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GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

5th August 1881, No. 1,135.

READ THE FOLLOWING PAPER :—

No. 55. Endorsement of the Government of Bengal, Financial Department, Agriculture, dated Calcutta, the 29th June 1881, No. 135b.

READ—

Letter from the Superintendent of the Royal Botanic Garden, Calcutta, and in charge of the Cinchona Cultivation in Bengal, No. 37C, dated 28th May 1881, submitting the Annual Report of the Government Cinchona Plantation in Bengal for the year 1880-81.

Letter from the same Officer, No. 14Q, dated 28th May 1881, submitting the Annual Report of the Quinologist for 1880-81.

THE planting operations of the year were confined to yellow bark trees and trees of the still unnamed hybrid variety. It has not been deemed necessary to increase the number of *Succirubra* trees, from which the Cinchona febrifuge is manufactured. There are now more than four millions of these trees on the two plantations of Mungpoo and Sittong, and this is quite sufficient to provide red bark for a much larger consumption of the febrifuge than there is any reason immediately to anticipate. Endeavours have therefore been confined to increasing the stock of quinine-producing trees to meet the demand for sulphate of quinine in the hospitals and different departments of the Government service. There are two descriptions of these trees on the plantations the supposed hybrid variety and the *Calisaya*. Of the former, which yields a bark rich in quinine, 90,320 plants were put out during the year, 85,320 at Mungpoo, and 5,000 at Sittong, and the total number now on the plantations is 199,898. Special attention has been devoted to the propagation of the *Ledgeriana* variety of *Calisaya*, which is especially rich in quinine, and 99,415 trees were planted out at Mungpoo. At Sittong 6,000 *Calisaya* trees were put out. There is a large nursery stock of *Ledgerianus*, and the permanent plantation of this valuable variety will probably be largely increased during the current year. The propagation of the species which yields the Carthagena or Columbian bark has been retarded by the attacks of the "thrip" pest. This species was only introduced in January 1880, when the late Mr. Biermann brought out four plants of it. There are now 60 rooted plants and 90 partially rooted cuttings, and every effort will be made to increase the stock. The total number of trees of all kinds planted out in the two divisions is now :—

	C. Succirubra (red).	C. Calisaya (yellow).	Unnamed variety.	Other kinds.	Total.
Mungpoo	2,902,335	393,915	146,020	30,592	3,472,862
Sittong	1,132,200	18,780	53,878	..	1,204,858
Total	4,034,535	412,695	199,898	30,592	4,677,720

2. The produce of the plantations during the year was 377,525lb. of dry bark, against 361,590lb. in 1879-80, and 261,659lb. in 1878-79. Of this, 348,560lb. were taken from Mungpoo, and 28,965 lb. from Sittong. Of the yield of the Mungpoo plantation, 267,335lb. were red bark, and 81,225lb. were *Calisaya* ;

the whole of the bark from Sittong was red. The yield was greater than that of the previous year by 16,000lb. The increase is due to the large quantity of *Calisaya* bark obtained by uprooting trees of the inferior and doubtful sorts to make room for the extended cultivation of the *Ledgeriana*.

3. The red bark was obtained partly by uprooting 75 acres of trees of 11 years' standing, the result being an outturn of 1,510lb. of dry bark per acre. This is a poor outturn, but it is said the patch was not a good one. The rest of the red bark and the yellow bark were obtained by thinning. The figures are as follows:—

	LB.
Red bark obtained by uprooting	113,550
Ditto ditto by thinning	182,750
Yellow bark obtained by thinning	81,225
Total	377,525

The proposal to take 300,000 to 350,000lb. of dry bark as the crop of the current year is approved.

4. It has been stated above that a large number of trees of the inferior kinds of *Calisaya* were uprooted during the year. This species includes several varieties, many of which, as Dr. King says, "produce barks which are essentially druggist's barks, being well suited for preparations, such as decoctions and tinctures, but being unsuited for the manufacture of febrifuge, and containing too little quinine to be worked profitably as sources of the pure sulphate of that alkaloid." There being thus no way of disposing locally of a considerable quantity of yellow bark, a consignment was sent to London for sale. The opportunity was taken to send a small quantity of really good *Ledgeriana* bark to get some idea of its commercial value. Dr. King remarks that yellow bark of any kind from India had never before been offered in the London market, and that indeed, except at Mungpoo, it is not grown anywhere in British India. The result was most satisfactory. *Ledgeriana* bark sold for 10s. 10d. per pound, and the inferior bark also fetched very good prices.

5. The expenditure on the plantations during the year amounted to Rs. 71,705-10-4, namely, Rs. 11,424-3-1 at Sittong, and Rs. 60,281-7-3 at Mungpoo. The former sum is chargeable to the Sittong capital account, and the latter, which was incurred in the old plantation, is chargeable as working expenses. Against this expenditure is to be set off the crop of the year, the whole of which has been made over to the factory, the value being debited to it. The value of the Sittong bark has been credited to the Sittong plantation, and the Superintendent proposes to credit the value of the bark every year till the plantation comes into full bearing.

6. The introduction of the Java plan of shaving the bark of living trees to the height of from 8 to 10 feet from the ground was an interesting feature in the operations of the year. The results have been favorable, as under this plan the bark renews perfectly. Dr. King proposes to test by analysis whether the renewed bark is as rich in medicinal alkaloids as the original bark. But the Dutch plan of grafting *Ledgeriana* on *Succirubra* stocks, which was also tried during the year, was not attended with success. A further trial, however, will be made.

7. The general condition of the plantations is satisfactory. The growth of *Succirubra* in Sittong is not as flourishing as it might be; but *Ledgeriana* and the hybrid variety are thriving well. It is found that these two varieties grow better on land with a southern exposure than on land that looks to the north. It will thus be possible to utilize a considerable area which has hitherto been considered unsuitable for any kind of cinchona.

8. It was stated in the Government Resolution on the Report for 1879-80 that the question of the erection of a small factory near Calcutta for the manufacture of pure sulphate of quinine, and of the appointment of a Quinologist in succession to Mr. Wood, were then under the consideration of the Government of India. During the past few months, however, matters have changed considerably in regard to these

questions. Mr. Gammie, who has since Mr. Wood's departure from India been in executive charge of the Mungpoo factory, has devoted much attention to the improvement of the febrifuge, and has discovered processes for manufacturing quinine and other preparations from the cinchona bark at a comparatively small cost. The results of his experiments have been satisfactory, and orders have been issued for the addition to the factory of the necessary apparatus to enable Mr. Gammie to carry them out on an extended scale by the new method. If these experiments succeed, no febrifuge factory near Calcutta will be required, and there will be no need for the appointment of a chemist to superintend the cinchona manufacture. The proposal therefore to obtain a Quinologist from Europe has been kept in abeyance for the present.

9. The total outturn of the febrifuge factory during the year was 9,296lb. against 9,434lb. 13oz. in 1879-80. The cost of manufacture, including the cost of the bark used, was Rs. 85,921-6-3, and the average cost per pound was only Rs. 9-3-10-625 against Rs. 10-2-0-084 in the previous year.

10. The stock of febrifuge in hand on 31st March 1880 was 3,726lb. 10oz., and the produce of the year was 9,296lb. Of the total stock of 13,022lb. 10oz., the following quantity was disposed of during the year:—

	lb.	oz.	lb.	oz.
To Medical Depot, Calcutta	3,000	0		
Ditto Bombay	2,000	0		
Ditto Madras	500	0		
Sold to public	3,150	11		
Given as samples, &c.	3	2		
Total	8,653	13		

There thus remained in stock 4,368lb. 13oz. at the close of the year, by no means too large a reserve to meet emergencies. The sales to the public are steadily growing. There was an increase of 358lb. in 1879-80, and 393lb. in 1880-81.

11. The financial results of the operations during the year were very satisfactory. The receipts from the sale of febrifuge and seed and plants, and the sale of bark in London, amounted to Rs. 1,79,657-2-11, as shown below:—

	RS.	RS.	A.	P.
By sale of febrifuge, seed and plants to the public.	56,436	11	6	
By credits from Medical Depôts for febrifuge—				
Calcutta	49,545			
Bombay	33,030			
Madras	8,305			
	90,880	0	0	
By sale of yellow bark in London	32,340	7	5	
Total	1,79,657	2	11	

12. The actual profit exhibited on the year's working was Rs. 80,290, equal to 8 per cent. on the capital of the plantation, while the value of the stock in hand at cost price was Rs. 94,924. This, however, does not represent the whole of the gain of the year. The price of quinine was very high, and the cost of 5,550lb., which would have been used by Government had the febrifuge not been available, would have been at the lowest estimate Rs. 5,50,000. The cost of the febrifuge used was only Rs. 90,880. There was thus a clear saving of Rs. 4½ lakhs. The savings effected by similar substitutions of febrifuge for quinine in previous years amounted to 11½ lakhs. The total saving therefore has already amounted to more than 16 lakhs of rupees.

13. The Lieutenant-Governor desires to thank Dr. King for his excellent management of the department during the year. Dr. King speaks in very high terms of the services of Mr. Gammie, who, in addition to his onerous duties in the

factory, has devoted much attention to the economical manufacture of sulphate of quinine. The commendation bestowed on Mr. Gammie is, the Lieutenant-Governor is enabled to say, well deserved.

ORDER.—Ordered that a copy of this Resolution, and of the reports referred to, be submitted to the Government of India in the Home, Revenue and Agricultural Department, and that a copy of the Resolution be forwarded to Dr. King for information.

Ordered further that a copy of the Resolution and of the Reports be forwarded to the Medical Department of this Government, and also to the Government of Madras and to the Surgeon-General, Bengal, for information.

By order of the Lieutenant-Governor of Bengal,

COLMAN MACAULAY,
Offg. Secretary to the Govt. of Bengal.

Copy of the Resolution, and of the two reports referred to, submitted to the Government of Madras for information.

By order of the Lieutenant-Governor of Bengal,

RAJENDRA NATH MITRA,
Assist. Secretary to the Govt. of Bengal.

ENCLOSURE No. 1.

From G. KING, Esq., M.B., Superintendent, Royal Botanical Gardens, Calcutta, in charge of Cinchona Cultivation in Bengal, to the Secretary to the Government of Bengal, Financial Department, dated Government Cinchona Plantation near Darjeeling, the 28th May 1881, No. 37C.

