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MADRAS RECORD OFFICE.

Government of Madras.

Revenue **DEPARTMENT.**

G.O. No. 1469 Press ~~Mis.~~

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Dated 30-7- ~~19~~1863

Not to be folded or roughly handled

Proceedings of the Madras Government, Revenue Department, 30th July 1863.

No. 537. Read the following letter from W. G. McIVOR, Esq., Superintendent Government Chinchona Plantations, Ootacamund, to J. D. SIM, Esq., Secretary to Government, Revenue Department, Fort Saint George, dated Ootacamund, 23rd July 1863, No. 59:—

SIR,

I have the honor to forward herewith Report on the Government Chinchona cultivation for the official year 30th April 1863.

No. 538. ORDER THEREON, 30th July 1863, No. 1,419.

The report as revised in the Revenue Department will be transferred to the Public Department for inclusion in the General Administration Report of the Presidency.

(True Extract.)

Secretary to Government.

To the Public Department.

Exd. S. T. Augustin,

Report
on
The Government Cinchona Plantations on the Neilgherries for 1862/63.

In forwarding this Report, it affords me much Satisfaction to be able to State, that the important object of introducing into, and cultivating the Quinine yielding Cinchonas in India, has now been successfully accomplished. The plants which have been increased in great numbers, grow luxuriantly, and extensive Plantations have been formed. The yield of Quinine even in our very young barks, has been ascertained much to exceed that usually found in the South American barks of commerce: the Peruvian Bark may therefore, fairly be considered restored to India as one of its future products. This result having been obtained, and it being one, fraught with importance to mankind; not only in a Commercial, but in a philanthropic point of view, I trust the Government will not consider it a digression from the legitimate sphere of this report for me to give a brief outline of the first attempts to introduce these plants, and of the causes which have mainly contributed, in securing the present highly Satisfactory issue, by placing the experiment beyond doubt in the very short period of little more than 2 years. In order to render the subjects treated of more easy of reference I have arranged them under the following heads:—

First attempts to introduce the Cinchonas into India——Para 2

Appointment

Appointment of Mr Markham and progress of undertaking ——— Para 3 to 5

Review of the Systems of cultivation and increase of Plants ——— " 6

Growth and condition of plants ——— " 7

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Progress of operations ——— " 14

Establishments ——— " 15

Concluding remarks ——— " 16 to 18

First attempts to introduce the Chinchonas into India.

2 In March 1852, the then Governor General (Lord Dalhousie) first recommended for the consideration of the Honorable the Court of Directors, a plan for the introduction into India of the Quinine yielding Chinchonas. The Court submitted this despatch to Dr Royle for report, and this eminent naturalist drew up a valuable paper on the subject dated 7th June 1852. The subject was then brought before the Board of Control; and an attempt was made to introduce the plants, through Her Majesty's Councils in South America, which ultimately failed. A few plants however, were obtained from the Botanical Gardens in Europe during the same year, and these were safely conveyed to India by Mr Fortune, who delivered them to Dr Falconer at that time the Director of the Botanical Gardens in Calcutta. Dr Falconer finding the plants dying off in the Botanical Gardens, forwarded them to Dr Campbell Superintendent of Darjeeling, where they arrived alive, but that Gentleman reported on the opening of the following year, that "the Chinchona trees were killed by the cold of last winter". The seeds also which were procured and forwarded by Mr Cathcart,

and

and sown in the Calcutta Botanical Gardens, "did not vegetate" while the plants forwarded by Mr Cope from Ecuador, although received in a living state ultimately died; and thus the laudable attempt originated by the late Lord Dalhousie ended in total failure. In 1855 another attempt was made under the direction of Dr Royle, Falconer and Thomson, which also ended in failure.

Appointment of Mr Markham and progress of undertaking.

