The latter was duly returned signed to this office.

No. 494-E.

Forwarded to the Revenue Department with advertence to its memorandum, No. 460, dated 15th August 1885.

Ootacamund,
21st August 1885.

(Signed) J. SHAW-STEWART, Col., R.E.,
Secy. to Govt., P.W.D.

Read—the following letter from M. A. LAWSON, Esq., Director, Government Cinchona Plantations, &c., Nílgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 22nd August 1885, No. 42 :—

With reference to official memorandum, No. 467, dated the 21st August 1885, Revenue, I have the honor to inform you that the total amount of cinchona bark, which has been given to Mr. Hooper for analyses, has been only a few pounds and the outside value of this will be under Rs. 10.

Read—the following letter from M. A. LAWSON, Esq., Director, Government Cinchona Plantations, Ootacamund, to the Secretary to Government, Revenue Department, dated Ootacamund, 2nd September 1885, No. 44 :—

With reference to official memorandum in the Revenue Department, No. 488, dated the 26th August 1885, I have the honor to forward a statement showing the description, quantity and value of the 20 bales or 2,000 lb. of bark supplied to Dr. E. L. Cleaver under the terms of G.O., No. 5389, of 2nd December 1884.

2. I have calculated the value of the bark after taking the unit of quinine at 5·35 pence, and then deducting 25 per cent.

Enclosure.

Statement showing the Quantity and Value of the Bark supplied to Dr. Cleaver under G.O., No. 5389, dated 2nd December 1884.

Description of Bark.	Number of Bales.	Quantity of Bark.	Number of units of Sulphate of Quinine.	Value per Bale in Rupees at 5·35 per unit.	Value per Bale reduced by 25 per cent.	Total Value.
		Lb.		Rs. A. P.	Rs. A. P.	Rs. A. P.
Dodabetta Renewed Crown .	5	500	4·06	109 0 0	81 12 0	408 12 0
Pykara Natural Red ..	5	500	1·56	41 0 0	30 12 0	153 12 0
Naduvatam Branch Red ..	5	500	1·29	31 0 0	23 4 0	116 4 0
Pykara Renewed Red ..	5	500	2·54	68 0 0	51 0 0	255 0 0
Total ..	20	2,000	..	249 0 0	186 12 0	933 12 0

Order—dated 11th September 1885, No. 1016, Revenue.

Miscellaneous.

In the first of the papers read above, the Director of Government Cinchona Plantations, Parks and Gardens, Nílgiris, submits his report on the cinchona plantations for the official year 1884-85 and the report of the Government Quinologist for the latter half of the same year.

2. *State of the Season.*—The season was on the whole not unfavorable, although on the Dodabetta estate some damage resulted in the earlier months of the year from drought and in the months of October and November from unusually heavy rain. At Naduvatam nearly the whole of the June plantings were destroyed by violent winds in the following month, but the damage done was easily repaired later in the season. On the Hooker and Wood estates the weather was all that could be desired.

3. *Condition of the Plantations.*—The plantations on the Dodabetta and Naduvatam estates were generally in fair condition, the trees coppiced last year having thrown up shoots satisfactorily. At Naduvatam the plantings of 1882 and 1883 are described as looking remarkably well, the result of their having been liberally manured. It is presumed that in replanting vacant plots the intention announced last year of confining particular varieties to particular plots has been carefully carried out. In

his present report Mr. Lawson proposes to convert a small portion of the Naduvatam estate into a kind of botanical garden for the use of students by grouping therein all the different species and the principal varieties of cinchona now growing in Southern India. The suggestion commends itself to Government and will be carried out, as proposed, by means of cuttings from the trees originally introduced from South America. It is presumed, however, that the Nílgiri hybrids will also be represented.

4. No mention is made of the plants of *C. Carthagena* planted out in former years at Dodabetta, but it seems clear that the climate does not suit them, and that they do much better at Naduvatam and Coonoor (Sim's Park).

5. The one surviving plant of *C. Santa Fé*, which was removed from Dodabetta to the Government Gardens and subsequently planted out at Naduvatam, has grown considerably and is in perfect health. A dozen cuttings from this plant are now in the propagating house at the Government Gardens, and will, it is hoped, be fit for planting out before the end of the season. About two hundred plants of *Remijia Purdieana*, which yields the *Cuprea* bark, have been raised from the seed received from Kew, and will also be planted out shortly at Naduvatam.

6. The Hooker estate has much improved, but the condition of the Wood estate on the other hand is described as "increasingly miserable." This is ascribed partly to the ravages of the Sambur (*Rusa Aristotelis*), to counteract which it is intended to fence the entire estate with barbed wire, and partly to the inefficiency of the overseer, Mr. Burrows. On the latter point the Government desire to receive a full report. It is observed that Mr. Burrows has been called upon to take two years' furlough, but the Government cannot regard this as a sufficient remedy for proved inefficiency. By a recent order, the Wood and Hooker estates, which have hitherto been supervised by the head overseers of Dodabetta and Naduvatam respectively, have been combined and constituted a separate head overseer's charge. Mr. Burrows' appointment has thus been abolished, and the Government desire to know whether it is intended to retain him in the public service.

7. The development of private plantations and the present depreciation in the value of cinchona bark have together brought about the extinction of the demand which used formerly to exist for plants and seedlings from the Government estates. The Director has therefore reduced the number of nurseries to one for each estate, which will suffice to meet the requirements of the plantations and will also suffice for the growth of seedlings enough to meet any external demand that is likely to arise. Of seed about 251 lb. were sold during the year, realising Rs. 1,033.

8. The drying house and store at Naduvatam commenced by the Public Works Department in 1881-82 were completed during the year under report at a total cost of Rs. 37,893. The only new work carried out departmentally during the year was the construction, at a cost of Rs. 270, of a set of cooly lines from the materials of the old jail recently dismantled.

9. Excluding the Wood estate, for which no accurate return can be furnished, the number of trees standing on the plantations on the 31st March 1884 was 1,122,766. Of these 7,937 were uprooted and 7,455 coppiced, and 513,370 trees were planted in the course of the year. The total number on the 31st March 1885 was thus 1,620,744. The report does not specify the varieties to which the newly-planted trees belonged. Some information on this point seems desirable.

10. *Use of Manures, &c.*—The stock of cattle manure collected during the previous year was utilized as usual during the year under report, but the supply proved insufficient, and arrangements have since been made for the proper storage of a sufficient quantity in the future. No allusion is made in the report to the effect of the artificial manures applied in April 1883. In the report for 1883-84 it was stated that samples of bark had been collected from the trees so treated and would be analysed in due course. The Government desire to know whether this has been done, and, if so, with what result.

11. It is noted that in consequence of the want of grass experienced during the last cold weather the Director has constructed *silos* for the preservation of fodder on

the Dodabetta and Wood estates. The result of the experiment will be watched with interest by the general public, and should be carefully reported. A file of papers on the subject of ensilage will be forwarded to the Director from the Government office.

12. *Crop.*—The crop of the year was 118,017 lb. of dry bark against 183,765 lb. in 1883-84. The high figure in the latter year was due, as was noted at the time, to the unusual amount of coppicing and uprooting that was found to be necessary. Adding the balance remaining over on the 31st March 1884, the total available quantity was 210,543 lb., of which 84,880 lb. were disposed of as marginally noted, leaving a balance in stock of 125,663 lb. Five local sales were held during the year at which 81,880 lb. were sold for Rs. 82,344, the prices realised comparing favorably with those of the English market.

	LB.
Sold by auction in Madras	81,880
Supplied to Bombay Medical Department	1,000
Supplied to Dr. Cleaver for experiment	2,000
Total ...	84,880

13. Towards the close of the year Messrs. Jenkins and Phillips drew the attention of the Right Honorable the Secretary of State for India to an improvement in the English prices of bark. A copy of their letter having been forwarded for the information of this Government, the present policy of local sales was reconsidered with the result that it was decided to continue it as it gives a wholesome stimulus to local trade, while, from a comparison of English and Indian prices, it would seem to entail no loss, at present at least, on the Madras Government. In order, however, to give certainty and stability to the market it was proposed to appoint fixed dates for the sale of bark and to guarantee that for the next two years not less than 70,000 lb. of bark should be offered for sale each year. These proposals were accepted by the Right Honorable the Secretary of State for India, and arrangements have now been made to carry them into effect.

14. *Subordinate Staff.*—In December last the Director reported that extensive defalcations and frauds had been discovered in connection with the Naduvatam estate. The Collector of the Nílgiris was at once directed to institute a thorough inquiry and scrutiny of the accounts with the assistance of Mr. Lawson, whose establishment was not suited for such work. It appeared from the Director's report that Mr. Hillier, the head overseer of the Naduvatam estate, was unable to account satisfactorily for sums received by him on account of the estate, amounting in the aggregate to Rs. 1,605-5-10, and that he had also misappropriated about eighty pieces of corrugated iron, besides timber, window frames, &c., from the materials of the dismantled jail. The result of the Collector's inquiry was that Mr. Hillier was prosecuted for criminal breach of trust as a public servant and sentenced to rigorous imprisonment for two years and a fine of Rs. 155. Sums aggregating Rs. 1,227-7-3 had to be written off the accounts as irrecoverable, while, as regards an outstanding advance of Rs. 242-13-8, a final report is still awaited. The Manager of the Director's office, Venkataratnam Naidu, was also prosecuted for misappropriating Rs. 200, the property of Government, and for accepting an illegal gratification from a contractor. On the first charge he was convicted by the Sessions Court, but was eventually acquitted by the High Court on appeal. A departmental code of rules and forms of account is now under preparation by the Treasury Deputy Collector of the Nílgiris, who has also been requested to undertake the annual audit of the head office accounts.

15. *Manufacture of Quinine, &c.*—Proposals have from time to time been made for the establishment of a private quinine factory in this country. Certain concessions were asked for in regard to fuel and the supply of bark from Government estates, but these the Right Honorable the Secretary of State was not prepared to grant. Certain English capitalists resolved, however, to send out a scientific chemist, Dr. E. L. Cleaver, for the purpose of conducting experiments; and from a letter addressed to Government by Messrs. Arbuthnot and Co. of Madras, it appears that, in consequence of certain experiments made by him at Calicut with 2,000 lb. of bark supplied to him from the Government estates, the gentlemen who sent him out will now in all probability proceed to form a company for the establishment of a private factory.

16. *Quinology.*—The Government note with pleasure the very useful work done since his arrival in this country by Mr. Hooper. His report shows that a satisfactory start has been made in the scientific investigation of cinchona culture and of the conditions which affect its alkaloidal value. During the year under report, however, his attention has been largely devoted to the practical question of manufacturing at a minimum of cost the liquid extract of cinchona devised by Dr. de Vrij of the Hague. A sample of this preparation manufactured under Mr. Hooper's directions has been tested in some of the hospitals with the most satisfactory results, and instructions have been issued for the preparation of 1,000 lb. of the extract in view to further trials. It has been found experimentally that the liquid extract can be produced at a price about 30 per cent. lower than that of the febrifuge obtained from Bengal, and there appear to be good reasons for believing that eventually the cost will be found to be still lower. In view, partly, of this fact, the question of establishing agencies under the Local Fund Boards for the distribution of cheap medicines to the poorer classes has been referred to those Boards for consideration.

17. *Receipts and Expenditure.*—The receipts of the year amounted to Rs. 84,895-7-5 as detailed on the margin against a revised estimate of Rs. 45,900. The bulk of the increase is due partly to the sale of a larger quantity of bark than was anticipated, partly to the inclusion in the lots sold of a larger proportion of crown bark than was at first intended, and partly to a slight recovery in prices. It was expected that some 600 bales would be sold for an average price of Rs. 75 per bale, but eventually 819 bales were disposed of for a fraction over 100 rupees each.

	Rs.	A.	P.
Value of bark sold locally ...	82,344	2	0
Value of bark supplied to Bombay Medical Department...	1,007	8	0
Sale-proceeds of seed, &c. ...	1,033	2	0
Miscellaneous	510	11	5
Total ...	84,895	7	5

18. The expenditure, as reported by the Director, was Rs. 87,903-4-10 against a budget estimate of Rs. 83,800 and a revised estimate of Rs. 91,240. This includes a sum of Rs. 2,681-6-2 adjusted during the year and representing the cost of manufacture of the 393 lb. of febrifuge advised in the Secretary of State's despatch recorded in G.O., No. 705, dated 4th June 1884. Of this amount, however, a sum of Rs. 101-11-1, representing the three latter items noted on the margin, has already been deducted from the receipts of 1883-84 in taking credit for the net value of the 393 lb. of febrifuge. The balance, viz., Rs. 2,579-11-1, should have been deducted at the same time, but was by an oversight omitted from the calculation. The deduction will now be made and the receipts of 1883-84 will then stand at Rs. 85,080-13-2. The charges for the year under report will consequently be reduced by the whole amount, viz., Rs. 2,681-6-2. To the figure thus arrived at must be added the charges (Rs. 1,602-7-8) incurred by the Public Works Department in the construction and repair of cinchona buildings. The whole charges for 1884-85 will thus amount to Rs. 86,824-6-4.

	£.	s.	d.
393 lb. febrifuge at 8*d.* per oz. ...	209	12	0
Packing	4	18	3
Analysis	3	3	0
Labels	0	4	0
Total ...	217	17	3

Equivalent at 1*s.* 7½*d.* per rupee. Rs. 2,681-6-2

19. The tabular statements which accompany the Director's report have been remodelled as directed in G.O., 17th September 1884, No. 1050. It is observed, however, that statement III still shows the expenditure of the head office for each *month* of the year. This is not necessary, a statement of annual charges being alone required, which should be compared with the budget and revised estimates. The Director is requested to report whether it would not be possible in future years to prepare statements, similar to those furnished in connection with the Bengal plantations, showing the number and distribution of the different varieties of plants on the several estates. A comparative statement should, also, be furnished showing the quantity of bark *of the different kinds* in store at the commencement of the year, collected and disposed of during the year, and remaining in store at its close.

20. The statement of capital and revenue account appended shows the financial results of the cinchona enterprise from its commencement to the end of 1884-85. The net result is a surplus of Rs. 5,51,743-4-7. In future the exact amount and value of bark supplied to the Government Quinologist should be reported for inclusion in this statement. A statement is also appended showing the receipts and charges of the year calculated in the manner directed in the Secretary of State's despatch, dated 14th September 1882, No. 31.

(True Extract.)

(Signed) W. WILSON,
Ag. Secretary to Government.

To the Director, Government Cinchona Plantations,
Parks and Gardens, Nílgiris, with file of papers on ensilage.
" Director of Revenue Settlement and Agriculture.
" Board of Revenue.
" Accountant-General.
" Public Works Department.
" Financial Department.
" Military Department.
" Surgeon-General with the Government of Madras.
" Superintendent, Government Central Museum.
" Honorary Secretary, Agri-Horticultural Society.

No. I.

STATEMENT showing the Capital and Revenue Account of the Government Cinchona Plantations, Nílgiris, from the commencement up to the Official Year 1884-85.

Year.	Charges.						Receipts.				Net Revenue (Difference between Columns 9 and 13).	
	Establishment including Superintendent's Salary.	Building and Plant.	Working Charges. Departmental Labor.	Working Charges. Convict Labor.	Total.	Total outlay to end of Year.	Simple interest at 4½ per cent. on outlay to end of previous year *plus* half outlay during the year.	Total of Columns 6 and 8.	Value of Bark supplied to Quinologist, or for experimental purposes.	Value of Bark sent to England, sold or supplied to other Governments or Departments.	Sale of Plants, Seeds, &c.	Total.	Surplus.	Deficit.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1860-61	..	..	4,821 15 0	..	4,821 15 0	4,821 15 0	108 7 11	4,930 6 11	..	..	..	..	..	4,930 6 11
1861-62	..	..	22,914 15 4	..	22,914 15 4	27,736 14 4	732 9 2	23,647 8 6	..	..	..	..	..	23,647 8 6
1862-63	..	..	48,390 0 0	..	48,390 0 0	76,126 14 4	2,336 15 0	50,726 15 0	..	..	..	..	..	50,726 15 0
1863-64	12,726 14 7	..	53,173 9 2	..	65,900 7 9	1,42,027 6 1	4,908 7 7	70,808 15 4	..	..	..	..	..	70,808 15 4
1864-65	24,444 8 11	..	59,666 12 0	..	84,111 4 11	2,26,138 11 0	8,283 11 9	92,395 0 8	..	..	..	..	..	92,395 0 8
1865-66	25,449 14 0	3,700 0 0	58,887 5 0	..	88,037 3 0	3,14,175 14 0	12,157 1 4	1,00,194 4 4	..	..	..	..	..	1,00,194 4 4
1866-67	23,803 9 10	3,025 0 0	52,632 0 0	48,666 10 8	1,28,127 4 6	4,42,303 2 6	17,020 12 6	1,45,148 1 0	..	..	2,450 0 0	2,450 0 0	..	1,42,698 1 0
1867-68	26,087 3 1	2,600 0 0	43,295 14 4	48,666 10 8	1,20,649 12 1	5,62,952 14 7	22,618 3 6	1,43,267 15 7	..	287 8 0	..	287 8 0	..	1,42,980 7 7
1868-69	25,671 7 10	2,030 0 0	30,636 1 0	48,666 10 8	1,07,004 3 6	6,69,957 2 1	27,740 7 8	1,34,744 11 2	..	..	1,680 0 0	1,680 0 0	..	1,33,064 11 2
1869-70	25,783 5 4	5,334 5 8	19,163 0 0	..	50,280 11 0	7,20,237 13 1	31,279 6 2	81,560 1 2	1,512 6 4	..	..	1,512 6 4	..	80,047 10 10
1870-71	23,730 5 4	300 0 0	6,143 0 0	..	30,173 5 4	7,50,411 2 5	33,089 9 8	63,262 15 0	4,364 14 8	..	323 14 0	4,688 12 8	..	58,574 2 4
1871-72	17,157 5 4	3,250 0 0	13,160 4 9	..	33,567 10 1	7,83,978 12 6	34,523 12 5	68,091 6 6	9,542 12 8	3,479 3 6	..	13,022 0 2	..	55,069 6 4
1872-73	12,724 0 0	550 0 0	16,441 0 0	..	29,715 0 0	8,13,693 12 6	35,947 10 2	65,662 10 2	16,806 15 8	4,388 2 1	227 1 4	21,422 3 1	..	44,240 7 1
1873-74	12,574 0 0	2,758 0 0	15,091 14 0	..	30,423 14 0	8,44,117 10 6	37,300 12 2	67,724 10 2	21,136 7 0	36,417 6 3	300 9 0	57,854 6 3	..	9,870 3 11
1874-75	16,406 8 0	1,700 0 0	17,417 0 0	..	35,523 8 0	8,79,641 2 6	38,784 9 2	74,308 1 2	8,576 0 0	..	273 4 0	8,849 4 0	..	65,458 13 2
1875-76	17,234 0 0	1,550 0 0	27,423 0 0	..	46,207 0 0	9,25,848 2 6	40,623 8 3	86,830 8 3	..	60,404 7 11	2,000 0 0	62,404 9 11	..	24,426 0 4
1876-77	8,064 5 4	6,715 8 11	44,850 3 0	..	59,630 1 3	9,85,478 3 9	43,004 13 6	1,02,634 14 9	..	1,07,878 4 0	2,579 3 10	1,10,457 7 10	7,822 9 1	..
1877-78	8,061 5 4	5,468 13 8	56,241 10 3	..	69,771 13 3	10,55,250 1 0	45,916 6 3	1,15,688 3 6	..	3,51,746 0 6	5,469 0 2	3,57,215 0 8	2,41,526 13 2	..
1878-79	9,637 2 8	10,090 14 1	53,954 10 8	..	73,682 11 5	11,28,932 12 5	49,144 1 10	1,22,826 13 3	..	3,92,217 10 1	8,136 9 2	4,00,354 3 3	2,77,527 6 0	..
1879-80	10,092 0 0	6,537 4 9	63,095 0 3	..	79,724 5 0	12,08,657 1 5	52,595 12 4	1,32,320 1 4	..	4,24,323 12 8	15,462 12 4	4,39,786 9 0	3,07,466 7 8	..
1880-81	11,879 1 0	11,367 0 4	72,858 15 3	..	96,105 0 7	13,04,762 2 0	56,551 14 11	1,52,656 15 6	..	3,33,295 1 3	13,175 4 8	3,46,470 5 11	1,93,813 6 5	..
1881-82	16,375 14 6	6,278 4 9	90,921 2 1	..	1,13,575 5 4	14,18,337 7 4	61,269 11 11	1,74,845 1 3	..	5,64,236 3 11	7,653 2 9	5,71,889 6 8	3,97,044 5 5	..
1882-83	15,094 14 1	32,247 11 5	50,049 11 5	..	1,06,392 4 11	15,24,729 12 3	66,219 0 3	1,72,611 5 2	..	5,82,003 10 1	4,345 7 10	5,86,349 1 11	4,13,737 12 9	..
1883-84	20,083 7 5	35,348 14 5	69,128 8 6	..	1,24,560 14 4	16,49,290 10 7	71,415 7 4	1,95,976 5 8	..	80,519 10 6	4,561 2 8	85,080 13 2	..	1,10,895 8 6
1884-85	20,413 3 4	6,220 10 5	60,190 8 7	..	86,824 6 4	17,36,115 0 11	76,171 10 0	1,62,996 0 4	933 12 0	83,351 10 0	1,543 13 5	85,829 3 5	..	77,166 12 11
Total ..	3,83,494 7 11	1,47,072 8 5	10,59,548 0 7	1,46,000 0 0	17,36,115 0 11	..	8,69,744 14 9	26,05,859 15 8	62,873 4 4	30,24,548 10 9	70,181 5 2	31,57,603 4 3	5,51,743 4 7	..

No. II.—STATEMENT showing the receipts and charges on account of the Government Cinchona Plantations, Nílgiris, for 1884-85 calculated in accordance with orders of the Secretary of State (*vide* G.O., No. 1163, dated 23rd October 1882).

	RS.	A.	P.		RS.	A.	P.
To value of stock on 31st March 1884 of 92,526 lb., at 8 annas 2·402 pies per pound	47,420	8	7	By value of stock on 31st March 1885 of 1,225,663 lb., at 11 annas 6·646 pies per pound...	90,743	1	4
To establishment and working	85,221	14	8	By value of 25,681 lb. of bark at cost price awaiting disposal in England ...	18,544	10	0
Profit on the year's working.	62,474	7	6	By value of 2,000 lb. of bark supplied to Dr. Cleaver ...	933	12	0
				By value of 81,880 lb. of bark sold locally	82,344	2	0
				By value of 1,000 lb. of bark supplied to Bombay Medical Department ...	1,007	8	0
				By sale-proceeds of seed ...	1,033	2	0
				By miscellaneous receipts ...	510	11	5
Total ...	1,95,116	14	9	Total ...	1,95,116	14	9

In 1884-85 the cost price of 1 lb. of bark is 11 annas 6·646 pies per pound, *i.e.*, Rs. 85,221-14-8, expenditure ÷ 118,017 lb. of bark, the crop of the year.

Exd. W. J. Lewis,

150 Copies

Order thereon No: 2388 tra/13.10.85

Communicates to S. E. IV Circle for information

Hijl S.S.

Govt. of {1885} Madras.

REVENUE.

Issued

Recd. *Encl.*

G.O., 11th September 1885, No. 1016.

