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Proceedings of the Madras Government, Revenue Department, 15th January 1867.

No. 376. Read the following letter from the Superintendent Government Chinchona Plantations, to the Secretary to Government, Revenue Department, Fort Saint George, dated Ootacamund, 20th September 1866, No. 63:—

1. In continuation to my letter of the 15th instant, I have the honor to forward herewith my administration Report on the Government Chinchona Plantations and Botanical Gardens for the official year 1865-66, and beg to express my regret for the delay in its transmission.

2. The manuscript of the new edition of "Notes on Chinchona cultivation" contains all information with reference to cultivation, and consequently this subject has been passed over without notice in the present Report.

REPORT ON THE GOVERNMENT CHINCHONA PLANTATIONS AND BOTANICAL GARDENS ON THE NEILGHERRIES FOR 1856-66.

Introductory observations.

1. In submitting this report it is gratifying to be able to state that, notwithstanding an unusually dry season, with high and parching wind, conditions unfavorable to cultivation, our works and planting operations have made more than usual progress, and our plants continue to maintain that luxuriance which has all along characterized their growth on the Neilgherries. The maximum monthly increase by propagation has reached as high as 78,725.

Maximum monthly increase by propagation.

Average increase.

2. The average monthly propagation throughout the year being 48,968 against 21,200, the result of last year, the total number of plants on the 1st May 1866 was 11,56,070 against 5,58,105 on the same date last year. Thus the number of plants has been doubled in one year, a result which, at the commencement of the season, we did not anticipate.

Number of plants on the 1st May 1866.

Number of plants issued to the public.

The total number of plants issued to the public is 1,00,757 against 7,8,612, the number issued from the commencement of the undertaking up to the 1st May 1865, giving in this respect also a satisfactory result.

Number of plants permanently planted out.

The number of plants permanently planted out up to date is 4,01,211 against 1,82,236, the number planted out on the 31st May last year. Our first plants, which were permanently planted out on the 30th August 1862, have now attained heights varying from twelve to twenty feet, the circumference of the

Height of plants and circumference of stems.

stems being from 11 to 22 inches. Nothing can be more promising than the present condition of these plants. They have already produced many millions of excellent seeds, so that Chinchona plants can now be easily increased to any extent. The seeds have been extensively distributed, and are now germinating by hundreds of thousands in different parts of the country. The bark of our oldest plants has also much increased in thickness, and improved in appearance, while the yield of crystalized sulphates has been ascertained by recent analysis to have reached the unprecedented quantity of ten per cent.

Oldest plants now producing excellent seeds.

Recent analysis shews great increase of Alkaloids.

3. The modifications found necessary in the system of cultivation being detailed and illustrated in the new edition of the Manual recently submitted to Government, I consider it unnecessary again to refer to the subject in this report. With these observations I proceed to particulars which, for the sake of convenience, are arranged under the following heads:—

Modifications in cultivation noticed in the Manual, therefore not repeated here.

Heads of Report.

1. Propagation ... ... Paras 4 & 5
2. Plants, condition and growth of ... ... ,, 6 ,, 7
3. Do. growth of, in the open ground ... ... ,, 9
4. Do. do. under the shade of living trees ... ... ,, 8
5. Felling forests, effect of, on water supply ... ... ,, 10
6. Alkaloids, formation of ... ... ,, 11 & 12
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8. Establishment ... ... ,, 15 ,, 16
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10. Progress of operations ... ... ,, 19 — 21
11. Botanical Gardens ... ... ,, 22 & 23
12. Tea Plantations ... ... ,, 24
13. Concluding remarks ... ... ,, 25 ,, 26
14. Appendix A., accounts from the commencement of operations to the 30th April 1866.
15. Appendix B., Meteorological observations at Neddivuttum.
16. Do. C., do. do. at Ootacamund.

Propagation.—4. The majority of our young plants have been recently raised from seed obtained from our oldest plants. The seeds begin to germinate about the sixteenth day after sowing, and from one ounce of seeds from 20,000 to 25,000 plants are obtained. Hence seeds offer far greater facilities for increasing our number of plants than either cuttings or buds, which hitherto was the only means by which we could increase our plants. From the 31st May 1865 to the 31st May 1866, the number of plants has been more than doubled, giving in this respect in one year a greater result than that attained in the four preceding

Propagation by seeds.

Offers great facilities for increasing plants.

years. Now, with abundance of seeds, our plants can be increased in a very short space of time to any desired number. The growing of seeds instead of cuttings and buds has necessitated a slight alteration in our propagating houses. These alterations have been effected, and we have now accommodation in our houses and hardening pits for about a million of seedlings. During the last few months we have raised about 7,00,000 seedlings, which are not yet all transplanted, and consequently not carried to account in our monthly propagating reports, as in these reports only transplanted plants are entered. By the end of this year we shall have more plants than would be required for the completion of the whole extent of the Government plantations, and then our propagating appliances can be almost entirely devoted to the production of plants for the public. As we have extensively distributed seeds, and these are easily raised, planters now, as a rule, are successful in raising the number of plants required for themselves. We have still, however, to continue the propagation of some of the species by cuttings and buds, such as C. Officinalis, C. Uritusinga, C. Lancifolia, &c., the original plants of these being of more recent introduction have not yet produced seeds. The plants of Uritusinga are, however, this season flowering freely, therefore next year in all probability we will have a large supply of seeds of this very valuable species.