3 It now became apparent to the Home authorities, that if success was to be obtained in this important undertaking; it could only be secured by the special services of a well qualified Agent to conduct the enterprise, and consequently in 1859 the services of Mr Clements R. Markham were engaged for this special duty. Mr Markham started on his expedition to America in the early part of 1860, and after surmounting many difficulties and dangers, arrived in India, at the end of the same year, with the first instalment of Chinchona plants; leaving the others to be forwarded by the various agents employed for that purpose. These plants had suffered considerably in being conveyed across the higher ridges of the Andes, and subsequently on their passage in the Red Sea; and when they arrived at Ootacamund were, as might be expected, in an unhealthy state. This condition of the plants immediately gave rise to the prediction of the entire failure of the expedition. An article to this effect appearing in the "Madras Daily Times" attracted the attention of Government, who had at this critical stage, various and seriously conflicting opinions urged upon them, as to the correct mode of cultivating the plants. and was further, called upon to believe that "we were risking our seeds and plants, by attempting to propagate them"

"in the"

"the Government Gardens at Ootacamund". The Soils we had selected for the experiment, as also the method of cultivation we had adopted, were totally condemned. The System of open cultivation was described as certain to bring ruin on the experiment, and as a "procedure quite" "opposed to all we know of the habits of the genus, as well as the opinions of" "so great an authority as Weddell, as well as the experience of the Dutch" "in Java". The humidity of the atmosphere of the Neilgherries, was described as "only 0.417 or nearly absolutely dry", leaving it to be inferred that during the months of January, February, March, and April." Our climate was as arid as that of the deserts of Arabia. A contrary position of facts, was urged by Mr. Markham and myself, but this was met by the assertion of our "ignorance of Botany and" "Science generally" leaving it to be presumed that Government would therefore be expert in following the Scientific opinions of Drs Macpherson and Anderson, who, besides their eminent attainment had the advantage of seeing the practical cultivation of the plants under Scientific direction in Java. Under these perplexing circumstances to the judgement of Sir Charles Wood Secretary of State for India, to the Government of Madras, and especially to the private enquiries of His Excellency Sir William Denison, in making a correct selection between these conflicting opinions, our present great success, and the gratitude of the present and future generations is entirely owing. And the great extension of a product unequalled in its value, beneficial to the whole world.

4— Now that we are enabled to look back upon the various arguments, and opinions, advanced at the time of the introduction of these plants, through the clear medium of developed success, which places in strong contrast, those opinions which were correct, with those that were erroneous.

This

This review cannot fail to leave the impression upon the mind, that had the Government adopted the Systems of Cultivation so forcibly recommended by the Scientific Gentlemen above mentioned, the undertaking would doubtless have been in a comparatively hopeless condition; as we could not have expected greater results than those which have attended the Java experiment; and this is to some satisfactory, that it is evident from the despatches of the Home Dutch Government, that the Cultivation of the Chinchona plant under the Government in that Island would shortly have ceased, and all further attempts discouraged, while it would have afforded an excuse for a like failure in India; and the establishment of the prediction which has already been made, that Chinchona plants are incapable of profitable cultivation; and thus like all other vegetable products of benefit to mankind, the Supply yielded in the wild state of the plant would ultimately cease, as only by cultivation can all such products, be produced in abundance so as to meet the yearly increasing demands.

5— These observations are made with the view of pointing out the danger of giving too implicit confidence to opinions hastily advanced as Scientific, and not to depreciate the knowledge of Science, as of its advantages, there can be no doubt; but, to apply these principles, in such a manner as faithfully to direct practice, in any matter yet unascertained by experiment is under every circumstance somewhat hazardous, for even to ensure a probability of success in implicitly practicing Scientific principles, requires an amount of correct reasoning, caution, and forethought so frequently overlooked, as to have the effect of bringing Science into disrepute; although the error lies with those who recklessly advance its principles, without considering their practical application.

Review of the Systems of Cultivation and increase of Plants.

6— The Governor in Council

in

in G. O. dated the 3rd July 1861 No. 1328, entrusted the conduct of the Cinchonas experiment to my care, giving me "full and entire control over the operations," consequently a plan and estimate was submitted with reference to the establishments required, and the manner in which the experiment should be carried out; these were liberally sanctioned in Government Order of the 7th September 1861 No. 1756. From this date, the experiment was prosecuted with a vigour commensurate with its importance, and the following is a brief review of the results. On the 9th May 1861, which may be taken as the commencement of the cultivation our number of plants was as follows.