Rw: 2388 tra/13. 10. 85.

SEPTEMBER.

Government Cinchona Plantations.

Report on the — for 1884-85, reviewed.

S. Engr IV Cir
Ex. P.W. ats.

15th November 1886, No. 988, Revenue.

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

Read—letter from M. A. LAWSON, Esq., Government Botanist and Director of Cinchona Plantations, Nílgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 6th July 1886, No. 32.

Abstract.—Forwarding the annual Administration Report on the Government Cinchona plantations for the year 1885-86.

Report of the Director of Government Cinchona Plantations, Nilgiris, for 1885-86.

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2. Wood.
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VI. Haystack.
VII. Silos.
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The number of statements accompanying the report are nine in number, the same as last year; but statements 3 and 4 of last year have been consolidated into statement No. 3 in the present report, in accordance with the desire expressed in paragraph 18 of G.O., 11th of September 1885, Mis. No. 1016, Revenue. Also the statement No. 5 of last year's report has been blended with No. 7 of this year's, and there have been added two new tables, viz., No. 8, specifying the varieties of the newly-planted trees, as ordered in paragraph 9 of the above quoted Government Order, and No. 9, giving a comparative statement showing the quantity of bark of all sorts in store at the commencement of 1885-86, and that which was collected and disposed of during that year, and the amount remaining in store at its close, according to the instructions issued by the Secretary of State for India, *vide* G.O., dated 3rd April 1886, No. 260, Revenue.

I. Season and Rainfall—*See Statement No.* 1, (*a*) *Dodabetta.*—The season for the past year was very favorable for carrying on all works connected with the upkeep of this estate. The total amount of rain registered during the year was 53·25 inches, spread over 154 days. This was about 8 inches less than what fell during the previous year, but it was spread over 154 days instead of 123 days, showing an

increase during the past year of 31 wet or cloudy days over last year. Very little rain fell during the early part of the year; indeed the spring showers failed almost entirely and it was not till the breaking of the monsoon, which began early (3rd of June), that the earth got at all wetted. The monsoon broke very gently, and continued with hardly any intermission for nearly six weeks, after which the weather continued very favorable till the end of the year. The wind was never furious, and with the exception of one storm in November, the rainfall was never excessive. On the 17th and 18th of this month, 4·30 inches of rain fell, but nothing more than a little wash on the steeper and more exposed parts of the plantation was experienced.

(*b*) *Naduvatam.*—The quantity of rain which was registered on this estate during the past year was 90·40 inches, spread over 132 days; this being very nearly the same amount of rain and the same number of wet days which occurred during the previous year. The season was good for all kinds of work, and the new plantings on the old plots which had been made during the last three years, are looking very well.

(*c*) *Pykara.*—This estate now comprises the two which were formerly known under the names of *Hooker* and *Wood.*

(1) *Hooker.*—The rainfall for the year on this plantation was 90·77 inches, spread over 134 days. Last year the amount of rain was 104·27 inches, spread over 136 days. With the exception of a storm in November, when 10·1 inches of rain fell in two days, the weather during the season was all that could be desired. On the occasion of this storm some damage was done, by reason of the great wash which took place on some of the slopes which were exposed to its full blast. Considerable damage was also done at the same time to several of the roads and paths on this estate, owing to drains and culverts becoming choked. The damage done, however, was not more than might have been expected from so violent a burst of wind and rain. The general appearance of the plantation is good and the younger plantings are much improved.

(2) *Wood.*—On this estate 74·18 inches fell during the year, and were spread over 129 days, the amount which was registered during the year before being 86·06 inches, which was spread over 139 days. Some damage was done to a portion of the coppice of 1884, which lies just below the water-course that runs from the Pykara river to the coffee estates in the plains, owing to the bursting of the bank of the water-course during one of the heavy storms which occurred during the autumn. The water-course has now been repaired and there is no further apprehension of the accident occurring again.

II. RECEIPTS AND EXPENDITURE—(*a*) *Receipts.*—The revised budget estimate of the receipts for the year was Rs. 76,290, the gross amount realized was Rs. 1,02,690-10-4; from this amount, however, there have to be deducted Messrs. Oakes and Co's. charges, which amount to Rs. 5,994-6-9, so that the net sum actually paid into the treasury was Rs. 96,696-3-7; from this again the sum of Rs. 72,940-4-2, being the amount of all charges connected with the maintenance of the department inclusive of the Quinologist's establishment, has to be deducted, so that the real earnings of Government amount to Rs. 23,755-15-5. The increase in receipts over the budget estimate is due to a larger amount of bark having been sold by auction during the year than was originally sanctioned by Government. The total amount sold in Madras being 111,140 lb.

(*b*) *Expenditure.*—The budget allotment for all charges connected with the department was originally Rs. 91,265. At the beginning of the year, however, a recalculation was made, when it was found that this sum was likely to be much in excess of the actual requirements of the department and consequently Rs. 10,000 were surrendered, leaving a revised allotment of Rs. 81,265. This, on submitting the regular estimate for the year, was reduced to Rs. 80,820. The actual charges for the year have been Rs. 72,940-4-2, a saving of Rs. 7,880 having been effected upon the regular estimate or Rs. 17,880 upon the original estimate. The cause of this difference between the estimated and the actual expenditure was due to the unsettled condition of the department during its late troubles and the discrepancy is not likely to occur again. In comparing the cost of working the estates during the past year with that of former

years it should be borne in mind that there have been several abnormal items of expenditure which in the aggregate amount to Rs. 7,719-8-10 as detailed below :—

	RS.	A.	P.
Charges of the Quinologist's Department	5,347	11	2
Hillier's defalcations ordered by Government to be written off (G.O., No. 952, of 22nd August 1885)	1,222	7	3
Charges for advertisement of Cinchona bark in England advised in Accountant-General's No. 80, of 7th June 1886.	1,149	6	5
Total ...	7,719	8	10

If this sum be deducted from Rs. 72,940-4-2, there is left Rs. 65,220-11-4 which will represent the normal cost of the department; and this sum, when all the renovations have been completed, will be still further decreased.

III. PERMANENT PLANTATIONS—(*a*) *Dodabetta.*—The condition of the estate is much the same as when I reported upon it last year. The coppice and inter-plantings are doing very well. All these were manured and will, I have no doubt, show the result of this liberality by an increase in the vigor of their growth. Statement No. 8 gives calculations of the number and the different sorts of plants growing at present upon this and the other estates.

(*b*) *Naduvatam.*—The general condition of this estate has materially improved during the last year. All the young plantations were highly cultivated and many of them freely manured, the result of which and the favorableness of the season is a fine vigorous growth of all the young plants. A considerable amount of the land, which in former years had been pitted for planting, but which had either never been planted at all or where the plants had died out, I planted up during the past year, chiefly with *Cinchona magnifolia.* Most of the remaining pitted land lies on slopes which are too steep for convenient cultivation or on poor soil or on places too much exposed, and all this land I propose to abandon.

The shelter belts which I have put up round many parts of the estate are doing well.

Santa Fé.—In my last year's report I mentioned that I had very nearly lost my only remaining specimen of cinchona *Santa Fé*, but that it had been saved by the skill of Mr. Jamieson; and I am happy in being able this year to report that not only is the old plant living, but that Mr. Jamieson has been able to raise between 20 and 30 new plants from it, most of which are now well rooted and will be ready for putting out in the plantations during the present season.

Four hundred and twenty plants of *C. Carthagena* raised in the Government Gardens, Ootacamund, from cuttings were planted out on the Naduvatam and Pykara estates, the lower elevation of which seems to suit them better than that of Dodabetta. As I mentioned in my last year's report those at Dodabetta are not doing satisfactorily.

The *Remijias* which I mentioned in my last report were planted out during the autumn on this estate; they have as yet made little or no progress, but they look perfectly healthy and will, I have no doubt, begin to grow during the warm season after the rain.

On the same plot of ground adjoining the land on which the *Remijias* have been planted, I have put out specimens of several species of cinchona, and this year I shall put out all the remaining species which we possess. These are not intended for commercial purposes, but by their being placed side by side and allowed to grow in a free and natural manner, it is hoped that they will enable those, who are interested in the subject, to examine the characters of the different kinds with greater readiness than can be done when they are scattered, not only over different parts of the same estate, but even over the different estates themselves as occurs at present.

(*c*) *Pykara*—(1) *Hooker.*—This plantation has greatly improved during the past year. The young plantings have been highly cultivated, the whole of the ground which they occupy has been deeply pitted and the greater part of it manured. The remaining portion of the estate requiring renovation is but small, when compared with that which has already been carried out during the last two years, and I shall, I hope, be able to complete it during the present season. The sambur are still troublesome on some parts of this plantation, but as barbed wire has been ordered from England and its arrival is now being daily expected, I hope that I shall be able before long to put up such a fence as will effectually keep out these intruders.

(*c*) *Pykara*—(2) *Wood.*—This plantation is hardly in a more satisfactory condition than it was when I reported upon it last year. Some of the succirubra coppice has done well and some of the planting close to the lines and the head overseer's dwelling, where the sambur dare not come, are also doing well, but in all the other parts of the plantation which lie at a distance from human habitations the young plants are destroyed as much as ever and no hope of any improvement can be expected until a substantial fence has been erected. Some underwood consisting chiefly of strobalanthis which was encroaching upon the plantations, I ordered to be cut during the winter as that tended to harbour the sambur, and I regret to say that towards the end of the dry season this brushwood caught fire during a high wind and that the fire spread through a portion of the shola which surrounds the Pykara falls and has seriously injured, if not killed, many very fine trees.

In a former report I recommended to Government that they should give up the cultivation of the Wood plantation altogether, but Government at that time thought my experience was of too short a duration to admit of their rashly adopting the suggestion, and I was desired to do my best to put it into repair; but my experience of the past three years makes me doubt if it will ever be very profitable to Government to retain it. The soil in many parts is poor and stony, other parts again are exposed to devastating blasts, and it is in bad weather difficult of access. At the best it will cost a large sum of money to repair the plantation, and it will be many years before it yields any reasonable returns to the money invested. If the greater part of the Wood plantation was abandoned and the few acres of land round the head overseer's bungalow and the drying sheds only were kept, the Pykara head overseer would be able to pay more attention to the Hooker plantation, which is now becoming a very valuable property. This would save nearly the whole of the expense of the upkeep of the Wood plantation or about Rs. 8,000 per annum.

IV. Upkeep.—The maintenance of the buildings, roads, drains, bridges, &c., with one exception has been well attended to on the Dodabetta, Naduvatam and Hooker estates. The exception is the Mucroochy bridge which spans the river crossing the road which leads from Naduvatum to Hooker.

V. Manure—(*a*) *Dodabetta.*—I have been able during the past year to obtain abundance of manure for this estate from purchases made in the town of Ootacamund, and on this account I have transferred the greater number of the Dodabetta cattle to Naduvatam.

Cattle.—Many of the draught cattle belonging to the Dodabetta estate are very old and several of them died during the past year. These I propose replenishing by young ones which may be obtained at a reasonable price during the fairs which are held yearly at Murally at Mysore. The great want on estates and indeed in all farms of this country is the want of a sufficiency of manure. Almost every estate has cattle upon it, which may be regarded purely as manure-making machines, but these machines are worked at very great waste, because owing to the cost of storing up fodder they are obliged to be sent out during the day on the hill sides to graze where all the manure which they make during the day is lost; but if a sufficiency of fodder could be stored in stacks or silos, these cattle might be altogether stall fed, with the result that there would be an immense increase of manure coming in to their owner. At the same time, they would become much fatter and therefore saleable for the purposes of the butcher. During the past year very considerable economy has been effected by using more largely than had hitherto been done the Government carts and bullocks for the transportation of bark to Mettupálayam and for the carriage of supplies to the estates.

(*b*) *Naduvatam.*—Owing to the transfer of the Dodabetta cattle and the purchase of the few additional animals, this estate has been much better off for manure during the past year than it had ever been before.

(*c*) *Pykara.*—Both the plantations of Hooker and Wood continue to be well supplied.

VI. Haystack.—During last autumn, I made a large haystack of grass obtained from the hills on the Government estate at Naduvatam at a cost of Rs. 109; the grass was cut by sickles and was well dried before being stacked. The hay turned out very fair and sufficed to keep in good condition all the cattle on the estate during the five dry months of January, February, March, April and May. I made another smaller stack

on the Dodabetta estate consisting entirely of *Briza maxima* commonly known as *Jacob's tears.* This grass completely covered many of the plots and often grew to the height of nearly two feet. The hay was not very well got on account of the weather being wet at the time it was harvested. Nevertheless it proved very nutritious and horses and cattle took to it readily. Dr. Shaw, Inspecting Veterinary Surgeon, Madras Army, to whom I sent some of these hays for experimentation, has been good enough to send me the following very interesting report on their quality, and the suggestions which he makes with regard to the other kinds of grasses, which may be used as hay, will be attended to during the present year:—

Dr. Shaw's report.

Adverting to my letter, No. 45-86, Ootacamund, 10th April 1886, I have the honor to report on the two samples of hay forwarded with your letter, No. 38, of 10th April.

2. The Naduvatam sample (name unknown) did not prove a success. It was in the first place coarse and wiry in its nature, and I should say over-dried, being crisp and crumbly when rubbed, and fracturing into small particles. It had little or no aroma and was here and there mouldy as if it had been exposed to dry on damp ground. The horses I tried this sample with did not evince any keenness to eat it, and two out of five absolutely refused it for some days, after which it was only sparingly partaken of.

3. No 2 sample (*Briza maxima*) or Jacob's tears was better saved, had an aroma of hay and, I think, if it had been cut a little earlier, or when more succulent, it would have afforded a better sample. Four horses partook of this sample, and kept in fine working condition on it. The fifth (a horse I had in training) being at the time on an allowance of oat hay, occasionally nibbled at it only.

4. As regards the feeding properties of the two samples, I do not think sample No. 1 is good enough to persevere with as a horse fodder; at the same time, I think it far preferable to the bad grass which is brought in during the dry months and which forms the bulk of stable supplies up here from November to May.

5. The question of stable fodder as an industry on these hills is one, I think, capable of great extension and would prove a remunerative investment to the agricultural classes if they could be encouraged to grow them. The cultivation of oats by General Morgan and Mr. J. Sullivan has proved that three crops can be produced from one tillage. The first and second crops can be cut as green fodder and the third allowed to go to ear and made into hay. I am using such now with the greatest success. The soil and climate of Ootacamund are particularly favorable for the cultivation of oats, the stalks of which attain a great size; and I have seen it growing with the ear just budding though seven feet high. I have no experience with the "Bromus" or South American oat grass, but General Morgan tells me it has taken favorably to the soil and has proved a valuable fodder.

VII. Silos.—In my last year's report I stated that I had made silos on the Dodabetta and Wood estates for the preservation of fodder during the wet weather. The silo on the Wood estate was never utilized, as a heavy storm flooded it before it could be properly roofed; but on the Dodabetta estate I made six silos, all of which have been successful, and I will describe their structure and the mode of filling them.

No. 1 was a brick-built pit lined with cement the internal measurement of which was as follows:—

Fifteen feet long by ten feet broad by twelve feet deep; the walls from top to bottom had a slope given to them inwards of six inches.

This pit was roofed with zinc so that no rain could by any possibility get into it. The cost of building the pit was Rs. 206. I began filling this pit on the 14th of October and finished on the 19th idem. The plants used for filling the silo were very numerous; indeed, almost everything was put in which it was known the cattle would eat in a green state such as *maize*, *cholum*, *ragi*, *lucerne*, *Spanish needle*, *Polygonum nepolense*, *Jacob's tears*, grass from the lawns of Government gardens, hill grass, swamp grass, &c., &c. All these with the exception of lawn grass, which had been cut by mowing machines, were passed through chaff-cutters and cut into pieces not bigger than an inch in length. As this was cut, the mixture was thrown into the silo and when a stratum of about two feet in thickness had been put in, it was trodden well down. This was repeated until the silo was completely filled when mats were placed on the top, then planks of blue gum and then two feet and-a-half of moderately dry earth. In the course of a week the earth sank exactly one foot, after which there was no further subsidence. During the subsidence the earth cracked around the edges of the pit and it was necessary to dig up the earth about these cracks with a

fork and then tread it down again, to prevent the access of air to the fodder below. It was opened on the of April in the presence of His Excellency the Commander-in-Chief, Brigadier-General Elles, C.B., Adjutant-General, Dr. Shaw and others who had experience in the making of silos. The fodder on being uncovered had lost its bright green color, owing to the partial decomposition of its chlorophyl, but with this exception it differed little in texture and appearance to what it had presented when first put in. On weighing a portion of it each cubic foot was found to contain a little over forty-seven pounds. The smell was exceedingly offensive, especially the upper layer of about half an inch in thickness. His Excellency the Commander-in-Chief, Brigadier-General Elles and Dr. Shaw pronounced it to be good, and on its being given to some of the bullocks it was at once greedily eaten by them, and since that time they have been fed upon nothing else, and they are said by Mr. T. Narrainasawmi Nayudu, the Assistant Superintendent, and Mr. McDonald, the Sub-overseer, to be generally in better condition than they have ever known them to be before at this time of the year and this in spite of their having done, at least, double the usual amount of work. Besides this silo which was both costly in its construction and in its filling, I made five others of a much cheaper description and which turned out ensilage, every bit as good as that from the big pit. These consisted of pits six feet cube dug in the earth in a place where there was no fear of springs or stagnant water. The fodder was put into them as it came from the field, that is without being cut up, and after it had been well trodden down mats were placed on the surface, and on the top of these two or three feet of earth, which was heaped up and sloped like a grave, and over this mats, thatch or plates of galvanized iron were placed to shoot off the rain. The ensilage in these pits shrank more or less, according to the particular plants which composed it. In one instance the earth sank as much as three and-a-half feet, and it was necessary, during the first few days, to fill up the cracks which were made in the soil by this shrinking. In one of these pits I stored up *Jacob's tears* separately, in a second *Spanish needle*, in a third *Polygonum nepolense*, and in the two others a mixture of plants. The fodder, which was turned out from all of them, proved, on experiment, to be everything that could be desired, although during the time that they were being filled, it was raining hard and the stuff saturated with moisture.

I shall in the future make no more costly silos, but use these earth-pits, only making them of larger dimensions, and covering them with a roof of thatch. The estates, hills and sholas of the Nílgiris and the Wynaad must possess an enormous amount of nutritious fodders which grow readily in the wet season, but which cannot be preserved for future use except by means of silos, and I look forward to the time when knife-weeding upon a cinchona or coffee estate will be regarded no longer as a disagreeable necessity.

VIII. Nurseries.—The demand for seed is still decreasing and that for plants and seedlings also. Most of the applications which I received during the year were from the planters in Ceylon.

IX. Crop.—The total amount of dry bark produced by the estates during the past year was 113,366 lb. In addition to this, there remained on the 31st March 1885, 125,663 lb., making a total of 239,029 of all sorts. Of this quantity, 113,940 lb. were disposed of during the year, so that the balance in stock at the end of March last was 125,089 lb. (See statement No. 9).

X. Buildings—(1) *New Works*—(*a*) *Dodabetta.*—New quarters for the clerk at Dodabetta which were sanctioned in G.O., No. 439, of 15th April 1885, were constructed at a cost of Rs. 609-7-0. The cattle-shed which was also sanctioned in same Government Order was not built, as it was found that the modification of the old one would suffice for the present.

(*b*) *Naduvatam.*—Instead of carrying out the construction of the bandymen's lines near the Government chuttrum, as was sanctioned in G.O., No. 439, of 15th April 1885, Revenue, I transformed some old cooly lines into a cattle-shed at a cost of Rs. 124-3-6 and transferred the bandymen to some old unoccupied lines adjoining the shed. This being more economical and at the same time quite as convenient as the proposed scheme, the cost of the bandymen's lines being estimated at Rs. 235-12-0.

(*c*) *Pykara.*—Brick cooly lines, roofed with iron for 20 families, were erected on the Wood plantation of this estate at a cost of Rs. 459-13-0 against an estimate of Rs. 650.

2. *Repairs.*—All the necessary repairs to the permanent buildings were satisfactorily carried out at a cost of Rs. 875-14-2.

	Rs.	A.	P.
Office and General	52	6	2
Dodabetta	149	2	0
Naduvatam	574	0	0
Pykara	100	6	0
Total ...	875	14	2

XI. General Remarks—*Staff of Subordinate Officers.*—The changes made in the staff of the subordinate officers during the previous year has proved of great advantage, and I feel it only right to say that the improvement of the estates and the economy which has been effected is due to the diligence which all have evinced and to the hearty co-operation which they have rendered me in carrying out the different works.

The service books of all the subordinates have been duly filled up in accordance with the instruction contained in G.O., No. 2957, dated 26th December 1877, *vide* also G.O., No. 396, dated 22nd February 1886, Public.

XII. Labor.—The same system is in force which I stated in my last year's report I had inaugurated in the year 1884-85 and is working satisfactorily.

XIII. Coppicing.—Several questions having been addressed to me during the year relating to coppicing, I have carefully attended to this matter and so far as my experience goes, I believe (1) that it is immaterial at what time of the year the trees are cut down; (2) that they should be cut quite close to the ground, for then the shoots have a better chance of making roots for themselves, and so becoming independent trees, than if they are allowed to spring from a point at a distance from the ground; shoots springing immediately from the ground are much less liable to be blown down by the winds; (3) the number of shoots which should be allowed permanently to remain will depend entirely on local circumstances. If the shoots are far apart, then two or even three may be allowed to grow, but if the shoots are close then one will, as a rule, be sufficient. No fixed rule, however, as to the number which should be left can be given; but if it is borne in mind that wood and bark are the result of the activities of the leaves, it will be readily understood that those trees which have the most leaves exposed to the light will produce the thickest stems and the largest amount of bark. The planter should therefore see that his coppice is not so thick as to prevent each individual shoot having its fair share of light.

XIV. Grafting.—The nearly allied species of cinchona seem to lend themselves, rather readily, to being grafted; but the labor entailed in grafting is so great that I do not believe it will ever pay to do this on a large scale.

XV. Quinologist's Department.—Mr. Hooper in accordance with the instructions issued in G.O., No. 550, of 12th May 1885, Revenue, went down to Madras to start the manufacture of 1,000 lb. of *De Vrij's Cinchona Liquida.* Of this amount, however, 500 lb. only were made and for some reason or other the manufacture of the febrifuge did not turn out quite satisfactory. So I asked Government that Mr. Hooper might be allowed to make the remaining 500 lb. in Ootacamund. Government accorded their sanction to my proposal, and Mr. Hooper has just completed his task. The febrifuge which he has turned out seems to be in every respect excellent, and will, I hope, prove a cheaper and at the same time as efficacious a drug as any that has as yet been made. Should the febrifuge prove acceptable to the poorer classes of natives, not only will all the bark which can be raised on the Government estates be required to meet the demand, but a very great deal more.

XVI. Other matters—connected with the chemical aspect of quinology, I leave Mr. Hooper to speak for himself, whose very interesting report I enclose.

XVII. Urgent need for a cheap febrifuge.—I am indebted to Surgeon-General G. Bidie for the following statistics. The population of the Madras Presidency was 29,000,000 at the last census. The total number of deaths during the last year from all causes was 615,449 as detailed below.