Alteration in the propogating houses necessary for seedlings.

7,00,000 seedlings raised during the last few months.

Sufficient plants for the Government plantations may be raised by the end of this year.

Some species have yet to be propagated by cuttings.

5. From the imported seeds of the C. Calisaya, received from Mr. Money, we have reared about 60,000 seedlings, apparently of three varieties; this is most important, as the "Yellow Bark" is acknowledged to be the best Quinine-producing species, especially in some of its varieties. A few seeds from Mr. Markham, also under the name of C. Calisaya, have germinated, and the plants are very distinct in appearance from even Mr. Money's seedlings, and in all probability they may turn out to be the very rare and valuable variety known as C. Calisaya Morado. It is with much regret I have to notice that the last batch of seeds of the Pitayo bark, gathered by Mr. Cross, has again failed. This is a most valuable species, and I hope that farther attempts will be made to introduce it, as it is of the utmost importance that we should not rest satisfied till our collection in India possesses every species of known or even reputed value.

60,000 plants raised from Mr. Money's Calisaya seed, apparently of three varieties.

Raised a few seeds from Mr. Markham under the name of C. Calisaya.

Probably C. Calisaya Morado

Seeds of Pitayo bark failed to germinate.

6. *Condition and growth of plants.*—The eleven plants planted out by the late Governor Sir William Denison and staff on the 30th August 1862, being placed in

an exposed situation, they suffered from the violence of the south-west monsoon, consequently have not made such rapid growth as the average of the plantation plants. Our older plants, although planted at twelve feet apart, now meet each other, and have thus caused, during the present year, a greater perpendicular growth than hitherto, which this year is nearly double that of last, while the circumference of the stems has increased as 16·5 to 10, which, together with the perpendicular height, gives an increase of the weight of bark in last year's growth upwards of five times as much, as the total amount produced in the three preceding years. Therefore, to cut down these plants, would be an enormous loss, as the stems will no doubt increase in this ratio for many years. These remarks refer principally to the C. Succirubra, which still continues to maintain a more robust habit and luxuriant growth than any of the other species, and this, together with its alkaloid-producing power, render it so far as our observations go, the most profitable and certain plant to cultivate. The growth of our C. Calisaya continues to be unsatisfactory and shrub-like, but this is now accounted for by it being recently ascertained to be the variety known as C. Calisaya Josepheana, which in its natural localities on the Andes is at most a mere shrub, producing bark of very inferior value to the tree Calisaya of the Bolivian forests. The C. Calisaya, apparently Morado, raised from Mr. Markham's seeds, has a very luxuriant growth, in this respect resembling the "Red Bark," as it also does in general appearance, but differing particularly in the deep red celiated young leaves. A light foliaged variety, produced among Mr. Money's seeds, also promises to be of a very robust habit, and we have, therefore, every reason to believe that among these varieties we may possess the true and valuable Bolivian tree Calisaya, which may one day outstrip in profitable cultivation the "Red Bark," because it is more productive in pure Quinine; but as there can be little doubt that Chinchonidine and Quinidine are medicinally equally as efficacious as Quinine, these alkaloids may not hereafter be separated by the manufacturers, and this will give the "Red Bark" a commercial advantage, which it does not now possess. The "Crown Barks," or C. Officinalis, and its varieties rank next in luxuriance to our "Red Bark," and as the analysis of the bark of this species shews a proportionate high per-centage of Quinine, these plants will doubtless be extensively cultivated, especially as the plant is much more hardy than the Red Bark. It also grows as well upon grass as upon forest land, and luxuriates even on the highest ridges of the Neilgherries, when sheltered from

Oldest plants in the plantations, planted at twelve feet apart, now meeting.

Bark increased as 16·5 to 10.

C. Succirubra continues to be the most luxuriant and best species to cultivate.

Our C. Calisaya ascertained to be the variety Josepheana, known as a shrubby kind of inferior value.

The true Bolivian C. Calisaya, probably among Mr. Money's seedlings.

C. Officinalis and its varieties rank next in luxuriance to the C. Succirubra.

Grow equally well on grass as on forest land, also on high ridges when protected from the monsoon.

the full force of the monsoon. The "Grey Barks" grow luxuriantly, although they will not bear exposure to fierce gales, and what is most remarkable, these plants under cultivation produce a large per-centage of Quinidine instead of Chinchonine, their usual product in a wild state on the Andes. In this instance, therefore, cultivation has changed an inferior alkaloid into one of comparatively high value, which has also been the result, but in a less degree, with the "Red Bark," and one we may anticipate in the Calisaya so soon as the plants attain sufficient age.

7. The C. Pahudiana, although yielding in its wild state bark worthless in commerce, promises, under cultivation, to become of some value, but not likely to enter into competition with any of the foregoing species. The plants of C. Lancifolia have been planted out in favorable localities, and every stimulant given in order to induce them to produce seeds as rapidly as possible; this species is almost as hardy as the "Crown Barks," and as it yields, perhaps, a higher per-centage of Quinine than the "Yellow" "Bolivian Barks," it is very important that we obtain as early as possible the means of increasing this very valuable sort.