Cinchona Succirubra		507
"	Calisaya	4
"	Nitida	392
"	Micrantha	211
"	Pitayana	14
	Total number	1128

On the 31st December 1861 these plants were increased to 8.613. On the 30th April 1862 they were further increased to 31.695, and on the 31st December of the same year the total number of plants was 117.706. not including 1.619 the number distributed to the public, which latter number considerably exceeded our original stock. On the 30th april 1863 the number of plants had been increased to 157.704. while at this date a total of 2.628 plants had been distributed to the public. 41.397 plants permanently planted out in the plantations; and covering about 85 Acres of land. The majority of these plants, having at the above date attained a height of from 16 to 3 feet, and are at the present moment in the finest possible state of health. The remainder

remainder of the plants being small were in the Nurseries, Hardening cases, and Propagating houses as follows.

Number of Cinchona plants permanently planted out	
on the 30th April 1863	41.397.
Do Do in the Nurseries in the open air	23.000.
Do Do in Propagating Houses & Hardening pits	93.307
Total number of rooted plants	157.704
Estimated number of Cuttings and Layers	25.000
Total number	182.704.

Thus our efforts in the propagation of these valuable plants has been attended with a Success quite unequalled.

Growth and Condition of the Plants. — The first plants were permanently planted out in the plantations in August 1862. The average growth of these during 9 months (including 3 months of winter) or up to the 30th April 1863) taking the whole of the plantations, may be estimated at about 2 feet; during the period the plants were becoming established after being transplanted, the growth was comparatively little. Eleven plants selected for measurement and planted by Sir W. Denison and other Gentlemen on the 30th August 1862, has been found to average 3 feet during 9 months, and this may be given as the fair average growth attained on the Neilgherries by all our five species of Cinchonas, after they have once become established in the ground. The brown barks being of a shrubby species, their growth in height is in consequence comparatively slow, although these plants are found to thrive equally as well as any of those imported. Indeed all the species thrive so nearly alike, that it is impossible to give one the preference over another in this respect. They however do not all equally well bear exposure to strong

gales

gales of wind, and heavy hailstorms. The Red, and Grey Barks, having large leaves suffer most under these circumstances, while the Yellow, and Crown barks, suffer least. The whole of the species have however shown a decided preference for the light brown or chocolate coloured soils so common in many localities on these hills. When planted in heavy vegetable loams, the plants make equal, if not greater progress in the dry and showery seasons of the year; but during the continuous rains they receive an evident check, the leaves losing their deep green appearance, assuming instead a yellowish tinge, apparently caused by the soil not parting with the rain water sufficiently rapidly to suit the requirements of the plants. So fast there can be no doubt that all the species of Cinchona are exceedingly impatient of excess of water at the roots. It is generally supposed that the plants require a great amount of moisture in the atmosphere, but from observations made during the monsoon this does not appear to be established; for while our atmosphere is saturated with moisture, the plants are less healthy than in the dry weather, and the leaves evidently more imperfectly elaborated; further experiments are now in progress, in order definitely to ascertain this important fact; as from the observations above noted, other causes may have operated besides the damp atmosphere, to produce during this period the imperfectly elaborated state of the juices; for example, an excess of water at the roots, and the comparative lower temperature of the soil, and want of sunshine.

Two of the large plants obtained in this [illegible] at Nolacamund are producing flowering spikes.

Formation of Alkaloids.

8— On the 4th April 1863, specimens of our Cinchona Bark, and wood, also

also dried leaves, decoction and infusion made from the same, were forwarded to Government in order to be submitted to Mr. Howard for analysis and report; the specimens embraced bark in all stages of growth from 1 month to 15; so as to enable that Eminent Chemist, to trace the earliest stage at which alkaloids begin to form, and thus throw much light upon the practical advantage or otherwise, of our proposed system of lopping and pruning.