Death from undescribed causes.	Fever.	Cholera.	Small-pox.	Bowel complaint.	Injury.	Total.
260,960	218,786	58,109	34,726	31,209	11,659	615,449

From these figures it will be seen that nearly one-third of the total number of deaths are due to malarious fever. A proportion which must be regarded as too high when it is considered that we have a specific medicine for this fatal disease.

XVIII. Prospects of the cinchona market.—So long as the cinchona alkaloids are produced chiefly for the European and North American consumption (non-fever stricken countries) the supply will always be in excess of the demand and the present low prices will continue to exist; but if a market can be found for the alkaloids in the malarious tracts of the tropics, this state of things would be reversed and the price of bark would go up.

Dr. Bidie tells me that he believes every one in the Presidency would be benefited by taking quinine in more or less quantities during certain seasons of the year, and he does not think that forty grains per head would be a high figure at which to place the yearly requirements of the country. If this be correct then close upon 2,000,000 pounds of bark averaging $6\frac{1}{2}$ per cent. of total alkaloids will be required for consumption in this Presidency alone.

Enclosures.

Letter from D. HOOPER, Esq., F.C.S., Government Quinologist, Ootacamund, to M. A. LAWSON, Esq., Government Botanist and Director of Cinchona Plantations, Nilgiris, dated Ootacamund, 6th July 1886.

I have the honor to present the following report on the analytical work conducted in the Government laboratory for the year ending March 31, 1886.

2. The report includes a valuation of the cinchona bark sold by auction in Madras during the year, and a complete analyses of all the different species of bark which were sent to the Colonial and Indian Exhibition in London. Some experiments in renewing bark and manuring trees are recorded; and tables are given showing the increase of alkaloids by growth, and the deterioration of alkaloids by age and other causes. The liquid cinchona which was partly made last year has been completed. Most of the analytical work has been done for Government, but several barks have been received from private parties, and I have to thank some of these gentlemen for information respecting samples they sent, as this enabled me to summarise results which are of general usefulness to planters.

3. There have been six sales of Government bark in Madras during the year, viz. September, October, November, December 1885, January and February 1886. Samples of the various kinds have been valued, which has given a reserve price to the auctioneers, but the competition being so brisk at each sale these prices were exceeded.

I append a statement showing the qualities of barks disposed of, their value in sulphate quinine, and the value of the unit in pence.

September 1885.

Description of Bark.	Sulphate quinine.	Value of unit.
	Per cent.	*d.*
Dodabetta Natural Crown	4·18	4·06
Naduvatam Root „	4·46	4·90
October 1885.		
Dodabetta Renewed Crown	4·06	5·85
„ Mossed „	4·70	5·48
Naduvatam „ „	4·05	5·37
„ Root „	4·46	5·38

description of Bark.	Sulphate quinine.	Value of unit.
	Per cent.	*d.*
November 1885.		
Dodabetta Natural Crown	4·18	6·70
„ Branch „	1·17	7·90
„ Root „	4·33	6·93
Naduvatam Natural „	3·52	7·10
„ Renewed „	4·22	7·52
„ Branch „	2·16	7·06
December 1885.		
Dodabetta Natural Crown	3·10	6·69
„ Mossed „	4·73	5·55
„ Renewed „	6·56	5·49
January 1886.		
Naduvatam Natural Red	1·56	4·97
February 1886.		
Naduvatam Renewed Red	2·54	4·62
„ Root „	1·38	5·25

4. These barks are, on the average, of the same value as those sold last year, but with regard to the value of the unit it will be observed that the market has experienced a great fluctuation during the year. In September the unit being 4·48*d*, October 5·52*d*, November 7·20*d*, December 5·91*d*, January and February 4·94*d*.

Bark sent to Indian and Colonial Exhibition.

—		Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.	Sulphate Quinine.
C. Officinalis. ..	Natural	2·77	1·57	·16	·39	·50	5·39	3·72
	Mossed	3·40	1·50	·20	·45	·62	6·17	4·57
	Renewed ..	4·20	·85	·22	·65	·70	6·63	5·66
C. Angustifolia.	Natural	3·97	1·32	·12	·12	·87	6·40	5·34
	Mossed	5·60	1·41	·33	·04	·97	8·35	7·53
	Renewed ..	4·91	·89	·38	·19	1·14	7·51	6·60
C. Succirubra ..	Natural	1·91	2·11	..	1·14	·88	6·04	2·57
	Mossed	1·69	2·03	..	1·68	·98	6·38	2·27
	Renewed ..	1·84	1·48	..	1·25	·71	5·28	2·47
	Branch	1·38	2·28	..	1·59	1·16	6·41	1·85
	Root	1·24	·77	·41	1·43	1·27	5·12	1·66
	Renewed shavings	2·30	1·16	..	2·06	1·45	6·97	3·09
C. Robusta ..	Natural	1·43	2·08	..	1·58	·31	5·40	1·92
	Mossed	1·92	3·16	..	·77	·35	6·20	2·58
	Renewed ..	4·40	2·54	..	·51	1·65	9·10	5·92
	Branch	1·64	2·71	..	1·17	·50	6·02	2·20
Micrantha ..	Natural	..	..	..	1·92	·40	2·32	..
	Renewed ..	tr	2·45	..	1·12	1·02	4·59	..
	Branch	..	..	..	1·60	·45	2·05	..
Calisaya	Natural	1·21	2·32	..	2·13	·29	5·95	1·62
	Branch	·59	·73	..	1·93	·48	3·73	·79
Anglica	Natural	·81	·88	·29	1·49	·44	3·91	1·09
	Branch	tr	tr	·25	2·04	·36	2·65	..
Ledgeriana.. ..	Natural	5·49	1·33	..	·81	·88	8·52	7·38
	Branch	2·21	·49	..	1·07	·50	4·27	2·97
Javanica.. ..	Natural	..	..	1·32	2·64	·48	4·44	..
	Branch	..	..	1·43	1·49	·45	3·37	..
Humboltiana ..	Natural	2·24	1·55	tr	·49	·90	5·18	3·01
	Renewed ..	1·28	·64	..	·43	1·07	3·43	1·72
Pitayenses ..	Natural	2·34	·56	1·10	1·93	·39	6·32	3·14
	Mossed	3·81	·95	·63	1·91	·37	7·67	5·12
	Renewed ..	2·50	·52	·78	2·33	·55	6·68	3·36
Pahudana ..	Natural	·04	·10	..	·39	·43	·96	·05
	Renewed ..	·51	1·19	..	·28	·87	2·85	·68

5. *Renewal by shaving.*—Shaving cinchona trees has been for some years a method of harvesting bark which in some districts works better than that of stripping and mossing. The cellular and richer portion of the bark is removed in this way and the librous portion is left. The bark thus treated thickens again and the shavings taken from it are found to be richer

still in alkaloids. The analyses of some succirubra shavings taken from trees grown in the Ouchterlony Valley will show to what an extent trees may be improved by this method. The renewals had been taken after intervals of twelve months; the experiment, therefore, has lasted over three years.

——	Quinine.	Other Alkaloids.	Total.
Original bark	1·35	5·87	7·22
Once renewed	2·46	4·22	6·68
Twice renewed	3·60	3·99	7·59
Thrice renewed	3·87	3·71	7·58

6. The increase in quinine during the first and second year by renewing is most satisfactory; the increase is not so prominent in the third year, but the bark is good, and indicates that shaving for at least four years might be permitted. The trees upon which these experiments were made were six years old when the original bark was taken. If at this comparatively early age they are not injured by shaving, and renew their bark so well, it is not desirable to wait for the trees to become more matured.

7. When trees are allowed to grow until they are over 12 years of age and then shaved, the renewal sets in more slowly, and the resulting bark does not compare more favorably with the original bark than if the trees operated upon had been half that age. This may be instanced by quoting some more analyses. Last December some interesting samples were sent by the Manager of the Glenrock Company, South-East Wynaad, consisting of some natural and renewed shavings of succirubra taken from trees of 6 and 12 years of age.

The following is the analysis of four of the samples:—

	Sulphate quinine.	Total.
Red bark, 6 years, natural	1·34	5·00
„ „ renewed, 2 years	2·54	6·95
„ „ 12 years, natural	2·43	7·41
„ „ renewed, 2 years	2·71	7·01

8. Thus it is seen that by renewing a 6-year-old tree 90 per cent. more of sulphate quinine is obtained, and by working on a 12-year-old tree, only an increase of 12 per cent. takes place during the same period of two years. With regard to the total alkaloids, it should also be noticed that the shaving has made an increase of 39 per cent. in the younger tree, while the older bark has somewhat deteriorated. One of the most important features in these results is that the renewed bark from the 6-year-old tree is superior to the natural bark from trees of twice that age.

9. I have had very few opportunities of observing the effect of shaving on pure Ledger barks, containing little, if any, alkaloid besides quinine, but it appears that hybrid Ledgers of the broad-leaved variety holding cinchonine, are capable of great improvement by the shaving process as the following renewals of 11 months will show compared with the natural bark of 6-year-old trees:—

	Sulphate quinine.	Total.
Ledger bark, narrow leaf, natural 1885	4·09	5·97
„ „ renewed, 1886	6·62	8·49
„ broad leaf, natural, 1885	2·90	6·61
„ „ renewed, 1886	5·19	8·51

10. The sulphate of quinine in the narrow-leaved Ledger had increased 62 per cent., and in the broad-leaved Ledger 79 per cent., the greater increase in the latter variety is due to the presence of other alkaloids which appear to develop quinine in the growth of the tree.

11. Shaving old trees has certainly not had a beneficial effect from some trials made on Government estates. Both red and crown trees from 16 to 21 years of age cannot well bear the removal of the bark in this way and the renewal takes place slowly and is impoverished instead of being enriched. A crown bark was taken from Dodabetta aged 20 and shaved. The shavings gave 3·66 sulphate of quinine; after six months some renewed shavings were taken and found to yield only 1·85 per cent. sulphate of quinine, the bark then was commencing to decay and the tree has since died.

12. *Experiment in manuring Cinchonas.*—The effect of manuring cinchona trees in order to stimulate their growth and produce a greater yield of alkaloid has been tried recently at Naduvatam. The first experiment was made upon a succirubra of 7 years growth. Cattle manure which had been previously kept for some time in closed pits was applied some six

months before the bark was taken for analysis. A sample of bark from a tree in the same plot, but which had not been manured, was collected at the same time for comparison. Two samples of magnifolia bark were taken from trees which had been manured in a similar manner to the succirubra; the first was 17 years, the second 20 years old, and samples from unmanured trees were taken for comparative analysis at the same time.

13. The results of the examination are tabulated below:—

——	Quinine.	Cinchonidine.	Cinchonine.	Amorphous alkaloids.	Total.
Succirubra manured	2·29	3·78	1·94	·52	8·53
„ unmanured	1·51	4·13	2·03	·32	7·99
Magnifolia 1 manured	3·78	3·90	·28	·82	8·78
„ „ unmanured	3·13	4·39	·56	·39	8·47
„ 2 manured	2 59	3·49	1·21	·53	7·82
„ „ unmanured	2·62	2·67	·67	·56	6·52

14. It will be seen that the manuring has had the effect of increasing, in each instance, the amount of total alkaloids in the bark; and the quinine, the most important feature, has received a gain of 52 per cent. in the succirubra, and 20 per cent. in the first magnifolia. In the older magnifolia bark the quinine remains about the same in quantity, and if no other influences were at work, it might be inferred that older trees are not so sensitive to the action of manure as younger and vigorous-growing trees which have not reached maturity. The food of such plants as cinchonas which yield alkaloid in large quantity must of necessity contain some nitrogenous element, and as this must be taken from the ground it is only fitting that a manure of this kind which contains some constituents which are similar in their nature to alkaloids should be supplied periodically to soils. Regarding the question from a commercial aspect the higher value of the bark would cover the expense of the manure and the cost of its application to the land. The succirubra bark mentioned in the first experiment, if the market price of the unit of quinine were 4*d*, would realize eight pence per pound, whereas the bark of the manured tree would be more than one shilling per pound. I believe the effect of manuring would be more apparent in Crown and Ledger barks with large proportions of quinine in the total alkaloids; in such cases, the extra outlay on manurial agents, compared with the additional value of the bark, would be much more remunerative.

15. *Increase of Alkaloids with the age of trees.*—A question of much importance in cinchona cultivation is the age to which trees should grow before the bark can be profitably taken. To settle such an inquiry, a large number of analyses of barks taken from trees of all ages should be available, and in the following tables I have made a selection of both Ledger and red barks and have arranged them according to age. Some of the figures are average of two or more analyses, and as the two lists represent some forty samples, I hope it will help to throw some light on the subject.

16. The first list comprises natural barks of the narrow-leaved variety of *C. Ledgeriana*, and with one exception, they all come from the Wynaad district.

17. The second list is by taking from my laboratory journal all those red barks whose ages have been determined, whether they come from the Government Plantations at Naduvatam or from private estates in Wynaad, Coorg or Travancore.

Ledger Barks.

——	Quinine.	Cinchonidine.	Other alkaloids.	Total.
20 months	1·68	·66	2·77	5·11
2 years	2·18	·65	2·69	5·52
3 „	3·28	·55	2·90	6·82
3½ „	4·73	·93	1·81	7·46
4½ „	4·97	·79	1·78	7·54
5 „	4·57	1·02	1·46	7·05
5 „	5·09	1·06	0·55	6·70
5½ „	7·54	·31	1·15	9·00
6 „	6·52	·76	·88	8·16
6½ „	5·97	1·18	1·00	8·15
8 „	7·59	1·16	1·45	10·20
20 „	5·58	1·24	·85	7·67

Red Barks.

—	Quinine.	Cinchonidine.	Cinchonine.	Amorphous alkaloids.	Total.
2 Years	·55	·72	1·20	1·22	3·69
3 ,, ...	·85	1·75	1·67	·99	5·26
3½ ,, ...	1·08	1·65	1·15	·64	4·52
4 ,, ...	1·13	2·03	1·79	·58	5·53
4½ ,, ...	1·02	2·64	1·78	·50	5·94
5 ,, ...	1·23	2·72	2·36	·52	6·83
5½ ,, ...	1·32	2·15	3·11	·63	7·21
6½ ,, ...	1·31	3·22	2·18	·71	7·42
7 ,, ...	1·70	2·69	2·28	·93	7·60
7½ ,, ...	1·78	3·18	1·97	·53	7·46
12 ,, ...	1·81	2 62	2·08	·90	7·41
16 ,, ...	1·08	·94	1·04	1·57	4·63
20 ,, ...	·78	1·13	1·37	·97	4·25

18. In the Ledger barks it will be noticed that there is a steady rise of quinine up to the age of between five and six years, after which there is no apparent increase.

19. In the second table of red barks, the same fact is shown that the bark has attained its maximum content of alkaloids when between 5 and 6 years of age. The quinine increases up to 12 years, but, as pointed out before, the renewed bark of the younger trees would much exceed the slightly increased value of these older barks. The trees of 16 and 20 years show a marked deterioration in alkaloids, although the bark is often in large thick fibrous pieces similar to the drug that was originally exported from the South American forests.

20. *Effect of Mould on Bark.*—It has been stated that bark loses much of its virtue when allowed to get mouldy or when kept in a damp atmosphere. I was asked more than a year ago to analyse some mouldy bark to obtain its value, but not knowing the composition of the fresh bark the result would not have been very useful. I have, therefore, made an experiment which shows that little if any effect is produced by prolonged contact with mould. A sample of powdered bark of known composition was taken in December 1884 and kept in an open dish on the floor of a dark damp room, a fungus (Penicillium) set in in a fortnight, and spread itself over the surface of the powder, and slightly increased its weight. The bark was constantly stirred so that fresh bark from beneath might be influenced by the fungus. It was mixed occasionally for 10 months and as the mycelium had by then penetrated to every particle of the powder it was analysed in October 1885, with the following results:—

	Original bark.	Mouldy bark.
Quinine	2·82	2·80
Cinchonidine	1·22	1·25
Quinidine	·18	·11
Cinchonine	·90	·87
Amorphous	·31	·45
Total...	5·43	5·48

21. It is thus manifest that the analyses, being almost identical, moulded barks of 10 months are not necessarily deteriorated.

22. *Liquid Extract of Cinchona.*—At the suggestion of Dr. Cornish last year, I prepared a sample of liquid cinchona which was reported upon most favorably by several medical officers in the Presidency and called forth an order from Government for the preparation of 1,000 lb. (G.O., No. 550, 12th May 1885). In August last, 1,000 lb. of bark were supplied to the Medical Stores in Madras, and resulted in the manufacture of 595 lb. of liquid extract (*vide* demi-official letter from Principal Medical Storekeeper, dated 10th September 1885). As a loss must have taken place in this outturn I received orders to produce another batch immediately under my supervision in Ootacamund (G.O., No. 55, 25th January 1886). 500 lb. of bark was powdered by the Medical Store Department, the maceration with the necessary chemicals and percolation was conducted in my laboratory, and the evaporation was made in ordinary chatties in an adjoining out-house: 340 lb. of liquid cinchona of the prescribed strength, 40 grains to the ounce, were thus made in two months at a cost of Rs. 211 as detailed below:—

	Rs.	A.	P.
Grinding 500 lb. of bark	4	0	0
Glycerine	52	0	0
Acid	9	0	0
Fuel	24	0	0
Labor	20	0	0
Chatties	3	8	0
500 lb. of branch succirubra bark estimated at 3 annas per lb. (taken the current value of the unit of quinine)	94	0	0
Rent	5	0	0
Total ...	211	8	0

Allowing for the high cost of buying the chemicals in Madras instead of from London direct, and taking into account the special expenses of this experiment, I consider that if made on a large scale and continuously, it should not cost more than Rs. 7 or Rs. 7-8-0 for an amount of liquid extract containing 1 lb. of solid febrifuge.

APPENDIX.

ANALYSIS of Cattle manure stored in covered pits on the Government estates.

Water	7·9
* Organic matter	61·1
† Ash soluble in acid	12·7
Siliceous residue	18·3
Total ...	100·0

ANALYSIS of sample of Peat from the Dodabetta Plantation and used for burning at the drying sheds.

Organic matter	86·8
Siliceous ash	13 2
Total ...	100·0

No. 1.

STATEMENT showing the Rainfall at the several Government Cinchona Plantations, Nilgiris, during the Official Year 1885-86.

Months.	Dodabetta.				Naduvatam.			
	For 1884-85.		For 1885-86.		For 1884-85.		For 1885-86.	
	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.
1	2	3	4	5	6	7	8	9
April 1885.	3·59	7	1·71	6	3·37	6	1·68	6
May ,, ...	5·05	12	2·14	13	3·85	8	4·26	8
June ,, ...	5·20	14	9·44	27	7·34	18	30·30	29
July ,, ...	1·87	12	4·72	19	19·38	28	17·79	26
August ,, ...	6·39	20	3·80	18	30·03	27	10·54	13
September ,, ...	3·28	10	6·32	13	9·23	24	3·81	14
October ,, ...	20·09	19	10·97	27	14·80	15	11·38	21
November ,, ...	11·68	19	8·15	12	2·58	8	5·80	6
December ,, ...	3·85	8	5·20	12	1·54	5	4·72	8
January 1886.	..	..	0·19	2	..	..	..	..
February ,, ...	..	..	...	..	..	..	..	..
March ,, ...	0·20	2	0·61	5	0·84	2	0·12	1
Total ..	61·20	123	53·25	154	92·96	141	90·40	132

* Containing ammonia .. .. 2·15
† Containing Tricalcic phosphate .. .. 3·50

No. 1.—(*Continued*).

Months.	Hookers.			Wood.		
	For 1884-85.	For 1885-86.		For 1884-85.		For 1885-86.
	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.
1	10	11	12	13	14	15	16	17
April 1885.	2·85	8	3·48	8	2·79	8	2·87	6
May ,, ...	5·76	10	3·44	11	8·59	11	2·70	11
June ,, ...	5·62	15	26·87	29	5·87	14	21·91	25
July ,, ...	15·63	24	16·73	27	11·42	25	10·76	24
August ,, ...	33·67	24	10·56	10	19·80	24	6·17	11
September ,, ...	10·16	22	3·14	13	6·61	22	3·53	9
October ,, ...	19·63	15	11·30	20	10·72	16	11·28	21
November ,, ...	5·07	13	12·14	7	6·43	14	11·38	9
December ,, ...	4·68	3	3·04	8	4·05	3	3·51	9
January 1885.	..	..	..	..	..	..	..	..
February ,, ...	..	..	..	..	..	..	..	..
March ,, ...	1·20	.. 2	0·07	.. 1	1·28	.. 2	0·07	.. 1
Total ..	104·27	136	90·77	134	86·06	139	74·18	129

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 2.

STATEMENT showing the Receipts on account of the Government Cinchona Plantations, Nilgiris, for 1885-86.

Particulars.	Sanctioned Budget Estimate for 1885-86.	Revised Budget Estimate for 1885-86.	Total Amount.	Charges paid by Messrs. Oakes and Co., Madras.	Net Amount.
	Rs.	Rs.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Value of bark sent Home	..	..	..	..	..
Do. sold locally	75,000	75,000	1,01,461 0 0	5,994 6 9	95,466 9 3
Do. to Bombay Medical Department	..	..	..	..	..
Do. to Madras Medical Department	..	..	..	..	..
Sale-proceeds of seed and plant	..	640	640 0 0	..	640 0 0
Miscellaneous	200	500	514 10 0	..	514 10 0
	50	150	75 0 4	..	75 0 4
Total ..	75,250	76,290	1,02,690 10 4	5,994 6 9	96,696 3 7

No. 3.—Statement showing the Expenditure in detail on account of the Government Cinchona Plantations, Nilgiris, for 1885-86.

Name of Plantations.	Salaries.			Nurseries.			Working Charges.			Manure.			Collection of Crop.		
	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.
Office and General ..	13,512	13,823	13,973 2 4	..	..	..	..	..	..	..	..	..	..	..	..
Dodabetta	3,516	3,538	3,538 0 0	500	500	440 3 0	8,600	6,100	6,284 9 11	1,800	3,300	2,877 0 7	8,900	5,857	4,249 2 0
Naduvatam	2,916	2,938	2,977 3 1	700	700	588 15 0	8,250	8,275	8,420 2 10	3,200	3,200	3,425 6 10	6,500	2,923	2,416 3 3
Hooker	600	600	600 0 0	500	500	422 3 6	6,000	7,552	6,143 4 11	900	800	316 6 6	500	600	525 13 0
Wood	840	1,540	1,225 0 0	300	400	389 10 6	4,925	4,400	3,165 3 9	750	750	554 7 6	750	1,175	878 1 3
Total ..	21,384	22,439	22,313 5 5	2,000	2,100	1,841 0 0	27,775	26,327	24,013 5 5	6,650	8,050	7,173 5 5	16,650	10,555	8,069 3 6

Name of Plantations.	Carriage of Crop.			New Works.			Repairs.			Firewood Plantations.			Contingencies.			Printing Charges.		
	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.
Office and General ..	5,000	1,000	349 2 0	..	..	..	500	500	52 6 2	..	..	..	2,000	1,400	1,428 5 2	..	100	36 4 0
Dodabetta	..	..	..	2,000	1,500	609 7 0	500	500	149 2 0	..	..	..	..	..	..	..	..	..
Naduvatam	..	..	..	235¾	235½	124 3 6	1,000	1,000	574 0 0	1 000	43½	43 8 0	..	..	..	..	..	..
Hooker	..	..	..	..	..	..	250	250	92 10 0	..	..	..	..	..	..	..	..	..
Wood	..	..	..	950	950	459 13 0	250	250	7 12 0	..	..	..	..	..	..	..	..	..
Total ..	5,000	1,000	349 2 0	3,185¾	2,685½	1,193 7 6	2,500	2,500	875 14 2	1,000	43½	43 8 0	2,000	1,400	1,428 5 2	..	100	36 4 0

Name of Plantations.	Travelling Allowance.			House Rent.			Peons' Clothing.			Unforeseen Charges.			Total.		
	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.
	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.
Office and General ..	1,500	2,000	1,890 0 10	520	520	517 8 0	100	100	50 0 0	1,000	1,000	1,222 7 3			
Dodabetta	..	..	..	..	..	..	..	..	..	..	..	774 1 1	24,132	20,443	21,442 11 3
Naduvatam	..	..	..	..	..	..	..	..	..	..	..	1,149 6 5			
Hooker	..	..	..	..	..	..	..	..	..	..	..	..	25,816	21,295	18,147 8 6
Wood	..	..	..	..	..	..	..	..	..	..	..	..	23,801¾	19,315	18,569 10 6
	..	..	..	..	..	..	..	..	..	..	..	..	8,750	10,302	8,100 5 11
	..	..	..	..	..	..	..	..	..	..	..	..	8,765	9,465	6,680 0 0
Total ..	1,500	2 000	1,890 0 10	520	520	517 8 0	100	100	50 0 0	1,000	1,000	3,145 14 9	91,264¾	80,820	72,940 4 2

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 4.