I HAVE the honor herewith to submit the annual report on the Government Cinchona Plantations in Bengal for the year ending 31st March 1881.

Nineteenth Annual Report, of the Government Cinchona Plantations in British Sikkim by Surgeon-Major G. KING, M.B., F.L.S., Superintendent of the Royal Botanical Garden, Calcutta, and of Cinchona Cultivation in Bengal.

THE avowed object of Government in maintaining its Cinchona Plantation in Sikkim is not to grow bark for sale in England or elsewhere, but to produce raw material for the manufacture of cinchona febrifuge for the use of the people of this country, and in strict accordance with this principle it has been conducted from the first. We have now had about four years experience of the manufacture of febrifuge on a large scale, and for about the same period the medicine has been in general use in this country. We have therefore some information to guide us, both as to the amount of febrifuge which the plantation can produce, and as to the amount which is likely to be consumed annually. The issues of febrifuge for the year 1879-80 amounted to 8,164 pounds, while the plantation is capable of producing a considerably larger quantity than that. Febrifuge being prepared from red bark, I do not consider it necessary or advisable to increase the stock of red bark trees for the present, and accordingly during the year which has just ended none were planted out. The number of red barks on the two plantations of Mungpoo and Sittong stands at more than four millions, and many of the trees are quite young. These are sufficient to provide raw material for a considerably extended consumption of febrifuge. Notwithstanding the good estimation in which febrifuge is now held by the medical profession in India, there still exists, and probably always will exist, the necessity of supplying Government hospitals and dispensaries with a certain amount of sulphate of quinine. It is therefore of importance to stock the plantation with a sufficient number of quinine-producing bark trees to meet the Government demand for quinine. Of such trees we have two sorts on the plantation—namely *Calisaya*, and a supposed hybrid variety which appeared on the plantation some years ago. Mr. Wood's analysis showed that this new variety yields a bark rich in quinine, and steady efforts have therefore for years been made to increase it. During the year 85,000 plants of this hybrid were put out at Mungpoo and 5,000 at Sittong, bringing up

the full number now on the plantation to close on two hundred thousand. As has been frequently explained in previous reports, *Calisaya* is a specific name which covers a large number of varieties, many of which produce barks which are essentially druggists' barks, being well suited for preparations such as decoctions and tinctures, but being unsuited for the manufacture of febrifuge, and containing too little quinine to be worked profitably as sources of the pure sulphate of that alkaloid. One of the varieties of *Calisaya* is surpassingly rich in quinine, and this, in compliment to the Collector who brought the seed of it from South America, has been named *Ledgeriana*. Mr. Wood's analysis of the various forms of *Calisaya* enabled us to distinguish the bad ones by their leaves, and my recent visit to the Dutch Plantations in Java confirmed the belief that our best trees of *Calisaya* are veritable *Ledgerianas*. Every effort has therefore been made to increase our stock of *Ledgeriana*, and during the year 99,415 plants of that variety of *Calisaya* were added to the permanent plantation. The difficulties of propagating this sort make progress rather slow, and the total number of *Calisaya* trees on the plantation still reaches only 412,000. There was, however, at the end of the year, a considerable nursery stock of young plants (namely 380,000), and during the year we have now entered upon, the *Ledgeriana* plantation (saving blight and bad weather) should be considerably increased. The total number of trees planted out on the two plantations is given in the following table:—

Total Trees in Permanent Plantation.

	Red. (<i>C. Succirubra</i>).	Yellow. (<i>C. Calisaya</i>).	New unnamed variety.	Other kinds.
Mungpoo Division	2,902,335	393,915	146,020	30,592
Sittong do.	1,132,200	18,780	53,878	...
Total ...	4,034,535	412,695	199,898	30,592

Grand Total of all kinds on both plantations.	{ Mungpoo	3,472,862
	{ Sittong	1,204,858
		4,677,720

2 Details of the year's crop.—The crop for the year consisted of 377,525 pounds of dry bark, of which 348,560 pounds were taken from the old and 28,965 pounds were got by thinning the new plantation. Of the yield of the old plantation 267,335 pounds were red bark, and 81,225 were *Calisaya*; the new plantation bark (28,965 pounds) was all red. This crop exceeds that of the previous year by about 16,000 pounds, and is the largest which has yet been gathered. The increase is due to the large quantity of *Calisaya*,—a bark which has formed but a small proportion of any former crop, while this year it forms nearly a fifth of the whole. And the largeness of the amount of *Calisaya* bark is due to the fact that during the year a great number of trees of inferior and doubtful sorts were uprooted. This was done as part of the policy of reducing the yellow bark plantation as quickly as possible to one of pure *Ledgeriana*. When this object has been completely effected, good trustworthy seed of a pure quinine-yielding bark tree may be hoped for, and propagation of the best species should thenceforward be made easier. The *Calisaya* bark got from these uprooted trees being, as already stated, unsuited for the manufacture either of febrifuge or of quinine, there was no way of disposing of it but by sending it to London for sale and, with the sanction of Government, a small consignment of it was shipped to England in the early part of the year. Yellow bark of any kind from India has never before been offered in the London market, and indeed, except at Mungpoo, it is not grown anywhere in British India. Opportunity was therefore taken to add to the consignment of inferior barks a small quantity of our really good *Ledgeriana* bark, so as to get some idea of its commercial value. The result was most satisfactory. The 625 pounds of *Ledgeriana* bark which were brought to auction in London sold for 10s 10d per pound. The inferior barks also brought excellent prices, one batch of 2,655 pounds having been sold for 7s 6d per pound. Other barks brought 5s 1d, 3s 10d, 3s 9d, 3s 8d, 3s 7d, 2s 10d, and 2s 9d per pound, and the average price obtained for the 12,519 pounds that were sold was 4s 6½d per pound. Steps have been taken, with the sanction of Government, for the clearing out, in a similar manner, of a further quantity of the inferior yellow bark now stored at the factory, and the results of the sale of this second lot will appear in the accounts of the present year. There is, however, no intention of sending to market any bark which can be used in the factory either for the production of febrifuge or of quinine. The red bark crop was taken by uprooting seventy-five acres of eleven years old trees, the result being an outturn of 1,510 pounds of dry bark per acre. This is a poor yield, but the patch was not a good one. The remainder of the red bark crop was obtained by thinning out trees where they stood too closely together.

The exact figures will be found as an appendix to this report.

3. *Expenditure for the year.*—The expenditure for the year amounted to Rs. 71,705-10-4, and thus fell short of the budget estimate and allotment by Rs. 1,783-5-8. Of this expenditure there was incurred on the young plantation at Sittong the sum of Rs. 11,424-3-1, and that sum is chargeable to the Sittong capital account. The whole of the remaining expenditure, namely Rs. 60,281-7-3, was incurred on the old plantation and is chargeable as working expenses, and against it there is to be set the crop for the year. The figures stand thus—

	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
Total expenditure for the year							71,705	10	4
<i>Capital expenditure.</i>									
Expenditure on Sittong Plantation	9,132	5	0						
Proportion of European, Native, and office establishment	2,291	14	1	11,424	3	1			
<i>Working expenses.</i>									
Up-keep and working of Rungbee, Rishap and Mungpoo	48,187	15	3						
Proportion of European and office establishment	12,093	8	0	60,281	7	3			
							71,705	10	4

Against the working expenditure on the old plantation there has to be set a bark crop of 348,560 pounds of dry bark, the cost price per pound of which is therefore annas 2 pies 9-2053, or equal to something less than four pence sterling. The whole of this bark, as well as the bark from Sittong (which for convenience of account I have valued at the same rate), has been made over to the factory, and the value of it (at cost price) has been debited to the factory. The value of the Sittong bark will be credited to the Sittong Plantation, and this practice will continue annually to be followed until the Sittong Plantation comes into full bearing. The accounts of this Sittong Plantation ought, when it is completed, to be of much interest to cinchona planters, as they will show at how cheap a rate a plantation can be put out when the price of experience does not form, as it so often does in new enterprises, a very heavy item in the capital expenditure.

4. *Carthagenia Bark.*—In last year's report I gave an account of the introduction, through Mr. Cross and the Royal Garden of Kew, of a new species of Cinchona, namely the species (as yet not botanically identified) which yields the Carthagenia or Columbian bark so largely imported to London from the northern part of South America. Four plants of this were brought out to India by the late Mr. Biermann in January 1880. They arrived in good condition and, during the year, they were increased largely by cuttings. Propagation went on most favorably for some time; but later on in the year the young plants were severely attacked by the pest only too well known to gardeners as "thrip." The usual treatment was applied with vigour, but in spite of this, when the year ended the six original plants had been increased only to 60 rooted plants and 90 partially rooted cuttings. Every effort will continue to be made to increase the stock of this interesting species.

5. *Distribution of Plants and Seed.*—The high prices got by the Dutch Government for their *Ledgeriana* bark has created a brisk enquiry for the seed of this variety, chiefly amongst Ceylon planters. *Succirubra* seed has also been in some demand. During the year the sum of Rs. 3,269-10 realized chiefly for the sale of *Ledgeriana* seed and plants was paid into the Treasury as Government revenue. This sum will be found entered in the general cash account given as an appendix to the Quinologist's report.

6. *Land Rent.*—The sum of Rs. 1,430-10 raised from settlers within the cinchona reserve was paid into the Darjeeling Treasury as land revenue. This does not appear amongst the plantation receipts.

7. *Survey of Sittong.*—The survey of the outlying parts of the reserve which are suitable for cinchona planting has now been completed and, by the courtesy of General Walker, C.B., Surveyor-General of India, I have been supplied with copies of the map. The map appears to be an excellent one, and it will be of great use in working the plantation accurately.

8. *Estimated crop of 1881-82.*—In accordance with the principle of working the plantation solely as a source of supply of raw material for the factory, the bark crop of 1881-82 must have reference to the demand for febrifuge; and to meet that demand I estimate that it will likely be necessary to take a crop of from 300,000 to 350,000 pounds, an amount which is considerably within the producing power of the plantation.