9— The result of Mr. Howards analysis (given in detail in Appendix) has exceeded the most sanguine expectations. The Bark of 15 months growth, "yielding" a first and second crystallization of white Sulphate of Quinine," and the product of alkaloids in a rough state, estimated at 6·30 per cent, while the percentage product in pure alkaloids, is 3·30 to 3·40 per cent, or nearly double the quantity of alkaloids found in the best average samples of the bark of Commerce. The correctness of our proposed system of lopping and pruning is therefore indisputably established, and the profit of Cinchona cultivation no longer a subject of doubt. The "Bark from the wood of current growth" yielded 2·59 per cent of alkaloids, of which 2·55 Soluble in Ether, appeared to be Quinine and Cinchonidine, and 0·4 per cent of Cinchonine. From these results it is apparent, that the very youngest bark produced on the Nilgherries, is equal in value, for the production of Quinine, to the best average samples of commercial barks imported from South America. But the most astonishing result, and contrary to the theory of all former writers on the subject, is the discovery of Quinine in the leaves; though in very small quantity— the percentage product of alkaloids, being 0·11 to 0·19 while of Kinovic acid 4·20 per cent; thus not only the bark, but the leaves, which fall from the trees will doubtless be of considerable value for the sake of gain.

&c.

10 ——— It was to be expected that under a judicious System of cultivation, the percentage product of alkaloids, could be made to attain a much higher ratio than that usually found in the barks of South. America; as cultivation has hitherto in every instance, developed in greater perfection, than can be obtained in a wild state the peculiar virtues of all plants; and there was never any just reason to suppose that the Cinchona would form an exception to this general rule; but, that cultivation should have effected so wonderful a result in the early formation of alkaloids in such large quantities as a highly favourable result which we would not have been justified in anticipating; and one which so entirely alters the features of Cinchona cultivation; that instead of looking forward to a harvest of bark in 20 or 30 years, Cinchona in its earlier productiveness, rivals that of Tea or Coffee; and thus its cultivation being placed within the reach of many of limited means, will be greatly extended. So far gratifying indeed, has this been appreciated by Cultivators here, that in a few days after the publication of the fact of Quinine being found in our barks, upwards of 3,000 plants were ordered, which completed the 1,000 plants, offered to the public in 1864/65, in consequence of which no more plants can be offered to the public at present.

Cultivation, system of, not modified.

11 ——— Nothing has occurred materially to change our method of cultivation since the date of my last report, in order to derive full advantage from the earlier formation of alkaloids; it becomes necessary to space Cinchonas further than 6 to 8 feet, being the greatest distance at which they should be planted, ~~and~~ that each alternate plant may be cut down, at the end of 5 or 6 years, in order to obtain a large harvest of bark, which at that period of growth will undoubtedly be of great value. This System could be successfully practised, as the 2 plants which yielded the bark forming the analyses in the appendix, were cut down on the 22nd of March last, and at the end of April they had thrown up fresh and vigorous shoots of from 3 to 5 inches in length; one of the plants was grown at an elevation of 6,200 feet, and the other at an elevation of 5,000 feet; however there seemed to be little difference in the growth of both plants, notwithstanding the great variation in elevation, nor is there any difference in the vigour, with which they have thrown out fresh shoots after being cut.

12 ——— The correctness of the system of lopping and pruning proposed at Para 38 of my last report being now established; and should the barks be found to attain the greatest perfection in 6 or 7 years growth, (as seems to be indicated by Mr. Howard's analysis) the system of close planting will have the further advantage, of enabling the cultivator, after the plants attain a growth of six years to cut down each alternate tree. On the ninth year after planting, this operation may be repeated, removing the trees left standing at the first cutting; while the shoots or suckers of these trees will take the place of the plants cut down; and this can be done every third year without materially diminishing the yearly harvest of bark supplied by lopping and prunings. These shoots would no doubt make far more vigorous growth than young plants; but to ensure their shooting uniformly, the operation of cutting and barking, would have to be performed at the end of the dry season; namely, about the middle of March; at which season it would also appear that the alkaloids will be found in greatest abundance; because of the highly concentrated state of the juices at this period of the year, but this

this of course must be definitely ascertained by experiment.