STATEMENT showing the Receipts and Expenditure of the Government Cinchona Plantations, Nílgiris, for 1885-86.

Classification.	Receipts. Budget Estimate.	Receipts. Up to the end of the year.	Classification.	Expenditure. A. Conservancy and Works. Budget Estimate.	A. Conservancy and Works. Up to the end of the year.	Expenditure. B. Establishment. Budget Estimate.	B. Establishment. Up to the end of the year.	Expenditure. Total. Budget Estimate.	Total. Up to the end of the year.
	RS.	RS. A. P.		RS	RS. A. P.	RS.	RS. A. P.	RS.	RS. A. P.
Bark sold locally	75,000	95,466 9 3	Office and General	2,500	3,547 6 11	17,943	17,895 4 4	20,443	21,442 11 3
Do. to Madras Medical Department ..	640	640 0 0	Dodabetta	17,757	14,609 8 6	3,538	3,538 0 0	21,295	18,147 8 6
Do. to Bombay Medical Department ..	..	..	Naduvatam	16,377	15,592 7 5	2,938	2,977 3 1	19,315	18,569 10 6
Sale of seed and plant	500	514 10 0	Hooker	9,702	7,500 5 11	600	600 0 0	10,302	8,100 5 11
Miscellaneous	150	75 0 4	Wood	7,925	5,455 0 0	1,540	1,225 0 0	9,465	6,680 0 0
Total ..	76,290	96,696 3 7	Total ..	54,261	46,704 12 9	26,559	26,235 7 5	80,820	72,940 4 2

No. 5.

STATEMENT showing the Variation in the Prices of Bark sold in Madras.

Name of Plantations.	Description of Bark.	1884-85. July 1884. Per 100 lb. Upset Price.	July 1884. Per 100 lb. Price realized.	August 1884. Per 100 lb. Upset Price.	August 1884. Per 100 lb. Price realized.	November 1884. Per 100 lb. Upset Price.	November 1884. Per 100 lb. Price realized.	February 1885. Per 100 lb. Upset Price.	February 1885. Per 100 lb. Price realized	March 1885. Per 100 lb. Upset Price.	March 1885. Per 100 lb. Price realized.	1885-86. September 1885. Per 100 lb. Upset Price.	September 1885. Per 100 lb. Price realized.	October 1885. Per 100 lb. Upset Price.	October 1885. Per 100 lb. Price realized.	November 1885. Per 100 lb. Upset Price.	November 1885. Per 100 lb. Price realized.	December 1885. Per 100 lb. Upset Price.	December 1885. Per 100 lb. Price realized.	January 1886. Per 100 lb. Upset Price.	January 1886. Per 100 lb. Price realized.	February 1886. Per 100 lb. Upset Price.	February 1886. Per 100 lb. Price realized.
		RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
Dodabetta ..	Natural Crown	104	104	104	unsold	100	94	..	..	100	100	90	89	..	..	90	146	130	108	..	..	..	..
	Mossed do.	..	..	95	95	..	..	100	126	100	127½	..	..	105	132	..	..	150	136	..	..	..	..
	Renewed do. .. .	182	172	182	152½	..	..	110	130	..	..	..	..	100	124	..	..	200	187	..	..	..	..
	Branch do.	..	..	..	..	..	..	40	41	..	..	..	..	..	..	25	48	..	..	..	..	..	..
	Root do.	..	..	150	unsold	..	..	..	..	..	..	..	..	..	..	110	155	..	..	..	..	..	..
Naduvatam ..	Natural do.	..	..	..	..	95	84	..	..	..	..	..	..	..	..	85	130	..	..	..	..	..	..
	Mossed do.	..	..	..	..	100	94	..	..	..	..	..	..	100	113	..	..	..	..	..	..	..	..
	Renewed do.	..	..	..	..	105	116	..	..	..	..	..	..	..	..	100	165	..	..	..	..	..	..
	Branch do.	..	..	..	..	40	43	..	..	..	..	..	..	..	..	48	79	..	..	..	..	..	..
	Root do.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Naduvatam and Pykara.	Natural Red	85	77	..	..	..	..	..	..	..	..	90	112	105	125	..	..	..	..	..	..	..	..
	Renewed do.	..	..	..	..	80	unsold	..	..	..	..	..	..	..	..	..	..	..	..	40	40½	..	..
	Root do.	..	..	..	..	30	do.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	61
																						30	37 / 38 / 40

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 6.

STATEMENT showing the Quantity of Seed, &c, sold to the Public during 1885-86.

Particulars.	Seed. LB.	Seed. OZ.	Plants.	Seedlings.
Cinchona Condaminea	21	3	...	...
Do. Magnifolia	32	11½	15,000	...
Do. Succirubra	22	8	...	...
Do. Pubescens	14	8	...	...
Do. Verdes	...		151	...
Do. Moradas	...		1,876	...
Do. Ledgeriana	...		800	...
Total ...	90	14½	17,827	...

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 7.

A.—STATEMENT showing the Total Yield of the Government Cinchona Plantations, Nílgiris, for 1885-86.

Name of Plantations.	Species of Produce.	BARK. Under-stripping and Mossing System. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Uprooting. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Coppicing. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Scraping. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Total Number of Trees decorticated.	Total Quantity of Green Bark collected.	Quantity when dry.	SEED.	PROPAGATION. Plants.	Seedlings.	Rooted cuttings.
				LB.			LB.			LB.			LB.		LB.	LB.	LB.	NO.	NO.	NO.	
Dodabetta.	Crown	9	44,865	98,013	..	..	..	..	1,894	12,440	..	5,505	8,491	52,264	118,944	53,140	..	..	..	..
Naduvatam.	Magnifolia ..	..	253	1,391	..	..	..	..	..	..	..	..	..	253	1,391	340	..	..	..	..
Hooker ..	Red	..	..	..	3	4,371	72,867	2	3,074	41,916	..	..	..	7,445	114,783	39,300	..	..	..	..
Wood ..	Crown	..	..	..	3	1,501	23,440	..	..	..	..	..	..	1,501	23,440	6,900	..	..	..	..
	Red	..	..	..	..	1,621	33,535	..	..	..	..	..	..	1,979	33,535	12,686	..	..	..	..
		..	..	..	..	358	3,850	..	..	..	..	..	..		3,850	1,000	..	..	..	..
	Add balance on 31st March 1885.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	113,366	..	..	..	..	
	Total ..	..	..	..	..	..	..	..	..	..	..	..	..	63,442	295,943	239,029	..	..	..	..

B.—STATEMENT showing the disposal of Bark and other Produce collected in the Government Cinchona Plantations, Nílgiris, during 1885-86.

Name of Plantation.	Name of Species.	BARK. Sent to Madras for Liquid Extract. Bales.	Quantity.	Sold in the Country. Bales.	Quantity.	Supplied to Medical Department, &c. Bales.	Quantity.	Total. Bales.	Quantity.	SEED. Sold to the Public.	Used for Nurseries.	Total.	PROPAGATED PLANTS AND SEEDLINGS. Plants. Sold to Public.	Permanently put up in the Plantations.	Seedlings. Sold to Public.	Transplanted.	Rooted Cuttings. Transplanted to Nurseries.	Remarks.
		NO.	LB.	NO.	LB.	NO.	LB.	NO.	LB.	LB.	LB.	LB.						
Dodabetta ..	Cinchona Bark ..	..	..	541	(a) 54,440	..	..	541	54,440	24½	½	24⅔	..	14,230	..	..	5,000	(a) Sample, &c., 340 lb.
Naduvatam ..	Do. ..	20	2,000	469	46,960	8	800	497	49,700	66⅔	..	66⅔	..	40,328	..	6,450	..	
Hooker	Do. ..	..	..	98	9,800	..	..	98	9,800	..	3	3	17,827	49,831	..	221,900	49,600	
Wood	Do. ..	..	..	..	..	..	..	..	..	..	4	4	..	2,818	..	42,000	..	
	Total ..	20	2,000	1,108	111,140	8	800	1,136	113,940	90⅔	7½	98⅛	17,827	(b) 107,207	..	270,350	54,600	(b) For varieties see statement No. 9.
	Add balance on 31st March 1886.	..	..	..	..	..	..	..	125,089	..	..	..	..	..	..	..	..	
		..	..	..	..	..	..	..	239,029	..	..	..	..	..	..	..	..	

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 8.

STATEMENT showing the approximate number of Plants in Permanent Plantations on 31st March 1886.

Species.	DODABETTA. Plants in last year.	Coppiced or uprooted.	Planted in this year.	Total.	NADUVATAM. Plants in last year.	Coppiced or uprooted.	Planted in this year.	Total.	HOOKER. Plants in last year.	Coppiced or uprooted.	Planted in this year.	Total.	WOOD. Plants in last year.	Coppiced or uprooted.	Planted in this year.	Total.	Grand Total.
C. Succirubra ..	..	..	..	..	84,617	7,445	..	77,172	5,069	1,501	..	3,568	55,523	358	..	55,165	135,905
C. Officinalis ..	585,694	1,894	..	583,800	85,495	..	7,936	93,431	336,217	..	10,591	346,808	136,968	1,621	..	135,347	1,159,386
C. Calisaya var. Ledger.	130	..	..	130	..	..	..	..	..	..	..	..	6,467	..	..	6,467	6,597
C. Javanica ..	..	..	..	..	..	..	50	50	..	..	..	..	..	..	..	..	50
C. Anglica ..	..	..	..	..	..	..	50	50	..	..	..	..	..	..	..	..	50
C. Micrantha ..	26	..	..	26	..	..	..	..	..	..	..	..	..	..	..	..	26
C. Pubescens ..	..	..	..	..	..	..	..	..	206,500	..	38,540	245,040	5,000	..	..	5,000	250,040
C. Pitayensis ..	43	..	..	43	..	..	..	..	..	..	..	..	..	..	..	..	43
C. Hybrids and others.	..	..	..	..	261,778	..	..	261,778	7,380	..	..	7,380	31,232	..	..	31,232	300,390
C. Carthagena ..	18	..	..	18	200	..	370	570	..	..	50	50	23	..	..	23	661
C. Santa Fé ..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	1
C. Magnifolia ..	47,576	..	14,230	61,806	..	..	31,817	31,817	..	..	600	600	..	..	2,700	2,700	96,923
C. Verdes ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36	36	36
C. Morada ..	..	..	..	..	..	..	50	50	..	..	50	50	..	..	72	72	172
C. Remijias ..	..	..	..	..	..	..	55	55	..	..	..	..	..	..	10	10	65
Total ..	633,487	1,894	14,230	645,823	432,091	7,445	40,328	464,974	555,166	1,501	49,831	603,496	235,213	1,979	2,818	236,052	1,950,345

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 9.

Comparative Statement showing the Quantity of Bark of all sorts in Store at the commencement of the year 1885-86, collected and disposed of during the year, and remaining in Store at its close.

Description of Bark.	1884-85.				
	Quantity in Store at the commencement of the year.	Collected during the year.	Total.	Disposed of during the year.	Balance at the close of the year.
1	2	3	4	5	6
Crown Bark	49,851	58,803	108,654	71,180	37,474
Red Bark	41,575	59,214	100,789	13,700	87,089
Cinchona Magnifolia or Pubescens	1,100	..	1,100	..	1,100
Total ..	92,526	118,017	210,543	84,880	125,663

Description of Bark.	1885-86.							
	Quantity in Store at the commencement of the year.	Collected during the year.	Total.	Disposed of during the year.	Balance at the close of the year.			
					Crop of 1883-84.	Crop of 1884-85.	Crop of 1885-86.	Total.
	7	8	9	10	11	12	13	14
Crown Bark	37,474	54,140	91,614	54,440	574	..	36,600	37,174
Red Bark	87,089	58,886	145,975	59,500	1,575	26,014	58,886	86,475
Cinchona Magnifolia or Pubescens.	1,100	340	1,440	..	1,100	..	340	1,440
Total ..	125,663	113,366	239,029	113,940	3,249	26,014	95,826	125,089

Ootacamund,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

Read—the following official memorandum from Colonel J. SHAW-STEWART, R.E., Secretary to Government, Public Works Department, to the Secretary to Government, Revenue Department, dated Ootacamund, 3rd August 1886, No. 471-D :—

In reply to memorandum from the Revenue Department, No. 229, dated 24th July 1886, the undersigned has the honor to state that, during the year 1885-86, a sum of Rs. 1,444 was spent in improvements to Cinchona Villa, Ootacamund, and that this is believed to have been the only outlay on cinchona buildings in that year.

Read—the following letter from M. A. LAWSON, Esq., Government Botanist and Director, Cinchona Plantations, Nílgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 13th August 1886, No. 51 :—

I have the honor to acknowledge the receipt of your official memorandum, No. 251, dated the 9th August 1886, and to inform you in reply that of the 125,663 lb. of cinchona bark shown as in store at the close of 1884-85, 96,114 lb. were harvested in that year, and the balance, or 29,549 lb., in former years, as detailed in the enclosed list.

Enclosures.

Statement showing the details of harvest to which the bark at close of 1884-85 belonged.

Description of Bark.	Crop of		Total.
	1883-84.	1884-85.	
	LB.	LB.	LB.
Crown bark	574	36,900	37,474
Red bark	27,875	59,214	87,089
Magnifolia	1,100	...	1,100
Total ...	29,549	96,114	1,25,663

Ootacamund,
13*th August* 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

Statement showing the particulars of Cinchona bark disposed of during 1885-86.

—	Product of 1883-84.	Value realised.		Product of 1884-85.	Value realised.	
		Gross.	Net.		Gross.	Net.
1	2	3	4	5	6	7
	LB.	RS. A. P.	RS. A. P.	LB.	RS. A. P.	RS. A. P.
Crown bark sold locally ..	25,500	23,279 0 0	21,903 14 2	70,100	63,995 0 0	60,214 3 4
Do. supplied to Madras Medical Department.	800	640 0 0	640 0 0	..	..	..
Total ..	26,300	23,919 0 0	22,543 14 2	70,100	63,995 0 0	60,214 3 4

—	Product of 1885-86.	Value realised.		Total.	Value realised.	
		Gross.	Net.		Gross.	Net.
	8	9	10	11	12	13
	LB.	RS. A. P.	RS. A. P.	LB.	RS. A. P.	RS. A. P.
Crown bark sold locally ..	15,540	14,187 0 0	13,348 7 9	(a) 111,140	1,01,461 0 0	95,466 9 3
Do. supplied to Madras Medical Department.	2,000	Experiment of liquid extract.	..	2,800	640 0 0	640 0 0
Total ..	17,540	14,187 0 0	13,348 7 9	113,940	1,02,101 0 0	96,106 9 3

(a) Includes 10 lb. of bark supplied to the Government Quinologist for the purpose of analyses.

Ootacamund,
23*rd August* 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

Order—dated 15th November 1886, No. 988, Revenue.

Miscellaneous.

His Excellency the Governor in Council proceeds to review the report on the administration of the Government Cinchona Plantations for the year 1885-86.

2. The season was, on the whole, very favorable, for though the rain was less in quantity than in the previous year, it was sufficient and well distributed, and there were, with a single exception, none of those violent storms which do so much harm alike to the young plants and to the soil on the slopes.

3. The work of planting up those portions of the estates which either have never been planted at all, or require renewing, was proceeded with satisfactorily. The number of new plants put down was 107,207, but as 12,819 of the old plants were

uprooted or coppiced, the net increase was only 94,388. The following statement affords particulars for the various estates :—

Estate.	Number			
	Planted in previous years.	Coppiced or uprooted.	Planted in 1885-86.	Total at end of 1885-86.
Dodabetta	633,487	1,894	14,230	645,823
Naduvatam	432,091	7,445	40,328	464,974
Hooker	555,166	1,501	49,831	603,496
Wood	235,213	1,979	2,818	236,052
Total ...	1,855,957	12,819	107,207	1,950,345

The recent planting on the Dodabetta estate was confined to the *Magnifolia* variety. At Naduvatam the new plants were chiefly *C. Officinalis* (7,936) and *C. Magnifolia* (31,817); on the Hooker estate, *C. Officinalis* (10,591) and *C. Pubescens* (38,540); and on the Wood estate, *C. Magnifolia* (2,700).

4. Plants of *C. Javanica*, *C. Anglica*, and *C. Morada*—50 of each variety—were planted on the Naduvatam estate in furtherance of the scheme for grouping together for the convenience of students plants of all the different varieties of cinchona.

5. The only remaining specimen of the *Santa Fé* variety is doing well, and 20 or 30 new plants have been raised from cuttings obtained from it. Fifty-five plants of *Remijia Purdieana*, which were raised from seed, sent from Kew, were planted out during the year. They are said to have made little or no progress, but they are perfectly healthy and the Director is confident that they will begin to grow during the warm season, which follows the rains. It is clear that the climate of Dodabetta does not suit the *Cinchona Carthagena*, but 420 plants of this variety, which were planted out on the Naduvatam and Hooker estates, are doing well.

6. Statement No. 8 shows, in detail, the number of plants of the different varieties of cinchona in the Government plantations. *C. Officinalis* heads the list, with 1,159,386 plants; then come *C. Pubescens*, with 250,040, *C. Succirubra*, with 135,905, and *C. Magnifolia*, with 96,923 : 300,390 plants are entered as "Hybrids and others."

7. The condition of the Wood estate still continues to be very unsatisfactory, owing, chiefly, to the damage done by sambur (*Rusa Aristotelis*). The Director states that in many parts the soil is poor and stony, that other portions are "exposed to devastating blasts," and that, in bad weather, the estate is difficult of access. He thinks it will be many years before it yields a reasonable return on the money which must be invested in order that it may be put into good order, and he accordingly recommends the abandonment of the greater part of it. The Government have not sufficient information before them to allow of their now passing orders on the question. They desire, therefore, to have a special report, giving all the information available regarding the capital outlay, cost of upkeep, value of yield, and estimated cost of repairs. The Director's attention is drawn to the fact that this plantation yielded, in 1885-86, 37,385 lb. of green bark at a cost of only Rs. 6,680, or Rs. 0-2-10 per lb., while, in the previous year, the yield was 30,252 lb. and the cost Rs. 5,473. It is observed, however, that no share of the general expenses of supervision, &c., is included in the cost.

8. *Financial.*—The following statement shows the receipts and charges during the year :—

—	Budget estimate.	Revised estimate.	Actuals.
	RS.	RS.	RS.
Receipts	75,250	76,290	1,02,690
Charges	91,265	80,300	78,935

The large excess of the actual receipts over the amount estimated was caused by the decision of Government to sell a quantity of Red barks in addition to the guaranteed quantity of Crown barks. It is observed that the Director does not include under the head of "Expenditure" the charges of Messrs. Oakes and Co. for advertising and selling bark. These items, however, form part of the legitimate expenditure of the department quite as much as the cost of carriage between Ootacamund or Naduvatam and Madras, and should, therefore, have been included in the charges. The Director has already been instructed* to, in future budgets, make due provision for this item.

* G.O., No. 348, Mis., dated 18th Jan. 1886.

In addition to the expenditure shown in the figures given above, a sum of Rs. 1,444 was expended by the Public Works Department on repairs to buildings attached to the Cinchona plantations. This outlay has been omitted from the account furnished by the Director as it was not met from his budget grant, but it has been included in the first of the statements appended to this order, giving the total receipts and expenditure since the plantations were started. A reference to this will show that the expenditure during 1885-86 was less than that of any year since 1878-79, while the receipts were higher than they have been since 1882-83. His Excellency the Governor in Council considers these results satisfactory.

9. *Crop.*—The amount of dry bark, obtained from the plantations during the year, was 113,366 lb., made up as follows :—

	LB.
Crown	65,826
Red	47,200
Magnifolia	340

The crop of the previous year was 118,017 lb. The amount in store, on the 31st March 1885, was 125,663 lb., and the quantity sold during the year was 113,940 lb : the stock on hand, at the close of the year, was, therefore, 125,089 lb.

10. The Director points out that the practice of sending the cattle kept for the purposes of supplying manure, to graze on distant hill-sides, instead of stall-feeding them, is most wasteful. The question, however, is purely a matter of the supply of a sufficiency of fodder, and the Director has himself indicated the solution of the difficulty in his remarks on the use of hay and silage. His experiments in this direction have been very fairly successful, and it should at no distant date be possible to store sufficient fodder to allow of the cattle being almost entirely stall-fed throughout the year. The attention of the Director of Revenue Settlement and Agriculture will, with reference to G.O, Revenue Department, No. 573, dated 9th July 1886, be called to the remarks upon silos, to be found in pages 5 to 6 of the report.

11. *Quinology.*—Turning now to the Quinologist's department, His Excellency the Governor in Council has much pleasure in congratulating Mr. Hooper upon the very interesting report submitted by him.

The quality of the bark sold during the year was, on the average, about the same as that disposed of in 1884-85. A table of the analyses of the various varieties of bark sent to the Colonial and Indian Exhibition shows that *C. Angustifolia* (mossed) was the richest in sulphate of quinine (7·53 per cent.), while *C. Robusta* was richest in total alkaloids (9·10 per cent.).

Mr. Hooper's experiments with bark obtained by the process of "shaving" show that that process produces excellent results in the case of trees of six years old, but that with twelve years old trees the increase in the yield of sulphate of quinine is comparatively trifling, while in the case of still older trees there is a diminution instead of an increase.

The experiments made regarding the effect of manure on cinchona trees go to prove that that important agent in all agricultural undertakings had in every case a most beneficial effect in increasing the total alkaloids. There was also a very considerable increase in the quantity of quinine in the case of two out of the three experiments made. These results are valuable and the Government desire that investigation in this direction should be continued with trees of other varieties, especially those naturally rich in quinine.

The analyses of barks taken from trees of various ages, given in paragraph 17 of Mr. Hooper's report, should be of use in assisting planters to determine the age at which it is most profitable to take the first crop. Since the value of these tables must depend upon the figures being representative of the average, as large a number of analyses as possible should be taken. It would be well, therefore, to give, in each year's report, tables based upon all the analyses accumulated up to date.