9. In my report on my visit made during 1879 to the Cinchona Plantations of the Dutch Government in Java, I described a mode of taking the bark crop which had recently been proposed by Mr. Moens, the Director of those plantations. This method consists in shaving off the greater part of the bark of a living tree to the height of from eight to ten feet from the ground, care being taken to leave everywhere a sufficiently thick layer of bark to cover the wood. This method has now had more than a year's trial on the Sikkim Plantation, a certain number of trees per month having been shaved since the beginning of the year 1880. The results have been favorable. Every month's trees have renewed their bark well, those shaved during April having done so (Mr. Gammie tells me) rather better than any of the rest. The bark of the trees earliest shaved is now about as thick as was the original bark and it is clean, healthy and uniform. There is no doubt therefore that under this plan bark renews perfectly. What now remains to be seen is whether the renewed bark is equally rich in medicinal alkaloids with the original. In order to test this, I intend to have some analyses made of samples of renewed bark, and the results of these analyses I hope to give in my next annual report.

10. The Dutch plan of grafting *Ledgeriana* on *Succirubra* stocks has also been tried during the year, but I regret to say with little success. The experiment will, however, be persevered in. In the matter of propagation of *Ledgeriana* we are now very well off; for, the bad varieties of *Calisaya* having been nearly all uprooted from the plantation, the seed yielded is now much more reliable than it has been heretofore. Our stock plants are, moreover, now in fairly good condition and yield a considerable number of cuttings.

11. The general condition of the plantation is satisfactory. The older trees look quite as well as ever I recollect to have seen them, and some of the younger planting is very fine indeed. The growth of *Succirubra* on the new plantation at Sittong is not, however, so satisfactory as could be wished. Contrary to all expectation, *Ledgeriana* and our quinine-producing hybrid are found to thrive better on land with a southern exposure than on land that slopes to the north. Mr. Gammie has therefore prepared for planting a considerable area of land which had hitherto been regarded as unsuitable for any kind of Cinchona. This satisfactory result will postpone for a few years the necessity for planting in the recently acquired Cinchona reserves in Bhutan. In planting *Ledgeriana* last year, Mr. Gammie took the precaution of putting two plants to each stake, with the view of cutting the second of them out should it turn out to be of a bad sort, or of transplanting one should both plants turn out true *Ledgeriana*. The majority of these recently put out plants are, however, turning out pure *Ledgerianas*; there will therefore be a considerable number of transplants available from this source during the approaching planting season.

12. The financial aspect of the whole cinchona enterprise will be found treated of in detail in paragraph 8 of the Quinologist's report. It is only necessary for me to state here that the result of the working of the old plantation for the year has been an actual profit of Rs. 80,000, which is equal to eight per cent. on the capital, and that (valued at cost price) the stock in hand in the godowns at the end of the year was worth Rs. 94,924. These are the actual cash results, but they by no means represent the whole of the advantage which Government has derived from its Cinchona property. During the year 5,500 pounds of febrifuge were used in Government hospitals and dispensaries in substitution of quinine. Quinine during the whole year ruled at a high rate, and in a trustworthy London Trade Circular, the average wholesale price for the year is given at 12 shillings per ounce. Calculated at a rate of exchange equal to 1s 8½d per rupee (and including nothing for the cost of transit to India), this is equal to Rs. 112 per pound. But even taking Rs. 100 as the price which Government would have had to pay for quinine, the cost of 5,500 pounds of it would have been Rs. 5,50,000, whereas an equal quantity of febrifuge was used at a nominal cost of Rs. 90,880. There was thus effected a clear saving of more than four and a half lakhs of rupees, a sum pretty nearly equal to half the total expenditure on the plantations (including compound interest at 4 per cent.) since their commencement. The savings effected by similar substitutions of febrifuge for quinine in former years amounted to eleven and three quarter lakhs, the total saving now therefore stands at sixteen and a quarter lakhs of rupees. As the object of Government is not to make money by its plantation, but to provide the masses of the people with a good remedy for fever, cheap enough to be within reach even of the poorest, it may soon become a question whether the selling price of the febrifuge might not be reduced.

13. During the year two additions were made to the plantation staff by the arrival from the Royal Gardens, Kew, of Messrs. Kennedy and Parkes. Mr. Pantling, who was formerly second assistant, was transferred early in the year to the curatorship of the Botanical Garden, Calcutta, and Mr. H. Crofton was appointed to officiate for him. Mr. Lister, the first assistant, has worked well during the year, and in him Mr. Gammie has had a most efficient and trustworthy helper. Mr. Gammie's own merits are already well known to Government, and during the past, as during former years, he has done admirable service.

14. The usual annual returns (five in number) are appended.

Table showing the number and distribution of Cinchona Plants in the Government Plantations, Mungpoo Division, on the 1st April 1881.

Names of species of Cinchona.	PLANTATION.				NURSERY.			
	Number in permanent plantation on 1st April 1880.	Uprooted during the year 1880-81.	Planted during the year 1880-81.	Number in permanent plantation on 1st April 1881.	Number of stock plants for propagation on 1st April 1881.	Number of seedlings or rooted cuttings in nursery beds for permanent plantations.	Number of rooted plants in seed or cutting beds.	Total nursery stock on 1st April 1881.
C. New variety	60,700	..	85,320	146,020	10,000	89,000	101,000	150,000
C. Succirubra	2,993,085	90,750	..	2,902,335	..	..	..	..
C. Calisaya	354,500	60,000	99,415	393,915	6,000	300,000	80,000	336,000
C. Micrantha	500	..	..	500	..	..	..	..
C. Officinalis and varieties ..	25,000	..	..	25,000	..	..	..	..
C. Pahudiana	5,092	..	..	5,092	..	..	..	..
C. Species yielding Carthagena bark	..	..	..	..	60	..	90	150
Total ..	3,438,877	150,750	184,735	3,472,862	16,060	339,000	181,090	536,150

Table showing the number and distribution of Cinchona Plants in the Government Plantation, Sittong Division, on the 1st April 1881.

Names of species of Cinchona.	Number in permanent plantation on 1st April 1881.	Uprooted during the year 1880-81.	Planted during the year 1880-81.	Number in permanent plantation on 1st April 1881.
C. New variety	48,878	..	5,000	53,878
C. Succirubra	1,132,200	..	..	1,132,200
C. Calisaya	12,780	..	6,000	18,780
Total ..	1,193,858	..	11,000	1,204,858

Account of Dry Cinchona Bark collected during Season 1880-81.

	Year of planting.	Distance apart at planting.	Original number of plants.	Approximate area in acres.	TOTAL.				Total of each species.
					Root.	Stem.	Branch.	Total.	
Succirubra—		Feet.			LB.	LB.	LB.	LB.	LB.
Upper Rishap—									
Uprooting	1869-70	6×6	90,750	75	42,770	33,975	36,805	113,550	..
Thinning	1869-71	6×6	..	..	25,775	25,195	26,620	77,590	..
Mungpoo Ridge—									
Thinning	1872-76	4×4	..	..	9,690	9,280	16,240	35,210	..
Tukdo Ridge—									
Thinning	1871-73	4×4	..	..	4,255	4,165	5,455	13,875	..
Rungbee—									
Thinning	1866-70	6×6	..	..	7,250	10,710	9,150	27,110	..
Sittong—									
Thinning	1876-77	4×4	..	..	4,050	10,200	14,715	28,965	..
Total Succirubra ..	..	..	..	..	93,790	93,525	108,985	296,300	296,300
Calisaya—									
Mungpoo—									
Thinning	1869-74	{ 5×5 4×4 }	..	..	24,385	26,565	26,220	77,170	..
Labdah—									
Thinning	1873-74	4×4	..	..	1,605	1,260	1,190	4,055	..
Total Calisaya ..	..	..	..	..	25,990	27,825	27,410	81,225	81,225
Total of both sorts ..	..	..	..	..	119,780	121,350	136,395	377,525	377,525

Stock of Bark on 1st April 1881.

	LB.	LB.
Succirubra	64,900	159,825
Calisaya	44,600	..
On the way to London	..	109,500
Officialis	..	3,900
Micrantha	..	3,977
Pahudiana	..	600
Total	..	277,802

Table showing the produce of the Government Cinchona Plantations in British Sikkim since their beginning.

MUNGPOO DIVISION.				LB.
Dry bark collected by pruning and thinning during	1869-70	..	..	2,400
Ditto ditto ditto	1870-71	..	..	12,500
Ditto ditto ditto	1871-72	..	..	39,000
Ditto ditto ditto	1872-73	..	..	Nil
Ditto ditto ditto	1873-74	..	..	16,000
Ditto ditto ditto	1874-75	..	..	39,405
Ditto ditto ditto	..	..	..	211,931
Crop of 1875-76	..	..	..	207,781
Do. of 1876-77	..	..	..	344,225
Do. of 1877-78	..	..	..	261,659
Do. of 1878-79	..	..	..	345,740
Do. of 1879-80	..	..	..	348,560
Do. of 1880-81	..	..	..	..
Total	..	..	..	1,829,201

SITTONG DIVISION.				LB.
Dry bark collected by pruning and thinning during	1879-80.	..	..	15,850
Ditto ditto ditto	1880-81.	..	..	28,965
Total	..	..	..	44,815

GEORGE KING, M.B., Surgeon-Major,
Superintendent, Royal Botanic Garden,
Calcutta.

ENCLOSURE No. 2.

From G. KING, Esq., M.B., Superintendent, Royal Botanic Gardens, Calcutta, and Officiating Government Quinologist, to the Secretary to the Government of Bengal, Revenue Department, dated Government Cinchona Plantation, near Darjeeling, the 28th May 1881, No. 14-Q.

I HAVE the honor herewith to submit the annual report of the Quinologist for the year ending 31st March 1881.

QUINOLOGIST'S REPORT FOR 1880-81.

THE operations at the factory during the year may be summarised as follows:—For a factory expenditure of Rs. 85,921-6-3 (including the cost of the bark used), 9,296lb. of cinchonl febrifuge were produced, of which 8,653lb. 13oz. were disposed of to the Government Medical Depôts and to the public.

