



(For report '866" see page 849 of 1877 Rpt.)

11

The report was not made at all

A R P
Charles ...

The Area of Botanic Gardens 80 - 2 - 30
 do - Economic Garden 100 - 1 - 31
 Total * 181 - 0 - 21 on 29th April 1908

* This was supplied by Surveys General S.S.

BOTANICAL GARDENS,

Singapore, 21st December, 1877.

SIR

I have the honor to submit to you the following report on my recent expedition to Perak, for the purpose of examining the flora and vegetable products of the country.

I left Singapore October 9th, in the S. S. "Pyah Pekhet" and after calling at Malacca, Klang, Salangor, and Durian-Sabatang, arrived at Penang at 9 A.M. on the 14th instant, and left at 9 P.M. on the same day, per S. S. "Sri Sarawak" for Larut, reaching Matang at 9 A.M. next morning.

The Resident being here, I reported myself to him, and spent the best part of the day looking around Matang, visiting the Custom and Court House and Gaol, with Mr. Sinclair.

I left Matang for Thaipeng to which place the Resident had preceded me in the evening, arriving there at 7 P.M. and stopped at the Residency.

Owing to the recent heavy rains, the roads were in bad condition, rendering a nine miles jolting over them, in the Larut gharries, a circumstance worthy of remembrance. October 16th, took a walk about Thaipeng and its suburbs: but saw little interesting from a botanical point of view.

The sides of the hill on which the Residency is built, which is about 100 feet high are mostly planted with Arabian Coffee, but they do not appear to be in a very flourishing condition, which I think is due as much to the want of proper thinning and pruning as to the sterility of the soil. Here, as in Singapore, it seems never to ripen a good crop at any one time, a few berries only here and there remaining together.

The plants of Liberian Coffee which were sent up from the Botanic Gardens, Singapore, in May last, and planted here, are growing well with robust, healthy foliage.

The greater portion of the land about Thaipeng is taken up by tin-mines, stretching in all directions for some miles. With these however, my present report has nothing to do.

Eastward from the Residency a splendidly wooded range of hills rise up to 4 or 5,000 feet and reaching from the Larut coast in the South to Quedah in the North. This range is known to the Malays by several names, but I think it is most frequently called Gunong Hijau.

The late Mr. Birch, with a large number of natives, went up to one of the peaks above the Residency in 1875, which he estimated to be 4,425 feet above sea-level; but there are some peaks near it still higher, and some of these Mr. Low wished me to explore; but some days must necessarily elapse before guides and men could be got together for the purpose of accompanying me.

October 17th. - As the men for the hill had not yet arrived I accompanied Mr. Low and Mr. Scott to see the tin-mines at Kamaunting.

October 18th. - To-day we were making active preparations for starting on the morrow as the men had arrived, and with them some who had been up with Mr. Birch; and at 9 A.M. on the 19th I left the Residency with 14 men and 4 or 5 days' provisions, and started for the hills. An hour's walking through disused tin-mines, swamps andalang patches, relieved by an occasional wade through a stream, brought us to the foot of the range. Immediately on entering the jungle we were gladdened by the sight of the most luxuriant undergrowth, Globbas, Herbaceous Melastomads, and Pinanga maculata being the most noticeable. We started climbing in a N.E. direction, and in half an hour reached an old hut at 800 feet which had been used by gutta collectors. At 1,800 we reached the place where Mr. Birch slept the first night after leaving Thaipeng; but the hut is now quite rotten and has fallen down.

Up to this point, Selaginellas, Lindsies, Davallias, Polypodiims, Menisciums, Licuala acutilida and Cissus porphyrophylla are the most frequent plants met with.

A little farther on we crossed a large stream near which I found several rare plants, including two Rhododendrons. Some old fallen trees here were beautifully covered with majestic Ferns and Grammatophyllum.

At 1,850 feet we fell in with a hut inhabited by three Chinamen, who are engaged in tin washing in the gorges, and as it was raining heavily, we decided on staying here for breakfast. Temperature at 12 o'clock 78° Fahr.

The rain continued all day so we made preparations for spending the night here, and during the afternoon I strolled through the Chinamen's mine.

The hill about this elevation appears to have been "worked" for some time, as I saw several abandoned gullies; and the present occupiers have dug up the gorge for a distance of 4 to 500 feet. They informed me that the average "find" of each man per day was about 2 catties. I saw one piece of pure tin about the size of a bantam's egg; but it showed no signs of having been dug from a lode.—Temperature at 6 p.m. 70 Fahr.

October 20th.—Arose at 6 a.m. and at 6.30 we left the hospitable Chinamen and recommenced our ascent, which, up to 2,700 feet was about the hardest work we had all the way up, the low jungle being composed mostly of Zingiberads, Dracaenas and Ferns. At 2,700 feet we fell in with a hut which has been used by Malays, as evidenced by the pillows being left behind, who during their stay here had cleared the ground for some distance round, and planted curians and coffee, &c. The coffee plants were looking very healthy although nearly overgrown with weeds; but they were bearing no fruit at the time of my visit. The "attora" grass (*Panicum repens*) was growing 2-3 feet high and very dense here, which speaks well for the soil. I think the best soil on this range is to be found about here, running up and down for about 5-600 feet from this point. At 3,200 feet we saw some signs of past mining operations and occasionally met with blocks of quartz cropping through the soil.

After reaching 3,800 feet the track descends for 100 feet, and for about a mile rises and falls several times until the foot of the peak is reached.

The jungle here was very beautiful, large masses of yellow, white, and red Rhododendrons (*R. javanicum*, and var. and *R. jasminiflorum*) scarlet, a *Eschynanthus* and a grand white *Medinella* covered the trunks of the largest trees, and a blooming profusely. Nothing could possibly surpass the gorgeousness of the immense masses of the yellow Rhododendron, covered with its large umbels of brilliant orange blooms, and on several trees *Solandra grandiflora* was bearing numbers of its enormous trumpet shaped blossoms. Nor were Orchids entirely absent, a charming new, a white-flowered *Dendrobium* was blooming very profusely in one or two places. At 4,000 feet, large boulders of granite 20 to 30 feet high were quite covered with Belangér's spleenwort, (*Asplenium Belangerii*) one of the prettiest ferns yet discovered.

At 9 a.m. we reached Mr. Birch's old camping ground, which, by my aneroid, I estimated to be 4,400 feet above sea level. Mr. Birch's party had cleared about 2 acres on the top, but it had grown very thick since, and we found it very difficult to walk through.

Several young trees had sprung up 40 feet since 1875; but nearly all the old trees left standing are dead. The undergrowth consisted mostly of *Litobrochia aurita*, *Pteris aquilina*, *Nephrolepis* and *Gleichenias*.

The soil consists of a layer of black vegetable mould 6-12' thick on a fine yellow friable loam, pretty freely mixed with granite particles.

From what I have seen of *Cinchona* in Ceylon I should have no hesitation in pronouncing this good *Cinchona* land, to say nothing of the possibility of growing good cabbages, &c. Temperature at 12 o'clock 71.5 Fahr.

Unfortunately the clouds were very low, and thick, shutting out the whole country below from our view, but the scene presented by so many peaks rising one behind the other was very fine.

After pitching our tent and getting breakfast, I started with some of my men for a taller peak South of our camping ground, which I found to be 4,650 feet where I saw some very pretty *Calanthes* (*C. curculigoides* and *C. angustifolia*), a few plants of the bloody pitcher plant (*Nepenthes sanguinea*) besides Rhododendrons and Ferns, &c.

Rain came on at 2.30 p.m. and continued till 7 p.m. which put an end to our botanizing for that day. Temperature at 6 p.m. 68° Fahr. From 7.30 to 8.30 p.m. we saw the lights at the Residency very plainly.

October 21st.—Temperature at 6 a.m. 61 Fahr. Started at 6.30 a.m. to visit another peak East of our camp, which appeared to be about 5,000 feet high, but soon after starting a very thick mist covered the hills, which unfortunately caused us to lose our road, and we got to the top of another hill still farther East which I found was only 4,750 feet; but we found several plants we had not previously met with.

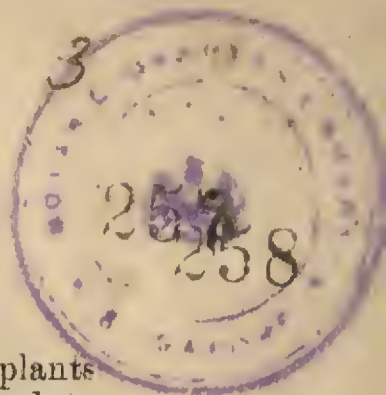
The vegetation on the top consists mostly of scrubby *Podocarpi*, *Dipteris Horsfieldii*, Rhododendrons, *Vaccinium* sp. *Oleandra neriiformis* and *Nepenthes sanguinea*, the last named in abundance.

A very pretty white flowered *Eria* was also blooming very profusely amongst the Ferns. Temperature at 9 on this peak 38°. Returning to our camping ground we collected several plants, including *Anætochilus setaceus* A. Dawsonianus, *Trichomanes ericoides* or a lot of Ferns and several Zingiberads.

Temperature at the tent at 12 o'clock 68°.—Rain came on at 1.30 which lasted till 3 p.m., after which we got occasional glimpses of the surrounding country. Temperature at 6 p.m. 66 Fahr. clear.

October 22nd.—Temperature at 6 a.m. 62° Fahr. Very thick, left at 7 a.m. on our descending journey, which, owing to the rain, we found less pleasant than ascending, and the mist prevented us from seeing more than 20 feet ahead. Not one of my men could be persuaded to climb a tree for an Orchid on account of the numerous Calami and Freycinetias.

However, I managed to secure a very fair stock of plants, including several rare, if not totally unknown species, and reached Thaipeng again at 12 o'clock in a perfect torrent of rain.



October 23rd—Very sore and stiff; the effects of yesterday's work; but took my plants to Matang and packed them for shipment to Singapore filling two large cases. Returned to Thaiping at 12.30 A.M.

October 24th settling with the men, raining heavily all day.

October 25th—Raining all day; sent my baggage on to Bukit Gantang, and at 4 P.M. I left for the same place, arriving there about 6 P.M. Here I spent the night and was very kindly treated by the Malay policemen.

October 26th left Bukit Gantang at 7.30 A.M. for Gapis after having engaged men to go up Gunong Pondok with me the next day.

The Brapit Pass forms the boundary between Perak proper and Larut, and the road rises 100 feet on the Larut side, and falls 200 feet to Gapis on the Perak side.

Here very many interesting plants are to be met with, notably an undescribed Araliad, while the most casual observer can hardly fail being struck by the majestic appearance of a number of plants of *Angiopteris evecta*. The Zingerworts muster here too in force, the most beautiful perhaps being *Alpinia nutans*. An alpinia with nankeen coloured flowers, and another with beautifully zebra striped foliage are abundant.

Arriving at Gapis I put up at the Police Station which is noted for its fever giving air, and waited for my men who arrived at 6 P.M. Temperature at 6 P.M. 79.° Raining all night.

October 27th—Had considerable difficulty in getting a guide to go up Gunong Pondok with me. Although several had promised the day before to be ready at 6 A.M. to-day and so got stocks of Quinine from me, no, one had put in an appearance at 8 A.M. when I sent two policemen to see what had become of them, and at 10 A.M. they returned bringing two of the deserters with them, and I started at once.

Gunong Pondok consists of two peaks almost isolated from any other range, composed of limestone, while all other hills for miles round are of granite formation.

On the Southern side it is quite perpendicular, except a small gorge running down between the two peaks, where there are trees, &c.—the only vegetation on the steep parts consisting of a few plants of *Cycas circinalis*, which have a miserably starved appearance. For 600 feet up the gorge our path was a tolerably easy one, through rank growing Zingiberads, but after that we had several bare walls of limestone to scale—from 10 to 20 feet high, for which we were obliged to construct ladders of sticks and roots.

From 1000 to 4400 feet I could see no soil at all; nothing but a lot of limestone blocks thrown together amongst which a few *Podocarpi* and *Pandanus* were growing, and a few herbaceous plants on the shady sides of the rocks: Eventually we reached an elevation of 1700 feet above Gapis which I found to be the highest point. Here the jungle is much more dense than at 1100 feet, and we found some *Cœlogynes*, and *Bolbophyllums*, *Pholidota imbricata*, an *Erides* and a very pretty *Anæctochilis*, and several Ferns.

In our descent I had the misfortune to fall about 20 feet, down a limestone ledge, breaking my watch, aneroid and thermometer. The last being the most important as the Resident informed me, that there were no more in Perak.

I was much disappointed with the results of my search on this hill, as I fully expected to find a distinct flora from any that I had previously seen, being my first search on limestone. Although we frequently met with large walls of limestone full of nooks, which seemed so well adapted as nidi for *Cypripediums*, &c. not one could be found.

Palms were represented by *Saguerus saccarifer* *Lacuala peltata* and *Pinanga maculata*, and *Alocasia Veitchii* was abundant in some places.

October, 28th ~~September~~ Left the Police station at 6 A.M. to visit some caves on Gunong Pondok, more especially for the purpose of examining the deposits of bats dung in them for a Report to the Resident.

We climbed up about 260 feet on the Eastern peak which brought us to the mouth of the cave. The entrance is about 40 feet high and the sides are covered with slimy green vegetable organism.

The species of bat which inhabits it is probably *Pteropus minimus*, of which there must be thousands in this one cave, and the noise they made when we disturbed their matutinal slumbers by lighting our torches was deafening. I went in for about 60 feet but the strong smell from the deposit of dung, &c., was too powerful to permit of my going further. I found it to be from 4 to 5 feet deep ranging in colour from black, the most recent, to quite white like saltpetre the earlier deposits.

This would form a valuable fertilizer for any quick growing crops such as Sugarcane and Tobacco, the Chinese here have already found out its use for making saltpetre.

The soil about the foot of Gunong Pondok appears to be very good, but I was informed that there are only about 4000 acres of it. Part of this would form a splendid place for trying *Ipecacuanha*.

October, 29th—Left Gapis at 8.30 A.M. and arrived at Kwalla Kangsa about noon. All the way along the road men and women and children were busy planting paddy, and the Malays told me that more paddy was being planted in Perak this year than there has been for a great number of years previous, which says a good deal for the state of the country. The low land between the Brapit Pass and Kwalla Kangsa appears to be adapted for paddy cultivation only. I saw some plots of Tobacco plants; but they were not over-luxuriant.

October, 30th and ~~November~~ 31st, were spent at the Residency at Kwalla Kangsa making arrangements for future, journeys.

November, 2nd ~~September~~—Left the Residency at 7 A.M. and crossed the Perak river to Sayong where some of the Rajah Muda's men met me to go up Gunong Sayong, in search of Gutta yielding trees.

Owing to the heavy rains we found the level country on the left bank submerged, of which the people here were taking advantage by turning out in whole families to plant paddy.

With two men I got to the top of Gunung Sayong, collecting several rare plants on our way; but the only Gutta trees we met with, were those yielding Gutta-taban and Gutta-sundek also called Gutta-putih, and of these only a few large trees, as they have been nearly all destroyed to get the Gutta. I succeeded in getting about 500 young plants to take to Singapore.

On this hill I first saw the "daun saang" of the Perak Malays—the Palm with very large leaves which Mr. Douglas mentions in his Report on his recent journey to Kinta, but I could find no good seeds. We met two men in the jungle searching for gutta who told us that they had come from Pahang through the jungle, looking for gutta all the way.

Ixoras were very showy in the jungle. *Acrotremas* and herbaceous *Melastomaceæ* abundant.

I found the people on this side of the river very civil and well disposed, almost all I met giving me the customary "tabih," which is sufficient evidence that the natives here are vastly changed from what they were two years ago, when these Sayong people were about the worst in Perak.

I returned to the Residency at 7.30 P.M., thoroughly tired.

November 2nd.—Packed the plants collected yesterday. Heavy rain as usual.

November 3rd.—Waiting for the guides Rajah Muda had promised to give me for ascending Gunung Bubo, but it came out that he had some private objection to my going up there—probably on account of his men having received money from the Resident to cut a road up it, which I afterwards found had not been done.

The Resident finding that promises only were to be had from the Rajah Muda advised me to go back to Gapis and try there for guides, and on the 4th instant, I left Kwalla Kangsa arriving at Gapis at 6 P.M.

November 5th and 6th.—Laid up at Gapis with fever; but some of my men were busy searching for guides and on the morning of the 7th we left for Bukit Gantang.

Arrived here I sent word to the Pungulu that I wanted him to assist me in getting guides to which he replied that he was too sick to come and see me or to see me if I went to him.

However, at last I got one old man who had been one of the party which Captain Speedy, sent up to fix a flag on the top in 1875, and at 12 o'clock we left Bukit Gantang en route to Gunung Bubo.

The first hour's travelling was through mud and running streams, minus boots and stockings, and by the time we had got up about 200 feet it commenced to rain in torrents putting botanizing out of the question altogether. The man who carried my portmanteau managed to let it fall into a small river we had to cross, thus leaving me without a dry article of clothing to wear.

We pushed on in the rain till we fell in with a charcoal-burner's hut at 150 feet where we stopped till next morning.

The Chinese charcoal burners are very numerous about this range from 1 to 2500 feet elevation where they are fast destroying all the largest trees.

It seems almost like Vandalism to cut down all the fine *Dipterocarpaceæ*, &c., for the sole purpose of making charcoal, when the timber is so valuable, especially when smaller trees would produce equally good charcoal, but would perhaps not give such good returns to the burners.

November 8th, Left the Chinamen's hut at 6.30 A.M., and after a very stiff climb we got up to 2,600 feet where we had an easy track for some distance through a jungle of "Bertam," (*Eugeissona triste*) and *Calami*.

At 3,000 feet we began to meet with *Selaginellas* *Polypodium platyphyllum*, *Tanitis Lindsaei*, &c., and *Rhododendron javanicum* was blooming on several of the trees.

At 2 P.M., we arrived at the top of a hill which the guide pronounced to be Gunung Bubo, nor would he be convinced of the mistake he had made, until I pointed out Gunung Bubo rising quite 2,000 feet above us to the S. E., and then he found out we were on Gunung Chey which is about 3,600 feet above sea level.

However, it was now too late in the day to remedy the mistake, so the tent was put up and the men got their evening meal, which consisted of roasted rice, as we could get water nowhere near.

Here I found *Nepenthes albo marginata*, some two or three spp. of *Rhododendron* *Gleichenia longissima*, *G. circinata*, *oleandra neoformis*, *Pteris Horsfieldii*, *Dammara* sp. *Dacrydium* sp. and a *Podocarpus*. Orchids were represented by *Pholidota* some small *Erias* and *Cœlogynes* and the beautiful, though diminutive *Coryanthes fornicata*.

November 9th, Left the top of Gunung Chey at 6.30 A.M., and started down the left side thinking to strike into some path to Bubo, getting down on this side we found rather hazardous several times being obliged to drop over granite rocks 15 to 20 feet high.