8. *Growth of plants under the shade of living trees.*—Further experience still tends definitely to confirm that none of the species of Chinchona can be successfully grown under the shade of other trees; all our attempts at cultivation in this manner have proved unsatisfactory, notwithstanding the plants have in other respects been placed in the most favorable localities, and received every care and attention. The Calisaya may require a certain degree of shade, but this can only be secured by placing the plants close together, so that they may shade each other, leaving the robust ultimately to destroy the weak in the struggle for space and light. The different species cannot be successfully mixed together, as the luxuriant growing species injure and ultimately destroy the weaker. When Chinchonas are used for ornamental planting, they should be placed in clumps or groups, each group containing a single species, and arranged so as to produce, by the variation of foliage, the desired effect.

9. *Cultivation in the open ground.*—During the present season, our planting has only been done in such land as has been entirely cleared of forest, and this in future will have to be the only system adopted. About 70,000 "Crown Barks" have been planted out on grass land,

The Grey Barks grow well, but will not bear exposure to fierce gales.

Produces Quinidine instead of Chinchonine, their usual product on the Andes.

Chinchona Lancifolia, a valuable kind.

Chinchona cannot be successfully grown under the shade of living trees.

Shade produced when necessary by close planting.

Chinchona when planted for ornament should be in groups, each of a separate species.

70,000 Crown Barks have been planted on grass land, and are doing well.

where they are doing well. The plants of this species, placed out on grass land in 1863-64, continue to grow as luxuriantly as the plants planted out, at the same time, on forest land; consequently, in future, these plants will be planted on grass land instead of forest, it being very desirable to cover some of the numerous grassy hills on the Neilgherries with forest vegetation. All the species of Chinchona are found to thrive best under full exposure to light and air therefore, prior to being planted in forest land, it is necessary to clear away the whole of the original forest.

Well adapted for covering grassy hills.

All the species of Chinchona thrive best under full exposure to light and air.

10. *Felling forest, effect of, on water supply.*—One result of the felling of the forests for Chinchona cultivation has been to establish the fact, that the felling of forests immediately, and greatly, increases the supply of water in the streams, a result contrary to all received opinions, and being also contrary to anticipation; it led to a series of careful observation, which have established beyond doubt that, when forests are felled, the supply of water is increased in volume from two to three times, according as the streams rise in, or receive their supply from land occupied by forest, and as this increased flow of water has been permanent for five years, it cannot be the result of any accidental peculiarity or accidental circumstance. Both from a scientific and a practical point of view these are very interesting facts, establishing an extraordinary discrepancy in an accepted theory which shakes the theory itself to its foundation. But when we reflect on the fact that trees exist upon moisture, and have been produced by the moisture of the locality where they exist, they must of necessity be a drain upon the moisture of the land in which they grow, and thus, apart from the great quantity of water which they draw from a depth of the soil, to be evaporated by the leaves and dissipated in the atmosphere. Another great fact attendant upon the production of forests seems to have been overlooked, namely, that it requires more constant and uniform moisture to support a seedling tree than is necessary to maintain a full grown one, this being further an incontestible evidence that all localities must have been more uniformly moist at, and prior to, the time the forest originated, than was necessary after the forest became established. Practically, this question is one of great moment, inasmuch as it shews that the existence of trees at the sources of springs and along the banks of streams greatly reduces the flow of water, as the trees are in fact so many pumps continually at work drawing up the

Felling of forests immediately, and greatly, increases the flow of water in streams.

Volume of water two to three times as great.

Increased flow maintained for five years.

Trees exist upon moisture and have been produced by moisture.

Great quantity of water drawn from the soil by trees and dissipated in the atmosphere.

Localities in which forests exist must have been more uniformly moist at the time of their production.

Trees along the banks and at the sources of streams greatly reduce the flow of water.

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moisture and dissipating it in the air, and converting the residue in the shape of elaborated juice into their own substance.

11. *Alkaloid, formation of, in the Bark.*—The most valuable discovery made in connection with Chinchona cultivation is the manner in which the alkaloids are formed, how they are deposited and increase in the bark, how they pass from one into another, and how they waste, oxidise, or pass into gum or coloring matter. In the spring of 1863 I observed that the deposit of alkaloids was invariably most abundant in the bark covered by the clumps of moss, which in staking the plants we had placed between the ties and the bark to prevent chafing. In the bark above the clumps of moss, the alkaloids were deficient, and immediately below the moss they were also deficient. This curious and interesting fact led to close observation, and suggested many experiments to test the manner in which the alkaloids were formed or deposited. The combined results of these experiments clearly indicated that the alkaloids are first formed or produced in a crude or impure state in the leaves. In this condition, and intimately combined with the elements of the sap, they are carried down and deposited in the bark, most impurely in the liber or inner bark. As this bark becomes transformed by age into cellular bark, in which the circulation of sap is not so rapid, a superior alkaloid is produced of great purity and easy of separation. It was also observed that a progress of waste or deterioration was in action on the outer cellular part of the bark. This apparently was caused by the action of light and air. Under moss this waste was not perceptible. These observations led to two facts of vital importance in Chinchona cultivation: first, that there is a constant and never ceasing Quinine-producing power going on in the leaves of the plants, while, as if obeying a natural law, to counterbalance the source of production, there is a continual waste in the surface of the bark. To protect the alkaloids from this waste, it is necessary to exclude the action of light and air from the bark, and thus securing the whole advantage of the producing process.

Discovery of the manner in which the alkaloids are produced within the tree.

Alkaloids observed to be most abundant under the clumps of moss used in staking.

Above and below the moss they were deficient.