2. The budget allotment of the factory for the year was Rs. 35,700, but of this sum only Rs. 27,784-10-9 were spent, so that there was a saving of Rs. 7,915-5-3. The details of the factory expenditure are given in the following table:—

	RS.	A.	P.
Paid for acid, 29,007 lb. ...	5,124	8	6
" packages for ditto. ...	222	8	0
" carriage of ditto. ...	3,026	12	9
" " of empty jars ...	1,552	11	3
" soda, carriage and storage of ditto. ...	5,950	5	3
" charcoal ...	202	13	6
" casks and other plant ...	472	14	9
" carriage of ditto. ...	201	13	3
" sundry expenditure ...	1,075	0	7
" labour in factory ...	2,596	6	9
" Quinologist ...	3,912	14	5
" travelling expenses ...	206	4	0
" carriage of febrifuge ...	731	10	3
" tins for ditto. ...	1,192	5	6
" advertisement charges ...	557	4	0
" labour in packing, &c. ...	458	6	0
Total ...	27,784	10	9

	RS.	A.	P.
Cost of bark, 218,005 lb. (crop of 1879-80), at annas 2-6-4147 per lb. ...	34,534	2	3
Cost of bark, 136,475 lb. (crop of 1880-81), at annas 2-9-2053 per lb. ...	23,602	9	3
	58,136	11	6

By febrifuge produced, 9,296 lb., at Rs. 9-3-10-625 per lb. ...	85,921	6	3
	85,921	6	3

3. These figures show that the net cost per lb. of the febrifuge was Rs. 9-3-10-625, which is about (14½) fourteen and a quarter annas less than the cost of the produce of 1879-80. They also show that the proportions debitable to raw material and to cost of manufacture are as follows:—

	RS.	A.	P.
Price of bark used in making 1 lb. of febrifuge ...	6	4	0-760
Cost of manufacture, tinning, advertising, and sale ...	2	15	9-865
Total ...	9	3	10-625

This decrease in net cost per lb. is due to the low price of the bark which was principally that of 1879-80, which stood at only annas 2 pies 6-4147 per lb.

4. During the year, 8,653 lb. 13 oz. of febrifuge were disposed of as follows:—

	lb.	oz.
To Medical Depot, Calcutta ...	3,000	0
Ditto. Bombay ...	2,000	0
Ditto. Madras ...	500	0
Sold to the public ...	3,150	11
Given as samples, &c. ...	3	2
Total ...	8,653	13

This result is better by 489 lb. than that of the previous year, during which only 8,164 lb. were disposed of. The most gratifying feature about it is, however, that the improvement is mainly due to the increase of 393 lb. in the sales to the general public, with whom the febrifuge is daily increasing in reputation as a thoroughly good cure for fever.

5. When the outturn of the past year is added to that of former years the total production of febrifuge at the factory since its commencement is brought up to nearly 37,000 lb. The subjoined table shows the exact result.

Febrifuge produced from commencement to 31st March 1881.

	lb.	oz.		lb.	oz.
Manufactured in 1874-75 ...	48	10	Supplied to Medical Depot, Calcutta	15,454	3
Ditto. in 1875-76 ...	1,940	6	Supplied to Medical Depot, Bombay	5,200	0
Ditto. in 1876-77 ...	3,750	12	Supplied to Medical Depot, Madras	1,100	0
Ditto. in 1877-78 ...	5,162	0	Supplied to Straits Settlements ...	30	0
Ditto. in 1878-79 ...	7,007	0	Sold for cash ...	10,393	8
Ditto. in 1879-80 ...	9,434	13	Samples, &c. ...	93	1
Ditto. in 1880-81 ...	9,296	0	Stock in hand on 31st March 1881	4,368	13
Total ...	36,639	9	Total ...	36,639	9

The stock on hand at the end of the year (4,368 lb.) may appear large. It is, however, equal to only about six months' consumption, and in my opinion this is not at all too large a reserve to have in hand to meet any possible sudden demand which may arise.

6. As has been explained in former reports the plantation and factory are worked financially as one concern. It is necessary for me therefore here to refer to the results of the working of the plantation. As will be seen by the plantation report, the total expenditure on the part of it which is in bearing was Rs. 60,281-7-3, and in return for this there was harvested a crop of 3,48,560 lb. of bark. This bark was taken over by the Quinologist at cost price, namely annas 2 pies 9-2053 per lb. Besides this bark from the old plantation, there was got by thinning the trees on part of the young or Sittong plantation 28,965 lb. of bark. The Sittong plantation is not yet in bearing, and its produce and accounts are kept separate from those of the old plantation. As a matter of convenience, however, these 28,965 lb. have been brought into the accounts at the same rate as the produce of the older plantation. The total produce of both plantations, namely 3,77,525 lb., was thus made over to the factory at a uniform rate of annas 2 pies 9-2053 per lb. Part of this bark was used in the factory during the year, a small part (unsuitable for manufacture or febrifuge) was sold in London in June, and of the balance part remained in store at the end of the year while part was on its way to London for sale there. The small consignment sent to England in June was brought to auction in London, and £2,825 19s. 11d. were realised for it. The Accountant-General has not as yet given the plantation credit for this sum. Account sales have, however, been duly supplied to me, and from these I am able to compile the following account:—

	RS.	A.	P.
Proceeds of sale of 12,519 lb. of yellow cinchona bark, net	33,084	13	3
£2,825 19s. 11d., at 1s. 8½d. per rupee ...	744	5	10
Less freight and other shipping charges ...			
Total ...	32,340	7	5

7. The stock account shows little change since last year. The exact state of it is as follows:—

Stock at 31st March 1880.			Stock at 31st March 1881.		
	RS.	A. P.		RS.	A. P.
Chemicals and stores ...	5,848	0 0	Chemicals and stores ...	6,500	0 0
Febrifuge 3,726½ lb. at Rs. 10-2-0-845 per lb. ...	37,732	0 0	Febrifuge 4,368 lb. 13oz. at Rs. 9-3-10-625 per lb. ...	40,380	0 0
Bark ...	55,125	13 5	Bark 277,802 lb. over-head at As. 2-9-2053 per lb ...	48,044	0 0
				94,924	0 0
			Decrease in value ...	3,781	13 5
Total ...	98,715	13 5	Total ...	98,715	13 5

8. Collecting these figures, the financial result of the working of the plantation and factory may be tabulated as follows:—

DR.	RS.	A.	P.	CR.	RS.	A.	P.
To value of stock at 31st March 1880	98,705	13	5	By value of stock at 31st March 1881	94,924	0	0
To value of bark yielded by the new (Sittong) plantation during 1879-80, viz., 15,850 lb. at As. 2-6-6147 per lb. (omitted in last year's accounts)	2,510	13	0	By cash receipts for sale of febrifuge, seed and plants...	56,436	11	6
To value of bark yielded by the new (Sittong) plantation during 1880-81, viz., 28,965 lb. at As. 2-9-2053 per lb...	5,008	5	0	By credits from Medical Depôts for febrifuge, viz.:—			
To cash received from treasury during 1880-81 for expenditure on old plantation	60,281	7	3	Calcutta ...	49,545	0	0
To cash received from treasury during 1880-81 for factory	27,784	10	9	Bombay ...	33,030	0	0
Profit on the year's working	80,290	1	6	Madras ...	8,305	0	0
Total	2,74,581	2	11	By sale of bark in London	90,880	0	0
					32,340	7	5
				Total	2,74,581	2	11

The profit of Rs. 80,290 shown in this statement is equal to a dividend of eight per cent. on the capital of the plantation, and of this dividend five per cent. are derived from the sale of febrifuge and three per cent. from the sale of a small quantity of yellow bark. This, however, does not represent all the advantage which Government derived from its cinchona property during 1880-81. For, as is shown in my report on the plantation, the saving effected by substituting febrifuge for quinine in Government hospitals and dispensaries during the year slightly exceeds four and a half lakhs of rupees, or in other words is nearly equal to half the entire capital expenditure on the plantation.

9. In addition to his duties as manager of the plantation, Mr. Gammie has been in executive charge of the factory during the year, and I have again to bring to the notice of Government the admirable efficiency with which he has discharged his onerous duties. Not only has Mr. Gammie conducted the routine of febrifuge manufacture with precision and skill, but he has spent much time on attempts to increase the percentage of it extracted from the bark. These attempts, I am glad to say, promise to end in success. Mr. Gammie has also succeeded in turning out a crystalline preparation of the febrifuge which, being free from the amorphous alkaloid, may prove a pleasanter medicine than the febrifuge in its present form. Mr. Gammie's crystalline febrifuge is a very pretty preparation, being nearly as white as quinine itself. It is now under trial in various Government hospitals, and if it is reported well of, arrangements can be made for its production on a large scale. Mr. Gammie has continued to direct his attention to the economical manufacture of sulphate of quinine. Decided progress has been made in this matter since last year, but further experiments will be necessary before I can advantageously submit a full report on the results. The head writer in the Cinchona Office, Baboo Gopal Chandra Datta, has worked exceedingly well during the year and to him my acknowledgments are due.

10. As an appendix to this report, I give a tabular statement of the details of the cash receipts for febrifuge, &c., for the year.

Cash Income for 1880-81.

	RS.	A.	P.
Cash received for sale of febrifuge and paid into the Bank of Bengal and other Government Treasuries	52,673	0	0
Credit for cash paid for febrifuge into Dinagopore Treasury by Civil Surgeon of Dinagopore during 1880-81	74	9	6
Credit for cash for febrifuge paid into Hooghly, Burdwan, Jessore, Rungpore, and Dinagopore Treasuries by Civil Surgeons of these districts during 1879-80, but credit not previously given to this office	295	8	0

Credit for cash paid into Bank of Bengal during 1880-81 by Superintendent of Lock and Police Hospitals, Calcutta, for febrifuge indented for during 1880-81, but supplied after the year had closed ... 124 0 0
Cash paid into Bank of Bengal, Calcutta, and into Darjeeling Treasury on account of sales of seeds, plants, and bark ... 3,269 10 0

Credit for febrifuge supplied to Medical Depôts, viz.:—

	RS.	A.	P.
Calcutta	49,545	0	0
Bombay	33,030	0	0
Madras	8,305	0	0
Total	90,880	0	0
Total credited by Accountant-General	1,47,316	11	6
Net proceeds of sale of bark in London (not credited by Accountant-General)	32,340	7	5
Total	1,79,657	2	11

No. 56.

ORDER THEREON, 5th August 1881, No. 1,135.

Miscellaneous.

COMMUNICATED to the Board of Revenue, Conservator of Forests, Surgeon-General with the Government of Madras, and the Commissioner of the Nilgiris.

(True Extract.)

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

To the Board of Revenue.
,, the Conservator of Forests.
,, the Surgeon-General with the Government of Madras.
,, the Commissioner of the Nilgiris.
,, the Superintendent, Government Central Museum.

Exd. W. H. French.