After a quarter of an hour's falling and scrambling we reached the bottom of the gorge and found by the aneroid that we had descended 950 feet, and here fell in with a beautifully limpid mountain stream which the men were only too glad to see.

Ferns of several genera were abundant here, and I found one of the curious *Balanop-hore*.

The guide and I fell out here about the direction we had to go, and as nearly all the coolies took his side I was obliged to give in to him, and we started climbing up a hill through an almost impenetrable mass of *Calamis*.

The guide soon changed his course again and descended 150 feet, and then up another hill 400 feet, and so we knocked about without knowing in the least where we were going until 2 o'clock, when we came across a good sized track which had been made by the Gutta men.

Here another dispute took place ending in our taking the road to Bukit Gantang, and after we had descended about 800 feet the old guide found out he was wrong, so we relegated him to the rear and retraced our steps and eventually came to a place which one of the men recognized as having been a resting place for the Gutta searchers, and here we pitched the tent, four men going on to search for some of the men who collect gutta.

I noticed one thing during the knocking about which puzzled me considerably. Just after leaving the foot of Gunung Chey we came to a lot of rotten bamboos lying on the ground, a few remaining erect, but quite rotten, the rootstocks also were quite rotten, and very few living plants were seen and those very young. No track of any sort could be detected near the place. Can it be that these bamboos have all flowered together and died? ; but if so where are the young seedlings which one would imagine would be the result?

They extended for quite half a mile in the direction we travelled.

Rain came on at 8.30 p.m., and soon after some large animal, probably a Rhinoceros, struck the tent several times, but beyond breaking one of the ropes he did no harm except perhaps startling us considerably.

November 10th.—My men returned at 5 a.m., having met with four Gutta-men who said that there was a very high hill near, but they knew of no road to it; but would do all they could to help me.

We started at 7.45 a.m., and after an hour climbing we found ourselves at the foot of the final peak at an elevation of 3,900 feet.

We had passed during the morning a great number of gutta taban trees which had been cut down, and although the men watched pretty closely, very few living trees could be seen below 3,000 feet.

At 10.15 a.m., we reached the spot where Captain Speedy's men fixed a flag in 1875; the rotten pole of which is still remaining, and here the men stopped, while I pushed on for another 200 feet ultimately getting to an altitude of 5,650 feet.

The path we cut from 3,900 feet to the top is a tolerably stiff one, and we found plenty of clear water in the crevices of the granite. The trunks of the trees are all covered with long *Musci* dripping with moisture.

On the "crown" of the peak the trees are mostly *Podocarpi* covered with long hanging *Usneas*.

Nepenthes sanguinea is abundant here, and *Matonia pectinata* is here shown in all its wild luxuriance. Judging by the foliage there must be at least 4 or 5 *Rhododendrons* that are new to me on this hill, but I could find nothing in bloom.

Gleichenia circinata and *Schizea malaccana* were abundant, and also a fern belonging to Blume's Genus *Lecanopteris*.

The native who were with me constructed some small baskets and filled them with various things as propitiatory offerings to the good spirits for invading their domains. Nearly all the natives I have had with me in Perak entertain a great deal of superstition about this hill, and hold it in great veneration.

We left the top of the hill at 1 p.m., by the way we ascended, although I tried very hard to persuade the men to try another path down, in order to get at another peak, but without avail, and arrived at our old camping ground at 4 p.m., thoroughly wet through.

November 11th.—Struck our tent early, and at 7 a.m., started for Bukit Gantang and found the road an extremely vexatious one, as we were unable to get on to a level "shoulder" of the ranges; but for some distance kept up a series of ascents and descents. Directly after leaving our camping ground we descended 200 feet, then rose 100 feet, fell 75 feet, rose 500, fell 200 feet, and then arise of 365 feet to 3,700 feet, leaving us after an hour of hard travelling 300 feet higher than when we started.

From this point the road falls all the way to the foot.

At 2,000 feet we fell in with a hut belonging to the Chinese charcoal-burners who were busy plying their vocation of destruction. We reached the Police Station at Bukit Gantang at 12 o'clock, myself minus boots, &c., which could not be worn in the last hour's walking, owing to mud and water. The rain also made it very unpleasant for botanizing purposes, as it came on at 9 a.m., and kept with us for the remainder of the journey.

I waited at Bukit Gantang until all the men had arrived, and leaving the plants, &c. behind, walked on to Gapis, which I did by way of keeping myself warm, as I had had no dry clothes for three days previous.

From Gapis I sent word to the Resident that I had returned from Gunung Bubo.

November 15th.—Started at 6 a.m., to walk to Kwalla Kangsa, but had only walked about 3 miles when I met a horse kindly sent by the Resident, and reached Kwalla Kangsa at 8 a.m., glad to get a change of dry clothes.

As regards the soil on the Bubo range, that below 3,000 feet consists mostly of a firm yellow soil, closely resembling clay, pretty freely intermixed with granite particles which renders it very gritty and greatly facilitates its being drained. I have seen fairly good coffee produced on much inferior soil than this in Ceylon.

In places where trees have been burned for charcoal the "Attora" grass is growing very densely and all herbaceous vegetation growing luxuriant.

From 3 to 4,000 feet the undergrowth consists mostly of the "Bertam" Palm, "Penang Lawyer" and other Palms and the soil has more vegetable mould in it with a looser subsoil. This altitude would include the tops of the majority of the hills, and embrace a good deal of gently undulating land along the ridges.

Above 4,000 feet there is but little soil, being almost bare granite where the vegetation has been cut away, and moreover the only hill above 4,000 feet viz., Gunung Bubo, is too steep for purposes of cultivation.

The Gutta men informed me that nearly all the trees of Gutta taban and Gutta putih below 3,500 have been cut down, but there are still a good number of plants of Gutta Singarip remaining, as it is not absolutely necessary to cut down this sort in order to procure the gutta.

A Durio which differs from the common Durian in bearing the fruit on the trunk instead of the branches is abundant, as also are the various Dipterocarpi yielding Dammar batu Dammar mata kuching and Dammar putih, &c.

The charcoal-burners have not, so far as I saw, ascended beyond 2,500 feet, but even below this there are still some very large trees although they are few when compared with the number of small ones.

Numerous streams have their rise in this range, which are utilized below for the paddy-fields. I noticed the paddy about here was ripening a heavy crop at the time of my visit November 13th Packing the plants from Bubo, and the 14th and 15th suffering from the effects of wearing and sleeping in wet clothes.

November 16th left Qualla Kangsa at 9. A.M., with 10 men and proceeded down the Perak river to Blanja, where we arrived at 3 P.M. On our arrival I sent a letter to Mr. Bruce asking for two Elephants to take me and my baggage on to Kinta, as I found that the surrounding country was submerged, and the road for the greater part of the distance under water.

The Elephants did not arrive till the 18th, and I spent the intervening time in searching the jungle about Blanja, but I found nothing worthy of special mention here.

The bank by the river was very pretty with *Asclepias curassavica*, with its bright scarlet and orange flowers, and some patches of a pink variety of *Sesamum* were very ornamental.

Since Blanja has been evacuated by the troops the houses have been left to fall down and the gardens to run wild and a rain-proof house is almost a desideratum just now.

The soil about Blanja grows capital sugar-cane and could doubtless be utilized for other surface rooting crops.

November 19th left Blanja at 6.30 A.M., for Kinta which place we reached at 5 P.M. where I was very kindly received by Mr. Bruce. In the jungle between the two places noticed *Ixora Griffithii* blooming profusely, the Saang palm, several *sterculias* in fruit, *Zingiberads* and *Melastomads* in great variety.

Just before reaching Kinta I met with a new species of *Dammara*, previously met with by Mr. Low, which I may safely say is the largest foliaged conifer known, but as I could get no cones I am unable to give a botanical diagnosis of the species. In a swamp close by *Vanda Hookerii* was blooming profusely, a plant hitherto supposed to be confined to Borneo and Labuan.

The plants of the Saang palm between Blanja and Kinta will not bear comparison with those on the Bubo range, where they are truly magnificent, some specimens that I saw on the latter range had over 100 fully developed leaves, the rhomboidal blades of which were over 15 feet long and 4 feet broad mounted on petioles 12 feet in length. The most minute search failed to reveal any young plants and some seeds I brought to Singapore proved on examination to be non-fertilized as no embryo could be found in them. On the Bubo range its limits seem to be between 3,000 feet and 3,900 feet elevation.

Between Blanja and Kinta, however, it grows at only 200 feet and on the Meera range it grows from the foot of the hills up to 2,400 feet, and on the Sayong up to 2,500 feet. It is invaluable to the Gutta men as two or three leaves are sufficient to cover a house large enough for five or six men.

Owing to the recent heavy rains, and consequent rising of the Kinta river, I found the country flooded for some distance around, about 2 feet of water covering Mr. Bruce's garden where only a week or so before Onions, Lettuces and Tomatoes, &c., gave promise of a plentiful crop of salads, &c.

November 20th.—Ill from the effect of a slight sunstroke which attacked me the day previous at Ayer-putch.

November 21st.—Still ill, but as the time allotted for my stay in Perak was drawing to an end I thought I had better start for the Kamper district, which the Resident had desired me to visit, and at 7.30 A.M. accompanied by Mr. Bruce, 5 sepoy, 14 coolies, and with 5 Elephants we left Kinta, and at 11 A.M., reached Pankalan Bahrn, a little village on the bank of the Snughie Raya composed of about a score of houses inhabited by Chinese and Malays.

This is the entrepôt for all the tin from Goping and other places E. of Kinta. At 3 P.M. we arrived at a large clearing planted with plantains and finding a fair-sized hut here, we put up for the night.

Between Kinta and this place some attempts at cultivation have been made, and some extensive tracts cleared, i. e. trees are cut down at 10 or 12 feet from the ground and left to lie, the jungle burned, which chars the timber and renders it useless, and then paddy is

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planted, which in most cases was very unpromising, and would by no means justify the reckless waste of timber cut down to afford space for planting it.

In low wet situations where "paddy turbuang" had been planted it was yielding a very fair crop, but sugar-cane and plantains looked half starved.

November 22nd, Left at 7.20 A.M., and at 8 A.M., entered Goping the headquarters of the Chinese miners in this district. This is the dirtiest place I ever saw, diffusing a combined odour of pigs, sewage and opium, offensive in the extreme, and the main street,—if such it can be called, was covered by about a foot of slimy mud.

The mines we passed in the neighbourhood were in active work having just enough water for washing purposes without being flooded like those at Kamunting. At 3 P.M. we reached the banks of the Kampar river, having stopped for some time at Gunong Maisa, a limestone hill about 600 feet high, where we found nothing of importance.

We arrived at Qualla Dipang at 5.30 thoroughly wet through owing to the heavy rains, and soon installed ourselves in a large Malay house there, which did not even admit the usual modicum of light usual to these structures.

Rajah Drahman paid us a visit at 7.30 P.M. and stayed some time. His head-dress was a novel one, and gave evidence to a spark of vanity in the wearer, consisting of the fringe of what is generally known as "spanish stripe" wound round his turban, the red, yellow, and white fringe looking very grotesque, as it is evidently kept carefully combed upward.

The soil between Goping and Qualla Dipang is by far the best I have seen in Perak, especially along the right bank of the Kampar river, where the Zingiberacæ are growing over 30 feet high, than which no better criterion could be desired of the fitness of the soil for tobacco cultivation. A small plantation of tobacco has been made at Pancalau Bahru, but the plants were too young at the time of my visit to report on, except that they appeared to be very healthy. Some very large "Waringan" trees (*Ficus retusa*) are noticeable along the Kampar river, and on the left bank a range of limestone or marble hills extend to Qualla Dipang, where two months could be spent very advantageously in searching the numerous crannies and nooks for rare plants.

In the thick jungles *Angiopteris evecta* attains to an immense size, and here also I saw several plants of *Ataccia cristata* with its weird and ghost-like inflorescence also *Clerodendron nutans* beautifully in bloom and ferns in abundance, as well as a number of plants of the "Gutta-singgarip." From Pulo Pisang to Qualla Dipang large patches of "paddy omar" were ripening heavy crops. In the Qualla Dipang valley Durians were ripening very large crops of fruit.

November 23rd, went out with Mr. Bruce to visit the limestone hills on the left bank of the river. As is usual with all limestone hills there are numerous caves at the base of these hills which are very diversified and interesting. Several of the plants growing here I also found on Gunong Pondok, but there were others new to me. The most noticeable plants known to me on this hill were *Alocasia Lowii*, *Impatiens Hookerii*, *Anætochilus xanthophyllus*, (very small), some *Gesneracæ*, *Begonia* sp., and a few Ferns, principally *Aspidiums* and *Sagenias*. Epiphytal Orchideæ represented by *Cymbidiums*.

This range of limestone hills is terminated at Qualla Dipang by a sharp precipitous peak, called by the Malays "Nasi Sabut" a perfect gigantic representation of a sugar-loaf, and up this peak I wished to get, although the natives informed me that no one had previously reached the top, and consequently no guides were to be had in whom any reliance could be put. Rajah Dris had at the Resident's request furnished me with letters to Rajah Ahmat and Datu Muda Rasat asking for guides and assistance, and having despatched these on the evening of our arrival at Qualla Dipang, Datu Muda Rasat promptly replied in person, and on returning from our botanizing trip we found him awaiting us with two Sekais who had previously attempted to ascend Nasi Sabut.

November 24th.—Started early accompanied by Mr. Bruce, Rajah Drahman and coolies, &c., and after crossing the Kampar river and an elephant ride of half an hour's duration we reached the foot of Nasi Sabut on the North side; rather against my own inclinations as to ascend on the South side appeared to me to be far more practicable.

The caves here are the homes, or at any rate the breeding-places, of numerous wild animals as evidenced by the number of tracks, &c. On the North and N. E. sides the hill is quite perpendicular from base to crown, and up this wall I was told was the only way up, two roots being pointed out to me as those by which the men had previously ascended for some distance, but I declined to attempt to get up by the same means and pushed through the jungle to the West, and having got up 200 feet with Mr. Bruce and Rajah Drahman, I left them, and commenced the ascent in earnest with 4 men. We found this much worse than Gunong Pondok, as we were obliged to construct bridges and ladders of sticks and roots; eventually getting up to an elevation of 950 feet about Qualla Dipang, where our further progress was stopped by an upright wall of rock quite 300 feet high, and after a few vain attempts we very reluctantly gave it up as impracticable and descended—an undertaking which proved more difficult than ascending. Doubtless, in the dry season one might get to the top, but the little soil that rests in the crevices of the marble was so slippery owing to the frequent rains that it made climbing rather dangerous.

Added to this the edges of the marble are so sharp that it is next to impossible for a bare-footed native to walk on it.

One man fell about 15 feet, but luckily was caught in the brushwood and sustained no hurt beyond the shaking and fright.

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Epiphytal Orchideæ were represented, so far as I saw by two *Phalænopsis*, *Crides suavisimum*? *Cœlogyne ocellata*, *C. Cunningü* and *Pholidota imbricata*, a sp. of *Anætochilus* formed beautiful patches in some of the crevices of the rocks. I was much disappointed at not being able to get to the top, as I feel certain that another 300 feet would have given much better results in the way of plants. From the hill we saw numerous Sekai clearings on the Bujong Malacca range where "paddy omar" was growing well.

November 25th.—Left Qualla Dipang at 7.30 A.M., and with all our staff of coolies, &c. poled down the river to Palei, intending to go up Bujong Malacca.

This has been attempted before by two Europeans, neither of whom succeeded in getting to the top.

As Palei offered no facilities for camping for the night, being a muddy swamp, and our guides not having arrived, we followed the advice tendered by the natives and poled farther down the river to Batu Karang, where we met Datu Muda Rasat, who treated us very kindly, regaled us with green coconuts, and placed a house at our disposal, but as there was about a foot of water around the house we decided on fixing the tent for the night on higher ground, Datu Rasat very kindly supplied, unsolicited, a lot of mats and necessaries for the coolies, &c., and he amused Mr. Bruce and myself with Malay folk lore tales for two or three hours.

November 26th arose at 4 A.M., and poled up the river to Palei which place we reached at 7 A.M., and leaving two sepoy to guard the boat, we commenced the ascent of Bujong Malacca, accompanied by 4 sekai guides, also furnished by Datu Rasat.

At 9 A.M. we had reached a fine mountain stream at 1,050 feet above Batu Karang, which, farther down is known as Sunghie Palei and flows into the Kamper river above Batu Karang.

The stones, &c., here were covered with *Meniscium salicifolium*, *Davallia affinis*, *D. elegans*, *Globbas*, *Selagnella Wallichii* and a pretty white *Begonia*. At 10 A.M. we reached an elevation of 2,250 feet where I left Mr. Bruce and Rajah Drabman, as it formed a good camping ground for the night, under shelter of a large granite rock about 40 feet high.

Accompanied by 2 sepoy, 2 sekai, and two coolies I proceeded to the top of the range, which I ascertained to be 3,550 feet above sea-level.

We passed several large granite rocks rising 50 or 60 feet above the soil under which some of the sekai, have erected their huts. In other places their huts are placed in most curious places, and unless one was looking for plants or tracking animals, they would not be noticed.

A few trees of gutta taban and gutta putih have been cut down on this range, but gutta singgarip is abundant below 1,500 feet. *Ficus* is represented by several species on this hill, but orchids and Ferns very meagrely, and on the top of the range the finest Rattans are abundant, the undergrowth consisting principally of the Bertam Palm (*Eugeissonia*). I returned and rejoined Mr. Bruce at 3 P.M.

November 27th, Arose at 5.30, and from our camping ground had a splendid view over the Kinta valley. Gumong Bubo. N.W. and the range at the Dindings S.W. Descended and reached our boat in the Kamper river at 10.30 and poled up to Qualla Dipang where we arrived at 12 o'clock.

The soil on Bujong Malacca varies but little, being principally a yellow loam very friable and in nearly all the places that I dug I found it to be over 2 feet deep. I would recommend this for Coffee cultivation and as the range is nowhere very steep a large tract could be cultivated.

There is plenty of good water up to 3,000 feet, and the facility with which produce could be sent down the Kamper river to Durian Sabatang and supplies brought up from thence, mark this as one of the most eligible spots for cultivation in Perak.

A sample of soil which Mr. Bruce brought from Chankat Laeang is worthy of mention here. It consisted of a black peaty soil mixed with about $\frac{2}{3}$ sand and he informed me that the paddy and Maize he saw growing in it far surpassed any other he had seen in the Native States.

It would doubtless yield good crops of surface rooting plants in damp weather, but probably contains too much sand to successfully resist the effects of a long drought.

November 28th—Left Qualla Dipang at 7.30 A.M., and after a long and wearisome ride on Elephants reached Kinta at 8 P.M. Two elephants which were bringing on the baggage behind were frightened by a Rhinoceros near their path and started for the jungle, in their flight shaking off their drivers and the principal part of the baggage, subsequently reaching Kinta at 9.30 P.M.

November 29th—At Kinta drying and arranging my specimens; three men laid up with swollen feet.