Alkaloids are first formed in the leaves in an impure state.

Carried down and deposited in the bark, impure in the liber.

In the cellular bark a superior alkaloid is produced.

On the outer surface of the bark a wasting progress was observed, apparently caused by light and air.

To prevent waste in the alkaloids, it is necessary to exclude light and air.

12. So interesting a discovery necessarily caused an entire alteration in our system of cultivation. It is indispensable that the leaves forming the laboratory should not be removed or destroyed. Our previous conceived notions of obtaining bark by means of loppings and prunings, or treating the plants as coppice, are altogether inadmissible, as

Leaves must not be destroyed, as they form the laboratory.

Obtaining bark by lopping and pruning quite inadmissible.

involving the destruction of the foliage. Now, unless we adopt the policy of "killing the goose that lays the golden egg," we must guard with the utmost care all foliage and leaf-producing branches, only removing such as are necessary to maintain the symmetry of the tree. By the aid of moss we may remove the cellular bark, without injury to the plant, and thus annually secure all the valuable alkaloids, without interrupting their continual formation and deposit.

Bark may be removed without injury to the tree by the aid of moss.

13. *Effects of mossing.*—As above mentioned, by the application of moss to the exterior of the bark, the process of oxidation or waste is arrested, and the alkaloids increased from 2½ per cent. to 15 or 20 per cent. Moreover, mossing more than doubles the bulk of the bark, thus making the direct yield of alkaloid per acre fully thirty times the quantity that can be procured under any other treatment. But this is a small advantage compared with the great one mossing affords, by enabling us to secure a yearly harvest of bark without damage to the plants or arrest of the Quinine-producing properties. By mossing every twelve or eighteen months, the entire cellular bark of the stem can be removed with facility and without injury.

A covering of moss applied to the outer bark prevents waste;

And the alkaloids increased from 2½ per cent. to 15 or 20 per cent.

By mossing, thirty times the quantity of bark can be procured annually than could be under any other treatment.

14. As the crown of the tree extends, and the foliage becomes abundant, the deposit of alkaloid yearly increases, while the expansion of the stem gives capacity for the reception of the alkaloid in the ratio of the cube. Thus, if a tree yields in the sixth year quarter of a pound of bark, in the twelfth year it will produce sixteen pounds. By treating the plant as coppice, a harvest of bark can only be obtained every sixth or seventh year, and as the capacity of the stem is, at six years growth, only one sixty-fourth part of what it would be at twelve years, there is not only by this system the loss of at least five years' produce, but there is also the loss of the yearly increasing Quinine-producing power, and also the capacity to receive the same. Under the mossing system one acre will yield annually three hundred times as much alkaloid as can be produced by any other

By the coppice system, a harvest of bark can only be reaped every sixth or seventh year, and the bark being young, is deficient both in its quantity of alkaloids, and in its capacity to receive them.

300 times the quantity of alkaloids can be obtained by mossing than could be by any other treatment;

method. These favorable results of the application of moss cannot, at present, be fully comprehended; but it must shortly render Quinine very abundant and cheap, and so place this inestimable medicine within the reach of the working classes of this country.

And thus place this valuable medicine within the reach of the working classes.

15. *Establishment.*—* * * I have to thank the majority of my Assistants for their hearty co-operation, zeal, and attention in carrying out the various duties entrusted to their charge. Mr. Batcock especially has shewn much diligence and skill in conducting the duties of the propagating department. The employment of convict labor has proved a great boon on the Dodabetta and Neddivuttum plantations, by giving us the advantage of being able to push forward the various operations at their proper seasons, which, in cultivation, is most important, and what we could not perfectly attain when depending only on free labor for the performance of the work. The convicts, as a body, work cheerfully and contentedly, many of them performing from two to three times as much work as can be procured from free laborers. On the Dodabetta plantation the convicts have now been employed for nearly twelve months. They have maintained excellent health, and, after a short location upon the plantations, men weakly and delicate on their arrival, become strong and robust. The nature of the labor is healthy, as also the situations of the Jails, therefore our plantations offer the advantages of employing convict labor to the benefit of Government, and the well-being of the men. The task of a convict on the plantation is that of a usual day's work of a free laborer. For all work performed over and above this task, the convict receives a reward equivalent to six Pice for a quarter of a task, or two Annas (3*d.*) for a full task. With this money the convicts may purchase any necessary article they require, or, at their option, it is kept for them until their sentence expires. This system of reward stimulates the convict to exertion, and teaches him the advantage to be obtained by constant and steady labor. The consequence is that nearly all the convicts, as they are released, get their families up from the plains, and settle down as free laborers on our plan-

The convict labor at Dodabetta and Neddivuttum has proved of great assistance.

The convicts work cheerfully, and many of them perform two to three times as much work as a free laborer.

Weakly men become strong and healthy on the plantations.

Convict's task and privileges.

Released convicts remain on the plantation as free laborers.

tations, an arrangement much more desirable than that they return to their previous haunts of crime, to be again exposed to temptation and the influence of evil associates.

16. In consequence of the high rate of provisions, free labor has been more plentiful this season than hitherto, and as this state of the labor market is likely to continue, it offers the means of at once pushing forward our works to completion, should the Government consider it desirable.