12. During the year, 595 lb. of *De Vrij's Cinchona liquida* were manufactured at the Medical Stores Depôt, and 340 lb. at Ootacamund. The total cost of the latter was only Rs. 211, and Mr. Hooper considers that manufacture on a larger scale would allow of a very considerable reduction in the cost of production. Further trials of this febrifuge are being made by medical officers, and if the promise of its success is fulfilled it is exceedingly probable that the whole of the bark of the Government plantations will soon be required for its manufacture.

13. In conclusion His Excellency the Governor in Council desires to express his satisfaction with the administration of the plantations during the year. It is gratifying to notice the very favorable terms in which Mr. Lawson speaks of the staff of subordinate officers attached to his department.

(True Extract.)

(Signed) J. F. PRICE,
Ag. Secretary to Government.

To the Government Botanist, &c.
,, the Director of Revenue Settlement and Agriculture.
,, the Board of Revenue.
,, the Public Works Department.
,, the Military Department.
,, the Surgeon-General with Government of Madras.
,, the Superintendent, Government Central Museum.
,, the Honorary Secretary, Agri-Horticultural Society.
,, the Chamber of Commerce.
,, the Editors' Table.

APPENDIX No. I.

STATEMENT showing the Capital and Revenue Account of the Government Cinchona Plantations, Nilgiris, from the commencement up to the Official Year 1885-86.

Year.	Charges.							
	Establishment including Superintendent's Salary.	Building and Plant.	Working Charges.		Total.	Total outlay to end of Year.	Simple interest at $4\frac{1}{2}$ per cent. on outlay to end of previous year *plus* half outlay during the year.	Total of Columns 6 and 8.
			Departmental Labor.	Convict Labor.				
1	2	3	4	5	6	7	8	9
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1860-61	..	..	4,821 15 0	..	4,821 15 0	4,821 15 0	108 7 11	4,930 6 11
1861-62	..	..	22,914 15 4	..	22,914 15 4	27,736 14 4	732 9 2	23,647 8 6
1862-63	..	..	48,390 0 0	..	48,390 0 0	76,126 14 4	2,336 15 0	50,726 15 0
1863-64	12,726 14 7	..	53,173 9 2	..	65,900 7 9	1,42,027 6 1	4,908 7 7	70,808 15 4
1864-65	24,444 8 11	..	59,666 12 0	..	84,111 4 11	2,26,138 11 0	8,283 11 9	92,395 0 8
1865-66	25,449 14 0	3,700 0 0	58,887 5 0	..	88,037 3 0	3,14,175 14 0	12,157 1 4	1,00,194 4 4
1866-67	23,803 9 10	3,025 0 0	52,632 0 0	48,666 10 8	1,28,127 4 6	4,42,303 2 6	17,020 12 6	1,45,148 1 0
1867-68	26,087 3 1	2,600 0 0	43,295 14 4	48,666 10 8	1,20,649 12 1	5,62,952 14 7	22,618 3 6	1,43,267 15 7
1868-69	25,671 7 10	2,030 0 0	30,636 1 0	48,666 10 8	1,07,004 3 6	6,69,957 2 1	27,740 7 8	1,34,744 11 2
1869-70	25,783 5 4	5,334 5 8	19,163 0 0	..	50,280 11 0	7,20,237 13 1	31,279 6 2	81,560 1 2
1870-71	23,730 5 4	300 0 0	6,143 0 0	..	30,173 5 4	7,50,411 2 5	33,089 9 8	63,262 15 0
1871-72	17,157 5 4	3,250 0 0	13,160 4 9	..	33,567 10 1	7,83,978 12 6	34,523 12 5	68,091 6 6
1872-73	12,724 0 0	550 0 0	16,441 0 0	..	2,9715 0 0	8,13,693 12 6	35,947 10 2	65,662 10 2
1873-74	12,574 0 0	2,758 0 0	15,091 14 0	..	30,423 14 0	8,44,117 10 6	37,300 12 2	67,724 10 2
1874-75	16,406 8 0	1,700 0 0	17,417 0 0	..	35,523 8 0	8,79,641 2 6	38,784 9 2	74,308 1 2
1875-76	17,234 0 0	1,550 0 0	27,423 0 0	..	46,207 0 0	9,25,848 2 6	40,623 8 3	86,830 8 3
1876-77	8,064 5 4	6,715 8 11	44,850 3 0	..	59,630 1 3	9,85,478 3 9	43,004 13 6	1,02,634 14 9
1877-78	8,061 5 4	5,468 13 8	56,241 10 3	..	69,771 13 3	10,55,250 1 0	45,916 6 3	1,15,688 3 6
1878-79	9,637 2 8	10,090 14 1	53,954 10 8	..	73,682 11 5	11,28,932 12 5	49,144 1 10	1,22,826 13 3
1879-80	10,092 0 0	6,537 4 9	63,095 0 3	..	79,724 5 0	12,08,657 1 5	52,595 12 4	1,32,320 1 4
1880-81	11,879 1 0	11,367 0 4	72,858 15 3	..	96,105 0 7	13,04,762 2 0	56,551 14 11	1,52,656 15 6
1881-82	16,375 14 6	6,278 4 9	90,921 2 1	..	1,13,575 5 4	14,18,337 7 4	61,269 11 11	1,74,845 1 3
1882-83	15,094 14 1	32,247 11 5	50,049 11 5	..	1,06,392 4 11	15,24,729 12 3	66,219 0 3	1,72,611 5 2
1883-84	20,083 7 5	35,348 14 5	69,128 8 6	..	1,24,560 14 4	16,49,290 10 7	71,415 7 4	1,95,976 5 8
1884-85	20,413 3 4	6,220 10 5	60,190 8 7	..	86,824 6 4	17,36,115 0 11	76,171 10 0	1,62,996 0 4
1885-86	26,235 7 5	3,513 5 8	50,629 13 10	..	80,378 10 11	18,16,493 11 10	79,933 11 2	1,60,312 6 1
Total ..	4,09,729 15 4	1,50,585 14 1	11,10,177 14 5	1,46,000 0 0	18,16,493 11 10	..	9,49,678 9 11	27,66,172 5 9

Statement showing the Capital and Revenue Account of the Government Cinchona Plantations, Nilgiris, &c.—*continued.*

Years.	Receipts.						Net Revenue (Difference between Columns 9 and 13).	
	Value of Bark supplied to Quinologist, or for experimental purposes.	Value of Bark sent to England, sold or supplied to other Governments or Departments.	Sale of Plants, Seeds, &c.	Total.	Surplus.	Deficit.		
	10	11	12	13	14	15		
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.		
1860-61	..	..	..	..	..	4,930 6 11		
1861-62	..	..	..	..	..	23,647 8 6		
1862-63	..	..	..	..	..	50,726 15 0		
1863-64	..	..	..	..	..	70,808 15 4		
1864-65	..	..	..	..	..	92,395 0 8		
1865-66	..	..	..	..	..	1,00,194 4 4		
1866-67	..	..	2,450 0 0	2,450 0 0	..	1,42,698 1 0		
1867-68	..	287 8 0	..	287 8 0	..	1,42,980 7 7		
1868-69	..	..	1,680 0 0	1,680 0 0	..	1,33,064 11 2		
1869-70	..	..	..	1,512 6 4	..	80,047 10 10		
1870-71	..	..	..	4,688 12 8	..	58,574 2 4		
1871-72	..	..	323 14 0	13,022 0 2	..	55,069 6 4		
1872-73	..	3,479 3 6	..	21,422 3 1	..	44,240 7 1		
1873-74	..	4,388 2 1	227 1 4	57,854 6 3	..	9,870 3 11		
1874-75	..	36,417 6 3	300 9 0	8,849 4 0	..	65,458 13 2		
1875-76	..	..	273 4 0	62,404 9 11	..	24,426 0 4		
1876-77	60,404 7 11	..	2,000 0 0	1,10,457 7 10	7,823 9 1	..		
1877-78	1,07,878 4 0	..	2,579 3 10	3,67,215 0 8	2,41,526 13 2	..		
1878-79	3,51,746 0 6	..	5,469 0 2	4,00,354 3 3	2,77,527 6 0	..		
1879-80	4,24,323 12 8	..	8,136 9 2	4,39,786 9 0	3,07,466 7 8	..		
1880-81	3,33,295 1 3	..	15,462 12 4	3,46,470 5 11	1,93,813 6 5	..		
1881-82	5,64,236 3 11	..	13,175 4 8	5,71,889 6 8	3,97,044 5 5	..		
1882-83	5,82,003 10 1	..	7,653 2 9	5,86,349 1 11	4,13,737 12 9	..		
1883-84	80,619 10 6	..	4,345 7 10	85,080 13 2	..	1,10,895 8 6		
1884-85	83,351 10 0	..	4,561 2 8	85,829 3 5	..	77,166 12 11		
1885-86	1,02,101 0 0	..	1,543 13 5	1,04,108 11 0	..	56,203 11 1		
	31,26,649 10 9	64,291 5 0	70,770 15 6	32,61,711 15 3	4,95,559 9 6	..		

APPENDIX II.

STATEMENT showing the receipts and charges on account of the Government Cinchona Plantations prepared in accordance with the instructions contained in the Secretary of State's despatch No. 3, dated 11th February 1886.

	Rs.	A.	P.		Rs.	A.	P.
To value of stock on 31st March 1885—				By value of stock on 31st March 1886—			
125,663 lb. as under—				1,25,089 lb. as under—			
29,549 lb. of 1883-84 at Annas 8, Pies 2·402 per lb.	15,144	2	9	32,49 lb. of 1883-84 at 8 2·402 ..	1,665	2	4
96,114 lb. of 1884-85 at Annas 11, Pies 6·646 per lb.	69,405	5	2	26,014 lb. of 1884-85 at 11 6·646 ..	18,785	1	5
				95,826 lb. of 1885-86 at 11 4·132 ..	67,942	10	1
	84,549	7	11		88,392	13	10
To establishment and working charges ..	80,378	10	11	By local sales of bark—			
				25,500 lb. of 1883-84 producing ..	23,279	0	0
To profit on sales of stock of 1883-84 ..	10,439	15	7	70,100 lb. of 1884-85 ,, ...	63,995	0	0
Do. do. 1884-85 ..	13,374	12	3	15,540 lb. of 1885-86 ,, ...	14,187	0	0
Do. do. 1885-86 ..	3,758	10	2		1,01,461	0	0
	27,573	6	0	By value of bark supplied to the Madras Medical Department, 800 lb. of 1883-84 ..	640	0	0
				By value of 2,000 lb. of bark of 1885-86 supplied to the Quinologist for preparation of liquid extract	14,18	0	8
				By sale-proceeds of seed and plant	514	10	0
				By miscellaneous receipts	75	0	4
					1,04,108	11	0
Total ..	1,92,501	8	10	Total ..	192,501	8	10

NOTE.—In 1885-86 the cost price of 1 lb. of bark is Annas 11—4·132, *i.e.*, Rs. 80,378-10-11 (expenditure) ÷ 113,366 lb. of bark, the crop of the year.

Exd W H French

160 Copies.

No 3142 w a/ 26th Nov. 1886

Communicated to the S.E. IV circle for information.

(sd) J.C.H.

Govt. of {1886} Madras.

REVENUE.

Issued

Recd. *Encl.*

G.O., 15th November 1886, No. 988.

No 3142 w a/ 26th Nov. 1886

NOVEMBER.

Government Cinchona Plantations.

Reviewing report on the — for the year 1885-86.

S.E. IV circle
Exr. P.W. Accts.

With order

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—letter from M. A. LAWSON, Esq., Government Botanist and Director of Cinchona Plantations, Nílgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 6th July 1886, No. 32.

ABSTRACT.—Forwarding the annual Administration Report on the Government Cinchona plantations for the year 1885-86.

Report of the Director of Government Cinchona Plantations, Nílgiris, for 1885-86.

CONTENTS.

I. Season and Rainfall.
(*a*) Dodabetta.
(*b*) Naduvatam.
(*c*) Pykara—
1. Hooker.
2. Wood.
II. Receipts and Expenditure.
(*a*) Receipts.
(*b*) Expenditure.
III. Permanent plantations.
(*a*) Dodabetta.
(*b*) Naduvatam.
(*c*) Pykara—
1. Hooker.
2. Wood.
IV. Up-keep.
V. Manure.
(*a*) Dodabetta.
(*b*) Naduvatam.
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VI. Haystack.
VII. Silos.
VIII. Nurseries.
IX. Crop.
X. Buildings—
1. New Works—
(*a*) Dodabetta.
(*b*) Naduvatam.
(*c*) Pykara.
2. Repairs.
XI. General Remarks.
XII. Labor.
XIII. Coppicing.
XIV. Grafting.
XV. Quinologist's Department.
XVI. Other matters.
XVII. Urgent need for a cheap febrifuge.
XVIII. Prospect of the Cinchona Market.

The number of statements accompanying the report are nine in number, the same as last year; but statements 3 and 4 of last year have been consolidated into statement No. 3 in the present report, in accordance with the desire expressed in paragraph 18 of G.O., 11th of September 1885, Mis. No. 1016, Revenue. Also the statement No. 5 of last year's report has been blended with No. 7 of this year's, and there have been added two new tables, viz., No. 8, specifying the varieties of the newly-planted trees, as ordered in paragraph 9 of the above quoted Government Order, and No. 9, giving a comparative statement showing the quantity of bark of all sorts in store at the commencement of 1885-86, and that which was collected and disposed of during that year, and the amount remaining in store at its close, according to the instructions issued by the Secretary of State for India, *vide* G.O., dated 3rd April 1886, No. 260, Revenue.

I. SEASON AND RAINFALL—*See Statement No.* 1, (*a*) *Dodabetta.*—The season for the past year was very favorable for carrying on all works connected with the upkeep of this estate. The total amount of rain registered during the year was 53·25 inches, spread over 154 days. This was about 8 inches less than what fell during the previous year, but it was spread over 154 days instead of 123 days, showing an

increase during the past year of 31 wet or cloudy days over last year. Very little rain fell during the early part of the year; indeed the spring showers failed almost entirely and it was not till the breaking of the monsoon, which began early (3rd of June), that the earth got at all wetted. The monsoon broke very gently, and continued with hardly any intermission for nearly six weeks, after which the weather continued very favorable till the end of the year. The wind was never furious, and with the exception of one storm in November, the rainfall was never excessive. On the 17th and 18th of this month, 4·30 inches of rain fell, but nothing more than a little wash on the steeper and more exposed parts of the plantation was experienced.

(*b*) *Naduvatam.*—The quantity of rain which was registered on this estate during the past year was 90·40 inches, spread over 132 days; this being very nearly the same amount of rain and the same number of wet days which occurred during the previous year. The season was good for all kinds of work, and the new plantings on the old plots which had been made during the last three years, are looking very well.

(*c*) *Pykara.*—This estate now comprises the two which were formerly known under the names of *Hooker* and *Wood.*

(1) *Hooker.*—The rainfall for the year on this plantation was 90·77 inches, spread over 134 days. Last year the amount of rain was 104·27 inches, spread over 136 days. With the exception of a storm in November, when 10·1 inches of rain fell in two days, the weather during the season was all that could be desired. On the occasion of this storm some damage was done, by reason of the great wash which took place on some of the slopes which were exposed to its full blast. Considerable damage was also done at the same time to several of the roads and paths on this estate, owing to drains and culverts becoming choked. The damage done, however, was not more than might have been expected from so violent a burst of wind and rain. The general appearance of the plantation is good and the younger plantings are much improved.

(2) *Wood.*—On this estate 74·18 inches fell during the year, and were spread over 129 days, the amount which was registered during the year before being 86·06 inches, which was spread over 139 days. Some damage was done to a portion of the coppice of 1884, which lies just below the water-course that runs from the Pykara river to the coffee estates in the plains, owing to the bursting of the bank of the water-course during one of the heavy storms which occurred during the autumn. The water-course has now been repaired and there is no further apprehension of the accident occurring again.

II. RECEIPTS AND EXPENDITURE—(*a*) *Receipts.*—The revised budget estimate of the receipts for the year was Rs. 76,290, the gross amount realized was Rs. 1,02,690-10-4; from this amount, however, there have to be deducted Messrs. Oakes and Co's. charges, which amount to Rs. 5,994-6-9, so that the net sum actually paid into the treasury was Rs. 96,696-3-7; from this again the sum of Rs. 72,940-4-2, being the amount of all charges connected with the maintenance of the department inclusive of the Quinologist's establishment, has to be deducted, so that the real earnings of Government amount to Rs. 23,755-15-5. The increase in receipts over the budget estimate is due to a larger amount of bark having been sold by auction during the year than was originally sanctioned by Government. The total amount sold in Madras being 111,140 lb.

(*b*) *Expenditure.*—The budget allotment for all charges connected with the department was originally Rs. 91,265. At the beginning of the year, however, a recalculation was made, when it was found that this sum was likely to be much in excess of the actual requirements of the department and consequently Rs. 10,000 were surrendered, leaving a revised allotment of Rs. 81,265. This, on submitting the regular estimate for the year, was reduced to Rs. 80,820. The actual charges for the year have been Rs. 72,940-4-2, a saving of Rs. 7,880 having been effected upon the regular estimate or Rs. 17,880 upon the original estimate. The cause of this difference between the estimated and the actual expenditure was due to the unsettled condition of the department during its late troubles and the discrepancy is not likely to occur again. In comparing the cost of working the estates during the past year with that of former

years it should be borne in mind that there have been several abnormal items of expenditure which in the aggregate amount to Rs. 7,719-8-10 as detailed below:—

	RS.	A.	P.
Charges of the Quinologist's Department	5,347	11	2
Hillier's defalcations ordered by Government to be written off (G.O., No. 952, of 22nd August 1885)	1,222	7	3
Charges for advertisement of Cinchona bark in England advised in Accountant-General's No. 80, of 7th June 1886.	1,149	6	5
Total ...	7,719	8	10

If this sum be deducted from Rs. 72,940-4-2, there is left Rs. 65,220-11-4 which will represent the normal cost of the department; and this sum, when all the renovations have been completed, will be still further decreased.

III. PERMANENT PLANTATIONS—(*a*) *Dodabetta.*—The condition of the estate is much the same as when I reported upon it last year. The coppice and inter-plantings are doing very well. All these were manured and will, I have no doubt, show the result of this liberality by an increase in the vigor of their growth. Statement No. 8 gives calculations of the number and the different sorts of plants growing at present upon this and the other estates.

(*b*) *Naduvatam.*—The general condition of this estate has materially improved during the last year. All the young plantations were highly cultivated and many of them freely manured, the result of which and the favorableness of the season is a fine vigorous growth of all the young plants. A considerable amount of the land, which in former years had been pitted for planting, but which had either never been planted at all or where the plants had died out, I planted up during the past year, chiefly with *Cinchona magnifolia.* Most of the remaining pitted land lies on slopes which are too steep for convenient cultivation or on poor soil or on places too much exposed, and all this land I propose to abandon.

The shelter belts which I have put up round many parts of the estate are doing well.

Santa Fè.—In my last year's report I mentioned that I had very nearly lost my only remaining specimen of cinchona *Santa Fè*, but that it had been saved by the skill of Mr. Jamieson; and I am happy in being able this year to report that not only is the old plant living, but that Mr. Jamieson has been able to raise between 20 and 30 new plants from it, most of which are now well rooted and will be ready for putting out in the plantations during the present season.

Four hundred and twenty plants of *C. Carthagena* raised in the Government Gardens, Ootacamund, from cuttings were planted out on the Naduvatam and Pykara estates, the lower elevation of which seems to suit them better than that of Dodabetta. As I mentioned in my last year's report those at Dodabetta are not doing satisfactorily.

The *Remijias* which I mentioned in my last report were planted out during the autumn on this estate; they have as yet made little or no progress, but they look perfectly healthy and will, I have no doubt, begin to grow during the warm season after the rain.

On the same plot of ground adjoining the land on which the *Remijias* have been planted, I have put out specimens of several species of cinchona, and this year I shall put out all the remaining species which we possess. These are not intended for commercial purposes, but by their being placed side by side and allowed to grow in a free and natural manner, it is hoped that they will enable those, who are interested in the subject, to examine the characters of the different kinds with greater readiness than can be done when they are scattered, not only over different parts of the same estate, but even over the different estates themselves as occurs at present.

(*c*) *Pykara*—(1) *Hooker.*—This plantation has greatly improved during the past year. The young plantings have been highly cultivated, the whole of the ground which they occupy has been deeply pitted and the greater part of it manured. The remaining portion of the estate requiring renovation is but small, when compared with that which has already been carried out during the last two years, and I shall, I hope, be able to complete it during the present season. The sambur are still troublesome on some parts of this plantation, but as barbed wire has been ordered from England and its arrival is now being daily expected, I hope that I shall be able before long to put up such a fence as will effectually keep out these intruders.

(c) *Pykara*—(2) *Wood.*—This plantation is hardly in a more satisfactory condition than it was when I reported upon it last year. Some of the succirubra coppice has done well and some of the planting close to the lines and the head overseer's dwelling, where the sambur dare not come, are also doing well, but in all the other parts of the plantation which lie at a distance from human habitations the young plants are destroyed as much as ever and no hope of any improvement can be expected until a substantial fence has been erected. Some underwood consisting chiefly of strobalanthis which was encroaching upon the plantations, I ordered to be cut during the winter as that tended to harbour the sambur, and I regret to say that towards the end of the dry season this brushwood caught fire during a high wind and that the fire spread through a portion of the shola which surrounds the Pykara falls and has seriously injured, if not killed, many very fine trees.

In a former report I recommended to Government that they should give up the cultivation of the Wood plantation altogether, but Government at that time thought my experience was of too short a duration to admit of their rashly adopting the suggestion, and I was desired to do my best to put it into repair; but my experience of the past three years makes me doubt if it will ever be very profitable to Government to retain it. The soil in many parts is poor and stony, other parts again are exposed to devastating blasts, and it is in bad weather difficult of access. At the best it will cost a large sum of money to repair the plantation, and it will be many years before it yields any reasonable returns to the money invested. If the greater part of the Wood plantation was abandoned and the few acres of land round the head overseer's bungalow and the drying sheds only were kept, the Pykara head overseer would be able to pay more attention to the Hooker plantation, which is now becoming a very valuable property. This would save nearly the whole of the expense of the upkeep of the Wood plantation or about Rs. 8,000 per annum.

IV. UPKEEP.—The maintenance of the buildings, roads, drains, bridges, &c., with one exception has been well attended to on the Dodabetta, Naduvatam and Hooker estates. The exception is the Mucroochy bridge which spans the river crossing the road which leads from Naduvatum to Hooker.

V. MANURE—(a) *Dodabetta.*—I have been able during the past year to obtain abundance of manure for this estate from purchases made in the town of Ootacamund, and on this account I have transferred the greater number of the Dodabetta cattle to Naduvatam.

Cattle.—Many of the draught cattle belonging to the Dodabetta estate are very old and several of them died during the past year. These I propose replenishing by young ones which may be obtained at a reasonable price during the fairs which are held yearly at Murally at Mysore. The great want on estates and indeed in all farms of this country is the want of a sufficiency of manure. Almost every estate has cattle upon it, which may be regarded purely as manure-making machines, but these machines are worked at very great waste, because owing to the cost of storing up fodder they are obliged to be sent out during the day on the hill sides to graze where all the manure which they make during the day is lost; but if a sufficiency of fodder could be stored in stacks or silos, these cattle might be altogether stall fed, with the result that there would be an immense increase of manure coming in to their owner. At the same time, they would become much fatter and therefore saleable for the purposes of the butcher. During the past year very considerable economy has been effected by using more largely than had hitherto been done the Government carts and bullocks for the transportation of bark to Mettupálayam and for the carriage of supplies to the estates.