65 Copies.

Original

Govt. of (1881) Madras.

REVENUE.

12

THE BOARD OF REVENUE,

&c, &c, &c.

Dated August 5th.

Printed 24th.

Recd.

Encl.

G.O., 5th August 1881, No. 1,135.

AUGUST.

Nos. 55-56.

SUBJECT.

Annual Report of the Government Cinchona Plantations and of the Quinologist in Bengal for the year 1880-81.—Communicating to the Board of Revenue, Conservator of Forests, Surgeon-General with the Government of Madras and the Commissioner of the Nilgiris, Regulation of the Government of Bengal on the—

No 37C, dated Govt. Cinchona Plantation near Darjeeling, the 28th May 1881.

From—GEORGE KING, Esq., M.B., Superintendent, Royal Botanical Gardens, Calcutta, in charge of Cinchona Cultivation in Bengal,

To—The Secretary to the Government of Bengal, Financial Department.

I HAVE the honour herewith to submit the annual report on the Government Cinchona Plantations in Bengal for the year ending 31st March 1881.

Nineteenth Annual Report of the Government Cinchona Plantations in British Sikkim by SURGEON-MAJOR GEORGE KING, M.B., F.L.S., Superintendent of the Royal Botanical Garden, Calcutta, and of Cinchona Cultivation in Bengal.

THE avowed object of Government in maintaining its Cinchona Plantation in Sikkim is not to grow bark for sale in England or elsewhere, but to produce raw material for the manufacture of cinchona febrifuge for the use of the people of this country, and in strict accordance with this principle it has been conducted from the first. We have now had about four years experience of the manufacture of febrifuge on a large scale, and for about the same period the medicine has been in general use in this country. We have therefore some information to guide us, both as to the amount of febrifuge which the plantation can produce, and as to the amount which is likely to be consumed annually. The issues of febrifuge for the year 1879-80 amounted to 8,164 pounds, while the plantation is capable of producing a considerably larger quantity than that. Febrifuge being prepared from red bark, I do not consider it necessary or advisable to increase the stock of red bark trees for the present, and accordingly during the year which has just ended none were planted out. The number of red barks on the two plantations of Mungpoo and Sittong stands at more than four millions, and many of the trees are quite young. These are sufficient to provide raw material for a considerably extended consumption of febrifuge. Notwithstanding the good estimation in which febrifuge is now held by the medical profession in India, there still exists, and probably always will exist, the necessity of supplying Government hospitals and dispensaries with a certain amount of sulphate of quinine. It is therefore of importance to stock the plantation with a sufficient number of quinine-producing bark trees to meet the Government demand for quinine. Of such trees we have two sorts on the plantation—namely *Calisaya*, and a supposed hybrid variety which appeared on the plantation some years ago. Mr. Wood's analysis showed that this new variety yields a bark rich in quinine, and steady efforts have therefore for years been made to increase it. During the year 85,000 plants of this hybrid were put out at Mungpoo and 5,000 at Sittong, bringing up the full number now on the plantation to close on two hundred thousand. As has been frequently explained in previous reports, *Calisaya* is a specific name which covers a large number of varieties, many of which produce barks which are essentially druggists' barks, being well suited for preparations such as decoctions and tinctures, but being unsuited for the manufacture of febrifuge, and containing too little quinine to be worked profitably as sources of the pure sulphate of that alkaloid. One of the varieties of *Calisaya* is surpassingly rich in quinine, and this, in compliment to the Collector who brought the seed of it from South America, has been named *Ledgeriana*. Mr. Wood's analysis of the various forms of *Calisaya* enabled us to distinguish the bad ones by their leaves, and my recent visit to the Dutch Plantations in Java confirmed the belief that our best trees of *Calisaya* are veritable *Ledgerianas*. Every effort has therefore been made to increase our stock of *Ledgeriana*, and during the year 99,415 plants of that variety of *Calisaya* were added to the permanent plantation. The difficulties of propagating this sort make progress rather slow, and the total number of *Calisaya* trees on the plantation still reaches only 412,000. There was,

however, at the end of the year, a considerable nursery stock of young plants (namely 380,000), and during the year we have now entered upon, the *Ledgeriana* plantation (saving blight and bad weather) should be considerably increased. The total number of trees planted out on the two plantations is given in the following table:—

Total Trees in permanent Plantation.

	Red. (<i>C. Succirubra</i> .)	Yellow. (<i>C. Calisaya</i> .)	New unnamed variety.	Other kinds.
Mungpoo Division - Sittong ditto	2,902,335 1,132,200	393,915 18,780	116,020 53,878	30,592
Total	4,034,535	412,695	169,898	30,592
Grand total of all kinds on both plantations	Mungpoo Sittong			3,472,862 1,201,858 4,677,720

2. *Details of the year's crop.*—The crop for the year consisted of 377,525 pounds of dry bark, of which 348,560 pounds were taken from the old and 28,965 pounds were got by thinning the new plantation. Of the yield of the old plantation 267,335 pounds were red bark, and 81,225 were *Calisaya*; the new plantation bark (28,965 pounds) was all red. This crop exceeds that of the previous year by about 16,000 pounds, and is the largest which has yet been gathered. The increase is due to the large quantity of *Calisaya*,—a bark which has formed but a small proportion of any former crop, while this year it forms nearly a fifth of the whole. And the largeness of the amount of *Calisaya* and doubtful sorts were uprooted. This was done as part of the policy of reducing the yellow bark plantation as quickly as possible to one of pure *Ledgeriana*. When this object has been completely effected, good trustworthy seed of a pure quinine-yielding bark tree may be hoped for, and propagation on the best species should thenceforward be made easier. The *Calisaya* bark is either of febrifuge or of quinine, there was no way of disposing of it but by sending it to London for sale and, with the sanction of Government, a small consignment of it was shipped to England in the early part of the year. Yellow bark of any kind from India has never before been offered in the London market, and indeed, except at Mungpoo, it is not grown anywhere in British India. Opportunity was therefore taken to add to the consignment of inferior barks a small quantity of our really good *Ledgeriana* bark, so as to get some idea of its commercial value. The result was most satisfactory. The 625 pounds of *Ledgeriana* bark which were brought to auction in London sold for 10s 10d per pound. The inferior barks also brought excellent prices, one batch of 2,655 pounds having been sold for 7s 6d per pound. Other barks brought 5s 1d, 3s 10d, 3s 9d, 3s 8d, 3s 7d, 2s 10d, and were sold as 4s 6½d per pound. Steps have been taken, with the sanction of Government, for the clearing out, in a similar manner, of a further quantity of the inferior yellow bark now stored at the factory, and the results of the sale of this second lot will appear in the accounts of the present year. There is, however, no intention of sending to market any bark which can be used in the factory either for the production of febrifuge or of quinine. The red bark crop was taken by uprooting seventy-five acres of eleven years old trees, the result being an outturn of 1,510 pounds of dry bark per acre. This is a poor yield, but the patch was not a good one. The remainder of the red bark crop was obtained by thinning out trees where they stood too closely together. The exact figures will be found as an appendix to this report.

3. *Expenditure for the year.*—The expenditure for the year amounted to Rs. 71,705-10-4, and thus fell short of the budget estimate and allotment by Rs. 1,783-5-8. Of this expenditure there was incurred on the young

plantation at Sittong the sum of Rs. 11,424-3-1, and that sum is chargeable to the Sittong capital account. The whole of the remaining expenditure, namely Rs. 60,281-7-3, was incurred on the old plantation and is chargeable as working expenses, and against it there is to be set the crop for the year. The figures stand thus—

	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
Total expenditure for the year	...	...					71,705	10	4
<i>Capital expenditure.</i>									
Expenditure on Sittong Plan- tation	...	...	9,132	5	0				
Proportion of European, Native, and office establish- ment	...	...	2,291	14	1		11,424	3	1
<i>Working expenses.</i>									
Up-keep and working of Rungbee, Rishap and Mungpoo	...	...	48,187	15	3				
Proportion of European and office establishment	...	...	12,093	8	0		60,281	7	3
							71,705	10	4

Against the working expenditure on the old plantation there has to be set a bark crop of 348,560 pounds of dry bark, the cost price per pound of which is therefore annas 2 pies 9-2053, or equal to something less than four pence sterling. The whole of this bark, as well as the bark from Sittong (which for convenience of account I have valued at the same rate), has been made over to the factory, and the value of it (at cost price) has been debited to the factory. The value of the Sittong bark will be credited to the Sittong Plantation, and this practice will continue annually to be followed until the Sittong Plantation comes into full bearing. The accounts of this Sittong Plantation ought, when it is completed, to be of much interest to cinchona planters, as they will show at how cheap a rate a plantation can be put out when the price of experience does not form, as it so often does in new enterprises, a very heavy item in the capital expenditure.

4. *Carthagena bark.*—In last year's report I gave an account of the introduction, through Mr. Cross and the Royal Garden of Kew, of a new species of Cinchona, namely the species (as yet not botanically identified) which yields the Carthagena or Columbian bark so largely imported to London from the northern part of South America. Four plants of this were brought out to India by the late Mr. Biermann in January 1880. They arrived in good condition and, during the year, they were increased largely by cuttings. Propagation went on most favourably for some time; but later on in the year the young plants were severely attacked by the pest only too well known to gardeners as "thrip." The usual treatment was applied with vigour, but in spite of this, when the year ended the six original plants had been increased only to 60 rooted plants and 90 partially rooted cuttings. Every effort will continue to be made to increase the stock of this interesting species.

5. *Distribution of plants and seed.*—The high prices got by the Dutch Government for their *Ledgeriana* bark has created a brisk enquiry for the seed of this variety, chiefly amongst Ceylon planters. *Succirubra* seed has also been in some demand. During the year the sum of Rs. 3,269-10 realised chiefly for the sale of *Ledgeriana* seed and plants was paid into the Treasury as Government revenue. This sum will be found entered in the general cash account given as an appendix to the Quinologist's report.

6. *Land rent.*—The sum of Rs. 1,430-10 raised from settlers with- in the cinchona reserve was paid into the Darjeeling Treasury as land revenue. This does not appear amongst the plantation receipts.

7. *Survey of Sittong.*—The survey of the outlying parts of the reserve which are suitable for cinchona planting has now been completed and, by the courtesy of General Walker, C. B., Surveyor General of India, I have been supplied with copies of the map. The map appears to be an excellent one, and it will be of great use in working the plantation accurately.