November 30th,—Went out botanizing around Kinta and procured some plants of the new Danomara and some *Eulophias*, &c., *Nepenthes laevis*, *N. ampullaria*, *Vanda Hookerii* *Plocoglottia plicatus*, and *Bromheadia* are abundant about this district. Very heavy rain all day.

December 1st.—Left Kinta at 9 A.M. with 3 elephants, an escort of 5 sepoy, and my staff of coolies, and arrived at Epoo at 11 A.M. This place we found quite flooded most of the Chinese shops being tenanted by fowls only. Here we were compelled to unload the elephants and take the baggage across the river in boats, an operation we had to repeat at Sunghie Paray, thus losing a good deal of time, with the result that Jellapong was reached at 3 P.M., instead of 1 P.M. as we had expected.

As it was raining heavily when we arrived here we determined on stopping for the night, the Pungulu here placing a large house at my disposal which accomodated the sepoy and coolies as well.

REPORT

OF THE

SINGAPORE

AGRI-HORTICULTURAL SOCIETY

FOR 1866.

Singapore :

PRINTED AT THE "STRAITS TIMES" PRESS.

1866.

Singapore Agri-Horticultural Society.

Established in the year 1859.

PRESIDENT.

THE GOVERNOR OF THE STRAITS SETTLEMENT.

THE HONORABLE MAJOR GENERAL

ORFEUR CAVENAGH.

VICE PRESIDENT.

THE RESIDENT COUNCILLOR.

THE HONORABLE LIEUTENANT COLONEL

R. MACPHERSON.

TRUSTEES.

The Vice President and the Treasurer for the time being.

MEMBERS OF COMMITTEE FOR 1866.

Brigadier Ireland.	Joze d'Almeida, Esq.
J. Bennett, Esq.	J. Murray, Esq.
J. J. Greenshields, Esq.	D. Rodger, Esq.
C. H. Harrison, Esq.	S. J. G. Jellicoe, Esq.
Hoh Ah Kay, Esq.	C. H. H. Wilson, Esq.

Honorary Secretary and Treasurer.

E. J. Leveson, Esq.

Superintendent.

Mr. L. Niven.

THE UNIVERSITY OF CHICAGO
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1900

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1900

ANNUAL REPORT
OF THE
SINGAPORE AGRI-HORTICULTURAL SOCIETY.

The extensive improvements in the Gardens and the expenditure requisite for completing the lake, having necessitated a considerable outlay, the members will be aware that at the last annual meeting it was decided to hold a second Fête and Fancy Fair, which was accordingly done in the month of May last and the result again proved very satisfactory, the net profit to the gardens being \$1717.21 ;--and the Committee take this opportunity of thanking the members and their friends, particularly the ladies, for their kind assistance and support on that occasion,

The Committee have great pleasure in informing the members and subscribers that the Government has been pleased, on application, to grant \$ 50 per mensem towards keeping up the gardens, which will be of material assistance, seeing that the income of the Society only averages \$ 120 per mensem owing to a falling off in donations and subscriptions.

From a statement (*See Appendix A*) which is laid before you this day it will be seen that no less a sum than \$17,429.78, has been voluntarily raised in Singapore since the formation of this Society in 1860, of which amount \$ 3749 (*See Appendix B*) have been Donations, and, as a great part of that amount has been necessarily devoted to laying out the grounds, which will ere long be completed, the income will in future be available for the actual development of Horticulture and Agriculture.

The Government had kindly allowed the services of 60 prisoners from the House of Correction to carry out the excavation of the lake, but owing to the small number of prisoners in Jail not more than an average of 30 have been available, and of late not more than 10, so that your Committee have been obliged to contract for Chinese coolies to complete the excavations; it is however highly probable that in the course of a week the number may be increased to 25, in which case, as the sluice to let off the water is to be commenced at once, the Committee expect that the lake will be ready to be filled by the end of the year; meanwhile the land on both sides is being tastefully laid out by the able Superintendent, whose exertions have been most meritorious, and Garden Road has been entirely re-metalled, and again opened to the public.

As the Lake occupies the only situation where the Coolies employed in the Gardens can live, and as a residence is required for a Superintendent, your Committee have bought the adjacent property, lately belonging to Adam Wilson Esq.,—for \$1,700 and empowered the Trustees to raise \$1,500 on mortgage of the newly acquired land and Superintendent's house to be erected thereon, which has been carried out accordingly.

To construct the Superintendent's house, the Government have kindly consented to allow the Society to be supplied with Bricks from the Government kilns at cost price, and as there will be no immediate necessity for the payment until the Society is in a position to make it, a contract will at once be entered into for the building.

One of the intentions of the Society being to supply members and subscribers with European vegetables, and "to secure improvement in the vegetable products of the island," part of the newly purchased property has been already planted, and as soon as regular fresh supplies of seeds now on the way begin to arrive, your Committee expect to be in a position to carry out the objects in view.

The plan of the Gardens is now complete, and the titles (*See Appendix C*) have been duly received from the Government and are laid before you.

To enable a Government Grant of the land to be made out it was necessary to have two trustees, and consequently your Committee have appointed the Vice President and Treasurer of the Society for the time being, and their successors, in that capacity, which appointment you will be this day asked to confirm.

The Treasurer's accounts are laid before you, showing a balance at credit on the 1st instant of \$1,479.44, (*See Appendices D E*) and the same are submitted to you for confirmation.

It has been brought to the notice of your Committee that some of the residents of Singapore who are not subscribers avail themselves of the Gardens of the Society, although they must be aware that only Members, Subscribers and Strangers have the right of admittance, and the Committee trust, as the funds of the Society depend chiefly upon subscriptions, which just at present are much needed, that all will see the necessity of lending their aid.

The Committee take this opportunity of expressing their thanks to the Government for the ready assistance which has been invariably given whenever asked for.

In conclusion your Committee beg to state that in consequence of the great satisfaction Mr. Niven has given in the discharge of his duties as Superintendent they propose to increase his salary to \$ 80 per mensem from the 1st of January next.

PROCEEDINGS AT THE ANNUAL MEETING OF SUBSCRIBERS.

The Annual Public Meeting of Subscribers to the Singapore Agri-Horticultural Society was held in the Exchange Rooms on Monday, November 19th, 1866.

The Hon'ble the Governor in the chair.

The Report was read by the Hon'ble the Governor.

Proposed by the Hon'ble the Governor.

Seconded by W. Paterson, Esq.

That the Report now read and the Treasurer's accounts be passed and confirmed.

Proposed by Captain Protheroe, A. D. C.

Seconded by Jose d'Almeida, Esq.

That the following gentlemen form the Committee for the ensuing year.

Brigadier Ireland	J. Murray	Esq.
Colonel Cooke	D. Rodger	"
J. Bennett Esq.,	S. J. G. Jellicoe	"
Hoh Ah Kay "	C. H. H. Wilson	"
F. Von der Heyde "	W. B. Smith	"

Proposed by the Hon'ble the Governor.

Seconded by S. J. G. Jellicoe, Esq.,

That this meeting records its hearty thanks to Mr. Leveson for his services, as Secretary and Treasurer of the Society, and requests Mr. Wilson to act in that capacity for the ensuing year.

Proposed by D. Rodger, Esq.,

Seconded by J. S. Atchison, Esq.,

That the Vice President and Treasurer of the Society for the ensuing year and their successors be and they are hereby appointed Trustees of the Society.

Proposed by E. J. Leveson, Esq.,

Seconded by J. Cameron, Esq., and carried with acclamation.

That the best thanks of this meeting be given to His Honor the Governor, for his presence at this meeting and the interest which he has always taken in the welfare of the Society.

(*Appendix A.*)

Receipts and Expenditure of the Agri-Horticultural Society since its formation in 1860.

	Receipts.	Expenditure.
1860	\$ 2348.75	\$ 2455.46
1861	„ 1646.50	„ 1579.54
1862	„ 1185.50	„ 1447.96
1863	„ 1920.25	„ 1485.72
1864	„ 1884.75	„ 1982.12
1865	„ 3364.62	„ 2814.55
1866 first 10 months	5079.41	„ 4184.99
		<hr/>
		\$ 15950.34
Bal. Nov. 1st 1866.		1479.44
	<hr/>	<hr/>
	\$ 17429.78	\$ 17429.78
	<hr/>	<hr/>

LIST OF DONATIONS TO THE AGRI-HORTICULTURAL SOCIETY.

	\$	Cts		\$	Cts
Angus G.	25	"		1210	"
Auchincloss P. W.	25	"	Gottlieb F. H.	25	"
Atchison J. S.	25	"	George W. R.	5	"
Armstrong J. W.	25	"	Greenshields J. J.	25	"
Armstrong F.	25	"	Gwyther J. H.	25	"
Aitken A. M.	25	"	Gunn A. J.	25	"
Allen W.	25	"	Harrison C. H.	50	"
Anderson J.	25	"	Hinnekindt H.	25	"
Adamson Wm.	25	"	Hutchinson A.	25	"
Aitken D.	25	"	Haakman H.	25	"
Burn, The Hon'ble Capt. J.	25	"	Hoh Ah Kay... ..	50	"
Bernard A.	25	"	Ireland, Brigadier.....	25	"
Brown A. B.	25	"	Joshua J.....	25	"
Bland J.	25	"	Jellicoe S. J. G.	25	"
Bennett J.	5	"	Joaquim P.	25	"
Brown G. H.	50	"	Kaltenbach G.	5	"
Buyers and Riach	20	"	Kendall F. R.	25	"
Blanco P.	5	"	Little M.	25	"
Baxter Jas.	5	"	Lyall Jas.	25	"
Bauer A.	25	"	Lagorée P.....	25	"
Baumgarten C.	25	"	Lecerf G. W.	5	"
Byramjee Pestonjee ...	25	"	Lipscombe G.	25	"
Buttery J.....	25	"	Leveson E. J.	50	"
Beaver H. R.	25	"	McCausland, Sir R. B.	25	"
Braddell T.	25	"	Man The Hon. Col. H.	25	"
Behn, Meyer and Co. .	25	"	Mactaggart W.	50	"
Cavenagh, The Hon. Ma- jor General O.....	50	"	Mac Nair, Capt.	25	"
Collyer G. C.	25	"	Mac Donald J. E.....	50	"
Cowpar, Dr. J.	25	"	Murray J.	50	"
Campbell T. H.	25	"	Mooyer Johs.	25	"
Cortes H.	25	"	Mac Neil R.	25	"
Cumming J. B.	25	"	Mayne, Capt. J. O.....	25	"
Cama B. H. and Co. ...	25	"	Maclelland C.	25	"
Cumming J. S.	25	"	Muller J. W.	25	"
Chong San Seng Chai	25	"	Niven J. P.	15	"
Cramer G.	25	"	Ormiston, W.	25	"
Cordes G. F.	25	"	Pereira F. E.	25	"
Dunman T.	25	"	Puttfarcken O.	50	"
D'Almeida Joaquim. ...	25	"	Paterson W.	25	"
D'Almeida Jose.	50	"	Padday R.	50	"
Davidson M. F.	25	"	Purvis J. M.	50	"
Davidson J.	25	"	Potter W. H.	25	"
De Souza M. F.	50	"	Remé G. A.	25	"
Elphinstone Major.....	25	"	Robertson J. H.	15	"
Franklin Lady	25	"	Rigg C. R.	25	"
Gilfillan S.	50	"	Rittershaus R.	25	"
			Rodger D.	50	"

§ 1210 ..

§ 2530

(Appendix B.)—Continued.

LIST OF DONATIONS TO THE AGRI-HORTICULTURAL
SOCIETY—Continued.

	\$	Cts		\$	Cts
Forward	2530	"	Forward	3230	"
Rose Surgeon Major J. Rautenberg, Schmidt & Co.	50	"	Inche Wan Abdul Ra- man	25	"
Simons H. M.	25	"	Tan Kim Cheng	50	"
Schreiber A.	50	"	Tivendale T.	5	"
Smith J. K.	25	"	Taylor M. W.	5	"
Smith J. C.	50	"	Tootal J. B.	25	"
Sullivan J. P. O.	25	"	Tizard T. H.	3	"
Scott W. R.	25	"	Van Hoorn H. J.	25	"
Sultan Ali Iskandarsah. Schmidt A. E.	50	"	Van Soest L.	25	"
Schwabe C.	25	"	Velge A.	25	"
Scott T.	25	"	Watson Jas.	25	"
Steel W.	25	"	Wilson C. H. H.	50	"
Short S.	25	"	Williams O. D.	25	"
Syed Abdoolah	25	"	Walker E.	25	"
Stewart H. J.	25	"	Woods R. C.	25	"
Staehelin G. E.	25	"	Wilkinson W.	25	"
Sherwood C. S.	25	"	Watson N. B.	50	"
Scrymgeour J. S.	25	"	Wagner T.	25	"
Tan Kim Seng	50	"	Young J.	25	"
Tumongong H. H. The.	50	"	Yap Ee Gin and Co. .	25	"
			Zapp R.	25	"
	\$ 3230	"		\$ 3743	"

(*Appendix C.*)

Government Grant of the Gardens to the Trustees of the Agri-Horticultural Society.

Indenture No. 88.

This Indenture made the Twenty seventh day of October in the year of Christ One Thousand Eight Hundred and Sixty Six. Between the Secretary of State for India in Council for and on behalf of Her Majesty Victoria Queen of the United Kingdom of Great Britain and Ireland Her Heirs and successors of the one part and the Honorable Ronald Macpherson Vice President and Edward John Leveson Treasurer of the Singapore Agri-Horticultural Society of the other part. Witnesseth that as well for and in consideration of the performance of the covenant and condition hereinafter reserved and set forth and which on the part and behalf of the said Vice President and Treasurer as aforesaid and their successors in Office are to be done and kept, the said Secretary of State for India in Council has granted bargained and released unto the said Honorable Ronald Macpherson and Edward John Leveson Vice President and Treasurer as aforesaid and their successors in Office. All that piece or parcel of Land called the Singapore, Agri-Horticultural Societies Gardens in the district of Tanglin in the Island of Singapore bounded on the North by Public Road, on the South by Public Road, on the East by Public Road, on the West by Public Road, as described in the plan annexed containing an Area of Fifty five Acres Three roods and Twenty eight poles together with all singular the appurtenances whatsoever to the said piece or parcel of Land belonging or in any wise appertaining or therewith used. To Have and To Hold the same unto the said Honorable Ronald Macpherson Vice President and Edward John Leveson Treasurer as aforesaid and their successors in Office for ever. Provided always and these presents are on the express condition that the said Land be used for Public purposes only under the Title and Assignment of the Agri-Horticultural So-

cieties Gardens, and that of the said Vice President and Treasurer as aforesaid or their successors in Office shall fail to act up to the letter and spirit of this Indenture and the Land be not used for the purpose heretofore set forth, then in such case the demise hereby made shall cease and determine and be void to all intents and purposes whatsoever and the Land revert to Government. In Witness whereof the Honorable Ronald Macpherson Esquire Resident Councillor of Singapore for the said Secretary of State for India in Council has affixed the Seal of his Office and subscribed his Signature and the said Honorable Ronald Macpherson as Vice President and Edward John Leveson Treasurer as aforesaid have signed their names, and affixed their seals the day and year aforesaid.

Signed sealed and Delivered } (Sigd.) R. Macpherson
in the presence of } Resident Councillor.

(Sigd.) John S. Atchison } (Sigd.) R. Macpherson
Notary Public } Vice President A. H. S.

Singapore. } (Sigd.) E. J. Leveson
(Sigd.) John Blundell } Treasurer A. H. S.

Registered at the Singapore Land Office, This 27th
October 1866.

Signed, JOHN BLUNDELL,
Head Clerk, Land Office.

(Appendix D.)

Dr. The Agri-Horticultural Society in Account

		\$	Ct.	\$	Ct.
1865					
Novr.	To Alt & Co., Nagasaki Invoice of lac- quered ware November 1864	135	64		
	Charged only	125	...	10	64
"	" 1 piece Brown Holland Decr, 1864	7	70		
"	" Marseille charges on Paris articles	48	50		
"	" Cash paid { credited in error }	22	05		
"	" { in previous acct. }	57	50	135	75
"	" Superintendent per this month	181	72		
"	" Collector	2	...	183	72
Decr.	" Superintendent per this month	195	30		
"	" Collector	2	...	197	30
"	" Balance			585	02
				1112	43
1866					
January	To 2 Wardian cases	10	...		
"	" Superintendent per this month.....	232	75		
"	" Collector	2	...	244	75
Febv,	" 7 Carriages for Band.....	7	...		
"	" Superintendent and Mandor per this month	167	93		
"	" Collector	2	...	176	93
March	" 2 Blank Books	2	50		
"	" Superintendent and Mandor per this month	186	37		
"	" Collector	2	...	190	87
April	" A. Wilson for a bill	1700	...		
"	" A. Logan bill of Sale	12	...		
"	" do. fee for registering lease.....	1	82		
"	" Executive department for bricks	2	80		
"	" Superintendent and Mandor per this month	155	86		
"	" Collector	2	...	1874	48
May	" Kee Ang for Sundries	49	35		
"	" Clerks for Fête	10	...		
"	" Superintendent and Mandor per this month	180	53		
"	" Collector	2	...	241	88
June	" Superintendent and Mandor per this month	172	15		
"	" Collector	2	...	174	15
				2903	06
July	To Balance			1573	04

(Appendix D.)

with E. J. Leveson, Esq., Treasurer

Cr.

		\$	Ct.	\$	Ct.
1865					
Novr.	By Balance			1073	43
Decr.	„ Subscriptions from June to Decem- ber 2 a \$ 7 50.....	15	...		
	4 „ „ 6	24	...	39	
				<hr/>	<hr/>
				1112	43
				<hr/>	<hr/>
1866					
January	By Balance on 1st January			585	02
June	„ Subscriptions from January to June 62 a \$ 7.50	465	...		
	1	3	75		
	1	1	25		
	43 a \$ 6	258	...		
	1	2	...		
	January to December				
	1 a \$ 7.50	15	...	745	...
				<hr/>	<hr/>
July	„ Balance			1573	04
				<hr/>	<hr/>
				2903	06
				<hr/>	<hr/>

E. & O. E.

(Signed) E. J. LEVESON,

Treasurer

1/13

(Appendix E.)

Dr. The Agri-Horticultural Society in

		\$	Ct	\$	Ct
1866	To Balance—			1,573	04
July	Stamp on Agreement		44		
"	Executive Department		850		
"	Garden Vases		320		
"	Swah Kean excavating lake	161	66		
"	Superintendent and Mandor per this Month	172	01		
"	Collector	2		347	81
August	Swah Kean excavating lake	300			
"	Superintendent and Mandor per this Month	195	70		
"	Collector	2		497	70
Sept.	Convent Materials for Fête		597		
"	Jas. Carter & Co. London for Seeds (July)..... £ 13. 18. 7.				
	2. 16 "				
	Carriage... 1, 10. "				
	<u>£ 18. 4. 7. @ 4/3d.</u>		8578		
Sept.	Swah Kean excavating lake		8264		
"	Superintendent per this month.....	191	40		
"	Collector	2		367	79
October	Invoice Scythes and Scythe Stones per "Rushing Water" £ 14. 3. 2. at 4/3...	66	63		
"	Collector.....	2		68	63
Novr.	Balance cash in hand.....			1,479	44
				<u>\$4,334</u>	<u>41</u>

(Appendix E.)