(b) *Naduvatam.*—Owing to the transfer of the Dodabetta cattle and the purchase of the few additional animals, this estate has been much better off for manure during the past year than it had ever been before.

(c) *Pykara.*—Both the plantations of Hooker and Wood continue to be well supplied.

VI. HAYSTACK.—During last autumn, I made a large haystack of grass obtained from the hills on the Government estate at Naduvatam at a cost of Rs. 109; the grass was cut by sickles and was well dried before being stacked. The hay turned out very fair and sufficed to keep in good condition all the cattle on the estate during the five dry months of January, February, March, April and May. I made another smaller stack

on the Dodabetta estate consisting entirely of *Briza maxima* commonly known as *Jacob's tears.* This grass completely covered many of the plots and often grew to the height of nearly two feet. The hay was not very well got on account of the weather being wet at the time it was harvested. Nevertheless it proved very nutritious and horses and cattle took to it readily. Dr. Shaw, Inspecting Veterinary Surgeon, Madras Army, to whom I sent some of these hays for experimentation, has been good enough to send me the following very interesting report on their quality, and the suggestions which he makes with regard to the other kinds of grasses, which may be used as hay, will be attended to during the present year:—

Dr. Shaw's report.

Adverting to my letter, No. 45-86, Ootacamund, 10th April 1886, I have the honor to report on the two samples of hay forwarded with your letter, No. 38, of 10th April.

2. The Naduvatam sample (name unknown) did not prove a success. It was in the first place coarse and wiry in its nature, and I should say over-dried, being crisp and crumbly when rubbed, and fracturing into small particles. It had little or no aroma and was here and there mouldy as if it had been exposed to dry on damp ground. The horses I tried this sample with did not evince any keenness to eat it, and two out of five absolutely refused it for some days, after which it was only sparingly partaken of.

3. No 2 sample (*Briza maxima*) or Jacob's tears was better saved, had an aroma of hay and, I think, if it had been cut a little earlier, or when more succulent, it would have afforded a better sample. Four horses partook of this sample, and kept in fine working condition on it. The fifth (a horse I had in training) being at the time on an allowance of oat hay, occasionally nibbled at it only.

4. As regards the feeding properties of the two samples, I do not think sample No. 1 is good enough to persevere with as a horse fodder; at the same time, I think it far preferable to the bad grass which is brought in during the dry months and which forms the bulk of stable supplies up here from November to May.

5. The question of stable fodder as an industry on these hills is one, I think, capable of great extension and would prove a remunerative investment to the agricultural classes if they could be encouraged to grow them. The cultivation of oats by General Morgan and Mr. J. Sullivan has proved that three crops can be produced from one tillage. The first and second crops can be cut as green fodder and the third allowed to go to ear and made into hay. I am using such now with the greatest success. The soil and climate of Ootacamund are particularly favorable for the cultivation of oats, the stalks of which attain a great size; and I have seen it growing with the ear just budding though seven feet high. I have no experience with the "Bromus" or South American oat grass, but General Morgan tells me it has taken favorably to the soil and has proved a valuable fodder.

VII. SILOS.—In my last year's report I stated that I had made silos on the Dodabetta and Wood estates for the preservation of fodder during the wet weather. The silo on the Wood estate was never utilized, as a heavy storm flooded it before it could be properly roofed; but on the Dodabetta estate I made six silos, all of which have been successful, and I will describe their structure and the mode of filling them.

No. 1 was a brick-built pit lined with cement the internal measurement of which was as follows:—

Fifteen feet long by ten feet broad by twelve feet deep; the walls from top to bottom had a slope given to them inwards of six inches.

This pit was roofed with zinc so that no rain could by any possibility get into it. The cost of building the pit was Rs. 206. I began filling this pit on the 14th of October and finished on the 19th idem. The plants used for filling the silo were very numerous; indeed, almost everything was put in which it was known the cattle would eat in a green state such as *maize, cholum, ragi, lucerne, Spanish needle, Polygonum nepolense, Jacob's tears,* grass from the lawns of Government gardens, hill grass, swamp grass, &c., &c. All these with the exception of lawn grass, which had been cut by mowing machines, were passed through chaff-cutters and cut into pieces not bigger than an inch in length. As this was cut, the mixture was thrown into the silo and when a stratum of about two feet in thickness had been put in, it was trodden well down. This was repeated until the silo was completely filled when mats were placed on the top, then planks of blue gum and then two feet and-a-half of moderately dry earth. In the course of a week the earth sank exactly one foot, after which there was no further subsidence. During the subsidence the earth cracked around the edges of the pit and it was necessary to dig up the earth about these cracks with a

fork and then tread it down again, to prevent the access of air to the fodder below. It was opened on the of April in the presence of His Excellency the Commander-in-Chief, Brigadier-General Elles, C.B., Adjutant-General, Dr. Shaw and others who had experience in the making of silos. The fodder on being uncovered had lost its bright green color, owing to the partial decomposition of its chlorophyl, but with this exception it differed little in texture and appearance to what it had presented when first put in. On weighing a portion of it each cubic foot was found to contain a little over forty-seven pounds. The smell was exceedingly offensive, especially the upper layer of about half an inch in thickness. His Excellency the Commander-in-Chief, Brigadier-General Elles and Dr. Shaw pronounced it to be good, and on its being given to some of the bullocks it was at once greedily eaten by them, and since that time they have been fed upon nothing else, and they are said by Mr. T. Narrainasawmi Nayudu, the Assistant Superintendent, and Mr. McDonald, the Sub-overseer, to be generally in better condition than they have ever known them to be before at this time of the year and this in spite of their having done, at least, double the usual amount of work. Besides this silo which was both costly in its construction and in its filling, I made five others of a much cheaper description and which turned out ensilage, every bit as good as that from the big pit. These consisted of pits six feet cube dug in the earth in a place where there was no fear of springs or stagnant water. The fodder was put into them as it came from the field, that is without being cut up, and after it had been well trodden down mats were placed on the surface, and on the top of these two or three feet of earth, which was heaped up and sloped like a grave, and over this mats, thatch or plates of galvanized iron were placed to shoot off the rain. The ensilage in these pits shrank more or less, according to the particular plants which composed it. In one instance the earth sank as much as three and-a-half feet, and it was necessary, during the first few days, to fill up the cracks which were made in the soil by this shrinking. In one of these pits I stored up *Jacob's tears* separately, in a second *Spanish needle*, in a third *Polygonum nepolense*, and in the two others a mixture of plants. The fodder, which was turned out from all of them, proved, on experiment, to be everything that could be desired, although during the time that they were being filled, it was raining hard and the stuff saturated with moisture.

I shall in the future make no more costly silos, but use these earth-pits, only making them of larger dimensions, and covering them with a roof of thatch. The estates, hills and sholas of the Nílgiris and the Wynaad must possess an enormous amount of nutritious fodders which grow readily in the wet season, but which cannot be preserved for future use except by means of silos, and I look forward to the time when knife-weeding upon a cinchona or coffee estate will be regarded no longer as a disagreeable necessity.

VIII. Nurseries.—The demand for seed is still decreasing and that for plants and seedlings also. Most of the applications which I received during the year were from the planters in Ceylon.

IX. Crop.—The total amount of dry bark produced by the estates during the past year was 113,366 lb. In addition to this, there remained on the 31st March 1885, 125,663 lb., making a total of 239,029 of all sorts. Of this quantity, 113,940 lb. were disposed of during the year, so that the balance in stock at the end of March last was 125,089 lb. (See statement No. 9).

X. Buildings—(1) *New Works*—(*a*) *Dodabetta.*—New quarters for the clerk at Dodabetta which were sanctioned in G.O., No. 439, of 15th April 1885, were constructed at a cost of Rs. 609-7-0. The cattle-shed which was also sanctioned in same Government Order was not built, as it was found that the modification of the old one would suffice for the present.

(*b*) *Naduvatam.*—Instead of carrying out the construction of the bandymen's lines near the Government chuttrum, as was sanctioned in G.O., No. 439, of 15th April 1885, Revenue, I transformed some old cooly lines into a cattle-shed at a cost of Rs. 124-3-6 and transferred the bandymen to some old unoccupied lines adjoining the shed. This being more economical and at the same time quite as convenient as the proposed scheme, the cost of the bandymen's lines being estimated at Rs. 235-12-0.

(*c*) *Pykara.*—Brick cooly lines, roofed with iron for 20 families, were erected on the Wood plantation of this estate at a cost of Rs. 459-13-0 against an estimate of Rs. 650.

2. *Repairs.*—All the necessary repairs to the permanent buildings were satisfactorily carried out at a cost of Rs. 875-14-2.

	Rs.	A.	P.
Office and General	52	6	2
Dodabetta	149	2	0
Naduvatam	574	0	0
Pykara	100	6	0
Total ...	875	14	2

XI. General Remarks—*Staff of Subordinate Officers.*—The changes made in the staff of the subordinate officers during the previous year has proved of great advantage, and I feel it only right to say that the improvement of the estates and the economy which has been effected is due to the diligence which all have evinced and to the hearty co-operation which they have rendered me in carrying out the different works.

The service books of all the subordinates have been duly filled up in accordance with the instruction contained in G.O., No. 2957, dated 26th December 1877, *vide* also G.O., No. 396, dated 22nd February 1886, Public.

XII. Labor.—The same system is in force which I stated in my last year's report I had inaugurated in the year 1884-85 and is working satisfactorily.

XIII. Coppicing.—Several questions having been addressed to me during the year relating to coppicing, I have carefully attended to this matter and so far as my experience goes, I believe (1) that it is immaterial at what time of the year the trees are cut down; (2) that they should be cut quite close to the ground, for then the shoots have a better chance of making roots for themselves, and so becoming independent trees, than if they are allowed to spring from a point at a distance from the ground; shoots springing immediately from the ground are much less liable to be blown down by the winds; (3) the number of shoots which should be allowed permanently to remain will depend entirely on local circumstances. If the shoots are far apart, then two or even three may be allowed to grow, but if the shoots are close then one will, as a rule, be sufficient. No fixed rule, however, as to the number which should be left can be given; but if it is borne in mind that wood and bark are the result of the activities of the leaves, it will be readily understood that those trees which have the most leaves exposed to the light will produce the thickest stems and the largest amount of bark. The planter should therefore see that his coppice is not so thick as to prevent each individual shoot having its fair share of light.

XIV. Grafting.—The nearly allied species of cinchona seem to lend themselves, rather readily, to being grafted; but the labor entailed in grafting is so great that I do not believe it will ever pay to do this on a large scale.

XV. Quinologist's Department.—Mr. Hooper in accordance with the instructions issued in G.O., No. 550, of 12th May 1885, Revenue, went down to Madras to start the manufacture of 1,000 lb. of *De Vrij's Cinchona Liquida.* Of this amount, however, 500 lb. only were made and for some reason or other the manufacture of the febrifuge did not turn out quite satisfactory. So I asked Government that Mr. Hooper might be allowed to make the remaining 500 lb. in Ootacamund. Government accorded their sanction to my proposal, and Mr. Hooper has just completed his task. The febrifuge which he has turned out seems to be in every respect excellent, and will, I hope, prove a cheaper and at the same time as efficacious a drug as any that has as yet been made. Should the febrifuge prove acceptable to the poorer classes of natives, not only will all the bark which can be raised on the Government estates be required to meet the demand, but a very great deal more.

XVI. Other matters—connected with the chemical aspect of quinology, I leave Mr. Hooper to speak for himself, whose very interesting report I enclose.

XVII. Urgent need for a cheap febrifuge.—I am indebted to Surgeon-General G. Bidie for the following statistics. The population of the Madras Presidency was 29,000,000 at the last census. The total number of deaths during the last year from all causes was 615,449 as detailed below.

Death from undescribed causes.	Fever.	Cholera.	Small-pox.	Bowel complaint.	Injury.	Total.
260,960	218,786	58,109	34,726	31,209	11,659	615,449

From these figures it will be seen that nearly one-third of the total number of deaths are due to malarious fever. A proportion which must be regarded as too high when it is considered that we have a specific medicine for this fatal disease.

XVIII. Prospects of the cinchona market.—So long as the cinchona alkaloids are produced chiefly for the European and North American consumption (non-fever stricken countries) the supply will always be in excess of the demand and the present low prices will continue to exist; but if a market can be found for the alkaloids in the malarious tracts of the tropics, this state of things would be reversed and the price of bark would go up.

Dr. Bidie tells me that he believes every one in the Presidency would be benefited by taking quinine in more or less quantities during certain seasons of the year, and he does not think that forty grains per head would be a high figure at which to place the yearly requirements of the country. If this be correct then close upon 2,000,000 pounds of bark averaging $6\frac{1}{2}$ per cent. of total alkaloids will be required for consumption in this Presidency alone.

Enclosures.

Letter from D. HOOPER, Esq., F.C.S., Government Quinologist, Ootacamund, to M. A. LAWSON, Esq., Government Botanist and Director of Cinchona Plantations, Nilgiris, dated Ootacamund, 6th July 1886.

I have the honor to present the following report on the analytical work conducted in the Government laboratory for the year ending March 31, 1886.

2. The report includes a valuation of the cinchona bark sold by auction in Madras during the year, and a complete analyses of all the different species of bark which were sent to the Colonial and Indian Exhibition in London. Some experiments in renewing bark and manuring trees are recorded; and tables are given showing the increase of alkaloids by growth, and the deterioration of alkaloids by age and other causes. The liquid cinchona which was partly made last year has been completed. Most of the analytical work has been done for Government, but several barks have been received from private parties, and I have to thank some of these gentlemen for information respecting samples they sent, as this enabled me to summarise results which are of general usefulness to planters.

3. There have been six sales of Government bark in Madras during the year, viz. September, October, November, December 1885, January and February 1886. Samples of the various kinds have been valued, which has given a reserve price to the auctioneers, but the competition being so brisk at each sale these prices were exceeded.

I append a statement showing the qualities of barks disposed of, their value in sulphate quinine, and the value of the unit in pence.

September 1885.

Description of Bark.	Sulphate quinine.	Value of unit.
	Per cent.	*d.*
Dodabetta Natural Crown	4·18	4·06
Naduvatam Root „	4·46	4·90
October 1885.		
Dodabetta Renewed Crown	4·06	5·85
„ Mossed „	4·70	5·48
Naduvatam „ „	4·05	5·37
„ Root „	4·46	5·38

Description of Bark.	Sulphate quinine.	Value of unit.
	Per cent.	*d.*
November 1885.		
Dodabetta Natural Crown	4·18	6·70
„ Branch „	1·17	7·90
„ Root „	4·33	6 93
Naduvatam Natural „	3·52	7·10
„ Renewed „	4·22	7·52
„ Branch „	2·16	7·06
December 1885.		
Dodabetta Natural Crown	3·10	6·69
„ Mossed „	4·73	5·55
„ Renewed „	6·56	5·49
January 1886.		
Naduvatam Natural Red	1·56	4·97
February 1886.		
Naduvatam Renewed Red	2·54	4·62
„ Root „	1·38	5·25

4. These barks are, on the average, of the same value as those sold last year, but with regard to the value of the unit it will be observed that the market has experienced a great fluctuation during the year. In September the unit being 4·48*d*, October 5·52*d*, November 7·20*d*, December 5·91*d*, January and February 4·94*d*.

Bark sent to Indian and Colonial Exhibition.

—		Quinine.	Cinchonidine.	Quinidine.	Cinchonine.	Amorphous Alkaloids.	Total.	Sulphate Quinine.
C. Officinalis. ..	Natural	2·77	1·57	·16	·39	·50	5·39	3·72
	Mossed	3·40	1·50	·20	·45	·62	6·17	4·57
	Renewed ..	4·20	·85	·22	·65	·70	6·63	5·66
C. Angustifolia.	Natural	3·97	1·32	·12	·12	·87	6·40	5·34
	Mossed	5·60	1·41	·33	·04	·97	8·35	7·53
	Renewed ..	4·91	·89	·38	·19	1·14	7·51	6·60
C. Succirubra ..	Natural	1·91	2·11	..	1·14	·88	6·04	2·57
	Mossed	1·69	2·03	..	1·68	·98	6·38	2·27
	Renewed ..	1·84	1·48	..	1·25	·71	5·28	2·47
	Branch	1·38	2·28	..	1·59	1·16	6·41	1·85
	Root	1·24	·77	·41	1·43	1·27	5·12	1·66
	Renewed shavings	2·30	1·16	..	2·06	1·45	6·97	3·09
C. Robusta ..	Natural	1·43	2·08	..	1·58	·31	5·40	1·92
	Mossed	1·92	3·16	..	·77	·35	6·20	2·58
	Renewed ..	4·40	2·54	..	·51	1·65	9·10	5·92
	Branch	1·64	2·71	..	1·17	·50	6·02	2·20
Micrantha ..	Natural	..	..	..	1·92	·40	2·32	..
	Renewed ..	tr	2·45	..	1·12	1·02	4·59	..
	Branch	..	..	..	1·60	·45	2·05	..
Calisaya	Natural	1·21	2·32	..	2·13	·29	5·95	1·62
	Branch	·59	·73	..	1·93	·48	3·73	·79
Anglica	Natural	·81	·88	·29	1·49	·44	3·91	1·09
	Branch	tr	tr	·25	2·04	·36	2·65	..
Ledgeriana	Natural	5·49	1·33	..	·81	·88	8·52	7·38
	Branch	2·21	·49	..	1·07	·50	4·27	2·97
Javanica	Natural	..	..	1·32	2·64	·48	4·44	..
	Branch	..	..	1·43	1·49	·45	3·37	..
Humboltiana ..	Natural	2·24	1·55	tr	·49	·90	5·18	3·01
	Renewed ..	1·28	·64	..	·43	1·07	3·43	1·72
Pitayenses ..	Natural	2·34	·56	1·10	1·93	·39	6·32	3·14
	Mossed	3·81	·95	·63	1·91	·37	7·67	5·12
	Renewed ..	2·50	·52	·78	2·33	·55	6·68	3·36
Pahudana ..	Natural	·04	·10	..	·39	·43	·96	·05
	Renewed ..	·51	1·19	..	·28	·87	2·85	·68

5. *Renewal by shaving.*—Shaving cinchona trees has been for some years a method of harvesting bark which in some districts works better than that of stripping and mossing. The cellular and richer portion of the bark is removed in this way and the librous portion is left. The bark thus treated thickens again and the shavings taken from it are found to be richer

still in alkaloids. The analyses of some succirubra shavings taken from trees grown in the Ouchterlony Valley will show to what an extent trees may be improved by this method. The renewals had been taken after intervals of twelve months; the experiment, therefore, has lasted over three years.

——	Quinine.	Other Alkaloids.	Total.
Original bark	1·35	5·87	7·22
Once renewed	2·46	4·22	6·68
Twice renewed	3·60	3·99	7·59
Thrice renewed	3·87	3·71	7·58

6. The increase in quinine during the first and second year by renewing is most satisfactory; the increase is not so prominent in the third year, but the bark is good, and indicates that shaving for at least four years might be permitted. The trees upon which these experiments were made were six years old when the original bark was taken. If at this comparatively early age they are not injured by shaving, and renew their bark so well, it is not desirable to wait for the trees to become more matured.

7. When trees are allowed to grow until they are over 12 years of age and then shaved, the renewal sets in more slowly, and the resulting bark does not compare more favorably with the original bark than if the trees operated upon had been half that age. This may be instanced by quoting some more analyses. Last December some interesting samples were sent by the Manager of the Glenrock Company, South-East Wynaad, consisting of some natural and renewed shavings of succirubra taken from trees of 6 and 12 years of age.

The following is the analysis of four of the samples:—

	Sulphate quinine.	Total.
Red bark, 6 years, natural	1·34	5·00
„ „ renewed, 2 years	2·54	6·95
„ „ 12 years, natural	2·43	7·41
„ „ renewed, 2 years	2·71	7·01

8. Thus it is seen that by renewing a 6-year-old tree 90 per cent. more of sulphate quinine is obtained, and by working on a 12-year-old tree, only an increase of 12 per cent. takes place during the same period of two years. With regard to the total alkaloids, it should also be noticed that the shaving has made an increase of 39 per cent. in the younger tree, while the older bark has somewhat deteriorated. One of the most important features in these results is that the renewed bark from the 6-year-old tree is superior to the natural bark from trees of twice that age.

9. I have had very few opportunities of observing the effect of shaving on pure Ledger barks, containing little, if any, alkaloid besides quinine, but it appears that hybrid Ledgers of the broad-leaved variety holding cinchonine, are capable of great improvement by the shaving process as the following renewals of 11 months will show compared with the natural bark of 6-year-old trees:—

	Sulphate quinine.	Total.
Ledger bark, narrow leaf, natural 1885	4·09	5·97
„ „ renewed, 1886	6·62	8·49
„ broad leaf, natural, 1885	2·90	6·61
„ „ renewed, 1886	5·19	8·51

10. The sulphate of quinine in the narrow-leaved Ledger had increased 62 per cent., and in the broad-leaved Ledger 79 per cent., the greater increase in the latter variety is due to the presence of other alkaloids which appear to develop quinine in the growth of the tree.

11. Shaving old trees has certainly not had a beneficial effect from some trials made on Government estates. Both red and crown trees from 16 to 21 years of age cannot well bear the removal of the bark in this way and the renewal takes place slowly and is impoverished instead of being enriched. A crown bark was taken from Dodabetta aged 20 and shaved. The shavings gave 3·66 sulphate of quinine; after six months some renewed shavings were taken and found to yield only 1·85 per cent. sulphate of quinine, the bark then was commencing to decay and the tree has since died.

12. *Experiment in manuring Cinchonas.*—The effect of manuring cinchona trees in order to stimulate their growth and produce a greater yield of alkaloid has been tried recently at Naduvatam. The first experiment was made upon a succirubra of 7 years growth. Cattle manure which had been previously kept for some time in closed pits was applied some six

months before the bark was taken for analysis. A sample of bark from a tree in the same plot, but which had not been manured, was collected at the same time for comparison. Two samples of magnifolia bark were taken from trees which had been manured in a similar manner to the succirubra; the first was 17 years, the second 20 years old, and samples from unmanured trees were taken for comparative analysis at the same time.

13. The results of the examination are tabulated below:—

——	Quinine.	Cinchonidine.	Cinchonine.	Amorphous alkaloids.	Total.
Succirubra manured	2·29	3·78	1·94	·52	8·53
„ unmanured	1·51	4·13	2·03	·32	7·99
Magnifolia 1 manured	3·78	3·90	·28	·82	8·78
„ „ unmanured	3·13	4·39	·56	·39	8·47
„ 2 manured	2·59	3·49	1·21	·53	7·82
„ „ unmanured	2·62	2·67	·67	·56	6·52

14. It will be seen that the manuring has had the effect of increasing, in each instance, the amount of total alkaloids in the bark; and the quinine, the most important feature, has received a gain of 52 per cent. in the succirubra, and 20 per cent. in the first magnifolia. In the older magnifolia bark the quinine remains about the same in quantity, and if no other influences were at work, it might be inferred that older trees are not so sensitive to the action of manure as younger and vigorous-growing trees which have not reached maturity. The food of such plants as cinchonas which yield alkaloid in large quantity must of necessity contain some nitrogenous element, and as this must be taken from the ground it is only fitting that a manure of this kind which contains some constituents which are similar in their nature to alkaloids should be supplied periodically to soils. Regarding the question from a commercial aspect the higher value of the bark would cover the expense of the manure and the cost of its application to the land. The succirubra bark mentioned in the first experiment, if the market price of the unit of quinine were 4*d*, would realize eight pence per pound, whereas the bark of the manured tree would be more than one shilling per pound. I believe the effect of manuring would be more apparent in Crown and Ledger barks with large proportions of quinine in the total alkaloids; in such cases, the extra outlay on manurial agents, compared with the additional value of the bark, would be much more remunerative.