8. *Estimated crop of 1881-82.*—In accordance with the principle of working the plantation solely as a source of supply of raw material for the factory, the bark crop of 1881-82 must have reference to the demand for febrifuge; and to meet that demand I estimate that it will likely be necessary to take a crop of from 300,000 to 350,000 pounds, an amount which is considerably within the producing power of the plantation.

9. In my report on my visit made during 1879 to the Cinchona Plantations of the Dutch Government in Java, I described a mode of taking the bark crop which had recently been proposed by Mr. Moens, the Director of those plantations. This method consists in shaving off the greater part of the bark of a living tree to the height of from eight to ten feet from the ground, care being taken to leave everywhere a sufficiently thick layer of bark to cover the wood. This method has now had more than a year's trial on the Sikkim Plantation, a certain number of trees per month having been shaved since the beginning of the year 1880. The results have been favourable. Every month's trees have renewed their bark well; those shaved during April having done so trees earliest shaved is now about as thick as was the original bark and it is clean, healthy and uniform. There is no doubt therefore that under this plan bark is equally rich in medicinal alkaloids with the original. In order to test this, I intend to have some analyses made of samples of renewed bark, and the results of these analyses I hope to give in my next annual report.

10. The Dutch plan of grafting *Ledgeriana* on *succirubra* stocks has also been tried during the year, but I regret to say with little success. The experiment will, however, be persevered in. In the matter of propagation of *Ledgeriana* we are now very well off; for, the bad varieties of *Calisaya* having been nearly all uprooted from the plantation, the seed yielded is now much more reliable than it has been heretofore. Our stock plants are, moreover, now in fairly good condition and yield a considerable number of cuttings.

11. The general condition of the plantation is satisfactory. The older trees look quite as well as ever I recollect to have seen them, and some of the younger planting is very fine indeed. The growth of *succirubra* on the new plantation at Sittong is not, however, so satisfactory as could be wished. Contrary to all expectation, *Ledgeriana* and our quinine-producing hybrid are found to thrive better on land with a southern exposure than on land that slopes to the north. Mr. Gammie has therefore prepared for planting a considerable area of land which had hitherto been regarded as unsuitable for any kind of Cinchona. This satisfactory result will postpone for a few years the necessity for planting in the recently acquired Cinchona reserves in Bhutan. In planting *Ledgeriana* last year, Mr. Gammie took the precaution of putting two plants to each stake, with the view of cutting the second of them out should it turn out to be of a bad sort, or of transplanting one should both plants turn out true *Ledgeriana*. The majority of these recently put out plants are, however, turning out pure *Ledgerianas*; there will therefore be a considerable number of transplants available from this source during the approaching planting season.

12. The financial aspect of the whole cinchona enterprise will be found treated of in detail in paragraph 8 of the Quinologist's report. It is only necessary for me to state here that the result of the working of the old plantation for the year has been an actual profit of Rs. 80,000, which is equal to eight per cent on the capital, and that (valued at cost price) the stock in hand in the godowns at the end of the year was worth Rs. 94,924. These are the actual cash results, but they by no means represent the whole of the advantage which Government has derived from its Cinchona property. During the year 5,500 pounds of febrifuge were used in Government hospitals and dispensaries in substitution of quinine. Quinine

during the whole year ruled at a high rate, and in a trustworthy London Trade Circular, the average wholesale price for the year is given at 12 shillings per ounce. Calculated at a rate of exchange equal to 1s 8½d per rupee (and including nothing for the cost of transit to India), this is equal to Rs. 112 per pound. But even taking Rs. 100 as the price which Government would have had to pay for quinine, the cost of 5,500 pounds of it would have been Rs. 5,50,000, whereas an equal quantity of febrifuge was used at a nominal cost of Rs. 90,880. There was thus effected a clear saving of more than four and a half lakhs of rupees, a sum pretty nearly equal to half the total expenditure on the plantations (including compound interest at 4 per cent) since their commencement. The savings effected by similar substitutions of febrifuge for quinine in former years amounted to eleven and three quarter lakhs, the total saving now therefore stands at sixteen and a quarter lakhs of rupees. As the object of Government is not to make money by its plantation, but to provide the masses of the people with a good remedy for fever, cheap enough to be within reach even of the poorest, it may soon become a question whether the selling price of the febrifuge might not be reduced.

13. During the year two additions were made to the plantation staff by the arrival from the Royal Gardens, Kew, of Messrs. Kennedy and Parkes. Mr. Pantling, who was formerly second assistant, was transferred early in the year to the curatorship of the Botanical Garden, Calcutta, and Mr. H. Crofton was appointed to officiate for him. Mr. Lister, the first assistant, has worked well during the year, and in him Mr. Gammie has had a most efficient and trustworthy helper. Mr. Gammie's own merits are already well known to Government, and during the past, as during former years, he has done admirable service.

14. The usual annual returns (five in number) are appended.

Table showing the number and distribution of Cinchona Plants in the Government Plantations, Mungpoo Division, on the 1st April 1881.

NAMES OF SPECIES OF CINCHONA.	PLANTATION.				NURSERY.			
	Number in permanent plantation on 1st April 1880.	Uprooted during the year 1880-81.	Planted during the year 1880-81.	Number in permanent plantation on 1st April 1881.	Number of stock plants for propagation on 1st April 1881.	Number of seedlings or rooted cuttings in nursery beds for permanent plantations.	Number of rooted plants in seed or cutting beds.	Total nursery stock on 1st April 1881.
C. New variety	60,760		85,820	146,020	10,000	39,000	101,000	150,000
C. Succirubra	2,998,085	30,750		2,902,335				
C. Calisaya	554,500	60,000	99,415	593,915	6,000	300,000	80,000	386,000
C. Micrantha	500			500				
C. Officinalis and varieties	25,000			25,000				
C. Pahudiana	5,002			5,002				
C. Species yielding Carthagena bark					60		90	150
Total	3,498,877	150,750	184,735	3,472,862	16,060	339,000	181,090	536,150

Table showing the number and distribution of Cinchona Plants in the Government Plantation, Sittong Division, on the 1st April 1881.

NAMES OF SPECIES OF CINCHONA.	Number in permanent plantation on 1st April 1881.	Uprooted during the year 1880-81.	Planted during the year 1880-81.	Number in permanent plantation on 1st April 1881.
C. New variety	48,878		5,000	53,878
C. Succirubra	1,132,200			1,132,200
C. Calisaya	12,780		6,000	18,780
Total	1,193,858		11,000	1,204,858

Account of Dry Cinchona Bark collected during Season 1880-81.

	Year of plant- ing.	Distance apart at planting.	Original num- ber of plants.	Approximate area in acres.	TOTAL.				Total of each species.
					Root.	Stem.	Branch.	Total.	
Succirubra—		Feet.			lb.	lb.	lb.	lb.	lb.
Upper Rishap—	1869-70	6x6	90,750	75	42,770	33,975	36,805	113,550	
Uprooting	1869-71	6x6			25,775	25,135	26,620	77,530	
Thinning	1872-76	4x4			9,690	9,230	16,240	35,210	
Mungpoo Ridge—	1871-73	4x4			4,255	4,165	5,455	13,875	
Thinning	1868-70	6x6			7,250	10,710	9,150	27,110	
Tukdo Ridge—	1876-77	4x4			4,050	10,200	14,715	28,965	
Thinning					93,790	93,525	108,955	296,300	
Total Succirubra									
Calisaya—									
Mungpoo—	1869-74	5x5 & 4x4			21,385	26,565	26,220	74,170	
Thinning	1873-74	4x4			1,605	1,250	1,190	4,055	
Labdah—					25,990	27,825	27,410	81,225	
Thinning					119,780	121,350	136,395	377,525	
Total Calisaya									
Total of both sorts									

Stock of Bark on 1st April 1881.

	lb	lb
Succirubra		
Calisaya		159,825
On the way to London	61,900	44,600
Officialis		109,500
Micrantha		3,900
Pahudiana		3,977
		600
Total		277,802

Table showing the produce of the Government Cinchona Plantations in British Sikkim since their beginning.

MUNGPOO DIVISION.

	lb
Dry bark collected by pruning and thinning during 1869-70...	2,400
Ditto ditto ditto 1870-71...	12,500
Ditto ditto ditto 1871-72...	39,000
Ditto ditto ditto 1872-73...	Nil
Ditto ditto ditto 1873-74...	16,000
Ditto ditto ditto 1874-75...	39,405
Crop of 1875-76	
Do. of 1876-77	211,931
Do. of 1877-78	207,781
Do. of 1878-79	344,225
Do. of 1879-80	261,659
Do. of 1880-81	345,740
	348,560
Total	1,829,201

SITTONG DIVISION.

	lb
Dry bark collected by pruning and thinning during 1879-80...	15,850
Ditto ditto ditto 1880-81...	28,965
Total	44,815

GEORGE KING, M.B., Surgeon-Major,

Superintendent, Royal Botanic Garden,

Calcutta.

C. E. G.—Reg. No. 3911C—251—15-7-81.

No. 14Q, dated Government Cinchona Plantation near Darjeeling, the 28th May 1881.

From—GEORGE KING, Esq., M.B., Superintendent, Royal Botanic Gardens, Calcutta,
and Offg. Govt. Quinologist,

To—The Secretary to the Government of Bengal, Revenue Department.

I HAVE the honor herewith to submit the annual report of the Quinologist for the year ending 31st March 1881.

QUINOLOGIST'S REPORT FOR 1880-81.

THE operations at the factory during the year may be summarised as follows:—For a factory expenditure of Rs. 85,921-6-3 (including the cost of the bark used), 9,296lb of cinchona febrifuge were produced, of which 8,653lb 13oz. were disposed of to the Government Medical Depôts and to the public.