Account with E. J. Leveson, Esqre., Treasurer

Cr.

		\$	Ct	\$	Ct
1866					
August	By Subscriptions from January to June.				
	25 a \$ 7.50	187	50		
	1		2	50	
	25 a \$ 6	150			
	From July to December 1 a \$ 7.50 ...	7	50	347	50
Sept.	„ Proceeds of Sundries sold by Geok Teat & Co.....	80	02		
	Less credited in Fête account.....	75	32		470
	„ Net proceeds of Fête 1866			1,717	21
	„ Cash for purchases at the Fête	62	50		
	„ Subscriptions from January 1865 to June 1866 1 a \$ 6 \$ 18 „ July to Decr, 1866 9 a \$ 6 \$ 54 „ do do „ 29 a \$ 7½ \$ 217.50	289	50	352	...
October	do do „ 8 a \$ 6 \$ 48 „				
	do do „ 12 a \$ 7½ \$ 90 „	138	...		
	„ Cash from Government 5 mos: at \$50	250	...		
	„ Mortgage on Hill purchased from A. Wilson, Esquire	1500	...	1,888	...
	„ 1 Donation.....			25	...
				\$4,334	41
Nov.	By Balance.....			\$1,479.	44

E. & O E.

(Signed) E. J. LEVESON,

Treasurer.

Singapore, 1st November, 1866.

LIST OF MEMBERS (DONORS) 1866.

The Hon'ble Major General Cavenagh.	Harrison C. H.
The Hon'ble Lt. Col. MacPherson.	Hoh Ah Kay.
H. H. The Maharajah of Johore.	Ireland Brigadier.
Inche Wan Abdul Rahman.	Jellicoe S. J. G.
Angus G.	Joaquim P.
Amstrong J. W.	Kustermann F.
Amstrong F.	Leveson E. J.
Atchison J. S.	Little M.
Bauer A.	Lipscombe G.
Baumgarten C.	Muller J. W.
Bernard A.	Murray Jas.
Beng Swee Tan.	Purvis J. M.
Davidson Jas.	Pereira F. E.
D'Almeida Jose.	Paterson W.
De Souza M. F.	Rodger D.
Elphinstone Major.	Scrymgeour J. S.
Greenshields J. J.	Schmidt A. E.
	Wagner T.
	Wilsone C. H. H.
	Young J.

LIST OF SUBSCRIBERS 1866.

Angullia E. E.	Campbell R.
Baker R.	Crockett J. F.
Brasier P.	Don Caballero de Rodas.
Bremer C.	Dunlop C.
Buchanan H.	Duff A.
Buckley C. B.	Engel E.
Bushell G.	Forrester J. R.
Brennand R.	Fentum G. B.
Burn Lt. H.	Fraser J. L.
Becker A.	Geok Teat.
Barnes F. D.	George W. R.
Belder C.	Gravenhorst Wm.
Cameron J.	Gulland W. G.
Cuppige W.	Grant Col. R. A.
Canters J.	Hansen J. F.

LIST OF SUBSCRIBERS 1866.—Continued.

Heyde vonder F.	Mooyer O.
Hooglandt T. D.	Oldham W.
Huxtable J.	Protheroe Capt. A. D. C.
Harper R. J.	Read W. H.
Hartwig F. R. C. P. von.	Remé H.
Harrison G.	Robb D.
Kaltenbach G.	Riechmann J. J.
Kirby J. L.	Ritgen F.
Keiser Dr. M.	Smith E. M.
Leccerf G. W.	Sturzenegger C.
Lehmann G.	Stahlknecht C. G.
Little Dr. R.	Scholfield T. R.
Logan A.	Smith W. B.
Lalla C. P.	Thomson T. S.
Maack H. F.	Troplong J. M. A. C.
McAlister A.	Voorthuysen J. v.
Manford W.	Weir Jas.
Martin A. M.	Waterhouse Revd. C. J.
Maxwell D.	Watson E. B.
Marshall W.	Wright R. J.

The Gardens are open to Members, Subscribers, and Strangers only.

A Donation of \$ 25 and a Subscription of \$1 per mensem constitute Membership of the Society.

Subscribers pay \$1.25 per mensem, payable in advance.

APPENDIX.

Contributions to the history of the Gutta producing trees of the Malay Peninsula.

The following varieties of Gutta are enumerated in the order of their respective value in Perak and Salangor.

		Per picul in Perak.	In Salangor.
1	Gutta-soosoo	... \$50 to 52	not known.
2	„ taban	.. \$45 „ 50	... \$50.00
3	„ rambong	.. \$32 „ 35	not known.
4	„ singgarip	\$17 „ 20	... \$20.00
5	„ putik-sundek	... \$15 „ 30	... \$15.00

1st.—Gutta-soosoo. Of this I was unable to get any samples or specimens of the tree producing it, and the only information I could glean concerning it, was that the tree is entirely destroyed except in the interior of Perak, that the gutta is firmer in texture than Gutta-taban and contains a little oil. This must not be confounded with the Gutta-soosoo, of Borneo which is a Caoutchouc or Rubber.

2nd.—Gutta-taban. This is the Gutta-percha of commerce, and the product of a tree described in 1837 by Sir Wm. Hooker under the name of Isonandra Gutta.

The Punghula of Kroh informed Mr. C. J. Skinner that in Perak there are two sorts, alike in foliage and general appearance, differing only in the colour of the flowers, one having white and the other red flowers, which are known to the Malays by the names of “ngiato putih” and “ngiato merah,” but the products of both trees are called Gutta-taban.

Isonandra Gutta is most abundant on Gunongs Meeru and Sayong and Bujong Malacca; a few large trees still exist on Gunong Bubo and the Thaipeng range. Small plants from 1 to 8 feet are abundant on the granite formations in Perak up to 3,500 feet elevation.

To procure the milk, the tree is cut down at 5 or 6 feet from the ground and the top cut off immediately, where it becomes too small for ringing, which the natives say causes the tree to yield a much larger quantity of milk, and the bark is then ringed with “golos” at intervals of 5 to 15 inches. The milk which continues to flow for about an hour is collected in vessels made of palm leaves or cocoanut shells and then boiled for about an hour, otherwise it becomes brittle and useless.

One of the principal gutta merchants of Perak informed Mr. Low, that a large tree will give 40 catties of gutta, but I am inclined to think that this is an exaggeration, as in reply to numerous enquiries among the men in the jungles I was told that from 5 to 15 catties is about the average quantity obtained, and never more than 20 catties.

The natives of Perak recognize no particular season for collecting the gutta, nor was I able to glean any information as to whether or not the trees yield more in one season than in another; but I expect that the gutta in the wet season contains a larger quantity of water and requires more boiling to drive it off,

I have no statistics relating to the supply or export of the various sorts of gutta of Perak, but I hope to be able soon so lay them before you.

From Klang 83 pcls. 83 cty. have been exported from January to November, 1877, so that it is probable that over 700 trees have been destroyed to furnish this quantity during that time.

It is generally—if not always, exported in the shape of oblong balls with a loop at the upper end through which a piece of rattan is put to facilitate its being carried through the jungles. They vary considerably in weight, but about 10 to 25 catties is about the average weight per ball.

In colour it is greyish white with a slightly red hue inside and bright umber brown outside, but the colour varies according to the quantity of bark and other impurities mixed with it.

If the cultivation of Isonandra Gutta is attempted, plants not larger than 1 foot high, should be procured from the jungles and lifted very carefully as they have always a long tap-root, and if this is broken or injured, the plants, even if they survive—take a long time to recover.

I believe the seeds are ripe in the dry season, and they might be procured from trees cut down then, but they should be sown at once, because, if allowed to get dry they would doubtless lose their germinating power.

3rd.—Gutta-rambong.—This is a Caoutchouc or Indian Rubber. I have not met with the tree producing it as the Malays told me it is only met with in the interior of Perak and on the Patani side of the Peninsula.

They describe the tree as having large roots above ground and large bright green leaves with red tips to the branches. The milk is obtained from these large roots which are tapped 10 or 12 times a year, a picul being sometimes taken from a large tree, but half a picul is the usual quantity. No cooking or preparation is necessary.

The Caoutchouc has the appearance of long strings irregularly welded together, and the best quality has a gum-like appearance, is very firm in texture, and a reddish brown colour; the inferior qualities have a large admixture of bark, &c., and is much drier without the gum-like consistency of the better qualities.

12

The caoutchouc from Perak has much the same appearance as Assam rubber and I have little doubt is produced by the same tree *i. e.* *Ficus elastica*, as the description of the tree by the Malays agrees very closely with that of the above named plant, the red points to the branches being probably the conspicuous red stipules, which envelope the young leaves. Specimens and young plants have been promised to Mr. Low and myself, and I hope before long to definitely settle the origin of gutta rambong. It is unknown at Klang.

4th.—Gutta-singgarip. This substance is also a Caoutchouc and agrees very closely in texture, appearance, and in the mode of preparation with the Gutta-soosoo of Borneo and Mr. Bruce the Assistant Commissioner of Police at Kinta, who has spent some time among the Gutta-soosoo collectors in Borneo, assures me that they are the same product. The Malays about Kwalla Kangsa spell it *سيفكاريف* but in Salangor and Durian Sabatang it is pronounced "Grip" and "Garape."

It is the produce of a large woody climber with stems about 6 or 8 inches in diameter, but often much less, of which there are two varieties, one with outer bark very dark with lighter coloured warts and inner bark red, the other has the outer bark light cork coloured with longitudinal channels, and the inner bark light yellow.

Both yield edible fruits of which the Malays are very fond, that of one being pomiform and the other pyriform, but I am unable to say which yields the pomiform fruit or which produces the other form as the plants were not in fruit at the time of my visit. The foliage of both plants is much alike.

The gutta from the dark barked variety is considered the best. I saw both sorts in quantity between Sungkie Raya and Qualla Dipang, and on Bujong Malacca below 2,000 feet, and with one or two plants on Gunung Gubo.

The long scandent stems are often cut down to procure the milk, but it is not absolutely necessary to do so, except to render the operation of collecting the gutta easier. The stem is generally ringed at intervals of 10 to 12 inches, and the milk allowed to run into vessels made of palm or other leaves, coconut shells or anything available for the purpose; it continues to flow for some time, but after flowing for 10 minutes it gets very watery and thin. One plant will yield from 5 to 10 catties of the coagulated caoutchouc. When raw it has the appearance of sour milk and to coagulate it the natives add salt or salt-water, and when freshly coagulated it is quite white, which gradually changes to a darker colour, but in one specimen I have all the transitions from black to white are represented—I find the black part has the largest proportion of earth, &c. It keeps white inside and on cutting it it presents a foecated appearance, the cells containing water and salt which have become enclosed during coagulation. In texture it is soft, very spongy, and very wet.

From January to November, 1877, 57 piculs, 45 catties were exported from Klang alone.

As I was unable to get flower or fruit I am unable to determine the species from which this substance is derived. Borneo rubber or Gutta-soosoo is said by Mr. Collins in his Report to be the produce of *Ureola elastica*, but I am inclined to think that one or two spp. of *Willubeia* yield the Gutta Singgarip of the Malay Peninsula.

That it is not obtained from *Ureola elastica* is evident, as I saw several old peduncles from which the flowers had fallen, and these were axillary, while *U. elastica* produces its flowers in terminal cymes, and I have frequently found in the Malay plant, numerous axillary tendrils which I believe never occurs in *Ureola*.

Ureola has also ovate acuminate leaves, rough on both surfaces, which, in the Malay plant are lanceolate-acuminate, and quite glabrous on both surfaces.

I have procured specimens of the foliage stems and gutta, which will be sent to Kew for identification.

5th.—Gutta-putih Syn. Gutta-sundek. This the product of an *Isonandra* with leaves differing from those of *I. gutta* in being much shorter and broader, more ovate in general outline and the pilose hairs on the under surface are not so fulvous as in that species.

Mr. Collins in his report attributes it to *Imacrophylla* (De Vriese), but I have no description of this plant at hand.

The gutta is obtained and prepared in the same manner as *G. taban* and trees are frequently met with on the Sayong and Meeru ranges. Of this variety 484 piculs, 56 catties were exported from Klang alone, from January to November, 1877. It is much whiter and more spongy than *G. taban* and is worth only \$15 per picul as against \$50 for *G. taban*.

When crossing the Meeru range from Kinta to Kwalla Kangsa I cut off some leafy branches from a tree which had been felled and ringed a few days before. These leaves were beautifully yellow on the lower surface, caused by small peltate scales, and not pilose hairs, as in the *Isonandras*, but on making enquiries from men about Sayong they pronounced them to be the foliage of some non-gutta yielding tree, which is certainly wrong as I saw the dry gutta adhering to the bark where it had been ringed.

A kind of gutta called *G. jelutong* is often used in Perak for mixing with *Guttas taban* and putih, thus rendering them very brittle, but I have not seen the gutta nor the tree producing it. *Isonandra Motleyana* is said to yield a gum, which in Java and Sumatra is known as *G. kolian*, and is used only for adulterating purposes.

Various spp. of Fig (*Ficus*) yield large quantities of milk, which in Perak is known as *Gutta-burong* as the only use to which it is put is for bird catching.

H. J. MURTON.

January 8th, 1878.

The Malays about here are engaged in mining, but I saw only their smelting places and none of their mines.

December, 2nd—Left Jellapong at 6 A.M., and after two hours of travelling through a swampy tract of land we arrived at Sunghie Meru where we left the Elephants to come on at their leisure, while we pushed on hoping to reach Kwalla Kangsa before nightfall as we had only one day's provisions with us.

Close to Sunghie Meru in the lalang patches *Phajus grandifolius* was blooming beautifully, the only place in which I have seen it in Perak.

After several ascents and descents we gained the highest point of the Meru range over which the road runs, which is about 2,400 feet above sea-level. From here there is a steep descent until Sunghie Menduru is reached at 500 feet elevation.

This is the road by which nearly all the tin from Jelappan and Kinta is transported to Kwalla Kangsa, on Elephants, and to me it was a subject of wonder however those sagacious animals manage to traverse it with heavy loads when one false step would be enough to send them 50 or 60 feet down the gorge, in fact a case of this sort which caused the death of an Elephant happened just previous to my visit.

I saw nothing on this range worthy of particular notice, save that the gutta men seemed pretty numerous, judging from the number of trees recently cut down, and their resting places. The soil is very poor consisting of close adhesive yellow clay.

At Sunghai Akhar a large tract of land is under paddy cultivation and promised to yield very fair crops.

After leaving the best mentioned place we had to swim across Sunghai Menduru and before we reached Sunghie Bawya this stream had to be crossed nine times either by means of a bridge, which was generally composed of one bamboo thrown across or by means of swimming, the last way by far the easier to me.

Boots were luxuries not to be indulged in where deep streams had to be crossed, and swamps waded through, so I did my best without them, and walked in my stockings till they were finished, an operation which required only about half an hour's walking to complete after which the remainder of the journey to Sayong was done *nudis pes*.

I reached Kwalla Kangsa at 6 P.M. accompanied by 1 sepoy and 3 coolies—the rest having dropped behind.

December 3rd—At Kwalla Kangsa rather stiff from the previous day's exercise.

December 4th—Two of the three elephants which left Kinta with me arrived at Kwalla Kangsa; owing to the state of the road they had fallen several times. Found my plants had arrived in a most deplorable condition, the box in which they were packed half-full of water, and most plants of a succulent or herbaceous texture rotting.

December 5th—Left the Residency at 7 A.M. and crossed the river to Sayong whence we went up Gunung Panjang in company with some gutta collectors, my principal object being, to find out the tree from which Gutta-putih or *G. sundik* is taken.

We met with a few trees of the Gutta-taban and Gutta-putih but all young trees not old enough for ~~cutting~~ ^{splitting} down.

I procured a sample of the prepared gutta, and I am indebted to Mr. Low for specimens of Gutta-taban, *G. singgarip* and *G. rambong*; and to Mr. C. J. Skinner for specimens of the two last from Kroh.

December 6th—Paid off all the coolies and left for Thaipeng, leaving two men in the pass to collect some plants there which I had pointed out to them.

December 7th—Getting men together to go up the Hijuu range again with Mr. Scott the Inspector of mines, who was going up at the Resident's request, to examine the hill for the purpose of cutting a road to the top if practicable.

December 8th—Left Thaipeng at 7.30 accompanied by Messrs. Scott and Kerr and arrived at the top at 1.30 P.M.

The jungle on this occasion presented a very different appearance from what it did in October, this time there was scarcely a flower to be seen, no Rhododendrons or *Aschyranthus* in bloom.

We were repaid in a great measure for our work by the beautiful view we had this time, as the weather was beautifully clear and the country for miles around was plainly visible to us. The hills in Keddah, Penang, and the coast a long way South of Matang, stood out very clear, but higher peaks shut out the view to the Eastward.

December 9th—Rain came on at 6 A.M. which rendered our descending journey rather unpleasant, and after descending very slowly, collecting plants as we went, we reached Thaipeng at 3 P.M.

December 10th—Took my plants to Matang and at 7 P.M. left in the "Sri Sarawak" for Penang where we arrived at 3 A.M. on the 11th and left per "Pyah Pekhet" at 4 P.M. on the same day for Singapore via the coast.

I went ashore at Klang for a little while, and went round the Fort and Barracks, &c.

One cannot help being struck by the remarkably clean appearance of everything about Klang, the police quarters, barracks &c. being kept beautifully neat and clean, and from what I saw of the roads they are the best I have seen in the Native States.

Owing to an attack of fever I was prevented from going ashore at Salangor or Malacca.

I arrived in Singapore, December 16th.

The Flora of Perak is not so rich or varied as I had expected to find it. Of some genera I had expected to find well represented I could not find a single species, notably *Cypripedium*.

If quite new plants are to be found, higher altitudes must be searched, as most of the

plants on the Perak hills are represented on Mount Ophir, which has been well explored by several botanical travellers and the plants described.

Added to this my visit was very badly timed as very few plants are to be found in bloom towards the end of the rainy season when they are making new growth; doubtless a trip in the dry season would give much better results. Several Bornean plants are found in Perak which have hitherto been reported from the former place only.

Below 4,000 feet elevation the Natural order best represented is the Zingiberaceae of which there are several genera.

Ferns are pretty numerous including two or three Bornean spp. but the genera Hymenophyllum and Trichomanes are represented by very few spp.

Palms are represented by few genera, some Singapore spp. being sent, and the orchids by very common species.

A brief resume of what I was able to glean respecting the Gutta producing trees of the Peninsula is appended.

In conclusion my thanks are due to Mr. Low for his assistance and for the useful information his intimate knowledge of Befany enabled him to give me, and to all the officials in the district through which I travelled, for their assistance and the kind manner in which I have been treated during my stay in the country.