17. *Progress of operations.*—In the propagating department a slight alteration has been made in the buildings in order to admit sufficient light for rearing seedlings, as they require more light than necessary to root-cuttings and buds. Our propagating houses and hardening cases afford accommodation for about 10,00,000 seedlings. The seedlings, when transplanted, cannot at once be placed in the nurseries, in consequence of their liability to damage by heavy rains, we have therefore had to construct, in the nursery grounds, temporary sheds to keep off the rain until such time as the seedlings are established. This is the only increased accommodation made to our open air nurseries during the present year. The total number of plants produced from the beginning of the undertaking to the 1st May 1866 was 11,23,645, exclusive of 1,00,757 distributed to the public. The number of plants propagated during the official year being 5,87,616. On the 31st July 1866 the number and distribution of our plants stood as follows :—

Total number of plants propagated from the beginning to the 1st May 1866 was 11,23,645, exclusive of 1,00,757 distributed to the public.

Number and distribution of plants on the 31st July 1866.

Plants permanently planted out on the plantations	4,01,211
Plants in the open air nurseries	47,000
Rooted plants and transplanted seedlings in propagating houses and hardening cases	8,68,779
Estimated number of unrooted cuttings and untransplanted seedlings.	2,00,000
	15,16,990

357 acres now under cultivation at Neddivuttum.

18. On the Neddivuttum plantations 73 additional acres have been planted, making 357, the total number of acres under cultivation on these plantations. The planting of this season has

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taken place principally on the Kilgraston, 2nd Denison, and Hooker estates. Here also 25 acres of grass land has been pitted for the reception of the Crown Barks. The roads, drains, fences, and water-courses on the Kilgraston and Hooker plantations have been finished. On the 2nd Denison the fence has been completed and joined to that of the 1st Denison plantation. The Jail is finished, and the convicts located in it since 16th of May last. A range of Police lines, covered with corrugated iron, is now in course of construction. The materials collected and being prepared for the construction of a Jail Hospital, and permanent cook-rooms.

25 acres of grass land planted on the Hooker estate.

Convicts located in the Jail at Neddivuttum since 16th May 1866.

19. On the Wood plantations at Pycara 21 acres of land have been planted out during this season, which gives a total of 92 acres under cultivation on this plantation; in the newly planted portion, the roads and drains have been formed, and two sides of the plantation enclosed by a ditch and fence so as to exclude wild animals, as this season they have done much damage to the plants, especially in the avenue.

92 acres have been planted on the Wood estate.

20. On the Dodabetta plantations the work has also made satisfactory progress, 72 acres of land being planted during this season, making the total extent under cultivation on these plantations 224 acres. On the 2nd plantation the Jail, Police lines, and out-houses attached have been completed. Here eighty-two convicts have been located since the 20th September last.

The total number of acres planted on the Dodabetta sites is 224.

Convicts located in the Dodabetta Jail since 20th September last.

21. On the Malakoondah plantation little has been done beyond improving the plantation roads, completing the Jail buildings, and constructing lines for the Police.

22. *Botanical Gardens.*—In the Botanical Gardens considerable improvements have been effected, the station parterre, in the centre of the garden, has been extended, three additional fountain basins formed, and the flower borders planted with choice flowers and shrubs. The building of the new orchid and fern house has been completed, though not yet been stocked with plants, in consequence

New orchid and fern house completed.

of the space being at present required for Chinchona seedlings. Around this orchid house, terraces, and parterres are now in course of formation, and being in a sheltered position in the garden, offer great advantages for the cultivation of tender and rare plants. This season has added some interesting plants to our collection. To Sir William Denison we are indebted for further large supplies of valuable timber tree seeds from Australia, as also for fine plants of Arancarias Excelsa, Cunninghannii Biduillii, and Cookii. The valuable Dammara Australis and an interesting collection of Burmese orchids.

Plants of valuable Australian Coniferæ and Burmese Orchids presented by Sir W. Denison.

To Dr. Cleghorn, Conservator of Forests, we are indebted for seeds of many valuable Himalayan fruit trees; among these the Cherry seems to have taken well to the climate, and this year has flowered. To this gentleman we are also indebted for the valuable medicinal Scammong (Convolvolus Scammonia), which also promises to succeed here. To Captain Beddome, Acting Conservator of Forests, for numerous interesting ferns; we have also to thank this gentleman for a collection of Australian seeds. To E. B. Thomas, Esq., for two plants of the Mangosteen. To. Mr. J. Horne, Superintendent of the Botanical Gardens, Port Louis, Mauritius, for a case of valuable and interesting plants, containing among others the Chinese Rice Papee plant, Aralia papy rifera,) the Birds nest fern (Neottopteris indus), &c.

Himalayan Cherry and Scammong presented by Dr. Cleghorn.

Ferns and Australian seeds from Captain Beddome.

Mangosteen from E. B. Thomas, Esq.

Rice Papee plant, Birds nest fern, &c., from Mr. J. Horne, Botanical Gardens, Mauritius.