2. The budget allotment of the factory for the year was Rs. 35,700, but of this sum only Rs. 27,784-10-9 were spent, so that there was a saving of Rs. 7,915-5-3. The details of the factory expenditure are given in the following table:—

	Rs.	A.	P.
Paid for acid, 29,007 lb	5,424	8	6
" packages for ditto	222	8	0
" carriage of ditto	3,026	12	9
" " of empty jars	1,552	11	3
" soda, carriage and storage of ditto	5,950	5	3
" charcoal	202	13	6
" casks and other plant	472	14	9
" carriage of ditto	201	13	3
" sundry expenditure	1,075	0	7
" labour in factory	2,596	6	9
" Quinologist	3,912	14	5
" travelling expenses	206	4	0
" carriage of febrifuge	731	10	6
" tins for ditto	1,192	5	3
" advertisement charges	557	4	0
" labour in packing, &c.	458	6	0
Total	27,784	10	9

	Rs.	A.	P.
Cost of bark, 218,005lb (crop of 1879-80), at annas 2-6-4147 per lb...	34,534	2	3
Cost of bark, 136,475lb (crop of 1880-81), at annas 2-9-2053 per lb...	23,602	9	3
	58,136	11	6
By febrifuge produced, 9,296lb, at Rs. 9-3-10-625 per lb	85,921	6	3
	85,921	6	3

3. These figures show that the net cost per lb of the febrifuge was Rs. 9-3-10-625, which is about (14 $\frac{1}{4}$) fourteen and a quarter annas less than the cost of the produce of 1879-80. They also show that the proportions debitable to raw material and to cost of manufacture are as follows:—

	Rs.	A.	P.
Price of bark used in making 1lb of febrifuge	6	4	0-760
Cost of manufacture, tinning, advertising, and sale	2	15	9-865
Total	9	3	10-625

This decrease in net cost per lb is due to the low price of the bark which was principally that of 1879-80, which stood at only annas 2 pies 6-4147 per lb.

4. During the year, 8,653lb 13oz. of febrifuge were disposed of as follows:—

	lb	oz.
To Medical Depot, Calcutta ...	3,000	0
Ditto, Bombay ...	2,000	0
Ditto, Madras ...	500	0
Sold to the public ...	3,150	11
Given as samples, &c. ...	8	2
Total ...	8,653	13

This result is better by 489lb than that of the previous year, during which only 8,164lb were disposed of. The most gratifying feature about it is, however, that the improvement is mainly due to the increase of 393lb in the sales to the general public, with whom the febrifuge is daily increasing in reputation as a thoroughly good cure for fever.

5. When the outturn of the past year is added to that of former years the total production of febrifuge at the factory since its commencement is brought up to nearly 37,000lb. The subjoined table shows the exact result.

Febrifuge produced from commencement to 31st March 1881.

	lb	oz.		lb	oz.
Manufactured in 1874-75 ...	48	10	Supplied to Medical Depot, Calcutta ...	15,454	3
Ditto in 1875-76 ...	1,940	6	Supplied to Medical Depot, Bombay ...	5,200	0
Ditto in 1876-77 ...	3,750	12	Supplied to Medical Depot, Madras ...	1,100	0
Ditto in 1877-78 ...	5,162	0	Supplied to Straits Settlements ...	30	0
Ditto in 1878-79 ...	7,007	0	Sold for cash ...	10,393	8
Ditto in 1879-80 ...	9,434	13	Samples, &c. ...	93	1
Ditto in 1880-81 ...	9,296	0	Stock in hand on 31st March 1881 ...	4,368	13
Total ...	36,639	9	Total ...	36,639	9

The stock on hand at the end of the year (4,368lb) may appear large. It is, however, equal to only about six months' consumption, and in my opinion this is not at all too large a reserve to have in hand to meet any possible sudden demand which may arise.

6. As has been explained in former reports the plantation and factory are worked financially as one concern. It is necessary for me therefore here to refer to the results of the working of the plantation. As will be seen by the plantation report, the total expenditure on the part of it which is in bearing was Rs. 60,281-7-3, and in return for this there was harvested a crop of 3,48,560lb of bark. This bark was taken over by the Quinologist at cost price, namely annas 2 pies 9-2053 per lb. Besides this bark from the old plantation, there was got by thinning the trees on part of the young or Sittong plantation 28,965lb of bark. The Sittong plantation is not yet in bearing, and its produce and accounts are kept separate from those of the old plantation. As a matter of convenience, however, these 28,965lb have been brought into the accounts at the same rate as the produce of the older plantation. The total produce of both plantations, namely 3,77,525lb, was thus made over to the factory at a uniform rate of annas 2 pies 9-2053 per lb. Part of this bark was used in the factory during the year, a small part (unsuitable for manufacture or febrifuge) was sold in London in June, and of the balance part remained in store at the end of the year while part was on its way to London for sale there. The small consignment sent to England in June was brought to auction in London, and £2,825 19s. 11d. were realised for it. The Accountant-General has not as yet given the plantation credit for this sum. Account sales have, however, been duly supplied to me, and from these I am able to compile the following account:—

	Rs.	A.	P.
Proceeds of sale of 12,519lb of yellow cinchona bark, net £2,825 19s. 11d., at 1s. 8½d. per rupee ...	33,084	13	3
Less freight and other shipping charges ...	744	5	10
Total ...	32,340	7	5

7. The stock account shows little change since last year. The exact state of it is as follows:—

<i>Stock at 31st March 1880.</i>				<i>Stock at 31st March 1881.</i>			
		Rs.	A. P.			Rs.	A. P.
Chemicals and stores ...		5,848	0 0	Chemicals and stores ...		6,500	0 0
Febrifuge 3726½lb at Rs. 10-2-0				Febrifuge 4,368lb 13oz. at Rs. 9-3-10-625 per lb		40,380	0 0
0-845 per lb ...		37,732	0 0	Bark 277,802lb over-head at As. 2-9-2053 per lb		48,044	0 0
Bark ...		55,125	13 5			94,924	0 0
				Decrease in value ...		3,791	13 5
Total ...		98,715	13 5	Total ...		98,715	13 5

8. Collecting these figures, the financial result of the working of the plantation and factory may be tabulated as follows:—

Dr.	Rs.	A.	P.		Cr.	Rs.	A.	P.
To value of stock at 31st March 1880 ...	98,705	13	5	By value of stock at 31st March 1881 ...	94,924	0	0	
To value of bark yielded by the new (Sittong) plantation during 1879-80, viz. 15,850 lb at As. 2-6-6147 per lb (omitted in last year's accounts) ...	2,510	13	0	By cash receipts for sale of febrifuge, seed and plants ...	56,436	11	6	
To value of bark yielded by the new (Sittong) plantation during 1880-81, viz. 28,965 lb at As. 2-9-2053 per lb ...	5,008	5	0	By credits from Medical Depôts for febrifuge, viz.:—				
To cash received from treasury during 1880-81 for expenditure on old plantation ...	60,281	7	3	Calcutta ...	49,545	0	0	
To cash received from treasury during 1880-81 for factory ...	27,784	10	9	Bombay ...	33,030	0	0	
Profit on the year's working ...	80,290	1	6	Madras ...	8,305	0	0	
Total ...	2,74,581	2	11	By sale of bark in London ...	90,880	0	0	
					32,340	7	5	
				Total ...	2,74,581	2	11	

The profit of Rs. 80,290 shown in this statement is equal to a dividend of eight per cent. on the capital of the plantation, and of this dividend five per cent. are derived from the sale of febrifuge and three per cent. from the sale of a small quantity of yellow bark. This, however, does not represent all the advantage which Government derived from its cinchona property during 1880-81. For, as is shown in my report on the plantation, the saving effected by substituting febrifuge for quinine in Government hospitals and dispensaries during the year slightly exceeds four and a half lakhs of rupees, or in other words is nearly equal to half the entire capital expenditure on the plantation.

9. In addition to his duties as manager of the plantation, Mr. Gammie has been in executive charge of the factory during the year, and I have again to bring to the notice of Government the admirable efficiency with which he has discharged his onerous duties. Not only has Mr. Gammie conducted the routine of febrifuge manufacture with precision and skill, but he has spent much time on attempts to increase the percentage of it extracted from the bark. These attempts, I am glad to say, promise to end in success. Mr. Gammie has also succeeded in turning out a crystalline preparation of the febrifuge which, being free from the amorphous alkaloid, may prove a pleasanter medicine than the febrifuge in its present form. Mr. Gammie's crystalline febrifuge is a very pretty preparation, being nearly as white as quinine itself. It is now under trial in various Government hospitals, and if it is reported well of, arrangements can be made for its production on a large scale. Mr. Gammie has continued to direct his attention to the economical manufacture of sulphate of quinine. Decided progress has been made in this matter since last year, but further experiments will be necessary before I can advantageously submit a full report on the results. The head writer in the Cinchona Office, Baboo Gopal Chandra Datta, has worked exceedingly well during the year and to him my acknowledgments are due.

10. As an appendix to this report, I give a tabular statement of the details of the cash receipts for febrifuge, &c., for the year.

Cash Income for 1880-81.

	Rs.	A.	P.
Cash received for sale of febrifuge and paid into the Bank of Bengal and other Government treasuries ...	52,673	0	0
Credit for cash paid for febrifuge into Dinagepore Treasury by Civil Surgeon of Dinagepore during 1880-81 ...	74	9	6
Credit for cash for febrifuge paid into Hooghly, Burdwan, Jessore, Rungpore, and Dinagepore Treasuries by Civil Surgeons of these districts during 1879-80, but credit not previously given to this office ...	295	8	0
Credit for cash paid into Bank of Bengal during 1880-81 by Superintendent of Lock and Police Hospitals, Calcutta, for febrifuge indented for during 1880-81, but supplied after the year had closed ...	124	0	0
Cash paid into Bank of Bengal, Calcutta, and into Darjeeling Treasury on account of sales of seeds, plants, and bark ...	3,269	10	0
Credit for febrifuge supplied to Medical Depôts, viz.:—			
Calcutta ...	49,545	0	0
Bombay ...	33,030	0	0
Madras ...	8,305	0	0
	90,880	0	0
Total credited by Accountant-General ...	1,47,316	11	6
Net proceeds of sale of bark in London (not credited by Accountant-General) ...	32,340	7	5
Total ...	1,79,657	2	11

FINANCIAL DEPARTMENT,

AGRICULTURE,

CALCUTTA, THE 29TH JUNE 1881.

RESOLUTION.

READ—

Letter from the Superintendent of the Royal Botanic Garden, Calcutta, and in charge of the Cinchona Cultivation in Bengal, No. 37C, dated 28th May 1881, submitting the Annual Report of the Government Cinchona Plantation in Bengal for the year 1880-81.

Letter from the same officer, No. 14Q, dated 28th May 1881, submitting the Annual Report of the Quinologist for 1880-81.