13 ——— That Chinchona cultivation will form one of the most profitable investments of Capital in India, is now a subject placed beyond doubt; while from the great altitudes, at which the plant thrives, it will have the inestimable advantage of placing the Cultivator in a healthy and invigorating climate. Under these circumstances I here give an outline of the probable profits of this Cultivation. Mr. Howard's analysis establishes that Chinchona bark grown in India, is beyond all comparison rich in alkaloids; this bark being of 15 months growth, and there can now be no doubt but the alkaloids will yearly increase in quantity, until probably a maximum percentage of from 7 to 10 be attained. It is true that this percentage, has never been found under the most favourable circumstances in South America; yet there is no reason to suppose, that it will not be obtained in the cultivated state of the plants; but, however this may be; in the mean time forming our calculations upon the quantity of alkaloid already ascertained to be in our bark, its value may be estimated at 6s per lb reducing this however to half or 3s per lb; the quantity of produce per acre at the end of 6 years from the date of planting, by cutting down each alternate tree or bearers, would give a return of at least 3 lbs of Bark per tree, or 1500 lbs, bearers being equal in value to £225. Our plantations have been formed at a cost of about £20, per acre, including all charges; such as, propagating houses, tools &c. superintendence &c. &c. The cost of keeping up the plantations, may be estimated at (£ 7-4-0) per acre, for annuum, or £36 per acre for 5 years, making a total cost with interest at 5 per cent for 6 years on the first sum, and proportionately on the other sums as expended, gives £10-6-8d. Add to this £10. per ton as the cost of packing, carriage and freight, gives for 1500 lb the produce of an acre £6-5-0, making the total cost £72-11-8d. But following out the safe principle of doubling the estimated cost and reducing the estimated returns by one half, still a property of great value has been formed, and the profit of £79-16-7 per acre produced besides; and thus without bringing to account the yearly harvests of lopping and Prunings. However fabulous such may appear, this is undoubtedly a result which can easily be realized. In fact under ordinary good management and in a well selected locality, I have no hesitation in saying this amount of profit may be doubled, the reason of this is, that in the artificial state of the market at the present time, the price of Peruvian Bark is not regulated as other produce, by the cost of production. There is no doubt, that in course of time when extensive plantations are formed, and a large supply of Bark is thrown into the market, prices will of necessity fall; but it is not to be expected, that the market will be materially affected in this respect, under 40 or 50 years, and even at that time it is very unlikely that barks containing from 4 to 5 per cent of alkaloids, will be reduced much below 3s per pound the data on which the above calculations are based.

<u>Progress of operations.</u> 14 ——— A range of propagating houses 180 feet in length, were completed in the early part of the season at a cost of Rupees 2.100; these houses have

also.

, been constructed on a new principle, and are found to answer the purposes of propagation exceedingly well. They afford accommodation for 42.000 plants, which together with 1 house previously constructed, give us quite sufficient appliances for the production of 30000 plants monthly; had we a sufficiency of wood for cuttings to keep the Propagating houses in full working; and as our supply of wood, continues to increase with our plants, this result may be expected to be obtained in a few months. The permanent buildings on the Neddiwattum Plantations have been completed, consisting of a Dwelling House, Stables, and out houses, Store, Cook House &c. The permanent House for the Assistant Superintendent on the Wood Plantation at Pycara, has also been completed, together with temporary buildings for 100 Coolies. On the 2nd Denison Estate ~~element~~ at Neddiwatte 25 additional acres of land have been planted; while on the Markham plantation also at Neddiwattum 200 acres have been felled, and is now in course of preparation for planting- thus making a total of 290 acres of land at Neddiwattum (either planted or more or less prepared for planting). On the Wood Plantation at Pycara 100 acres of Forest have been felled and is also in course of preparation for planting- On the Dodabetta Plantation the 55 acres originally prepared have been planted; and also 30 acres on the 2nd Dodabetta lots is also in course of preparation.