23. The following table exhibits the distribution of plants and seeds by this Garden for the official year 1865-66.

Distribution of plants and seeds from the Gardens :—

	Fruit trees and shrubs.	Timber trees.	Shrubs and flowers.	Collection of seeds.	Amount.
					RS. A. P.
1865 May	24	744	484	52	467 10 0
,, June	8	800	67	44	191 3 0
,, July	25	9,258	70	26	397 9 7
,, August	40	7,339	141	21	492 4 0
,, September	19	333	132	19	168 0 0
,, October	81	916	258	17	211 13 0
,, November	.....	1,318	401	14	147 7 0
,, December	32	8	166	9	132 5 5
1866 January	.....	.....	8	6	19 2 0
,, February	.....	.....	19	10	48 5 0
,, March	.....	.....	36	15	47 1 0
,, April	7	229	667	35	234 3 2
Total distribution ...	236	20,945	2,449	268	2,556 15 2

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24. *Tea Plantation.*—The experimental tea plantation, sanctioned by the Government in December 1863, has received an addition of 1,700 plants of the Assam tea, raised from seeds, furnished by Government in March 1865. The plantation now contains 13,500 plants, which are in a promising condition. This year some of the plants are producing flowers, we may therefore shortly expect a supply of tea seeds for distribution.

13,500 tea plants placed in the plantation.

25. *Concluding remarks.*—By the above details it will be observed that, during the present year, our operations have made great progress. That as the plants have produced abundance of seeds, a very important object has been attained, which renders available the means of increasing the cultivation to an unlimited extent. During the year 166 acres of land has been planted, and many young plants placed out in the spaces between our large plants, which were originally placed at twelve feet apart, as this distance was found to be too great. The number of acres at present under cultivation in the Government plantations is 673.

26. In conclusion, I beg to render my grateful acknowledgments to the Government of Madras for the liberality in which my suggestions have been met. To Mr. Markham, of the India House, for his hearty co-operation, and the interest he has exhibited in the successful development of this important undertaking. To Mr. J. W. B. Money, for a very valuable collection of seeds of C. Calisaya; and to Mr. J. E. Howard, my best thanks are due for the very important information he has so liberally furnished.

A

Sanctioned estimate cost of each Chinchona Plantation from commencement of operations to 30th April 1866.

Particulars.	Operations preparatory to receipt of plants.	Superintendent and Office Establishment.					Nursery Department.					Dodabetta		
	1860-61.	1861-62.	1862-63.	1863-64.	1864-65.	1865-66.	1861-62.	1862-63.	1863-64.	1864-65.	1865-66.	1861-62.	1862-63.	1863-64.
Grant for the preparation of sites	2,000	...	...	...	...	...	...	...	...	...	...	...	...	...
Establishments, including salaries, &c.	.....	4,200	5,350	5,880	8,180	8,768	3,324	4,305	4,609	3,948	4,048	2,280	5,400	5,700
Buildings	.....	...	...	...	...	...	1,200 2,000	...	...	800	...	560	...	...
Tool and Store-rooms ...	.....	...	...	...	...	...	...	...	...	...	...	...	250	...
Coolies' quarters	.....	...	...	...	...	...	...	...	...	...	...	200	500	...
Felling	.....	...	...	...	...	...	...	...	...	...	...	400	1,500	...
Clearing	.....	...	...	...	...	...	...	...	...	...	...	280	1,500	...
Pitting	.....	...	...	...	...	...	...	...	...	...	...	400	1,500	...
Carriage of plants	.....	...	...	...	...	...	...	...	...	...	...	150	...	...
Planting and shading ...	.....	...	...	...	...	...	...	...	...	...	...	200	500	...
Trenching	.....	...	...	...	...	...	...	...	...	...	...	1,800	...	...
Enclosing	.....	...	...	...	...	...	756	...	...	...	...	...	5,850	...
Road making	.....	...	...	...	...	...	...	...	...	...	...	...	2,025	...
Tools	.....	...	...	...	...	...	...	...	...	...	...	...	1,200	...
Contingencies	.....	...	...	...	...	...	196	...	...	300	500	399	1,200	...
Total	2,000	4,200	5,350	5,880	8,180	8,768	7,476	4,305	4,609	5,048	4,548	6,669	21,425	5,700

Plantations.		Neddivuttam Plantations.					Pycara Plantations.				Malakoondah Plantations.			Total.
1864-65.	1865-66.	1861-62.	1862-63.	1863-64.	1864-65.	1865-66.	1862-63.	1863-64.	1864-65.	1865-66.	1863-64.	1864-65.	1865-66.	
...	...	...	...	...	...	...	.....	...	...	...	...	...	...	2,000
7,248	8,790	5,064	8,412	15,348	12,360	16,260	.....	4,033	6,564	7,014	...	5,600	3,120	1,65,805
600	7,000	2,080	...	...	750	8,500	1,530 2,000	...	...	...	...	750	2,500	30,270
250	...	250	...	...	400	...	250	...	350	375	125	150	...	2,400
...	200	1,000	1,000	...	300	400	1,000	...	200	...	500	250	...	5,550
550	...	1,500	3,000	...	900	1,500	1,500	...	900	750	6,150	900	...	19,550
550	...	1,500	3,000	...	900	1,500	1,500	...	900	750	...	900	...	13,280
550	...	2,000	3,000	...	900	2,000	.....	...	900	1,000	...	900	...	13,150
150	400	450	450	...	400	900	.....	...	350	450	...	50	...	3,750
200	350	550	550	...	350	900	.....	1,300	250	450	...	...	...	5,600
500	600	4,000	...	...	1,100	900	.....	8,000	1,250	700	...	1,250	...	20,100
550	...	3,900	...	...	...	1,350	.....	750	...	550	375	300	650	15,031
...	800	1,520	...	...	550	1,000	.....	1,350	200	600	675	1,500	500	10,720
800	525	1,282	...	...	900	1,000	.....	1,282	500	...	641	700	500	9,330
500	4,000	2,003	1,831	...	600	1,200	.....	2,046	350	500	846	250	300	14,021
12,448	19,665	27,099	21,243	15,348	20,410	37,410	7,780	18,761	12,714	18,139	9,312	13,500	7,570	3,30,557

Actual expenditure on each Chinchona Plantation from commencement of operations to 30th April 1866.