The planting operations of the year were confined to yellow bark trees and trees of the still unnamed hybrid variety. It has not been deemed necessary to increase the number of *Succirubra* trees, from which the Cinchona febrifuge is manufactured. There are now more than four millions of these trees on the two plantations of Mungpoo and Sittong, and this is quite sufficient to provide red bark for a much larger consumption of the febrifuge than there is any reason immediately to anticipate. Endeavours have therefore been confined to increasing the stock of quinine-producing trees to meet the demand for sulphate of quinine in the hospitals and different departments of the Government service. There are two descriptions of these trees on the plantations, the supposed hybrid variety and the *Calisaya*. Of the former, which yields a bark rich in quinine, 90,320 plants were put out during the year, 85,320 at Mungpoo, and 5,000 at Sittong, and the total number now on the plantations is 199,898. Special attention has been devoted to the propagation of the *Ledgeriana* variety of *Calisaya*, which is especially rich in quinine, and 99,415 trees were planted out at Mungpoo. At Sittong 6,000 *Calisaya* trees were put out. There is a large nursery stock of *Ledgerianas*, and the permanent plantation of this valuable variety will probably be largely increased during the current year. The propagation of the species which yields the Carthagena or Columbian bark has been retarded by the attacks of the "thrip" pest. This species was only introduced in January 1880, when the late Mr. Biermann brought out four plants of it. There are now 60 rooted plants and 90 partially rooted cuttings, and every effort will be made to increase the stock. The total number of trees of all kinds planted out in the two divisions is now:—

	C. <i>Succirubra</i> (red).	C. <i>Calisaya</i> (yellow).	Unnamed variety.	Other kinds.	Total.
Mungpoo ...	2,902,335	893,015	146,020	30,592	3,472,962
Sittong ...	1,132,200	18,780	53,878		1,204,858
Total ...	4,034,535	412,895	199,898	30,592	4,677,720

2. The produce of the plantations during the year was 377,525lbs. of dry bark, against 361,590lbs. in 1879-80, and 261,659lbs. in 1878-79. Of this 348,560lbs. were taken from Mungpoo, and 28,965lbs. from Sittong. Of the yield of the Mungpoo plantation, 267,335lbs. were red bark, and 81,225lbs. were *Calisaya*; the whole of the bark from Sittong was red. The yield was greater than that of the previous year by 16,000lbs. The increase is due to the large quantity of *Calisaya* bark obtained by uprooting trees of the inferior and doubtful sorts to make room for the extended cultivation of the *Ledgeriana*.

3. The red bark was obtained partly by uprooting 75 acres of trees of 11 years' standing, the result being an outturn of 1,510lbs. of dry bark per acre. This is a poor outturn, but it is said the patch was not a good one. The rest

Recd 2/3/77

of the red bark and the yellow bark were obtained by thinning. The figures are as follows:—

	lbs.
Red bark obtained by uprooting	113,550
Ditto ditto by thinning	182,750
Yellow bark obtained by thinning	81,225
Total	377,525

The proposal to take 300,000 to 350,000lbs. of dry bark as the crop of the current year is approved.

4. It has been stated above that a large number of trees of the inferior kinds of *Calisaya* were uprooted during the year. This species includes several varieties, many of which, as Dr. King says, "produce barks which are essentially druggists' barks, being well suited for preparations, such as decoctions and tinctures, but being unsuited for the manufacture of febrifuge, and containing too little quinine to be worked profitably as sources of the pure sulphate of that alkaloid." There being thus no way of disposing locally of a considerable quantity of yellow bark, a consignment was sent to London for sale. The opportunity was taken to send a small quantity of really good *Ledgeriana* bark to get some idea of its commercial value. Dr. King remarks that yellow bark of any kind from India had never before been offered in the London market, and that indeed, except at Mungpoo, it is not grown anywhere in British India. The result was most satisfactory. *Ledgeriana* bark sold for 10s. 10d. per pound, and the inferior bark also fetched very good prices.

5. The expenditure on the plantations during the year amounted to Rs. 71,705-10-4, namely, Rs. 11,424-3-1 at Sittong, and Rs. 60,281-7-3 at Mungpoo. The former sum is chargeable to the Sittong capital account, and the latter, which was incurred in the old plantation, is chargeable as working expenses. Against this expenditure is to be set off the crop of the year, the whole of which has been made over to the factory, the value being debited to it. The value of the Sittong bark has been credited to the Sittong plantation, and the Superintendent proposes to credit the value of the bark every year till the plantation comes into full bearing.

6. The introduction of the Java plan of shaving the bark of living trees to the height of from 8 to 10 feet from the ground was an interesting feature in the operations of the year. The results have been favourable, as under this plan the bark renews perfectly. Dr. King proposes to test by analysis whether the renewed bark is as rich in medicinal alkaloids as the original bark. But the Dutch plan of grafting *Ledgeriana* on *Succirubra* stocks, which was also tried during the year, was not attended with success. A further trial, however, will be made.

7. The general condition of the plantations is satisfactory. The growth of *Succirubra* in Sittong is not as flourishing as it might be; but *Ledgeriana* and the hybrid variety are thriving well. It is found that these two varieties grow better on land with a southern exposure than on land that looks to the north. It will thus be possible to utilize a considerable area which has hitherto been considered unsuitable for any kind of cinchona.

8. It was stated in the Government Resolution on the report for 1879-80 that the question of the erection of a small factory near Calcutta for the manufacture of pure sulphate of quinine, and of the appointment of a Quinologist in succession to Mr. Wood, were then under the consideration of the Government of India. During the past few months, however, matters have changed considerably in regard to these questions. Mr. Gammie, who has since Mr. Wood's departure from India been in executive charge of the Mungpoo factory, has devoted much attention to the improvement of the febrifuge, and has discovered processes for manufacturing quinine and other preparations from the cinchona bark at a comparatively small cost. The results of his experiments have been satisfactory, and orders have been issued for the addition to the factory of the necessary apparatus to enable Mr. Gammie to carry them out on an extended scale by the new method. If these experiments succeed, no febrifuge factory near Calcutta will be required, and there will be no need

for the appointment of a chemist to superintend the cinchona manufacture. The proposal therefore to obtain a Quinologist from Europe has been kept in abeyance for the present.

9. The total outturn of the febrifuge factory during the year was 9,296lbs. against 9,434lbs. 13oz. in 1879-80. The cost of manufacture, including the cost of the bark used, was Rs. 85,921-6-3, and the average cost per pound was only Rs. 9-3-10-625 against Rs. 10-2-0-084 in the previous year.

10. The stock of febrifuge in hand on 31st March 1880 was 3,726lbs. 10oz., and the produce of the year was 9,296lbs. Of the total stock of 13,022lbs. 10oz., the following quantity was disposed of during the year:—

	lbs.	oz.	lbs.	oz.
To Medical Depot, Calcutta	3,000	0		
Ditto Bombay	2,000	0		
Ditto Madras	500	0		
Sold to public	3,150	11		
Given as samples, &c.	3	2		
Total	8,653	13		

There thus remained in stock 4,368lb. 13oz. at the close of the year, by no means too large a reserve to meet emergencies. The sales to the public are steadily growing. There was an increase of 358lbs. in 1879-80, and 393lbs. in 1880-81.

11. The financial results of the operations during the year were very satisfactory. The receipts from the sale of febrifuge and seed and plants, and the sale of bark in London, amounted to Rs. 1,79,657-2-11, as shown below:—

	Rs.	Rs.	A.	P.
By sale of febrifuge, seed and plants to the public		56,436	11	6
By credits from Medical Depôts for febrifuge—				
Calcutta	49,545			
Bombay	33,030			
Madras	8,305			
		90,880	0	0
By sale of yellow bark in London		32,340	7	5
Total		1,79,657	2	11

12. The actual profit exhibited on the year's working was Rs. 80,290, equal to 8 per cent. on the capital of the plantation, while the value of the stock in hand at cost price was Rs. 94,924. This, however, does not represent the whole of the gain of the year. The price of quinine was very high, and the cost of 5,550lbs., which would have been used by Government had the febrifuge not been available, would have been at the lowest estimate Rs. 5,50,000. The cost of the febrifuge used was only Rs. 90,880. There was thus a clear saving of Rs. 4½ lakhs. The savings effected by similar substitutions of febrifuge for quinine in previous years amounted to 11½ lakhs. The total saving therefore has already amounted to more than 16 lakhs of rupees.

13. The Lieutenant-Governor desires to thank Dr. King for his excellent management of the department during the year. Dr. King speaks in very high terms of the services of Mr. Gammie, who, in addition to his onerous duties in the factory, has devoted much attention to the economical manufacture of sulphate of quinine. The commendation bestowed on Mr. Gammie is, the Lieutenant-Governor is enabled to say, well deserved.

ORDER—Ordered that a copy of this Resolution, and of the reports referred to, be submitted to the Government of India in the Home, Revenue and Agricultural Department, and that a copy of the Resolution be forwarded to Dr. King for information.

Ordered further that a copy of the Resolution and of the Reports be forwarded to the Medical Department of this Government, and also to the Government of Madras and to the Surgeon-General, Bengal, for information.

By order of the Lieutenant-Governor of Bengal,

COLMAN MACAULAY,

Offg. Secretary to the Government of Bengal.

(4)

No. 135b.

Copy of the Resolution, and of the two reports referred to, submitted to,
the Government of Madras for information.

By order of the Lieutenant-Governor of Bengal,

Rajendra Nath Mitra

Assistant Secretary to the Government of Bengal.

CALCUTTA,

The 29th June 1881.

No. 3449.

From

The Government of
Bengal
Financial
Dept.

Dated

29 June

Recd.

25 July

No. 1356

Print
5/8

Encl.

SUBJECT.

Forwarding for information
copy of the Resolution on the An-
nual Reports of the Govt. Chemi-
cal Plantation in Bengal
and of the Director for the
year 1880-81.

Fifth Rev. C. A. 1.

4
Rev 6/50/82

Ch. 11/36

19. Communicated to the Board of Revenue
in accordance with the Board's order
with the Government of Bengal and
the Government of the Province.

1. To the Board of Revenue
2. To the Government of Bengal
3. To the Government of the Province
4. To the Government of the District
5. To the Government of the District
6. To the Government of the District
7. To the Government of the District
8. To the Government of the District
9. To the Government of the District
10. To the Government of the District