I have, &c.,

H. J. MURTON,

*Sept. Botanical Gardens, Singapore,
and Government Botanist S. S.*

*To the Chairman of the
Gardens Sub-Committee.*

RAFFLES LIBRARY AND MUSEUM,
Singapore, 14th March, 1876.

GENTLEMEN,

I herewith beg to hand you the following Report on the Raffles Library and Museum for the year 1875.

I am, Gentlemen,
Your obedient Servant,

JAMES COLLINS.

*To the Raffles Library
and Museum Committee.*

Report on the Raffles Library and Museum for the year 1875.

LIBRARY.

I have great pleasure in reporting that the Library has been very prosperous during the past year, as will be seen from the number of books added thereto, and the great increase in the number of subscribers and visitors.

The number of subscribers for 1875 is as follows:—

Proprietors	...	...	9
1st-class Subscribers	...	...	50
2nd do.	...	...	131

The numbers for 1874 were—

Proprietors	...	...	9
1st-class Subscribers	...	...	31
2nd do.	...	...	62

The Proprietors, as will be remembered, are those who, on condition of giving up to the Government all claims to the original Library, and the Government paying the debt of that Library, were to become 1st-class Subscribers for life, without any payment; such right, however, not being transferable. There are at present only six of the original proprietors who avail themselves of this right.

The fees taken for subscriptions &c. amount, for the year 1875, to \$368.30, and which amount has been paid to the Treasury. This sum, when compared with the number of subscribers, may seem rather low, but is to be accounted for in two ways. First, that many subscribers, on account of their short stay here, only join for a single quarter, and that, as the Reading-room is perfectly free, many find this quite sufficient for their purpose without borrowing books or periodicals; and also that before the commencement of the present year many annual subscriptions were paid which, although partly for 1875, are included in the accounts of 1874.

Nearly 5,000 books have been lent during the past year.

The number of visitors has been steadily increasing. During the year 1875, considerably over 4,000 persons availed themselves of the Reading-room, and with very evident satisfaction; especially Naval Officers, Passengers passing through, and Naturalists, who have always freely availed themselves of this boon placed within their reach by the Committee.

The additions to the Library have been very numerous during the past year. Over 2,000 new volumes have been added by purchase, and our Library of Malayan Literature has been greatly enhanced in value by the many welcome additions made during the year.

I cannot let this opportunity pass without reporting to the Committee on the great care, attention and zeal shewn by Messrs. Edmonston and Douglas, our Library Agents, in carrying out the orders of the Library Sub-Committee, leaving in fact nothing to be desired.

The Library, too, is greatly indebted to the Government for very valuable sets of Official Gazettes, Blue Books, Consular Reports and other documents, and as these are received at the Colonial Secretary's Office they are forwarded to the Library, thus making it a Repository of most valuable official information.

The Library is also indebted to several friends for various books and periodicals, as will be seen from the Appendix. Also to the Editors of the *Straits Times* and *Straits Observer*, for their courtesy in inserting any lists of new books free of charge. To the

Directors of the Peninsular and Oriental Steam Navigation Company the Library is indebted for several cases of books delivered in Singapore free of freight.

The Rules framed by the Committee for the Library have now been in operation for some considerable time, and I have great pleasure in reporting that no cause of complaint has been received, or suggestions for alterations or amendment, but that always I have met with a very ready acquiescence with them from all using the Library. The amount of fines for the year only amounted to \$6.90, ranging from 5 cents to \$1, and only \$6 for destroying books.

The Committee, during the past year, drew up and published the following Rules for Out-Station Subscribers.

RAFFLES LIBRARY & MUSEUM, SINGAPORE.

OUT-STATION SUBSCRIBERS.

1. The Committee of the Raffles Library and Museum, desirous of extending the privileges of the Library to residents of Penang, Malacca, and the Native States under the protection of the Government of the Straits Settlements, hereafter called "Out-Station," have made the following Regulations.

2. Any persons desirous of joining the Library can do so by applying to the Lieutenant-Governor or Acting Resident, or other person selected by themselves and approved of by the Committee, who shall act as Local Secretary.

3. The Local Secretary shall be considered responsible for the safety of the books lent, and that the Rules of the Library be adhered to.

4. No book will be lent to an Out-Station till it has been in the Library for 12 months, and no periodical till it has been in the Library for 6 months.

5. All parcels of books will be forwarded to the Local Secretary and must be returned by him within 3 months of date of receipt, and all charges for carriage, &c., must be defrayed by the subscribers, and the books returned to the Library with all charges prepaid.

6. The subscription shall be \$6 per annum, payable half-yearly in advance, entitling the subscriber to two complete works and one periodical at a time, but subscribers may have a greater number of works by paying extra subscriptions at the same rate.

This arrangement, I am sorry to say, has met with no response, partly owing, I believe, to the difficulty in getting books to and from Singapore, and also the diffidence of accepting the responsibilities and trouble of a Local Secretary-ship.

A new Catalogue of Books, containing all additions to the Library up to September, 1875, has been published, and has met with a ready sale. The additions since that date, especially of official papers, will necessitate the publication of an extensive supplement within the next six months.

The great disadvantage the Library labours under is the want of space. At present the Library is inconveniently crowded, and does not admit of such an arrangement as would, especially in the case of reference books, much facilitate their use, and renders it highly difficult to find room for any additions. This overcrowding is the more to be guarded against when it is remembered that in a tropical climate, books must be freely exposed to the air and constantly examined and cleaned, in order to prevent damp and the ravages of white ants and other destructive insects.

MUSEUM.

From the total want of room, the extension of the Museum has been totally suspended. During the earlier part of the year I arranged two cases along the side of the Reading-room, but as the space became necessary to the Library, I had to pack the specimens away out of sight.

Our present quarters, which we owe to the continued courtesy of the Municipal Commissioners, do not contain sufficient available space for the Library, and therefore renders it impossible to display any Museum objects, and I have been forced to discontinue collecting till I have proper space, as unless such specimens can be constantly examined, they speedily are destroyed. The only objects I have collected, and this during the earlier part of the year, have been those only which are not often to be obtained, or are not so liable to be destroyed by insects. The collection of the most important and interesting objects, viz: Eastern commercial products, has not therefore been entered on, and to the want of these illustrations is due the suspension for the present of the series of lectures started by Sir Andrew Clarke and continued under His Excellency Sir Wm. F. D. Jervois.

The chief additions during the year have been a set of Kyan specimens of dress, domestic utensils, &c., which were purchased, and a most valuable collection of Siamese commercial products, antiquities and other objects presented by His Majesty the King of Siam. These I have not been able to exhibit for want of space, and I would beg leave most earnestly that this Committee would urge upon the Government the necessity of providing a proper building as soon as possible; and as soon as this is provided I propose publishing a descriptive Catalogue of the Museum, with the donors' names attached to all presentations.

Before closing the present Report, I would beg to bring before this Committee one or two matters for their favourable consideration, with reference to the increasing the knowledge of, and the probable further development of, the commercial capabilities of the Straits Settlements and the Malayan Peninsula. As is well known to every one conversant with the Colonial Markets at home, there is a constant enquiry as to what capabilities of production of fibres, timbers, gums, resins, drugs, &c. these countries possess, and on the possession and development of such capabilities depends the opening up such countries to the beneficial influences of commerce and civilization.

On the present occasion I will only beg to draw your attention to two commercial substances, in order to obtain your permission to my endeavour to follow up for the benefit of these Settlements a work which I have already commenced elsewhere. These two substances are India Rubber and Gutta Percha.

In obedience to a Commission from the then Secretary of State for India in Council, I published in 1872 a Report on India Rubber, in which I strongly urged the necessity of cultivation. This Report was approved of, and immediate steps were taken by the Indian Government to carry out the suggestions I had given, and the cultivation is steadily progressing in India. My first idea, an idea which I have not abandoned, was that Singapore and the Malayan Peninsula were the best localities for this cultivation, especially as the plant yielding Gutta Susu (*Urceola elastica*, —*Roxb.*) is a native of the Straits, and the other plants yielding the best commercial varieties would do well here. Seeds of these can be obtained, and with the present Garden staff would be well cared for, and several doubtful points cleared up.

With regard to Gutta Percha, an essentially Straits product, although I received a similar Commission from the India Government, I have been unable up to the present time to publish a Report. The result of my work in England and Holland has left a most vivid impression that the whole of the work must be done *de novo* and on the spot, as it is not known for certain what tree or trees yield the genuine Gutta Percha. The great desiderata are to ascertain the whole history of the subject and to endeavour to provide a constant and reliable article, especially for cable work.

Beside the botanical origin of the different varieties, the ignorance of which must preclude all attempts at cultivation or conservation, there are many points with regard to the best method of preparation which can only be arrived at by actual experiment. Incidentally I may mention that some of the finest Gutta Percha, as for instance those of Dr. Montgomery, on which the earliest patents were based, are now for the most part so much resin. This change is due to the facility with which, if certain conditions are not attended to, the Gutta will absorb oxygen, and split up into two resins known as *albina* and *fluavile*.

Since I have had charge of the Museum, printed and written queries and instructions have been freely distributed on these and other substances, and promises of assistance readily given.

I would therefore ask this Committee to authorize visits to the surrounding countries, for which provision has been made in the estimates, so that I may be able to examine into some of these subjects and make collections for the Museum; and although one cannot predict great discoveries, which are often stumbled upon haphazard, yet the great interest attached to the whole subject will not allow of my letting a single opportunity of increasing our knowledge pass unheeded.

JAS. COLLINS, F.B.S.E., &c.,
Government Economic Botanist,
Secretary and Librarian Raffles Library and Museum.

*Abstract of Estimated and Actual Expenditure of the Raffles Library and Museum
from December 1st, 1874, to November 30th, 1875.*

	ESTIMATED.		ACTUAL.	
	\$	C.	\$	C.
ESTABLISHMENT:—				
Salary of Secretary, Librarian, &c.	2,400	...	2,400	...
Salaries of Library Clerk and Peons	752	...	512	...
Office Expenses	348	...	205	22
LIBRARY:—				
Purchase of Books and Binding and Repairing do. ...	3,500	...	4,580	93
MUSEUM:—				
Purchase of Specimens and collection of Minerals ...	3,000	...	772	77
	10,000	...	8,470	92
Amount of vote ... ..	...	...	10,000	00
Amount actually received from Colonial Treasury ...	8,470	92	...	...
Less amount of Subscriptions paid in	368	30	8,102	62
Balance 1st December, 1875. ... ..	...	...	1,897	38

Report on the Zoological Department for 1875.

ALTHOUGH a year has now elapsed since we took over the management, we regret that on account of numerous difficulties comparatively little progress has been made in the Zoological Department.

The money allowed us for this department, although quite sufficient for the upkeep of a Zoological Garden of fair dimensions, when thoroughly organised, is quite inadequate for us, as our large expenditure is, and will for some time be, the erection of suitable houses for the various animals.

When the Committee took over the management, a small collection of birds was found. They were kept in a large house or shed, which was considered unsuitable, and as the collection of fowls and pheasants was increasing largely, it was considered necessary to erect a good house for the same, which is now occupied.

In consequence of many animals having been presented by numerous friends, and no suitable accommodation being ready, we have been obliged to make a temporary use of the aviary for these animals.

We have, during the year, bought the material for a large kangaroo shed and enclosure, which is now in course of erection.

In May last a fine two-horned rhinoceros was presented to us by Sir A. Clarke, through the Datu Klana of Sunghie Ujong; a good house has been built for this animal, and that on a rather large scale, with a view of widening it at a little expense for the accommodation of an elephant and tapir, which animals we hope soon to have in our collection.

The animals purchased have been comparatively few, but many have been presented.

Besides the Datu Klana, the liberal donor of the rhinoceros and a pair of argus pheasants, we are much indebted to the late Mr. Birch, who not only manifested great interest in the Zoological Department, but was also the instrument of procuring many specimens for it.

We have also to record our thanks to Mr. Newman in Bangkok, and to Captain Kirk of the Steamer *Royalist*, who took great trouble in procuring for us animals from Siam and from Borneo.

From the Acclimatisation Society in Melbourne we received a fine and valuable collection of Australian animals, such as kangaroos, emeus, parrots, eagles, black swans, &c., and from the Zoological Gardens in Hamburg a fine pair of white swans.

The next building we intend putting up is a monkey house;—and here our spirited and liberal citizen Mr. Cheang Hong Lim has come forward most unexpectedly, promising us a sum of about \$2,000 for building the same.

Orders have been sent to England to get the work done there without loss of time.

The collection of monkeys could be easily increased, but the means of keeping these animals at present are very primitive, and in no way an ornament to the gardens.

Until late, we have had, through the courtesy of Colonel Crowe, two soldiers from H. M. 1-10 Regiment, for looking after the animals, with the assistance of several natives, but this did not work as desired, and we have lately engaged a European as a keeper, for whom a small bungalow is now being built, to enable him to be constantly at the place, which is absolutely necessary, and we trust this arrangement will work better.

Appended is a list of animals in the gardens.

Singapore, January, 1876.

WM. KROHN,
Member of the Committee.

List of Animals in the Gardens at the end of 1875.

One two-horned Rhinoceros	...	from the Datu Klana of Sunghie Ujong,
		presented by Sir Andrew Clarke.
„ Sloth Bear	... ..	„ „ Mr. Birch.
„ Jackal	... ..	„ „ Mr. Newman.
Two Tiger Cats	... ..	„ „ Captain Kirk.
One Civet Cat		
„ Sambur Deer	.. ..	„ „ Mr. Jamie.
„ do.	... ..	„ „ Mr. Brinkmann.
Two Philippine Deer		
One great Kangaroo	... ..	„ „ Acclimatisation Society in
Three red do.	... ..	„ „ Melbourne.
One bush-tailed Wallaby	... ..	„ „ „
Two Porcupines		
Three Australian Rabbits	... ..	„ „ Mr. T. S. Thomson.
Six Kantchills (Mousedeer)		
Two Orang-utangs	... ..	„ „ Captain Kirk.
Two common Macaques		
Three pigtailed do.		
One black do.		
Two white Swans	... ..	„ „ Zoological Gardens in Hamburg.
Four black do.	... ..	„ „ Acclimatisation Society in Mel-
		bourne.
—Siamese Teals.		
Three mandarin Ducks		
Two moskovit Ducks.		
„ Pelicans		
Seven Adjutants.		
Three Cyrus Cranes.		
Two white Storks.		
„ Herons.		

Cockatoos and Parrots.		Banksfowl (wildfowl.)
Vieillot's Pheasant, fireback.		Copper-coloured do.
Rufous-tailed do. do.		Crown Pigeon.
Siamese do. do.		Sundry Pigeons and Doves.
Golden do.		Two wedgetailed Eagles.
Silver do.		Two Hawks.
Ring do.		Two Owls.
Peacock do.		One Vulture (caught in the garden).
Argus do.		

Statement of Expenditure for the Zoological Gardens, Singapore, for the year ending November 30th, 1875.

	\$	C.	\$	C.
Estimated ...	3,000	00		
By Government Warrant ...	443	10		
			3,443	10
Expended				
By Aviary men and Coolie-hire	435	87		
„ Soldiers' wages	85	00		
„ Food for Animals	299	94		
„ Purchase of Animals	132	10		
„ Tools and Materials	1,312	89		
„ Rails for Deer Park	443	10		
„ Building Aviary	634	59		
„ Building Rhinoceros-house	310	00		
„ Cart-hire and Contingencies	26	88		
Total ...			\$3,680	37
Deficit ...			\$ 237	27

True statements.

(Signed)

H. J. MURTON,
Superintendent,
Botanic Gardens,
Singapore.

March 8th, 1876.

Report on Government Botanic Gardens.

Singapore, March 9th, 1876.

GENTLEMEN,

I have the honour to submit to you my first annual report of the progress and condition of the Botanic Garden during the year 1875.

No very extensive alterations have as yet been made, as the five months which have elapsed since my arrival have been mostly taken up by the general routine.

Much difficulty has been experienced with the flower-beds, which are infested with a species of sedge (*Cyperus tuberosus*?) which has probably been introduced into the Garden by using partially decomposed animal manure. As a last resource I am now having a foot of the top soil removed and the remainder trenched to the depth of 3 feet, by which I hope this pest will be destroyed. The trenching of the beds has given the Garden a barren appearance in some places, but a few months' growth of the young plants will remedy that.

Several of the walks and drives have been re-made where necessary, and many of the principal drives require re-metalling at once, which I have been unable to do owing to the difficulty of procuring laterite. The bridge leading into the Garden from the Barracks has been renewed. The old trees and shrubs which previously overgrew the clump of sago palms near the principal entrance have been removed, and a collection of young palms planted in front of the sago palms.

A large number of old and dead trees and shrubs have been removed, and are being replaced where necessary by young plants of a more ornamental character; and the line of old betel-nut palms (*Areca Catechu*) bordering Napier Road has also been removed, and is being replaced by *Seaforthia elegans*.

The two small ponds which contained the collection of *Nymphaeas* and *Victoria regia* have been made into one, which is a great improvement to this part of the Garden, beside giving more space for the cultivation of aquatic plants. One part has been devoted to the sacred Lotus (*Nelumbium speciosum*), and at one end it is proposed to locate a pair of alligators. The bank of the pond near Napier Road has been planted with a collection of the various species of *Seaforthia* and *Kentia*, two genera of palms from Australia and Howe's Island. On the garden side an extensive collection of ornamental trees and shrubs has been planted, which are already assuming a striking appearance. Nearly all the alterations in this part of the garden were necessitated in order to get soil for the levelling required for building the Rhinoceros-house.

The Office mentioned in my report of August, 1875, has been commenced, and is now rapidly approaching completion. This will also accommodate the Botanical Library and the collection of dried specimens until the proposed Herbarium is erected. The large verandah around it will prove a boon to visitors, who hitherto have had no proper place of shelter from the heavy showers of rain. It is proposed to erect an Orchid House near the Office, in lieu of the one now existing, which is ill adapted to their growth. It is hoped that the verandah around the Office will afford facilities for ripening the orchids, and giving them a distinct season of rest, by which I hope to secure a larger proportion of bloom than is usually obtained from orchids grown in Singapore.

During the year large numbers of *Phalœnopsis*, *Arides*, *Saccolabiums*, *Dendrobiums*, &c., have been established on the trees in various parts of the garden.

A catalogue has been compiled of all the plants in the garden which I have as yet determined; but a very large number still remain to be identified. The catalogue is appended to this report.

A good collection of standard botanical works has been ordered from England, in addition to a microscope, which will afford very great assistance in the identification of the large number of plants which remain to be determined.

The experimental garden is as yet in its infancy; consequently I have little to report in this department.

Trials are being made with the Liberian and Cape Coast coffees, in order to prove or otherwise their adaptability for commercial purposes in this colony. From all that is known of these new products, it is fully anticipated that they will prove the most useful and remarkable introductions of the present century. The fruit is of much better flavour than the old *C. Arabica*, and they produce berries nearly double the size of that species, and are said to be very prolific. I fear Singapore will not prove well adapted for the cultivation even of these species, but the Malay Peninsula promises a good field for this enterprise, and I shall endeavour to get some eligible planters in the Peninsula, Province Wellesley, and Penang to plant some of these species, and report on their progress, and I shall be glad to receive applications for some at any time.