That forming the total extent of land upon which ~~plants~~ have been commenced ~~upon~~ ~~acres~~ of which 200 were planted on the 30th April last. In our felling operations of this season we have cleared away the entire forest,

forest, leaving only the trees on the ridges for shelter, as the plants have been found to grow best when planted in the open ground; and in fact there cannot now be a doubt, but this is the only correct method of cultivating Cinchona plants.

Establishments. 15 During last year our Establishments have been much more perfectly organised than previously, and are now in a more efficient state of working, which have in a great degree tended to the satisfactory results detailed in this report. There is however one disadvantage, which we labor under, that is the continual endeavours of Planters to draw away our men so soon as they are trained to our work; but this drawback is not now so much felt, as in the early stages of our operations; because we now have a great number of people in our establishments acquainted with the management of the plants, who are always ready to fill the places of those who may be drawn away by greater inducements. It affords me much satisfaction to be able to state, that my Deputy Superintendent Mr. Batcock, has shown much zeal and ability in carrying out the work entrusted to his charge. I have also much reason to be satisfied with the care and diligence exhibited by Mr. Patmore in supervising the works on the Neddiwattum Plantations, while Mr Darling who undertook on contract the felling of the forest and the construction of roads on the Wood Plantation at Pycara; has performed this work entirely to my satisfaction. Mr. Sm

overseer of the Dodabetta Plantation, has taken a great interest in his work, and exhibitted considerable skill in the management of the plants. I have also reason to be satisfied with the work of the overseers, as also of the office establishment. Narrainsawmy Naidoo, is entitled to special notice in having made great exertions in the performance of his duties as Pay Clerk and Accountant.

Concluding Remarks. 16___ Already 10 valuable species of Chinchona have been introduced into India, and 9 of these, have been increased and cultivated to a large extent; one very valuable species C. Lancifolia, of which we originally received 4 plants from Java in such an unhealthy state; that with great difficulty its introduction was secured by a single cutting from one of the original plants which all ultimately died. This cutting has now produced 4 small but healthy plants; these will soon produce a supply of wood which will enable us to proceed with the propagation of this species. Mr. Markham fearing that this valuable sort might not be secured to India; with the concurrence of the Secretary of State, engaged the services of Mr. Cross to proceed to New Granada to procure seeds of this species, as also of the other species of Chinchona inhabiting this region; of these we may expect to receive about the present year, when we hope to [illegible] the species of [illegible] and [illegible] species Chinchona Undulata [illegible] Wood for the fine plants of which we are indebted to J. E. Howard Esqre. has been immense to. This species seems to be peculiarly well suited to this climate (elevation 7. 200 feet) and to form one of our most valuable species in C as it is exceedingly hardy and rich in alkaloids.

17___ The effects of our dry season up plants does not appear to produce any unfavo results; but the contrary, as the plants indicate season is beneficial by thoroughly elaborating and there cannot be a doubt but that it will affect the deposit of alkaloids in the bar publication of the Meteorological observations Chinchona Plantations must be reserved un tested by more correct instruments which shortly to receive from England; as the publics matter of this sort where error may exist is to mislead.

18___ In concluding this re to tender my grateful acknowledgements to cy Sir William Denison and the Governme for the confidence they have reposed in me, post so liberally given to this important un My best acknowledgements are also due to Markham Esqre. of the India House for mu information and assistance which has greatly in bringing this experiment to its present suc

Government Gardens
Ootacamund 21st July 186[illegible]

[illegible]
Superintendent
Chinchona P

No. 1419.

1863

Rec'd from Govt. 7th July No. 1750.

The report as regards
in the Revenue department
will be transferred to the Public
department for inclusion
in the General Administration
Report of the Residency.

Fort St. George
30th July 1863

5 Apies To the Public Dept. Dated 31st July

No. 337-588

No. 1419. 30th July 63