Particulars.	Operations preparatory to receipt of plants.	Superintendent and Office Establishment.					Propagation and Nursery Department.					Dodabetta		
	1860-61.	1861-62.	1862-63.	1863-64.	1864-65.	1865-66.	1861-62.	1862-63.	1863-64.	1864-65.	1865-66.	1861-62.	1862-63.	1863-64.
Establishment, including salaries, &c.	114 2 3	4,347	5,343	6,437	7,971	8,142	2,024 11 6	3,329	3,440	3,478	4,539	1,481	2,274	2,605
Buildings	... ...	...	...	...	...	...	2,647 0 0	3,578	3,000	1,500	...	865	...	...
Tool and Store-rooms	... ...	...	...	...	...	...	... ...	...	...	...	...	...	...	230
Coolies' quarters ...	... ...	...	...	...	...	...	... ...	...	...	...	...	...	250	500
Felling	302 5 3	...	...	...	...	...	... ...	...	...	...	...	448	750	500
Clearing	... ...	...	...	...	...	...	... ...	...	...	...	...	400	750	400
Pitting	... ...	...	..	...	...	...	... ...	...	...	...	...	848	750	1,010
Carriage of plants ...	... ...	...	...	...	...	...	... ...	...	..	...	...	245	200	140
Planting and shading	... ...	...	...	...	...	...	... ...	...	...	...	...	355	450	560
Trenching ...	... ...	...	...	...	...	...	... ...	...	...	...	...	...	...	1,200
Enclosing ...	... ...	...	...	...	...	...	... ...	...	...	...	...	...	2,800	...
Road making ...	300 0 0	...	...	...	...	...	... ...	...	...	...	...	600	700	2,070
Tools	271 0 0	...	...	...	...	...	... ...	...	...	...	170	394	304	600
Contingencies	67 0 0	...	...	...	50	200	... ...	...	...	450	700	124	460	500
Total.....	1,054 7 6	4,347	5,343	6,437	8,021	8,342	4,671 11 6	6,907	6,440	5,428	5,409	5,760	9,688	10,315

Plantations.		Neddivuttum Plantations.					Pycara Plantations.				Malakoondah Plantations.			Total.
1864-65.	1865-66.	1861-62.	1862-63.	1863-64.	1864-65.	1865-66.	1862-63.	1863-64.	1864-65.	1865-66.	1863-64.	1864-65.	1865-66.	
7,083	5,235	2,919 0 0	6,195	5,874	12,507	12,052	...	1,608	1,880	2,086	...	971	1,671	1,15,596 13 9
7,250	4,500	1,560 0 0	...	1,000	8,550	4,000	1,683	...	...	...	350	500	890	41,873 0 0
...	200	... ...	350	500	450	169	275	...	250	320	...	300	...	3,044 0 0
...	308	... ...	1,750	1,000	500	400	1,100	550	250	...	...	250	...	6,858 0 0
650	1,300	1,780 7 3	1,500	2,200	800	...	1,500	2,000	750	1,500	2,400	851	...	19,231 12 6
650	1,300	... ...	1,500	2,200	500	700	1,125	2,000	750	1,500	1,125	500	825	16,225 0 0
500	2,000	1,680 7 3	858	2,000	700	1,500	...	1,000	600	1,355	...	738	750	16,289 7 3
250	700	540 1 9	900	750	362	959	...	65	350	600	...	...	...	6,061 1 9
700	2,000	640 1 8	900	898	500	1,000	...	65	300	400	...	...	...	8,768 1 8
600	800	... ...	1,972	1,780	1,135	500	...	...	1,000	700	...	...	200	9,887 0 0
357	1,200	... ...	1,550	900	...	760	...	679	...	750	...	300	750	10,046 0 0
1,000	1,000	1,100 0 0	1,000	2,000	327	...	...	1,500	504	400	502	875	800	14,678 0 0
499	686	700 0 0	400	868	650	900	...	1,500	1,000	250	...	1,000	...	10,192 0 0
800	1,510	340 0 0	915	850	1,200	1,800	...	400	250	350	100	125	250	11,441 0 0
20,339	22,738	11,251 1 11	19,790	22,812	28,181	24,740	5,683	11,367	7,380	10,211	4,477	6,410	6,136	2,90,191 4 11

OOTACAMUND,
20th September 1866.

(Signed) W. G. McIVOR,
Superintendent, Government Chinchona Plantations.

B.

Meteorological observations made on the Government Chinchona Plantations at Neddivuttum from 1st May 1865 to 30th April 1866.

Months.	Hygrometer.		Maximum in shade.	Minimum in shade.	Solar radiation.	Terrestrial radiation.	Rain in inches.	Days with rain.	Days without rain.
	Dry Bulb.	Wet Bulb.							
May	66	62	76	57	77	64	2·95	18	13
June	61	58	66	56	63	59	19·25	26	4
July	59	58	68	55	62	58	38·33	31	...
August	...	...	...	...	...	...	...	...	...
September	...	...	...	...	...	...	...	...	...
October	62	58	75	56	76	60	3·69	12	19
November	61	57	76	56	84	61	1·86	7	23
December	64	54	76	51	90	61	1·5	3	28
January	62	52	79	50	95	62	0·12	1	30
February	...	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...	...
April	70	62	68	60	...	70	3·15	5	25
Total ...	...	...	...	...	...	..	70·85	103	142
Mean...	63·25	57·62	73	55·12	78·14	62	...	...	...