Of *Ipecacuanha* the stock as yet is very limited, consisting only of a few plants given me by Dr. Thwaites during my stay in Ceylon, but I hope soon to be in a position to make some extensive trials with this valuable plant. The result of these trials will be very important, as it is disappearing from its native habitats, which may in a great measure be attributed to the small quantity of drug afforded by even a full-grown plant. Its importance in India as a remedy for dysentery, and the increasing costliness of the drug, have occasioned active measures to be taken for attempting its cultivation there.

With regard to these trials Dr. King, in his report for the year 1874, thus speaks:--

“ Experience having shown that this plant requires essentially tropical conditions, warm well-sheltered places, with good virgin soil, were chosen; some of the plants thus put out were protected by the natural shade of the forest, others by a sloping thatch of grass. Until the arrival of the cold season all went well, but the unusually low temperature that prevailed during that season was fatal to the majority of the plants, and I am driven reluctantly to the conclusion that it is doubtful whether ipecacuanha can be successfully cultivated as an outdoor crop in Sikkim.—This is also the opinion of Mr. Gammie, the resident manager of the Cinchona plantation.”

Judging from Dr. King's experience, and from its native habitats, viz: in shady forests of South America, lying between 8° and 22° S. lat., the Straits promises a good field for the cultivation of this plant. To mark its importance and increasing costliness, I extract the following average prices at which the drug was purchased wholesale in London, during three periods of 10 years each, from Flückiger and Hanbury's Pharmacographia:—

10 years ending 1850,	average price	2s. 9½d.	per lb.
10 " 1860,	" "	6s. 11½d.	"
10 " 1870,	" "	8s. 8¼d.	"

Cardamum cultivation promises to become a profitable speculation for small proprietors in this Colony. I hope soon to have a stock for distribution.

A large number of economic and medicinal plants have been introduced, and an "Economic Garden" will be commenced almost immediately on the ground now occupied by the nursery, which will be removed to the back of the hill below the manager's residence. In the new economic ground I shall endeavour to represent, systematically arranged, all the plants yielding economic and medicinal products which are amenable to cultivation in this climate. This department I venture to hope will in a few years form one of the most instructive and interesting features of the Garden.

A quantity of slate labels, recommended by Dr. Hooker, have been ordered from England. As soon as they arrive, the labelling of the trees, shrubs, &c. will be commenced. From June 30th to November 30th, over 700 baskets of flowers were supplied to subscribers, and I cannot forbear again recommending that this practice be stopped or considerably modified, as the Garden can never present a gay appearance under existing circumstances. A large number of plants have also been supplied to the subscribers, and arrangements are now being made to meet the constant demands for seeds.

From June 30th to November 30th, 11 Wardian cases of plants and 10 large boxes of epiphytal orchids have been despatched to other botanical establishments. Large quantities of seeds and plants have been sent to various establishments in Australia, consisting principally of bread-fruit, litchi, rambutan, durian, mangosteen, mango, pepper, clove, nutmeg, sapodilla, gamboge, and quassia. A case of gutta percha (*Isonandra gutta*) has been forwarded to Ceylon for trial there. A list of the contributors to the Garden and a list of the subscribers are appended.

It is my unpleasant duty to report many serious infringements of the Rules, not only by natives but also by Europeans. The latter on more than one occasion have been detected cutting flowers by moonlight. The principal part of the collection of orchidaceæ, ferns, and rare plants have been kept private, as they have often been removed when exposed to the public, while as regards orchids the flowers are almost invariably cut. It might be advisable to call to the minds of the perpetrators of these thefts that several of the plants now in the Garden are quite unique in the Straits Settlements, and it might happen that such a unique plant found in their possession might lead to their prosecution to give account from whom they received it.

To Dr. Thwaites, F.R.S., &c., and his assistant, M. M. Hartog, Esquire, F.L.S., my thanks are due for much valuable assistance and instruction I received from them during my stay in Ceylon; and also to Mr. Niven, the Manager of this Garden, for much valuable assistance in its management.

It seems desirable that the present opportunity should be used to direct attention to the timber supply of Singapore. Good timber trees have almost entirely disappeared, and we have large tracts of land at present overrun by "lalang" grass (*Imperatia Kænigii*) and *Elephantopus scaber*, the soil of which is too poor for cropping purposes, but well adapted to the growth of such trees as the "tembesoe" (*Fagraea peregrina*), redwood (*Gluta velutina*), beside numerous *Calophyllums* and *Dipterocarpaceæ*. Trees of this sort might be planted on the sides of future public roads, instead of the worthless *Erythrinæ*, &c., now used for similar situations.

The Garden, with the sanction of the Government, could thus be rendered useful to the Colony by forming nurseries of valuable timber-producing trees, while many exotic species, as ebony, calamander, teak, and mahogany, &c., could be introduced.

I have, &c.,

(Signed) H. J. MURTON,
Superintendent.

APPENDIX I.

Contributors of Plants and Seeds to the Garden for the year ending November 30th, 1875.

- | | |
|---|---|
| The Royal Gardens, Kew, per The Hon'ble Major McNair: a case of Liberian and Cape Coast coffee. | The Queensland Acclimatization Society: araucarias, &c. |
| The Royal Botanic Gardens, Ceylon: an extensive collection of plants and seeds. | Sir Wm. Macarthur, Sydney: Australian plants. |
| The Royal Botanic Gardens, Brisbane: palms and cycads. | The Hon'ble Dr. Little: palms and seeds, &c. |
| The Royal Botanic Gardens, Mauritius: palm and pandanus seeds. | The Hon'ble Ho Ah Kay (Whampoa): plants and seeds. |
| The Botanic Gardens, Rockhampton: Australian plants. | R. Jamie, Esq.: orchids and seeds. |
| The Government Gardens, Hongkong: Chinese fruit trees and seeds, &c. | Captain Kirk: orchids from Sarawak. |
| | " Carpenter: do. do. do. |
| | C. Baumgarten, Esq.: seeds. |

APPENDIX II.

List of Subscribers to the Botanic Gardens for the year ending November 30th, 1875.

- | | | |
|---------------------------|-----------------------------|-------------------------------------|
| Almeida, E. d' | Fraser, J. | Maier, S. J. |
| Almeida, Joze d' | Geiger, H. W. | Mullholland, W. |
| Armstrong, F. | Gottlieb, F. H. | McNair, The Hon'ble Major |
| Asmus, H. <i>Adams</i> | Goe Seu Swee. | MacArthur, J. R. |
| Basagoiti, J. P. de | Harper, R. I. | Oldham, W. |
| Baumgarten, C | Hartwig, F. C. von | Officers 1/10th Regt. |
| Ban Sen | Heng Kim Teng. | " Royal Artillery. |
| Becker, A. | Hinnekindt, H. | Pell, B. |
| Bishop, F. C. | Hoo Swee. | Pestonjee, B. <i>C. P. Richards</i> |
| Brasier, P. | Hullett, R. W. | Purvis, J. M. |
| Brennand, J. | Iranee, B. K. | Ritter, E. |
| Brussel, J. | Jervois, H. E. Sir W. F. D. | Seah Chew Seah. <i>Sohoh 76</i> |
| Campbell, R. | " Lady. | Sidgreaves, Sir Thos. |
| Campion, W. G. | The Staff. | Smith, W. B. |
| Carrington, W. T. | Kim Ting. | Suhl, M. |
| Chea Hun Seang. | Koek, E. | Tan Beng Swee. |
| Chan Boo Hee. | Kok Eng Hoon. | " Eng Quan. |
| Clarke, H. E. Sir A. | Lee Cheng Tee. | " Kim Ching. |
| " Lady | " Cheng Yean. | " Kim Tiang. |
| The Staff. | " Boon Bing. <i>Sutton</i> | " Qui Lan. |
| Cumming, A. S. | Little, The Hon'ble R. | " Seng Poh. |
| Currie, A. <i>Douglas</i> | Lim Eng Bee. | " Heng Hoon. |
| Cuthbertson, T. | " Soon Keat. | Wee Boon Tek. |
| Donaldson, A. L. | " Teang Swee. | Whampoa, The Hon'ble H. A. K. |
| DeSouza, M. F. | Low Ah Jit. | Willans, The Hon'ble W. W. |
| Edgar, G. | " Han Kim | Wood, The Hon'ble H. W. |
| Emmerson, C. | Maack, H. F. | Wyngaarden, P. A. C. |
| Engel, E. | Mansfield, G. <i>Huller</i> | Zeltmann, T. |

APPENDIX III.

Statement of Expenditure for the Botanical Gardens for the year ending November 30th, 1875.

	\$	C.	\$	C.
SUPERINTENDENT'S SALARY AND EXPENSES—				
Estimated ...			1,700	00
Expended ...			1,002	26
			697 74	
MANAGER'S SALARY—				
Estimated ...			960	00
Expended ...			960	00
PAYMENT OF MORTGAGE ON MANAGER'S HOUSE—				
Estimated ...			4,000	00
Expended ...			4,000	00
GARDEN EXPENSES—				
Estimated ...				2,340 00
Expended ...				
" By Mandor and Coolie-hire	1,061	67		
" " Soldiers' Wages	70	00		
" " Tools and Materials, &c.	558	10		
" " Building Coolie-house	113	48		
" " Manure	89	75		
" " Metalling	99	75		
" " Gharry-hire	32	90		
" " Cart-hire	59	95		
" " two months' Interest on Mortgages	53	33		
			2,138 93	
			BALANCE ...	\$210 07

APPENDIX IV.

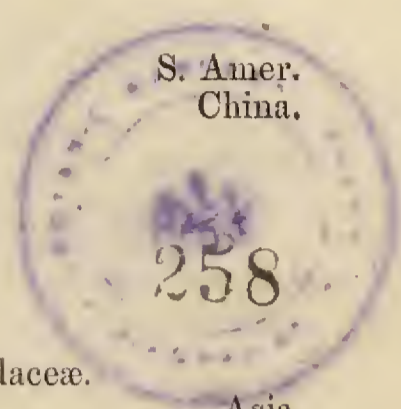
Catalogue of Plants under cultivation in the Botanic Garden, November, 1875.

Abrus, L.	Leguminosæ.		lunulatum, Burm.	Tropics.
preicatorius, L.		E. Ind.	macrophyllum, Sw.	Trop. Amer.
Abutilon, Gartue.	Malvaceæ.		trapeziforme, L.	Trop. Amer.
venosum, H. Turrich.		Mex.	Æchmea, R. et P.	Bromeliaceæ.
Thompsonii, Hort.			fulgens, Melin.	Brazil.
Acacia, Neck.	Leguminosæ.		Ærides, Lour.	Orchidaceæ.
Farnesiana, Willd.		E. Ind.	affine, Lindl.	E. Ind.
Acalypha, L.	Euphorbiaceæ.		odoratum, Lour.	"
tricolor, L.		S.S. Isl.	quinquevulnerum.	"
Acanthophippium, Lindl.	Orchidaceæ.		suavissimum, Lobb.	Java.
bicolor, Lindl.		Ceylon.	virens	"
Actinopteris, Link.	Filices.		Æschynanthus, Jacq.	Cyrtandraceæ.
radiata, Link.		Trop. As. & Africa.	javanica, Hk.	Java.
Adenantha, L.	Leguminosæ.		Lobbiana, Hk.	"
pavonina, L.		E. Ind.	Agave, L.	Amaryllidaceæ.
Adiantum, L.	Filices.		americana, L.	Mex.
cuneatum, L. & F.		Trop. Amer.	Allamanda, L.	Apocynaceæ.
hispidulum, Sw.		Trop. Old World.	cathartica, D.C.	S. Amer.

neriifolia, Hk.		S. Amer.	Barleria, L.	Acanthaceae.	E. Ind.
Schottii, Pohl.		Brazil.	Gibsonii, Hk.		
Alocasia, Schott.	Aroideae.		Barringtonia, Forsk.	Myrtaceae.	Moluccas.
Jenningsii, Veitch.		E. Ind.	speciosa, L.		
Lowii, Hort.		Borneo.	Bauhinia, L.	Leguminosae.	
Aloysia, Orteg.	Verbenaceae.		purpurea, L.		E. Ind.
citriodora, Orteg.		Chili.	tomentosa, L.		Ceylon.
Alpinia, L.	Scitaminaceae.		variegata, L.		E. Ind.
cernua, Sims.		E. India.	Begonia, L.	Begoniaceae.	
Galanga, Sw.		"	argyrostigma, Fisch.		Brazil.
nutans, Rose.		"	continiifolia.		
Alternanthera, Fors R.	Amarantaceae.		hydrocotylifolia, Hk.		Mex.
sessilis, R. Br.		China.	nitida, Dryand.		Jamaica.
Amherstia, Wall.	Leguminosae.		Bentinckia.	Palmaceae.	
nobilis, Wall.		Martaban.	coddapanna.		
Amomum, L.	Zingiberaceae.		Bignonia, L.	Bignoniaceae.	
pulchellum, Thw.		Ceylon.	gracilis, Lodd.		S. Amer.
Ananassa, Lindl.	Bromeliaceae.		grandiflora, Jacq.		"
sativa, Mill.		S. Amer.	Blechnum, L.	Filices.	
" fol. var.			orientale, L.		E. Ind.
Angelonia, H. & B.	Scrophulariaceae.		Bœhmeria, Jacq.	Urticaceae.	
floribunda, Kunze.		Brazil.	nivea, Hk.		China.
Anæctochilus, Blume.	Orchidaceae.		Borassus, L.	Palmaceae.	
Dawsonianus.		Malay Islands.	flabelliformis, L.		Ceylon.
Anona, Adans.	Anonaceae.		Bougainvillea, Comm.	Nyctagineae.	
muricata, L.		S. Amer.	spectabilis, Hk.		S. Amer.
reticulata, L.		"	var. glabra, Lindl.		Brazil.
Antigonum, Endl.	Polygonaceae.		" splendens, Hort.		"
leptopus, Hk.		S. Amer.	Bowenia, F. Muell.	Cycadaceae.	
Aphelandra, R. Br.	Acanthaceae.		spectabilis, F. Muell.		E. Austr.
cristata, Bot. reg.		W. Ind.	Brassaia, Endl.	Araliaceae.	
Araucaria, Juss.	Coniferae.		actinophylla, Endl.		E. Austr.
Bidwillii, Hk.		E. Austr.	Bromheadia, Lindl.	Orchidaceae.	
Cookii, R. Br.		N. Caledonia.	palustris, Lindl.		Singapore.
Cunninghami, Ait.		E. Austr.	Brownea, Jacq.	Leguminosae.	
" var. glauca, Hort.			coccinea, L.		Venezuela.
excelsa, R. Br.		Norfolk Isl.	Brunsfelsia, L.	Scrophulariaceae.	
Rulei, F. Muell.		N. Caledonia.	americana, L.		W. Ind.
Areca, L.	Palmaceae.		Bryophyllum, Salsb.	Crassulaceae.	
alba, Rumph.		Moluccas.	proliferum, Salsb.		Molucc.
aurea, Hort.		Seychelles.			
Baueri, Hk.		Norfolk Isl.	Caladium, Vent.	Aroideae.	
catechu, L.		E. India.	argyrites, Versch.		Brazil.
concinna, Thw.		Ceylon.	Belleymei, Hort.		
malayensis?			bicolor, Vent.		"
monostachya, Mart.		N. Austr.	Chantinii, Lem.		"
nenga, Blume.		Java.	Houlletii, Chant, et Lem.		"
rubra, Bory.		Mauritius.	Newmanii, Hort.		
triandra, Rxb.		Java.	Wightii, Hort.		
Arenga, Labill.	Palmaceae.		Calamus, L.	Palmaceae.	
saccharifera, Labill.		Java, &c.	Roxburghii, Griff.		Ceylon.
Artocarpus, L.	Artocarpaceae.		rudentum, Lour.		"
incisa, L. fil.		S. S. Isl.	tenuis, Roxb.		"
integrifolia, L. fil.		E. Ind.	Calanthe, R. Br.	Orchidaceae.	
polyphema, Pers.		Singapore.	veratrifolia, R. Br.		E. Ind.
Arum, L.	Aroideae.		versicolor, Lindl.		Ceylon.
trilobatum, L.		Ceylon.	Calliandra, Benth.	Leguminosae.	
Aspidium, Swtz.	Filices.		hæmatocephala, Benth.		S. Amer.
molle, Swtz.		Tropics.	Calophyllum, L.	Guttiferae.	
Asplenium, L.	Filices.		inophyllum, L.		Malay Arch.
midus, L.		E. Ind.	Calotropis, L.	Asclepiadaceae.	
prolongatum, Hk.		Ceylon.	gigantea, L.		E. Ind.
Thwaitesii, A. Br.		"	Calpicarpum, G. Don.	Apocynaceae.	
zeylanicum, Hk.		"	Roxburghii, G. Don.		
Aucuba, Thunb.	Cornaceae.		Cananga, Aubl.	Anonaceae.	
japonica, Thunb.		Japan.	odorata, Aubl.		E. Indies.
Averrhoa, L.	Oxalidaceae.		Carica, L.	Papayaceae.	
Bilimbi, L.		E. Ind.	papaya, L.		S. Amer.
Carambola, L.		"	Caryophyllus, L.	Myrtaceae.	
			aromaticus, L.		E. Ind.
Bambusa, Schreb.	Graminaceae.		Caryota, L.	Palmaceae.	
arundinacea, Retz.		E. Ind.	urens, L.		E. Ind.
stricta, Roxb.		"	Wightii, Thw.		Ceylon.