15. *Increase of Alkaloids with the age of trees.*—A question of much importance in cinchona cultivation is the age to which trees should grow before the bark can be profitably taken. To settle such an inquiry, a large number of analyses of barks taken from trees of all ages should be available, and in the following tables I have made a selection of both Ledger and red barks and have arranged them according to age. Some of the figures are average of two or more analyses, and as the two lists represent some forty samples, I hope it will help to throw some light on the subject.

16. The first list comprises natural barks of the narrow-leaved variety of *C. Ledgeriana*, and with one exception, they all come from the Wynaad district.

17. The second list is by taking from my laboratory journal all those red barks whose ages have been determined, whether they come from the Government Plantations at Naduvatam or from private estates in Wynaad, Coorg or Travancore.

Ledger Barks.

——	Quinine.	Cinchonidine.	Other alkaloids.	Total.
20 months	1·68	·66	2·77	5·11
2 years	2·18	·65	2·69	5·52
3 „	3·28	·55	2·90	6·82
3½ „	4·73	·93	1·81	7·46
4½ „	4·97	·79	1·78	7·54
5 „	4·57	1·02	1·46	7·05
5 „	5·09	1·06	0·55	6·70
5½ „	7·54	·31	1·15	9·00
6 „	6·52	·76	·88	8·16
6½ „	5·97	1·18	1·00	8·15
8 „	7·59	1·16	1·45	10·20
20 „	5·58	1·24	·85	7·67

Red Barks.

—	Quinine.	Cinchonidine.	Cinchonine.	Amorphous alkaloids.	Total.
2 Years	·55	·72	1·20	1·22	3·69
3 „	·85	1·75	1·67	·99	5·26
3½ „	1·08	1·65	1·15	·64	4·52
4 „	1·13	2·03	1·79	·58	5·53
4½ „	1·02	2·64	1·78	·50	5·94
5 „	1·23	2·72	2·36	·52	6·83
5½ „	1·32	2·15	3·11	·63	7·21
6½ „	1·31	3·22	2·18	·71	7·42
7 „	1·70	2·69	2·28	·93	7·60
7½ „	1·78	3·18	1·97	·53	7·46
12 „	1·81	2 62	2·08	·90	7·41
16 „	1·08	·94	1·04	1·57	4·63
20 „	·78	1·13	1·37	·97	4·25

18. In the Ledger barks it will be noticed that there is a steady rise of quinine up to the age of between five and six years, after which there is no apparent increase.

19. In the second table of red barks, the same fact is shown that the bark has attained its maximum content of alkaloids when between 5 and 6 years of age. The quinine increases up to 12 years, but, as pointed out before, the renewed bark of the younger trees would much exceed the slightly increased value of these older barks. The trees of 16 and 20 years show a marked deterioration in alkaloids, although the bark is often in large thick fibrous pieces similar to the drug that was originally exported from the South American forests.

20. *Effect of Mould on Bark.*—It has been stated that bark loses much of its virtue when allowed to get mouldy or when kept in a damp atmosphere. I was asked more than a year ago to analyse some mouldy bark to obtain its value, but not knowing the composition of the fresh bark the result would not have been very useful. I have, therefore, made an experiment which shows that little if any effect is produced by prolonged contact with mould. A sample of powdered bark of known composition was taken in December 1884 and kept in an open dish on the floor of a dark damp room, a fungus (Penicillium) set in in a fortnight, and spread itself over the surface of the powder, and slightly increased its weight. The bark was constantly stirred so that fresh bark from beneath might be influenced by the fungus. It was mixed occasionally for 10 months and as the mycelium had by then penetrated to every particle of the powder it was analysed in October 1885, with the following results:—

	Original bark.	Mouldy bark.
Quinine	2·82	2·80
Cinchonidine	1·22	1·25
Quinidine	·18	·11
Cinchonine	·90	·87
Amorphous	·31	·45
Total...	5·43	5·48

21. It is thus manifest that the analyses, being almost identical, moulded barks of 10 months are not necessarily deteriorated.

22. *Liquid Extract of Cinchona.*—At the suggestion of Dr. Cornish last year, I prepared a sample of liquid cinchona which was reported upon most favorably by several medical officers in the Presidency and called forth an order from Government for the preparation of 1,000 lb. (G.O., No. 550, 12th May 1885). In August last, 1,000 lb. of bark were supplied to the Medical Stores in Madras, and resulted in the manufacture of 595 lb. of liquid extract (*vide* demi-official letter from Principal Medical Storekeeper, dated 10th September 1885). As a loss must have taken place in this outturn I received orders to produce another batch immediately under my supervision in Ootacamund (G.O., No. 55, 25th January 1886). 500 lb. of bark was powdered by the Medical Store Department, the maceration with the necessary chemicals and percolation was conducted in my laboratory, and the evaporation was made in ordinary chatties in an adjoining out-house: 340 lb. of liquid cinchona of the prescribed strength, 40 grains to the ounce, were thus made in two months at a cost of Rs. 211 as detailed below:—

	Rs.	A.	P.
Grinding 500 lb. of bark	4	0	0
Glycerine	52	0	0
Acid	9	0	0
Fuel	24	0	0
Labor	20	0	0
Chatties	3	8	0
500 lb. of branch succirubra bark estimated at 3 annas per lb. (taken the current value of the unit of quinine)	94	0	0
Rent	5	0	0
Total ...	211	8	0

Allowing for the high cost of buying the chemicals in Madras instead of from London direct, and taking into account the special expenses of this experiment, I consider that if made on a large scale and continuously, it should not cost more than Rs. 7 or Rs. 7-8-0 for an amount of liquid extract containing 1 lb. of solid febrifuge.

APPENDIX.

ANALYSIS of Cattle manure stored in covered pits on the Government estates.

Water	7·9
* Organic matter	61·1
† Ash soluble in acid	12·7
Siliceous residue	18·3
Total ...	100·0

ANALYSIS of sample of Peat from the Dodabetta Plantation and used for burning at the drying sheds.

Organic matter	86·8
Siliceous ash	13·2
Total ...	100·0

No. 1.

STATEMENT showing the Rainfall at the several Government Cinchona Plantations, Nilgiris, during the Official Year 1885-86.

Months.	Dodabetta.				Naduvatam.			
	For 1884-85.		For 1885-86.		For 1884-85.		For 1885-86.	
	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.
1	2	3	4	5	6	7	8	9
April 1885.	3·59	7	1·71	6	3·37	6	1·68	6
May „	5·05	12	2·14	13	3·85	8	4·26	8
June „	5·20	14	9·44	27	7·34	18	30·30	29
July „	1·87	12	4·72	19	19·38	28	17·79	26
August „	6·39	20	3·80	18	30·03	27	10·54	13
September „	3·28	10	6·32	13	9·23	24	3·81	14
October „	20·09	19	10·97	27	14·80	15	11·38	21
November „	11·68	19	8·15	12	2·58	8	5·80	6
December „	3·85	8	5·20	12	1·54	5	4·72	8
January 1886.	..	..	0·19	2	..	..	..	..
February „	..	..	...	..	..	..	..	..
March „	0·20	2	0·61	5	0·84	2	0·12	1
Total ..	61·20	123	53·25	154	92·96	141	90·40	132

* Containing ammonia .. .. 2·15
† Containing Tricalcic phosphate .. .. 3·50

No. 1.—(*Continued*).

Months.	Hooker.		Wood.			
	For 1884-85.		For 1885-86.	For 1884-85.		For 1885-86.
	Rainfall.	Number of Wet Days.	Rainfall.	Rainfall.	Number of Wet Days.	Rainfall.	Number of Wet Days.
1	10	11	12	13	14	15	16	17
April 1885.	2·85	8	3·48	8	2·79	8	2·87	5
May ,, ...	5·76	10	3·44	11	8·59	11	2·70	11
June ,, ...	5·62	15	26·87	29	5·37	14	21·91	29
July ,, ...	15·63	24	16·73	27	11·42	25	10·76	24
August ,, ...	33·67	24	10·56	10	19·80	24	6·17	11
September ,, ...	10·16	22	3·14	13	6·61	22	3·53	9
October ,, ...	19·63	15	11·30	20	19·72	16	11·28	21
November ,, ...	5·07	13	12·14	7	6·43	14	11·38	9
December ,, ...	4·68	3	3·04	8	4·05	3	3·51	9
January 1885.	..	..	..	..	..	..	..	..
February ,, ...	1·20	.. 2	0·07	.. 1	1·28	.. 2	0·07	.. 1
March ,, ...								
Total ..	104·27	136	90·77	134	86·06	139	74·18	129

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 2.

STATEMENT showing the Receipts on account of the Government Cinchona Plantations, Nilgiris, for 1885-86.

Particulars.	Sanctioned Budget Estimate for 1885-86.	Revised Budget Estimate for 1885-86.	Total Amount.	Charges paid by Messrs. Oakes and Co., Madras.	Net Amount.
	Rs.	Rs.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Value of bark sent Home	..	..	..	..	..
Do. sold locally	75,000	75,000	1,01,461 0 0	5,994 6 9	95,466 9 3
Do. to Bombay Medical Department	..	..	..	..	..
Do. to Madras Medical Department	..	..	..	..	..
Sale-proceeds of seed and plant	.. 200	640	640 0 0	..	640 0 0
Miscellaneous	50	500	514 10 0	..	514 10 0
		150	75 0 4	..	75 0 4
Total ..	75,250	76,290	1,02,690 10 4	5,994 6 9	96,696 3 7

No. 3.—Statement showing the Expenditure in detail on account of the Government Cinchona Plantations, Nilgiris, for 1885-86.

Name of Plantations.	Salaries.			Nurseries.			Working Charges.			Manure.			Collection of Crop.		
	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.
Office and General ..	13,512	13,823	13,973 2 4	..	..	..	..	..	..	..	..	..	..	..	..
Dodabetta	3,516	3,538	3,538 0 0	500	500	440 3 0	8,600	6,100	6,284 9 11	1,800	3,300	2,877 0 7	8,900	5,857	4,249 2 0
Naduvatam	2,916	2,938	2,977 3 1	700	700	588 15 0	8,250	8,275	8,420 2 10	3,200	3,200	3,425 6 10	6,500	2,923	2,416 3 3
Hooker	600	600	600 0 0	500	500	422 3 6	6,000	7,552	6,143 4 11	900	800	316 6 6	500	600	525 13 0
Wood	840	1,540	1,225 0 0	300	400	389 10 6	4,925	4,400	3,165 3 9	750	750	554 7 6	750	1,175	878 1 3
Total ..	21,384	22,439	22,313 5 5	2,000	2,100	1,841 0 0	27,775	26,327	24,013 5 5	6,650	8,050	7,173 5 5	16,650	10,555	8,069 3 6

Name of Plantations.	Carriage of Crop.			New Works.			Repairs.			Firewood Plantations.			Contingencies.			Printing Charges.		
	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.
Office and General ..	5,000	1,000	349 2 0	..	..	..	500	500	52 6 2	..	..	..	2,000	1,400	1,428 5 2	..	100	36 4 0
Dodabetta	..	..	..	2,000	1,500	609 7 0	500	500	149 2 0	..	..	..	..	..	..	..	..	..
Naduvatam	..	..	..	235¾	235½	124 3 6	1,000	1,000	574 0 0	1 000	43½	43 8 0	..	..	..	..	..	..
Hooker	..	..	..	..	..	..	250	250	92 10 0	..	..	..	..	..	..	..	..	..
Wood	..	..	..	950	950	459 13 0	250	250	7 12 0	..	..	..	..	..	..	..	..	..
Total ..	5,000	1,000	349 2 0	3,185¾	2,685½	1,193 7 6	2,500	2,500	875 14 2	1,000	43½	43 8 0	2,000	1,400	1,428 5 2	..	100	36 4 0

Name of Plantations.	Travelling Allowance.			House Rent.			Peons' Clothing.			Unforeseen Charges.			Total.		
	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.	Budget Estimate.	Revised Estimate.	Actuals.
	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.	Rs.	Rs.	Rs. A. P.
Office and General ..	1,500	2,000	1,890 0 10	520	520	517 8 0	100	100	50 0 0	1,000	1,000	1,222 7 3 774 1 1 1,149 6 5	24,132	20,443	21,442 11 3
Dodabetta	..	..	..	..	..	..	..	..	..	..	..	..	25,816	21,295	18,147 8 6
Naduvatam	..	..	..	..	..	..	..	..	..	..	..	..	23,801¾	19,315	18,569 10 6
Hooker	..	..	..	..	..	..	..	..	..	..	..	..	8,750	10,302	8,100 5 11
Wood	..	..	..	..	..	..	..	..	..	..	..	..	8,765	9,465	6,680 0 0
Total ..	1,500	2,000	1,890 0 10	520	520	517 8 0	100	100	50 0 0	1,000	1,000	3,145 14 9	91,264¾	80,820	72,940 4 2

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 4.

STATEMENT showing the Receipts and Expenditure of the Government Cinchona Plantations, Nílgiris, for 1885-86.

Classification.	Receipts. Budget Estimate.	Receipts. Up to the end of the year.	Classification.	Expenditure. A. Conservancy and Works. Budget Estimate.	A. Conservancy and Works. Up to the end of the year.	Expenditure. B. Establishment. Budget Estimate.	B. Establishment. Up to the end of the year.	Expenditure. Total. Budget Estimate.	Total. Up to the end of the year.
	RS.	RS. A. P.		RS	RS. A. P.	RS.	RS. A. P.	RS.	RS. A. P.
Bark sold locally	75,000	95,466 9 3	Office and General	2,500	3,547 6 11	17,943	17,895 4 4	20,443	21,442 11 3
Do. to Madras Medical Department ..	640	640 0 0	Dodabetta	17,757	14,609 8 6	3,538	3,538 0 0	21,295	18,147 8 6
Do. to Bombay Medical Department ..	..	..	Naduvatam	16,377	15,592 7 5	2,938	2,977 3 1	19,315	18,569 10 6
Sale of seed and plant	500	514 10 0	Hooker	9,702	7,500 5 11	600	600 0 0	10,302	8,100 5 11
Miscellaneous	150	75 0 4	Wood	7,925	5,455 0 0	1,540	1,225 0 0	9,465	6,680 0 0
Total ..	76,290	96,696 3 7	Total ..	54,261	46,704 12 9	26,559	26,235 7 5	80,820	72,940 4 2

No. 5.

STATEMENT showing the Variation in the Prices of Bark sold in Madras.

Name of Plantations.	Description of Bark.	1884-85. July 1884. Per 100 lb. Upset Price.	July 1884. Per 100 lb. Price realized.	August 1884. Per 100 lb. Upset Price.	August 1884. Per 100 lb. Price realized.	November 1884. Per 100 lb. Upset Price.	November 1884. Per 100 lb. Price realized.	February 1885. Per 100 lb. Upset Price.	February 1885. Per 100 lb. Price realized.	March 1885. Per 100 lb. Upset Price.	March 1885. Per 100 lb. Price realized.	1885-86. September 1885. Per 100 lb. Upset Price.	September 1885. Per 100 lb. Price realized.	October 1885. Per 100 lb. Upset Price.	October 1885. Per 100 lb. Price realized.	November 1885. Per 100 lb. Upset Price.	November 1885. Per 100 lb. Price realized.	December 1885. Per 100 lb. Upset Price.	December 1885. Per 100 lb. Price realized.	January 1886. Per 100 lb. Upset Price.	January 1886. Per 100 lb. Price realized.	February 1886. Per 100 lb. Upset Price.	February 1886. Per 100 lb. Price realized.
		RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
Dodabetta ..	Natural Crown	104	104	104	unsold	100	94	..	..	100	100	90	89	..	..	90	146	130	108	..	..	..	..
	Mossed do.	..	..	95	95	..	..	100	126	100	127½	..	..	105	132	..	..	150	136	..	..	..	..
	Renewed do. .. .	182	172	182	152½	..	..	110	130	..	..	..	..	100	124	..	..	200	187	..	..	..	..
	Branch do.	..	..	..	..	..	..	40	41	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Root do.	..	..	150	unsold	..	..	..	..	..	..	..	..	..	..	25	48	..	..	..	..	..	..
Naduvatam ..	Natural do.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	110	155	..	..	..	..	..	..
	Mossed do.	..	..	..	..	95	84	..	..	..	..	..	..	..	..	85	130	..	..	..	..	..	..
	Renewed do.	..	..	..	..	100	94	..	..	..	..	..	..	100	113	..	..	..	..	..	..	..	..
	Branch do.	..	..	..	..	105	116	..	..	..	..	..	..	..	..	100	165	..	..	..	..	..	..
	Root do.	..	..	..	..	40	43	..	..	..	..	..	..	..	..	48	79	..	..	..	..	..	..
Naduvatam and Pykara.	Natural Red	85	77	..	..	..	..	..	..	..	..	90	112	105	125	..	..	..	..	..	..	..	..
	Renewed do.	..	..	..	..	80	unsold	..	..	..	..	..	..	..	..	..	..	..	..	40	40½	..	..
	Root do.	..	..	..	..	30	do.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	50	61
																						30	37 / 38 / 40

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 6.

STATEMENT showing the Quantity of Seed, &c., sold to the Public during 1885-86.

Particulars.	Seed. LB.	Seed. OZ.	Plants.	Seedlings.
Cinchona Condamenia	21	3	....	...
Do. Magnifolia	32	11½	15,000	...
Do. Succirubra	22	8	...	...
Do. Pubescens	14	8	...	...
Do. Verdes	...		151	...
Do. Moradas	...		1,876	...
Do. Ledgeriana	...		800	...
Total ...	90	14½	17,827	...

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 7.

A.—STATEMENT showing the Total Yield of the Government Cinchona Plantations, Nílgiris, for 1885-86.

Name of Plantations.	Species of Produce.	BARK. Under-stripping and Mossing System. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Uprooting. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Coppicing. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Scraping. No. of Plots.	No. of Trees decorticated.	Outturn of Green Bark.	Total Number of Trees decorticated.	Total Quantity of Green Bark collected.	Quantity when dry.	SEED.	PROPAGATION. Plants.	Seedlings.	Rooted cuttings.
				LB.			LB.			LB.			LB.		LB.	LB.			NO.	NO.	NO.
Dodabetta.	Crown	9	44,865	98,013	..	..	..	..	1,894	12,440	..	5,505	8,491	52,264	118,944	53,140	..	..	..	..
Naduvatam.	Magnifolia ..	..	253	1,391	..	..	..	..	..	..	..	..	..	253	1,391	340	..	..	..	..
Hooker ..	Red	..	..	..	3	4,371	72,867	2	3,074	41,916	..	..	..	7,445	114,783	39,300	..	..	..	..
Wood ..	Crown	..	..	..	3	1,501	23,440	..	..	..	..	..	..	1,501	23,440	6,900	..	..	..	..
	Red	..	..	..	..	1,621	33,535	..	..	..	..	..	..	1,979	33,535	12,686	..	..	..	..
		..	..	..	..	358	3,850	..	..	..	..	..	..		3,850	1,000	..	..	..	..
	Add balance on 31st March 1885.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	113,366	..	..	..	..	..
	Total ..	..	..	..	..	..	..	..	..	..	..	..	..	63,442	295,943	239,029	..	..	..	..

B.—STATEMENT showing the disposal of Bark and other Produce collected in the Government Cinchona Plantations, Nílgiris, during 1885-86.

Name of Plantation.	Name of Species.	BARK. Sent to Madras for Liquid Extract. Bales.	Quantity.	Sold in the Country. Bales.	Quantity.	Supplied to Medical Department, &c. Bales.	Quantity.	Total. Bales.	Quantity.	SEED. Sold to the Public.	Used for Nurseries.	Total.	PROPAGATED PLANTS AND SEEDLINGS. Plants. Sold to Public.	Permanently put up in the Plantations.	Seedlings. Sold to Public.	Transplanted.	Rooted Cuttings. Transplanted to Nurseries.	Remarks.
		NO.	LB.	NO.	LB.	NO.	LB.	NO.	LB.	LB.	LB.	LB.						
Dodabetta ..	Cinchona Bark ..	..	..	541	(a) 54,440	..	..	541	54,440	24½	½	24⅔	..	14,230	..	..	5,000	(a) Sample, &c., 340 lb.
Naduvatam ..	Do. ..	20	2,000	469	46,900	8	800	497	49,700	66$\frac{25}{32}$	..	66$\frac{25}{32}$	..	40,328	..	6,450	..	
Hooker	Do. ..	..	..	98	9,800	..	..	98	9,800	..	3	3	17,827	49,831	..	221,900	49,600	
Wood	Do. ..	..	..	..	..	..	..	..	..	..	4	4	..	2,818	..	42,000	..	
	Total ..	20	2,000	1,108	111,140	8	800	1,136	113,940	90$\frac{29}{32}$	7½	98$\frac{3}{32}$	17,827	(b) 107,207	..	270,350	54,600	(b) For varieties see statement No. 9.
	Add balance on 31st March 1886.	..	..	..	..	..	..	..	125,089	..	..	..	..	..	..	..	..	
		..	..	..	..	..	..	..	239,029	..	..	..	..	..	..	..	..	

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 8.

STATEMENT showing the approximate number of Plants in Permanent Plantations on 31st March 1886.

Species.	DODABETTA. Plants in last year.	Coppiced or up-rooted.	Planted in this year.	Total.	NADUVATAM. Plants in last year.	Coppiced or up-rooted.	Planted in this year.	Total.	HOOKER. Plants in last year.	Coppiced or up-rooted.	Planted in this year.	Total.	WOOD. Plants in last year.	Coppiced or up-rooted.	Planted in this year.	Total.	Grand Total.
C. Succirubra ..	..	..	..	..	84,617	7,445	..	77,172	5,069	1,501	..	3,568	55,523	358	..	55,165	135,905
C. Officinalis ..	585,694	1,894	..	583,800	85,495	..	7,936	93,431	336,217	..	10,591	346,808	136,968	1,621	..	135,347	1,159,386
C. Calisaya var. Ledger.	130	..	..	130	..	..	..	..	..	..	..	..	6,467	..	..	6,467	6,597
C. Javanica ..	..	..	..	..	..	..	50	50	..	..	..	..	..	..	..	..	50
C. Anglica ..	..	..	..	..	..	..	50	50	..	..	..	..	..	..	..	..	50
C. Micrantha ..	26	..	..	26	..	..	..	..	..	..	..	..	..	..	..	..	26
C. Pubescens ..	..	..	..	..	..	..	..	..	206,500	..	38,540	245,040	5,000	..	..	5,000	250,040
C. Pitayensis ..	43	..	..	43	..	..	..	..	..	..	..	..	..	..	..	..	43
C. Hybrids and others.	..	..	..	..	261,778	..	..	261,778	7,380	..	..	7,380	31,232	..	..	31,232	300,390
C. Carthagena ..	18	..	..	18	200	..	370	570	..	..	50	50	23	..	..	23	661
C. Santa Fé ..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	1
C. Magnifolia ..	47,576	..	14,230	61,806	..	..	31,817	31,817	..	..	600	600	..	..	2,700	2,700	96,923
C. Verdes ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	36	36	36
C. Morada ..	..	..	..	..	..	..	50	50	..	..	50	50	..	..	72	72	172
C. Remijias ..	..	..	..	..	..	..	55	55	..	..	..	..	..	..	10	10	65
Total ..	633,487	1,894	14,230	645,823	432,091	7,445	40,328	464,974	555,166	1,501	49,831	603,496	235,213	1,979	2,818	236,052	1,950,345

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

No. 9.