Meteorological observations made at the Botanical Gardens, Ootacamund, from 1st May 1865 to 30th April 1866.

Months.	Hygrometer.		Maximum in shade.	Minimum in shade.	Solar radiation.	Terrestrial radiation.	Terrestrial radiation at night.	Rain in inches.	Days with rain.	Days without rain.
	Dry Bulb.	Wet Bulb.								
May	60	58	72	54	114	77	48	8·06	22	9
June	58	57	69	53	106	76	50	2·67	14	16
July	57	56	65	56	98	71	53	8·83	24	7
August	59	58	65	52	102	71	50	2·48	16	15
September	57	55	68	51	113	75	45	2·61	11	19
October	58	56	69	51	110	71	45	11·22	15	16
November	57	53	70	43	114	74	43	2·11	8	22
December	53	47	73	46	117	77	38	1·19	4	27
January	56	46	71	45	123	77	35	0·58	2	29
February	60	48	78	46	132	84	37	...	...	28
March	65	52	77	53	135	86	40	0·13	2	29
April	63	56	76	54	128	82	49	4·03	19	11
Total	...	...	...	...	...	...	...	43·91	137	228
Annual Mean... ..	58·58	53·5	71·08	50 75	116	76·75	44·41	...	...	...

OOTACAMUND,
20th September 1866.

1865. *Notes on the weather at Ootacamund.*

MAY.—Rain-fall equally distributed throughout the month; occasional heavy showers, a little thunder towards the end; weather generally open without mist or fog.

JUNE.—Month characterized by fog and mist with high wind; rain-fall nots heavy, stormy towards the end of the month; south-west monsoon commenced on the 6th.

Proceedings of the Madras Government, Revenue Department,
15th January 1867.

JULY.—Month generally stormy and wet with heavy rain; direction of clouds observed to be changed on the 23rd, south-west monsoon probably ended.

AUGUST.—Beginning of month foggy and dull with moderate rain; end more open with occasional fog and wind.

SEPTEMBER.—Beginning and end of month rainy; weather throughout generally open with passing clouds; a little fog and mist in the middle of the month.

OCTOBER.—Month characterized by heavy rain-fall with thunder. Days without rain, hot sunshine with passing clouds.

NOVEMBER.—Month generally serene with passing clouds; mist and fog not heavy; rain-fall light.

DECEMBER.—Beginning of month cloudy and rainy; middle and end generally open with light clouds.

1866.

JANUARY.—Month generally clear and serene; a little rain and cloud in the middle; the end also cloudy.

FEBRUARY.—Month generally hot and sunny, with a little cloud; atmosphere more or less hazy.

MARCH.—Month hot and sunny; a few clouds with light rain about the 8th; atmosphere very hazy throughout.

APRIL.—End of the month generally rainy and cloudy with thunder; a little rain with distant thunder in the beginning; intermediate days generally open weather with passing clouds.

(Signed) W. J. McIVOR,
Supt. Govt. Chinchona Plantations.

No. 377. ORDER THEREON, 15th January 1867, No. 175.

Miscellaneous.

1. The Governor in Council considers the results of the year highly satisfactory, and, in forwarding the Report to the Secretary of State, will again record his appreciation of Mr. McIvor's skill and devotion to this important undertaking.

2. The Governor in Council regrets, at the same time, to have to censure Mr. McIvor for the very improper reflection on the proceedings of Government, contained in paragraph 15 of his Report, which will be expunged from the printed copy. The Governor in Council has a high sense of Mr. McIvor's qualifications and services, but cannot allow any subordinate thus to canvass the conduct of the Government.

(True Extract.)

(Signed) J. D. SIM,
Secretary to Government.

To the Superintendent of the Government Chinchona Plantations.

Exd. T. O'Connor.

The first consideration the 2d. result of the year highly rela-
-tive to and in foreign duty
the report of the Lords, will appear
record his abbreviation, the
Mr. Mc Lean's Skill & dexterity
& this important under the duty.

The first regrets, at the same
time, to have to censure Mr.
Mc Lean for the very imperfect
reflection on the Prov: of part con-
tained in para 15 of his re-
-port - which will be strongly
from the printed copy - The
first has a high sense of Mr.
Mc Lean's qualifications & services
but cannot allow any subordinate
thus to canvass the conduct of the
Govt.

J. B. Wednesday 1867.

Copy of Letter Chairman Govt. Chinese Chinese
15 Nov 1867 - 38

Fro. 27 Feb/65. f. 542-3.

Rev. 1866. Oct. 6
Govt. No. 4585

To,
The Superintendent
Govt. Cinchona Plantations
Dalsemund

&
The Secretary to Govt
Revenue Dept.
Madras

No. 63
Dated 20 September 1866
Rec'd 22 Oct.

Forwards Administrative
Report on the Govt Cinchona
Plantations & Botanical
Gardens for the official year
1865.66.

No 175 - 15 Jany

Order acknowledged

No. 376-377