Cassia, L.	Leguminosæ.		ornatum, Herb.	Brazil.
florida, Vehl.		Sumatra.	Crossandra, Salisb.	Acanthaceæ.
fistula, L.		Egypt.	infundibuliformis, Nees.	E. Ind.
sumatрана			Croton, L.	Euphorbiaceæ.
alata, L.		E. India.	angustifolium.	
Castanospermum, A. Cunn.	Leguminosæ.		discolor, Rich.	Domingo.
australe, A. Cunn.		E. Austr.	elegans, Hort.	S. S. Islands.
Casuarina, Rumph.	Casuarineæ.		lacciferum.	Ceylon.
equisetifolia, Forst.		E. India.	pictum, Hort.	S. S. Islands.
torulosa, Ait.		Austr.	variegatum, Hort.	
Catakidozamia.	Cycadaceæ.		Cupressus, L.	Coniferae.
Hopii.		E. Austr.	torulosa, Don.	Nepal.
Centropogon, R.	Lobeliaceæ.		var. torulosa.	
Lucyanus, Hk.		Mex.	Curcuma, L.	Zingiberaceæ.
Cephaelis, A. Rich.	Cinchonaceæ.		longa, L.	E. Ind.
Ipecacuanha, Rich.		S. Amer.	Cyathea, Smith.	Filices.
Ceratopteris, Brong.	Filices.		Hookerii, Thw.	Ceylon.
thalictroides, Brong.		Singapore.	sinuata, H. & G.	"
Chamærops, L.	Palmaceæ.		Cycas, L.	Cycadaceæ.
humilis, L.		China.	Boivinii?	
Chirita, Ham.	Gesneraceæ.		circinalis, L.	E. Ind.
sinensis.		China.	cylindricus?	
Chrysophyllum, L.	Sapotaceæ.		media, R. Br.	E. Austr.
Cainito.		S. Amer.	revoluta, Thunb.	Japan.
Cinnamomum, Burm.	Laurineæ.		Cymbidium, Swartz.	Orchidaceæ.
aromaticum, Nees.		China.	aloifolium, Swartz.	E. Ind.
zeylanicum, Nees.		"	ensifolium, Lindl.	"
Cissus, L.	Vitaceæ.		Cyrtopera, Lindl.	Orchidaceæ.
discolor, Blume.		Java.	Gardnerii, Thw.	Ceylon.
Clerodendron, L.	Verbenaceæ.		Cypripedium, L.	Orchidaceæ.
nutans, Wall.		E. Ind.	barbatum, Ldl.	Java.
Thompsoniæ, Balf.		Africa.	Hookeriæ, Rehb. fil.	Borneo.
„ var. Balfourii, Hort.			Lowii, Ldl.	"
viscosum.			Stonei, Hk.	"
Clitoria, L.	Leguminosæ.		niveum.	Malay Isl.
ternatea, L.		E. Ind.	Cyrtanthera, Nees.	Acanthaceæ.
fl. alba.			Pohliana, Nees.	S. Amer.
Coccoloba, Jacq.	Polygonaceæ.		Dacrydium, Sol.	Coniferae.
platyclada, F. Muel.		E. Austr.	Horsfieldii?	Penang.
Cocos, L.	Palmaceæ.		Dalechampia, Plum.	Euphorbiaceæ.
flexuosa, Mart.		Brazil.	Roezliana rosea, A. Muell.	Mex.
nucifera, Willd.		"	Datura, L.	Solanaceæ.
Cœlogyne, Lindl.	Orchidaceæ.		suaveolens, Willd.	Mex.
cristata, Lindl.		Nepal.	Davidsonia.	
cinnamonea, T. et B.		Java.	purgens.	
Cummingii, Lindl.		Singapore.	Dendrobium, L.	Orchidaceæ.
flaccida, Lindl.		Nepal.	amœnum, Wall.	E. Ind.
longifolia, Lindl.		Mt. Salak.	Boxallii	
Lowii,		Borneo.	breviflorum	
ochracea, Ldl.		Khasia.	chrysotoxum, Ldl.	E. Ind.
ovalis, Ldl.		Nepal.	chrysanthum, Wall.	E. Ind.
pandurata, Ldl.		Borneo.	compressum.	
Coffea, L.	Cinchonaceæ.		Dalhousieanum, Pxt.	E. Ind.
arabica, L.		Arabia.	Devonianum	
liberica.		Liberia.	eburneum	
var. ?		C. C. Castle.	Falconerii	
Colea, Bojer.	Crescentiaceæ.		fimbriatum var. oculatum, Ldl.	
floribunda.			Gibsonii	
Colocasia, Schott.	Aroideæ.		lorigicornu, Ldl.	Java.
macrorhiza, Hasskl.		E. Ind.	macranthum, Ldl.	Amboyna.
var. fol. var.			macrophyllum, Rich.	E. Ind.
Combretum, Lœffl.	Combretaceæ.		moschatum, Wall.	E. Ind.
grandiflorum, G. Don.		Sierra Leone.	McCarthyæ, Thw.	Ceylon.
Pinceanum, Hort.			nobile, Ldl.	Macao.
Cookia, Ponner.	Aurantiaceæ.		Pierardii, Rxb.	Ganges delta.
punctata, Retz.		China.	sanguinolentum	
Corypha, L.	Palmaceæ.		secundum, Ldl.	Java.
australis, R. Br.		E. Austr.	speciosum, Sm.	Austr.
Taliera, Roxb.		E. Ind.	Veitchianum, Ldl.	Java.
Costus, L.	Zingiberaceæ.		Dianella, Lam.	Liliaceæ.
Afer, Hk.		E. Ind.	ensifolia, Red.	E. Ind.
Crinum, L.	Amaryllidaceæ.		Dieffenbachia, Schott.	Aroidea.
amabile, Herb.		E. Ind.	picta, Schott.	Brazil.
asiaticum, L.		China.		

Doryanthes, R. Br.	Amaryllidaceæ.	hortense, Nees.	E. Ind.
Palmerii.	E. Australia.	pictum, Nees.	"
Doryophora, Endl.	Atherospermaceæ.	Grevillea, R. Br.	Proteaceæ.
Sassafras, Endl.	E. Austr.	robusta, Cunn.	E. Austr.
Dracæna, L.	Liliaceæ.	Hedychium, Kœnig.	Scitaminaceæ.
heliconiæfolia, Baker.		angustifolium, Roxb.	Bengal.
terminalis, Ldl.	S. S. Islands.	Heliconia, L.	Musaceæ.
Drimyspermum, Reims.	Aquellaiaceæ.	bicolor, Klsch.	Brazil.
cauliflorum, Thw.	Ceylon.	Hibiscus, L.	Malvaceæ.
Durio, L.	Malvaceæ.	Cooperii	
zibethinus, Dl. C.	Malay Isles.	moscheutos, L.	S. Amer.
Duranta, L.	Verbenaceæ.	rosa-sinensis, L.	China.
Plumierii, L.	S. Amer.	var. fl. luteo	
		" " " plena	
Elæis, Jacq.	Palmaceæ.	" " plena	
guineensis, L.	Guinea.	" fulgidus	
Elephantopus, Cass.	Compositæ.	" carneus	
scaber, Cass.	E. Ind.	" salmoneus	
Elettaria, Rheede.	Zingiberaceæ.	Hoya, R. Br.	Asclepiadaceæ.
floribunda, Thw.	Ceylon.	carnosa, R. Br.	Asia.
Eranthemum, R. Br.	Acanthaceæ.	Humboldtia, Vahl.	Leguminosæ.
aspersum		laurifolia, Vahl.	Ceylon.
sanguinervum, Hort.		Hydrangea, L.	Saxifragaceæ.
Eria, Ldl.	Orchidaceæ.	hortensis, D.C.	China.
convallarioides, Ldl.	Nepal.	Hymenœa, L.	Leguminosæ.
flava, Ldl.	Java.	glandulosa	
stellata, Ldl.	Java.	Hyophorbe, Goert.	Palmaceæ.
Eucharis, Ldl.	Amaryllidaceæ.	Verschaffeltii, Hort.	E. Ind.
amazonica, Ldl.	S. America.	Hypericum, L.	Hypericaceæ.
Eugenia, L.	Myrtaceæ.	Mysorensis, W. et A.	E. Ind.
domestica, Rumph.	Malay Isl.	Ilex, L.	Rhamnaceæ.
jambosa, L.	E. Ind.	aquifolium, L.	Eur.
hypolenca, Thw.	Ceylon.	Indigofera, L.	Leguminosæ.
Smithii.	Austr.	tinctorea, L.	India.
Eulophia, R. Br.	Orchidaceæ.	Inga, Willd.	Leguminosæ.
macrostachya, Ldl.	Singapore.	Samau.	E. Ind.
Euphorbia, L.	Euphorbiaceæ.	Ipomœa, L.	Convolvulaceæ.
canariensis		Bona, Nox	
splendens, Bog.	Madagascar.	Iresine, Willd.	Amaranthaceæ.
Tirucallii, L.	Java.	Herbstii, Hk.	Brazil.
		" aureo-reticulata	
Fatsia, Dcn. et Pl.	Araliaceæ.	Isonandra, Wight.	Sapotaceæ.
papyrifera, Dcn. et Pl.	China.	gutta, Hk.	Malay Isles.
Ficus, L.	Moraceæ.	Isotoma, Ldl.	Lobeliaceæ.
australis, Willd.	E. Austr.	longiflora, Presl.	E. Ind.
macrophylla, Desf.	Moreton Bay.	Ixora, L.	Cinchonaceæ.
elastica, L.	E. Ind.	Bandhuca, L.	E. Ind.
repens		coccinea, L.	"
religiosa, L.	E. Ind.	Jasminium, L.	Jasminaceæ.
Fittonia, Cœm.	Acanthaceæ.	officinale, L.	E. Ind.
argyroneura, Cœm.	Peru.	pubescens, Hainlt.	E. Ind.
Fourcroya, Vent.	Amaryllidaceæ.	Jatropha, L.	Euphorbiaceæ.
gigantea, Vent.	S. Amer.	Curcas, L.	S. Amer.
Franciscea, Pohl.	Scrophulariaceæ.	Jonesia, Roxb.	Leguminosæ.
latifolia	"	Asoca, Roxb.	E. Ind.
uniflora		declinata, Jack.	Java.
Garcinia.	Guttiferæ.	Kœmpferia, L.	Zingiberaceæ.
Mangostana, L.	Java.	rotundata, L.	E. Ind.
Morella, Desrous.	Ceylon.	Kentia, Blum.	Palmaceæ.
oblongifolia.	Hongkong.	Belmoreana, C. Moore,	L. Howe's Isl.
Xanthochymus, Rxb.	E. Ind.	Canterburyana, C. Moore,	"
Gardenia, L.	Cinchonaceæ.	Forsteriana	"
florida, L.	China.	Moorei, F. Muel	"
Gleditschia, L.	Leguminosæ.	Lagerstrœmia, L.	Lythraceæ.
sinensis, Lam.	China.	indica, L.	E. Ind.
Gloriosa, L.	Liliaceæ.	regina, Roxb.	Malabar.
superba, Ldl.	E. Ind.	Lagunaria, G. Don.	Malvaceæ.
Goodyera, R. Br.	Orchidaceæ.	Patersonii, G. Don.	E. Austr.
procera, Hk.	E. Ind.	Lansium, Rump.	Meliaceæ.
Grammatophyllum, Blume.	Orchidaceæ.	domesticum, Jack.	Malay Isl.
speciosum, Blume.	Malay Isl.	Lantana, L.	Verbenaceæ.
Graptophyllum.	Acanthaceæ.	mixta, L.	Brazil.



Latania, Commers.	Palmaceæ.	Mauritius.	Nepenthes, L.	Nepenthaceæ.	Singapore.
aurea, Hort.		Madagascar.	ampullacea, Jack.		"
borbonica, Lam.		E. Ind.	lævis, Jack.		"
glaucophylla, Lodd.			Rafflesiana, Jack.		"
Lawsonia, L.	Lythraceæ.	Egypt.	Nephelium.	Anacardiaceæ.	Malay Isl.
incrimis, L.			lappaceum, L.		"
Licuala, Rumph.	Palmaceæ.	E. Ind.	mutabile, Bl.		
peltata, Roxb.			Nephrodium, Richr.	Filices.	Ceylon.
Livistonia, R. Br.	Palmaceæ.	Java.	undulatum, Thw.		
altissima, Zoll.		Java.	Nephrolepis, Schott.	Filices.	E. Ind.
rotundifolia, Mart.			exaltata, Schott.		
Lodoicea, Labill.	Palmaceæ.	Seychelles.	Nerium, L.	Apocynaceæ.	S. Eur.
Seychellarum, Labill.			oleander, L.		
Lygodium, Sw.	Filices.	Singapore.	Nymphæa, L.	Nympheaceæ.	E. Ind.
dichotomum.		Singapore.	stellata, Willd.		
scandens			rubra.		
Lycopodium, L.	Lycopodiaceæ.	Singapore.	Oncidium, Swartz.	Orchidaceæ.	Jamaica.
phlegmaria,			altissimum, Sw.		Brazil.
			flexuosum, Sims.		Trinidad.
Macadamia, F. Muell.	Proteaceæ.	N. Austr.	papilio, Ldl.		
ternifolia, F. Muell.			Opuntia, Tournef.	Cactaceæ.	Brazil.
Macodes, Blume.	Orchidaceæ.	Java.	monacantha, Haw.		
Petola, Blume.			Oreodoxa, Mart.	Palmaceæ.	Antilles.
Macrozamia, Miq.	Cycadaceæ.		oleracca, Mart.		Cuba.
cylindrica			regia, Hk.		
Miquellii, Wendl.			Ornithogalum, L.	Liliaceæ.	Cape of Good Hope.
McKenziei			caudatum, Ait.		
sclerocarpa			Panax, L.	Araliaceæ.	
ternifolia			fruticosum, L.		E. Ind.
Malpighia, L.	Malpighiaceæ.	E. Ind.	Prancratium, Spreng.	Amaryllidaceæ.	Malabar.
coccifera, L.			malabathricum, Herb.		
volubilis			Pandanus, L. fil.	Pandanaceæ.	Banka.
Manettia, Mutis.	Cinchonaceæ.	Brazil.	Lais, Kunz.		Mauritius.
cordifolia.			utilis, Bory.		
Maranta, L.	Marantaceæ.		Passiflora, L.	Passifloraceæ.	Trop. Amer.
discolor			quadrangularis, L.		Brazil.
Lindenii, Hat.			trifasciata.		
Martinezia.	Palmaceæ.		Pedilanthus, Neck.	Euphorbiaceæ.	Cuba.
caryotæfolia			tithymaloides, Poit.		
granatensis			Paxtonia.	Orchidaceæ.	Singapore.
Melaleuca, L.	Myrtaceæ.	E. Ind.	rosea.		
leucadendron, L.			Pennantia.	Anacardiaceæ.	Austr.
Meniscum.	Filices.	Ceylon.	Cunninghamii.		
Thwaitesii.			Pentas, Benth.	Cinchonaceæ.	Africa.
Meyenia, Schlecht.	Acanthaceæ.	Brazil.	carnea, Benth.		
erecta, Arrab.			Petroea, L.	Verbenaceæ.	S. America.
„ var. fl. albo.			volubilis, L.		
Michelia, L.	Magnoliaceæ.	E. Ind.	Phajus, Lindl.	Orchidaceæ.	Ceylon.
champaca, L.			bicolor, Lindl.		E. Ind.
Microstylus, Nutt.	Orchidaceæ.	Ceylon.	grandifolius, Lindl.		Ceylon.
discolor, Lindl.			iuridus, Thws.		
Rheedii, Lindl.			Wallichii.		
Mimosa, L.	Leguminosæ.	S. Amer.	Phalœnopsis, Blum.	Orchidaceæ.	Manila.
pubica, L.			amabilis, Ldl.		Java.
Mimusops, L.	Sapotaceæ.	E. Ind.	grandiflora, Bl.		
elengi, L.			„ aurea.		
Mirabilis, L.	Nyctaginaceæ.	Peru.	cornu-cervi, Khl. et v. H.		Java.
jalapa, L.			Luddemanniana		
Murraya, L.	Aurantiaceæ.	E. Ind.	rosea		
exotica, L.			Schilleriana, Rehb.		Philippines.
Musa, L.	Musaceæ.	E. Ind.	Phœnix, L.	Palmaceæ.	Arabia.
coccinea, Andr.			dactylifera, L.		E. Ind.
sapientum, L.			sylvestris, Roxb.		
Myrmecodia, Jacq.	Cinchonaceæ.	Singapore.	Pinanga, Blume.	Palmaceæ.	
armata, Jacq.			ternatensis		
Myroxylon, Nutt.	Leguminosæ.		Pinus, L.	Coniferæ.	Canaries.
Parietæ			canariensis, Sweet.		Levant.
Myristica, L.	Myristicaceæ.	Malay Isl.	halepensis, Mell.		Calif.
moschata, L.			insignis, Dougl.		
Nauclea, Lam.	Cinchonaceæ.		Piper, Spr.	Piperaceæ.	E. Ind.
Leichardtii			nigrum, L.		
Nelumbium, Juss.	Nympheaceæ.	E. Ind.	Pittosporum, Banks.	Pittosporaceæ.	
speciosum, Willd.			crassifolium		

Platycereum, Des v.	Filices.		Sandoricum, Cav.	Meliaceæ.	
biforme, Blume.		Singapore.	indicum, Cav.		E. Ind.
Plumbago, L.	Plumbaginaceæ.		Sansevieria, Thb.	Liliaceæ.	
capensis, Thb.		Cape of Good Hope.	zeylanica, Willd.		Ceylon.
Plumeria, L.	Apocynaceæ.		Sapota.	Sapotaceæ.	
lanceolata			Achras.		
Pôdocarpus, L. Hint.	Taxaceæ.		Scutellaria, L.	Labiatae.	
australis			ventricosa.		
spinulosus, R. B.		Austr.	Seafortia, R. Br.	Palmaceæ.	
Poinciana, L.	Leguminosæ.		elegans, R. Br.		E. Austr.
pulcherrima, L.		E. Ind.	Selaginella.	Lycopodiaceæ.	
„ fl. lutea.			cæsia, Hort.		E. Ind.
regia, Bojer.		Madagascar.	erythropus, Spreng		Trop. America
Polypodium, L.	Filices.		inæqualifolia, Spr.		Trop. Asia.
Gardnerii, Thw.		Ceylon.	Serissa, Commers.	Rubiaceæ.	
quercifolium, L.		E. Ind.	fœtida, Commers.		China.
Pritchardia.	Palmaceæ.		Sethia, Kth.	Erythroxyloideæ.	
pacifica			acuminata, Arn.		Ceylon.
Psidium, Willd.	Myrtaceæ.		Solanum, L.	Solanaceæ.	
Guava var. pyriferum.			macranthum.		
Pteris, L.	Filices.		Stachytarpheta, Vahl.	Verbenaceæ.	
aspericaulis			indica, Vahl.		E. Ind.
tripartita			mutabilis, Vahl.		Trinidad.
serrulata, L. fil.		China.	Statice, L.	Plumbaginaceæ.	
Pterocarpus, L.	Leguminosæ.		Holfordii, Hort.		
indicus, L.		E. Ind.	Stenocarpus, R. Br.	Proteaceæ.	
Ptychosperma, Labil.	Palmaceæ.		Cunninghamii, R. Br.		Aust.
Alexandra, F. Muell.		Austr.	Stephanotis, Thoms.	Asclepiadaceæ.	
rupicola, Thw.		Ceylon.	floribunda, Brong.		Madagas.
Punica, L.	Myrtaceæ.		Sterculia, L.	Sterculiaceæ.	
granatam, L.		S. Eur.	acerifolia, A. Cunn.		E. Austr.
„ fl. pl.			diversifolia, G. Don.		E. Austr.
Quassia, L.	Simarubaceæ.		quadrifida, R. Br.		E. Austr.
amara, L.		Surinam.	Stevensonia.	Palmaceæ.	
Quisqualis, L.	Combretaceæ.		grandifolium.		
indicus, L.		E. Ind.	Stigmatophyllum, Juss.	Malpighiaceæ.	
Raphistemma, Wall.	Asclepidaceæ.		ciliatum, Juss.		Brazil.
pulcherrima			Stellingia, L.	Euphorbiaceæ.	
Ravenala, Adam.	Musaceæ.		sebifera, Michx.		China.
madagascarensis, Somer.		Madagas.	Swietenia, D. C.	Cedrelaceæ.	
Renanthera.	Orchidaceæ.		mahogani, L.		S. Amer.
arachnites			Tabernæmontana, L.	Apocynaceæ.	
Lowii			coronaria, L.		E. Ind.
Rhus, L.	Terebinthaceæ.		„ fl. pl.		
succedanea, L.		Japan.	Thea, L.	Ternstroemiaceæ.	
Rhyncospermum, Ldl.	Apocynaceæ.		chinensis, L.		China.
jasminoides, Ldl.		China.	Theobroma, L.	Sterculiaceæ.	
Rivinia, L.	Phytolaccaceæ.		cacao, L.		S. Amer.
lævis, L.		E. Ind.	Thunbergia, L.	Acanthaceæ.	
Rondeletia, L.	Cinchonaceæ.		alata, Hk.		Africa.
speciosa, Lodd.		Mex.	grandiflora, Roxb.		E. Ind.
Russelia, L.	Scrophulariaceæ.		Turnera, Plum.	Turneraceæ.	
fuscata			trioniiflora, Hk.		Brazil.
juncea, Luc.		Mex.	Uroskinnera, Ldl.	Scrophulariaceæ.	
Sabal, Adams.	Palmaceæ.		spectabilis, Ldl.		Guatemala.
mauritiformis			Vanda, Ldl.	Orchidaceæ.	
palmetto			gigantea, Lindl.		Moulmein.
Saccharum, L.	Graminaceæ.		Hookeræ.		
officinarium, L.		E. Ind.	suavis, Lindl.		Balie.
Sagenia.	Filices.		teres, Lindl.		E. Ind.
Thwaitesii, Baker.		Ceylon.	tricolor, Lindl.		E. Ind.
Saccolabium, Blum.	Orchidaceæ.		Victoria, Schomb.	Nymphaeaceæ.	
ampullaceum.			regia, Schomb.		S. Amer.
Cruikshankii.			Vinca, L.	Apocynaceæ.	
guttatum.			rosea, L.		E. Ind.
Harrisonæ.			Wormia, Rottb.	Dilleniaceæ.	
„ violacea.			subsessilis, Miq.		Singapore.
Huttonii, Hk. fil.		Java.	Yucca, L.	Liliaceæ.	
Sagus.	Palmaceæ.		aloifolia, L.		S. Amer.
lævis.			Zalacca, Rum.	Palmaceæ.	
Sanchezia, R. et P.	Acanthaceæ.		edulis, Rum.		Singapore.
nobilis, R. et P.			Zephyranthes, Herb.	Amaryllidaceæ.	
var. fol. var.		Ecuador.	Herbertiana.		Cape of Good Hope.