COMPARATIVE Statement showing the Quantity of Bark of all sorts in Store at the commencement of the year 1885-86, collected and disposed of during the year, and remaining in Store at its close.

Description of Bark.	1884-85. Quantity in Store at the commencement of the year.	Collected during the year.	Total.	Disposed of during the year.	Balance at the close of the year.
1	2	3	4	5	6
Crown Bark	49,851	58,803	108,654	71,180	37,474
Red Bark	41,575	59,214	100,789	13,700	87,089
Cinchona Magnifolia or Pubescens	1,100	..	1,100	..	1,100
Total ..	92,526	118,017	210,543	84,880	125,663

Description of Bark.	1885-86. Quantity in Store at the commencement of the year.	Collected during the year.	Total.	Disposed of during the year.	Balance at the close of the year. Crop of 1883-84.	Crop of 1884-85.	Crop of 1885-86.	Total.
	7	8	9	10	11	12	13	14
Crown Bark	37,474	54,140	91,614	54,440	574	..	36,600	37,174
Red Bark	87,089	58,886	145,975	59,500	1,575	26,014	58,886	86,475
Cinchona Magnifolia or Pubescens.	1,100	340	1,440	..	1,100	..	340	1,440
Total ..	125,663	113,366	239,029	113,940	3,249	26,014	95,826	125,089

OOTACAMUND,
6th July 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

READ—the following official memorandum from Colonel J. SHAW-STEWART, R.E., Secretary to Government, Public Works Department, to the Secretary to Government, Revenue Department, dated Ootacamund, 3rd August 1886, No. 471-D :—

In reply to memorandum from the Revenue Department, No. 229, dated 24th July 1886, the undersigned has the honor to state that, during the year 1885-86, a sum of Rs. 1,444 was spent in improvements to Cinchona Villa, Ootacamund, and that this is believed to have been the only outlay on cinchona buildings in that year.

READ—the following letter from M. A. LAWSON, Esq., Government Botanist and Director, Cinchona Plantations, Nilgiris, to the Secretary to Government, Revenue Department, dated Ootacamund, 13th August 1886, No. 51 :—

I have the honor to acknowledge the receipt of your official memorandum, No. 251, dated the 9th August 1886, and to inform you in reply that of the 125,663 lb. of cinchona bark shown as in store at the close of 1884-85, 96,114 lb. were harvested in that year, and the balance, or 29,549 lb., in former years, as detailed in the enclosed list.

ENCLOSURES.

STATEMENT showing the details of harvest to which the bark at close of 1884-85 belonged.

Description of Bark.	Crop of 1883-84.	Crop of 1884-85.	Total.
	LB.	LB.	LB.
Crown bark	574	36,900	37,474
Red bark	27,875	59,214	87,089
Magnifolia	1,100	...	1,100
Total ...	29,549	96,114	1,25,663

OOTACAMUND,
13*th August* 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

STATEMENT showing the particulars of Cinchona bark disposed of during 1885-86.

—	Product of 1883-84.	Value realised. Gross.	Value realised. Net.	Product of 1884-85.	Value realised. Gross.	Value realised. Net.
1	2	3	4	5	6	7
	LB.	RS. A. P.	RS. A. P.	LB.	RS. A. P.	RS. A. P.
Crown bark sold locally ..	25,500	23,279 0 0	21,903 14 2	70,100	63,995 0 0	60,214 3 4
Do. supplied to Madras Medical Department.	800	640 0 0	640 0 0	..	..	..
Total ..	26,300	23,919 0 0	22,543 14 2	70,100	63,995 0 0	60,214 3 4

—	Product of 1885-86.	Value realised. Gross.	Value realised. Net.	Total.	Value realised. Gross.	Value realised. Net.
	8	9	10	11	12	13
	LB.	RS. A. P.	RS. A. P.	LB.	RS. A. P.	RS. A. P.
Crown bark sold locally ..	15,540	14,187 0 0	13,348 7 9	(a) 111,140	1,01,461 0 0	95,466 9 3
Do. supplied to Madras Medical Department.	2,000	Experiment of liquid extract.	..	2,800	640 0 0	640 0 0
Total ..	17,540	14,187 0 0	13,348 7 9	113,940	1,02,101 0 0	96,106 9 3

(a) Includes 10 lb. of bark supplied to the Government Quinologist for the purpose of analyses.

OOTACAMUND,
23*rd August* 1886.

(Signed) M. A. LAWSON,
Government Botanist and Director.

ORDER—dated 15th November 1886, No. 988, Revenue.

Miscellaneous.

His Excellency the Governor in Council proceeds to review the report on the administration of the Government Cinchona Plantations for the year 1885-86.

2. The season was, on the whole, very favorable, for though the rain was less in quantity than in the previous year, it was sufficient and well distributed, and there were, with a single exception, none of those violent storms which do so much harm alike to the young plants and to the soil on the slopes.

3. The work of planting up those portions of the estates which either have never been planted at all, or require renewing, was proceeded with satisfactorily. The number of new plants put down was 107,207, but as 12,819 of the old plants were

uprooted or coppiced, the net increase was only 94,388. The following statement affords particulars for the various estates :—

Estate.	Number			
	Planted in previous years.	Coppiced or uprooted.	Planted in 1885-86.	Total at end of 1885-86.
Dodabetta	633,487	1,894	14,230	645,823
Naduvatam	432,091	7,445	40,328	464,974
Hooker	555,166	1,501	49,831	603,496
Wood	235,213	1,979	2,818	236,052
Total ...	1,855,957	12,819	107,207	1,950,345

The recent planting on the Dodabetta estate was confined to the *Magnifolia* variety. At Naduvatam the new plants were chiefly *C. Officinalis* (7,936) and *C. Magnifolia* (31,817); on the Hooker estate, *C. Officinalis* (10,591) and *C. Pubescens* (38,540); and on the Wood estate, *C. Magnifolia* (2,700).

4. Plants of *C. Javanica*, *C. Anglica*, and *C. Morada*—50 of each variety—were planted on the Naduvatam estate in furtherance of the scheme for grouping together for the convenience of students plants of all the different varieties of cinchona.

5. The only remaining specimen of the *Santa Fé* variety is doing well, and 20 or 30 new plants have been raised from cuttings obtained from it. Fifty-five plants of *Remijia Purdieana*, which were raised from seed, sent from Kew, were planted out during the year. They are said to have made little or no progress, but they are perfectly healthy and the Director is confident that they will begin to grow during the warm season, which follows the rains. It is clear that the climate of Dodabetta does not suit the *Cinchona Carthagena*, but 420 plants of this variety, which were planted out on the Naduvatam and Hooker estates, are doing well.

6. Statement No. 8 shows, in detail, the number of plants of the different varieties of cinchona in the Government plantations. *C. Officinalis* heads the list, with 1,159,386 plants; then come *C. Pubescens*, with 250,040, *C. Succirubra*, with 135,905, and *C. Magnifolia*, with 96,923: 300,390 plants are entered as "Hybrids and others."

7. The condition of the Wood estate still continues to be very unsatisfactory, owing, chiefly, to the damage done by sambur (*Rusa Aristotelis*). The Director states that in many parts the soil is poor and stony, that other portions are "exposed to devastating blasts," and that, in bad weather, the estate is difficult of access. He thinks it will be many years before it yields a reasonable return on the money which must be invested in order that it may be put into good order, and he accordingly recommends the abandonment of the greater part of it. The Government have not sufficient information before them to allow of their now passing orders on the question. They desire, therefore, to have a special report, giving all the information available regarding the capital outlay, cost of upkeep, value of yield, and estimated cost of repairs. The Director's attention is drawn to the fact that this plantation yielded, in 1885-86, 37,385 lb. of green bark at a cost of only Rs. 6,680, or Rs. 0-2-10 per lb., while, in the previous year, the yield was 30,252 lb. and the cost Rs. 5,473. It is observed, however, that no share of the general expenses of supervision, &c., is included in the cost.

8. *Financial.*—The following statement shows the receipts and charges during the year :—

—	Budget estimate.	Revised estimate.	Actuals.
	RS.	RS.	RS.
Receipts	75,250	76,290	1,02,690
Charges	91,265	80,300	78,935

The large excess of the actual receipts over the amount estimated was caused by the decision of Government to sell a quantity of Red barks in addition to the guaranteed quantity of Crown barks. It is observed that the Director does not include under the head of "Expenditure" the charges of Messrs. Oakes and Co. for advertising and selling bark. These items, however, form part of the legitimate expenditure of the department quite as much as the cost of carriage between Ootacamund or Naduvatam and Madras, and should, therefore, have been included in the charges. The Director has already been instructed* to, in future budgets, make due provision for this item.

* G.O., No. 348, Mis., dated 18th Jan. 1886.

In addition to the expenditure shown in the figures given above, a sum of Rs. 1,444 was expended by the Public Works Department on repairs to buildings attached to the Cinchona plantations. This outlay has been omitted from the account furnished by the Director as it was not met from his budget grant, but it has been included in the first of the statements appended to this order, giving the total receipts and expenditure since the plantations were started. A reference to this will show that the expenditure during 1885-86 was less than that of any year since 1878-79, while the receipts were higher than they have been since 1882-83. His Excellency the Governor in Council considers these results satisfactory.

9. *Crop.*—The amount of dry bark, obtained from the plantations during the year, was 113,366 lb., made up as follows :—

	LB.
Crown	65,826
Red	47,200
Magnifolia	340

The crop of the previous year was 118,017 lb. The amount in store, on the 31st March 1885, was 125,663 lb., and the quantity sold during the year was 113,940 lb: the stock on hand, at the close of the year, was, therefore, 125,089 lb.

10. The Director points out that the practice of sending the cattle kept for the purposes of supplying manure, to graze on distant hill-sides, instead of stall-feeding them, is most wasteful. The question, however, is purely a matter of the supply of a sufficiency of fodder, and the Director has himself indicated the solution of the difficulty in his remarks on the use of hay and silage. His experiments in this direction have been very fairly successful, and it should at no distant date be possible to store sufficient fodder to allow of the cattle being almost entirely stall-fed throughout the year. The attention of the Director of Revenue Settlement and Agriculture will, with reference to G.O, Revenue Department, No. 573, dated 9th July 1886, be called to the remarks upon silos, to be found in pages 5 to 6 of the report.

11. *Quinology.*—Turning now to the Quinologist's department, His Excellency the Governor in Council has much pleasure in congratulating Mr. Hooper upon the very interesting report submitted by him.

The quality of the bark sold during the year was, on the average, about the same as that disposed of in 1884-85. A table of the analyses of the various varieties of bark sent to the Colonial and Indian Exhibition shows that *C. Angustifolia* (mossed) was the richest in sulphate of quinine (7·53 per cent.), while *C. Robusta* was richest in total alkaloids (9·10 per cent.).

Mr. Hooper's experiments with bark obtained by the process of "shaving" show that that process produces excellent results in the case of trees of six years old, but that with twelve years old trees the increase in the yield of sulphate of quinine is comparatively trifling, while in the case of still older trees there is a diminution instead of an increase.

The experiments made regarding the effect of manure on cinchona trees go to prove that that important agent in all agricultural undertakings had in every case a most beneficial effect in increasing the total alkaloids. There was also a very considerable increase in the quantity of quinine in the case of two out of the three experiments made. These results are valuable and the Government desire that investigation in this direction should be continued with trees of other varieties, especially those naturally rich in quinine.

The analyses of barks taken from trees of various ages, given in paragraph 17 of Mr. Hooper's report, should be of use in assisting planters to determine the age at which it is most profitable to take the first crop. Since the value of these tables must depend upon the figures being representative of the average, as large a number of analyses as possible should be taken. It would be well, therefore, to give, in each year's report, tables based upon all the analyses accumulated up to date.

12. During the year, 595 lb. of *De Vrij's Cinchona liquida* were manufactured at the Medical Stores Depôt, and 340 lb. at Ootacamund. The total cost of the latter was only Rs. 211, and Mr. Hooper considers that manufacture on a larger scale would allow of a very considerable reduction in the cost of production. Further trials of this febrifuge are being made by medical officers, and if the promise of its success is fulfilled it is exceedingly probable that the whole of the bark of the Government plantations will soon be required for its manufacture.

13. In conclusion His Excellency the Governor in Council desires to express his satisfaction with the administration of the plantations during the year. It is gratifying to notice the very favorable terms in which Mr. Lawson speaks of the staff of subordinate officers attached to his department.

(True Extract.)

Ag. Secretary to Government.

To the Government Botanist, &c.
„ the Director of Revenue Settlement and Agriculture.
„ the Board of Revenue.
„ the Public Works Department.
„ the Military Department.
„ the Surgeon-General with Government of Madras.
„ the Superintendent, Government Central Museum.
„ the Honorary Secretary, Agri-Horticultural Society.
„ the Chamber of Commerce.
„ the Editors' Table.

APPENDIX No. I.

Statement showing the Capital and Revenue Account of the Government Cinchona Plantations, Nilgiris, from the commencement up to the Official Year 1885-86.

Year.	Establishment including Superintendent's Salary.	Working Charges. Departmental Labor.	Working Charges. Convict Labor.	Working Charges. Total.	Building and Plant.	Total outlay to end of Year.	Simple interest at 4½ per cent. on outlay to end of previous year *plus* half outlay during the year.	Total of Columns 6 and 8.
	Charges.							
	2	4	5	6	3	7	8	9
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1860-61	..	4,821 15 0	..	4,821 15 0	..	4,821 15 0	108 7 11	4,930 6 11
1861-62	..	22,914 15 4	..	22,914 15 4	..	27,736 14 4	732 9 2	23,647 8 6
1862-63	..	48,390 0 0	..	48,390 0 0	..	76,126 14 4	2,336 15 0	50,726 15 0
1863-64	..	53,173 9 2	..	53,173 9 2	..	1,42,027 6 1	4,908 7 7	70,808 15 4
1864-65	..	59,666 12 0	..	59,666 12 0	..	2,26,138 11 0	8,283 11 9	92,395 0 8
1865-66	..	58,887 5 0	..	58,887 5 0	3,700 0 0	3,14,175 14 0	12,157 1 4	1,00,194 4 4
1866-67	..	52,632 0 0	48,666 10 8	1,28,127 4 6	3,025 0 0	4,42,303 2 6	17,020 12 6	1,45,148 1 0
1867-68	..	43,295 14 4	48,666 10 8	1,20,649 12 1	2,600 0 0	5,62,952 14 7	22,618 3 6	1,43,367 15 7
1868-69	..	30,636 1 0	48,666 10 8	1,07,004 3 6	2,030 0 0	6,69,957 2 1	27,740 7 8	1,94,744 11 2
1869-70	..	19,163 0 0	..	50,280 11 0	5,334 5 8	7,20,257 13 1	31,279 6 2	81,560 1 2
1870-71	..	6,143 0 0	..	30,173 5 4	300 0 0	7,50,411 2 5	33,089 9 8	63,262 15 0
1871-72	..	13,160 4 9	..	33,567 10 1	3,250 0 0	7,83,978 12 6	34,623 12 5	68,091 6 6
1872-73	..	16,441 0 0	..	2,9715 0 0	550 0 0	8,13,693 12 6	35,947 10 2	65,662 10 2
1873-74	..	15,091 14 0	..	30,423 14 0	2,758 0 0	8,44,117 10 6	37,300 12 2	67,724 10 2
1874-75	..	17,417 0 0	..	35,523 8 0	1,700 0 0	8,79,641 2 6	38,784 9 2	74,308 1 2
1875-76	..	27,423 0 0	..	46,207 0 0	1,550 0 0	9,25,848 2 6	40,623 8 3	86,830 8 3
1876-77	..	44,850 3 0	..	59,630 1 3	6,715 8 11	9,85,478 3 9	43,004 13 6	1,02,634 14 9
1877-78	..	66,241 10 3	..	69,771 13 3	5,468 13 8	10,55,250 1 0	45,916 6 3	1,15,688 3 6
1878-79	..	53,954 10 8	..	73,682 11 5	10,990 14 1	11,28,932 12 5	49,144 1 10	1,22,826 13 3
1879-80	..	63,095 0 3	..	79,724 5 0	6,637 4 9	12,08,657 1 5	52,595 12 4	1,32,320 1 4
1880-81	..	72,858 15 3	..	96,105 0 7	11,367 0 4	13,04,762 2 0	56,551 14 11	1,52,656 15 6
1881-82	..	90,921 2 1	..	1,13,575 5 4	6,278 4 9	14,18,337 7 4	61,269 11 11	1,74,845 1 3
1882-83	..	50,049 11 5	..	1,06,392 4 11	32,247 11 5	15,24,729 12 3	66,219 0 3	1,72,611 5 2
1883-84	..	69,128 8 6	..	1,24,560 14 4	35,348 14 5	16,49,290 10 7	71,415 7 4	1,95,976 5 8
1884-85	..	60,190 8 7	..	86,824 6 4	6,220 10 5	17,36,115 0 11	76,171 10 0	1,62,996 0 4
1885-86	..	50,629 13 10	..	80,378 10 11	3,513 5 8	18,16,493 11 10	79,933 11 2	1,60,312 6 1
Total ..	4,09,729 15 4	11,10,177 14 5	1,46,000 0 0	18,16,493 11 10	1,50,585 14 1	..	9,49,678 9 11	27,66,172 5 9

Statement showing the Capital and Revenue Account of the Government Cinchona Plantations, Nilgiris, &c.—*continued.*

Years.	Receipts.								Net Revenue (Difference between Columns 9 and 13).	
	Value of Bark supplied to Quinologist, or for experimental purposes.		Value of Bark sent to England, sold or supplied to other Governments or Departments.		Sale of Plants, Seeds, &c.		Total.		Surplus.	Deficit.
	10		11		12		13		14	15
	Rs.	A. P.	Rs.	A. P.	Rs.	A. P.	Rs.	A. P.	Rs. A. P.	Rs. A. P.
1860-61	..		..		..		..		..	4,930 6 11
1861-62	..		..		..		..		..	23,647 8 6
1862-63	..		..		..		..		..	50,726 15 0
1863-64	..		..		..		..		..	70,808 15 4
1864-65	..		..		..		..		..	92,395 0 8
1865-66	..		..		2,450	0 0	2,450	0 0	..	1,00,194 4 4
1866-67	..		287	8 0	..		287	8 0	..	1,42,698 1 0
1867-68	..		..		1,680	0 0	1,680	0 0	..	1,42,980 7 7
1868-69	..		..		..		1,512	6 4	..	1,33,064 11 2
1869-70	..		..		323	14 0	4,688	12 8	..	80,047 10 10
1870-71	..		3,479	3 6	..		13,022	0 2	..	58,574 2 4
1871-72	..		4,388	2 1	227	1 4	21,422	3 1	..	55,069 6 4
1872-73	..		36,417	6 3	300	9 0	57,854	6 3	..	44,240 7 1
1873-74	..		..		273	4 0	8,849	4 0	..	9,870 3 11
1874-75	..		..		..		..		..	65,458 13 2
1875-76	..		60,404	7 11	2,000	0 0	62,404	9 11	..	24,426 0 4
1876-77	..		1,07,878	4 0	2,579	3 10	1,10,457	7 10	7,822 9 1	..
1877-78	..		3,51,746	0 6	5,469	0 2	3,57,215	0 8	2,41,526 13 2	..
1878-79	..		3,92,217	10 1	8,136	9 2	4,00,354	3 3	2,77,527 6 0	..
1879-80	..		4,24,323	12 8	15,462	12 4	4,39,786	9 0	3,07,466 7 8	..
1880-81	..		3,33,295	1 3	13,175	4 8	3,46,470	5 11	1,93,813 6 5	..
1881-82	..		5,64,236	3 11	7,653	2 9	5,71,889	6 8	3,97,044 5 5	..
1882-83	..		5,82,003	10 1	4,345	7 10	5,86,349	1 11	4,13,757 12 9	..
1883-84	..		80,519	10 6	4,561	2 8	85,080	13 2	..	1,10,895 8 6
1884-85	..		83,351	10 0	1,543	13 5	85,829	3 5	..	77,166 12 11
1885-86	..		1,02,101	0 0	589	10 4	1,04,108	11 0	..	56,203 11 1
	..		31,26,649	10 9	70,770	15 6	32,61,711	15 3	4,95,539 9 6	..
Total ..	64,291	5 0								

APPENDIX II.

STATEMENT showing the receipts and charges on account of the Government Cinchona Plantations prepared in accordance with the instructions contained in the Secretary of State's despatch No. 3, dated 11th February 1886.

	Rs.	A.	P.		Rs.	A.	P.
To value of stock on 31st March 1885—				By value of stock on 31st March 1886—			
125,663 lb. as under—				1,25,089 lb. as under—			
29,549 lb. of 1883-84 at Annas 8, Pies 2·402 per lb.	15,144	2	9		As.	P.	
96,114 lb. of 1884-85 at Annas 11, Pies 6·646 per lb.	69,405	5	2	32,49 lb. of 1883-84 at	8	2·402 ..	1,665 2 4
	84,549	7	11	26,014 lb. of 1884-85 at	11	6·646 ..	18,785 1 5
To establishment and working charges ..	80,378	10	11	95,826 lb. of 1885-86 at	11	4·132 ..	67,942 10 1
							88,392 13 10
To profit on sales of stock of 1883-84 ..	10,439	15	7	By local sales of bark—			
Do. do. 1884-85 ..	13,374	12	3	25,500 lb. of 1883-84 producing ..			23,279 0 0
Do. do. 1885-86 ..	3,758	10	2	70,100 lb. of 1884-85 ,, ...			63,995 0 0
	27,573	6	0	15,540 lb. of 1885-86 ,, ...			14,187 0 0
							1,01,461 0 0
				By value of bark supplied to the Madras Medical Department, 800 lb. of 1883-84 ..			640 0 0
				By value of 2,000 lb. of bark of 1885-86 supplied to the Quinologist for preparation of liquid extract			14,18 0 8
				By sale-proceeds of seed and plant			514 10 0
				By miscellaneous receipts			75 0 4
							1,04,108 11 0
Total ..	1,92,501	8	10	Total ..			192,501 8 10

NOTE.—In 1885-86 the cost price of 1 lb. of bark is Annas 11—4·132, *i.e.*, Rs. 80,378-10-11 (expenditure) ÷ 113,366 lb. of bark, the crop of the year.

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Govt. of {1886} Madras.

REVENUE.

24 sc

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24.11.86

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Recd. 24.11.86 Encl.

G.O., 15th November 1886, No. 988.

No. 3142 w a/ 26th Nov. 1886

NOVEMBER.

Government Cinchona Plantations.

Reviewing report on the — for the year 1885-86.

S.E. IV circle

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