H. J. MURTON,
Superintendent.



BOTANICAL GARDENS,

Singapore, 21st. December, 1877.

SIR

I have the honor to submit to you the following report on my recent expedition to Perak, for the purpose of examining the flora and vegetable products of the country.

I left Singapore October 9th, in the S. S. "Pyah Pekhet" and after calling at Malacca, Klang, Salangor, and Durian-Sabatang, arrived at Penang at 9 A.M. on the 14th instant, and left at 9 P.M. on the same day, per S. S. "Sri Sarawak" for Larut, reaching Matang at 9 A.M. next morning.

The Resident being here, I reported myself to him, and spent the best part of the day looking around Matang, visiting the Custom and Court House and Gaol, with Mr. Sinclair.

I left Matang for Thaipeng to which place the Resident had preceded me in the evening, arriving there at 7 P.M. and stopped at the Residency.

Owing to the recent heavy rains, the roads were in bad condition, rendering a nine miles jolting over them, in the Larut gharries, a circumstance worthy of remembrance. October 16th, took a walk about Thaipeng and its suburbs: but saw little interesting from a botanical point of view.

The sides of the hill on which the Residency is built, which is about 100 feet high are mostly planted with Arabian Coffee, but they do not appear to be in a very flourishing condition, which I think is due as much to the want of proper thinning and pruning as to the sterility of the soil. Here, as in Singapore, it seems never to ripen a good crop at any one time, a few berries only, here and there, colouring together.

The plants of Liberian Coffee which were sent up from the Botanic Gardens, Singapore, in May last, and planted here, are growing well with robust, healthy foliage.

The greater portion of the land about Thaipeng is taken up by tin-mines, stretching in all directions for some miles. With these however, my present report has nothing to do.

Eastward from the Residency a splendidly wooded range of hills rise up to 4 or 5,000 feet and reaching from the Larut coast in the South to Quedah in the North. This range is known to the Malays by several names, but I think it is most frequently called Gunong Hijau.

The late Mr. Birch, with a large number of natives, went up to one of the peaks above the Residency in 1875, which he estimated to be 4,425 feet above sea-level; but there are some peaks near it still higher, and some of these Mr. Low wished me to explore; but some days must necessarily elapse before guides and men could be got together for the purpose of accompanying me.

October 17th.—As the men for the hill had not yet arrived I accompanied Mr. Low and Mr. Scott to see the tin-mines at Kamunting.

October 18th.—To-day we were making active preparations for starting on the morrow as the men had arrived, and with them some who had been up with Mr. Birch; and at 9 A.M. on the 19th I left the Residency with 14 men and 4 or 5 days' provisions, and started for the hills. An hour's walking through disused tin-mines, swamps and lalang patches relieved by an occasional wade through a stream, brought us to the foot of the range. Immediately on entering the jungle we were gladdened by the sight of the most luxuriant undergrowth, Globbas, Herbaceous Melastomads, and Pinanga maculata being the most noticeable. We started climbing in a N.E. direction, and in half an hour reached an old hut at 800 feet which had been used by gutta collectors. At 1,800 we reached the place where Mr. Birch slept the first night after leaving Thaipeng; but the hut is now quite rotten and has fallen down.

Up to this point, Selaginellas, Lindsas, Davaalias, Polypoduims, Meniscums, Licuala acutifida and Cissus porphyrophylla are the most frequent plants met with.

A little farther on we crossed a large stream near which I found several rare plants, including two Rhododendrons. Some old fallen trees here were beautifully covered with majestic Ferns and Grammatophyllum.

At 1,850 feet we fell in with a hut inhabited by three Chinamen, who are engaged in tin washing in the gorges, and as it was raining heavily, we decided on staying here for breakfast. Temperature at 12 o'clock 78° Fahr.

The rain continued all day so we made preparations for spending the night here, and during the afternoon I strolled through the Chinamen's mine.

The hill about this elevation appears to have been "worked" for some time, as I saw several abandoned gullies; and the present occupiers have dug up the gorge for a distance of 4 to 500 feet. They informed me that the average "find" of each man per day was about 2 catties. I saw one piece of pure tin about the size of a bantam's egg; but it showed no signs of having been dug from a lode.—Temperature at 6 p.m. 70 Fahr.

October 20th.—Arose at 6 A.M. and at 6.30 we left the hospitable Chinamen and recommenced our ascent, which, up to 2,700 feet was about the hardest work we had all the way up, the low jungle being composed mostly of Zingiberads, Dracenas and Ferns. At 2,700 feet we fell in with a hut which has been used by Malays, as evidenced by the pillows being left behind, who during their stay here had cleared the ground for some distance around, and planted curians and coffee, &c. The coffee plants were looking very healthy although nearly overgrown with weeds; but they were bearing no fruit at the time of my visit. The "attora" grass (*Panicum repens*) was growing 2-3 feet high and very dense here, which speaks well for the soil. I think the best soil on this range is to be found about here, running up and down for about 5-600 feet from this point. At 3,200 feet we saw some signs of past mining operations and occasionally met with blocks of quartz cropping through the soil.

After reaching 3,800 feet the track descends for 100 feet, and for about a mile rises and falls several times until the foot of the peak is reached.

The jungle here was very beautiful, large masses of yellow, white, and red Rhododendrons (*R. javanicum*, and var. and *R. jasminiflorum*) scarlet *Eschynanthus* and a grand white *Medinella* covered the trunks of the largest trees, and a blooming profusely. Nothing could possibly surpass the gorgeousness of the immense masses of the yellow Rhododendron, covered with its large umbels of brilliant orange blooms, and on several trees *Solandra grandiflora*, was bearing numbers of its enormous trumpet shaped blossoms. Nor were Orchids entirely absent, a charming new, a white-flowered *Dendrobium* was blooming very profusely in one or two places. At 4,000 feet, large boulders of granite 20 to 30 feet high were quite covered with Belangér's spleenwort. (*Asplenium Belangerii*) one of the prettiest ferns yet discovered.

At 9 A.M. we reached Mr. Birch's old camping ground, which, by my aneroid, I estimated to be 4,400 feet above sea level. Mr. Birch's party had cleared about 2 acres on the top, but it had grown very thick since, and we found it very difficult to walk through.

Several young trees had sprung up 40 feet since 1875; but nearly all the old trees left standing are dead. The undergrowth consisted mostly of *Litobrochia aurita*, *Pteris aquilina*, *Nephrolepis* and *Gleichenias*.

The soil consists of a layer of black vegetable mould 6-12' thick on a fine yellow friable loam, pretty freely mixed with granite particles.

From what I have seen of *Cinchona* in Ceylon I should have no hesitation in pronouncing this good *Cinchona* land, to say nothing of the possibility of growing good cabbages, &c. Temperature at 12 o'clock 71.5 Fahr.

Unfortunately the clouds were very low, and thick, shutting out the whole country below from our view, but the scene presented by so many peaks rising one behind the other was very fine.

After pitching our tent and getting breakfast, I started with some of my men for a taller peak South of our camping ground, which I found to be 4,650 feet where I saw some very pretty *Calanthes* (*C. cuculligoides* and *C. angustifolia*), a few plants of the bloody pitcher plant (*Nepenthes sanguinea*) besides Rhododendrons and Ferns, &c.

Rain came on at 2.30 P.M. and continued till 7 P.M. which put an end to our botanizing for that day. Temperature at 6 P.M. 68° Fahr. From 7.30 to 8.30 P.M. we saw the lights at the Residency very plainly.

October 21st.—Temperature at 6 A.M. 61 Fahr. Started at 6.30 A.M. to visit another peak East of our camp, which appeared to be about 5,000 feet high, but soon after starting a very thick mist covered the hills, which unfortunately caused us to lose our road, and we got to the top of another hill still farther East which I found was only 4,750 feet; but we found several plants we had not previously met with.

The vegetation on the top consists mostly of scrubby *Podocarpi*, *Dipteris Horsfieldii*, Rhododendrons, *Vaccinium* sp. *Oleandra neriformis* and *Nepenthes sanguinea*, the last named in abundance.

A very pretty white flowered *Eria* was also blooming very profusely amongst the Ferns. Temperature at 9 on this peak 58°. Returning to our camping ground we collected several plants, including *Anæctochilus setaceus* A. Dawsonianus, *Trichomanes ericoides* or a lot of Ferns and several Zingiberads.

Temperature at the tent at 12 o'clock 68°.—Rain came on at 1.30 which lasted till 3 P.M., after which we got occasional glimpses of the surrounding country. Temperature at 6 P.M. 65 Fahr. clear.

October 22nd.—Temperature at 6 A.M. 62° Fahr. Very thick, left at 7 A.M. on our descending journey, which, owing to the rain, we found less pleasant than ascending, and the mist prevented us from seeing more than 20 feet ahead. Not one of my men could be persuaded to climb a tree for an Orchid on account of the numerous *Calami* and *Freycinetias*.

However, I managed to secure a very fair stock of plants, including several rare, if not totally unknown species, and reached Thaipeng again at 12 o'clock in a perfect torrent of rain.

October 23rd—Very sore and stiff; the effects of yesterday's work; but took my plants to Matang and packed them for shipment to Singapore filling two large cases. Returned to Thaipeng at 12.30 A.M.

October 24th settling with the men, raining heavily all day.

October 25th—Raining all day: sent my baggage on to Bukit Gantang, and at 4 P.M. I left for the same place, arriving there about 6 P.M. Here I spent the night and was very kindly treated by the Malay policemen.

October 26th left Bukit Gantang at 7.30 A.M. for Gapis after having engaged men to go up Gunong Pondok with me the next day.

The Brapit Pass forms the boundary between Perak proper and Larut, and the road rises 100 feet on the Larut side, and falls 200 feet to Gapis on the Perak side.

Here very many interesting plants are to be met with, notably an undescribed *Araliad*, while the most casual observer can hardly fail being struck by the majestic appearance of a number of plants of *Angioptoris evecta*. The Zingerworts master here too in force, the most beautiful perhaps, being *Alpinia nutans*. An alpinia with nankeen coloured flowers, and another with beautifully zebra striped foliage are abundant.

Arriving at Gapis I put up at the Police Station which is noted for its fever giving air, and waited for my men who arrived at 6 P. M. Temperature at 6 P. M. 79.° Raining all night.

October, 27th—Had considerable difficulty in getting a guide to go up Gunong Pondok with me. Although several had promised the day before to be ready at 6 a. m. to-day and so got stocks of Quinine from me, no, one had put in an appearance at 8 a. m. when I sent two policemen to see what had become of them, and at 10 a. m. they returned bringing two of the deserters with them, and I started at once.

Gunong Pondok consists of two peaks almost isolated from any other range, composed of limestone, while all other hills for miles round are of granite formation.

On the Southern side it is quite perpendicular, except a small gorge running down between the two peaks, where there are trees, &c.—the only vegetation on the steep parts consisting of a few plants of *Cycas circinalis*, which have a miserably starved appearance. For 600 feet up the gorge our path was a tolerably easy one, through rank growing Zingiberads, but after that we had several bare walls of limestone to scale—from 10 to 20 feet high, for which we were obliged to construct ladders of sticks and roots.

From 1000 to 4400 feet I could see no soil at all; nothing but a lot of limestone blocks thrown together amongst which a few *Podocarpi* and *Pandanus* were growing, and a few herbaceous plants on the shady sides of the rocks: Eventually we reached an elevation of 1700 feet above Gapis which I found to be the highest point. Here the jungle is much more dense than at 1400 feet, and we found some *Cœlogynes*, and *Bolbophyllums*, *Pholidota imbricata*, an *Erides* and a very pretty *Anætochilis*, and several Ferns.

In our descent I had the misfortune to fall about 20 feet, down a limestone ledge, breaking my watch, aneroid and thermometer. The last being the most important as the Resident informed me, that there were no more in Perak.

I was much disappointed with the results of my search on this hill, as I fully expected to find a distinct flora from any that I had previously seen, being my first search on limestone. Although we frequently met with large walls of limestone full of nooks, which seemed so well adapted as *nidi* for *Cypripediums*, &c. not one could be found.

Palms were represented by *Saguerus saccarifer* *Licuala peltata* and *Pinanga maculata*, and *Alocasia Veitchii* was abundant in some places.

October, 28th September, Left the Police station at 6 A. M. to visit some caves on Gunong Pondok, more especially for the purpose of examining the deposits of bats dung in them for a Report to the Resident.

We climbed up about 260 feet on the Eastern peak which brought us to the mouth of the cave. The entrance is about 40 feet high and the sides are covered with slimy green vegetable organism.

The species of bat which inhabits it is probably *Pteropus minimus*, of which there must be thousands in this one cave, and the noise they made when we disturbed their matutinal slumbers by lighting our torches was deafening. I went in for about 60 feet but the strong smell from the deposit of dung, &c., was too powerful to permit of my going further. I found it to be from 4 to 5 feet deep ranging in colour from black, the most recent, to quite white like saltpetre the earlier deposits.

This would form a valuable fertilizer for any quick growing crops such as Sugarcane and Tobacco, the Chinese here have already found out its use for making saltpetre.

The soil about the foot of Gunong Pondok appears to be very good, but I was informed that there are only about 4000 acres of it. Part of this would form a splendid place for trying *Ipecacuanha*.

October, 29th—Left Gapis at 8.30 A.M. and arrived at Kwalla Kangsa about noon. All the way along the road men and women and children were busy planting paddy, and the Malays told me that more paddy was being planted in Perak this year than there has been for a great number of years previous, which says a good deal for the state of the country. The low land between the Brapit Pass and Kwalla Kangsa appears to be adapted for paddy cultivation only. I saw some plots of Tobacco plants; but they were not over-luxuriant.

October, 31st, and November, 1st, were spent at the Residency at Kwalla Kangsa making arrangements for future, journeys.

November, 2nd September.—Left the Residency at 7 A. M. and crossed the Perak river to Sayong where some of the Rajah Muda's men met me to go up Gunong Sayong, in search of *Gutta* yielding trees.

Owing to the heavy rains we found the level country on the left bank submerged, of which the people here were taking advantage by turning out in whole families to plant paddy.

With two men I got to the top of Gunong Sayong, collecting several rare plants on our way; but the only Gutta trees we met with, were those yielding Gutta-taban and Gutta-sundek also called Gutta-putih, and of these only a few large trees, as they have been nearly all destroyed to get the Gutta. I succeeded in getting about 500 young plants to take to Singapore.

On this hill I first saw the "daun saang" of the Perak Malays—the Palm with very large leaves which Mr. Douglas mentions in his Report on his recent journey to Kinta, but I could find no good seeds. We met two men in the jungle searching for gutta who told us that they had come from Pahang through the jungle, looking for gutta all the way.

Ixoras were very showy in the jungle, *Acrotremas* and herbaceous *Melastomaceæ* abundant.

I found the people on this side of the river very civil and well disposed, almost all I met giving me the customary "tabih," which is sufficient evidence that the natives here are vastly changed from what they were two years ago, when these Sayong people were about the worst in Perak.

I returned to the Residency at 7.30 P.M., thoroughly tired.

November 2nd.—Packed the plants collected yesterday. Heavy rain as usual.

November 3rd.—Waiting for the guides Rajah Muda had promised to give me for ascending Gunong Bubo, but it came out that he had some private objection to my going up there—probably on account of his men having received money from the Resident to cut a road up it, which I afterwards found had not been done.

The Resident finding that promises only were to be had from the Rajah Muda advised me to go back to Gapis and try there for guides, and on the 4th instant, I left Kwalla Kangsa arriving at Gapis at 6 P.M.

November 5th and 6th.—Laid up at Gapis with fever; but some of my men were busy searching for guides and on the morning of the 7th we left for Bukit Gantang.

Arrived here I sent word to the Pungulu that I wanted him to assist me in getting guides to which he replied that he was too sick to come and see me or to see me if I went to him.

However, at last I got one old man who had been one of the party which Captain Speedy, sent up to fix a flag on the top in 1875, and at 12 o'clock we left Bukit Gantang en route to Gunong Bubo.

The first hour's travelling was through mud and running streams, minus boots and stockings, and by the time we had got up about 200 feet it commenced to rain in torrents putting botanizing out of the question altogether. The man who carried my portmanteau managed to let it fall into a small river we had to cross, thus leaving me without a dry article of clothing to wear.

We pushed on in the rain till we fell in with a charcoal-burner's hut at 150 feet where we stopped till next morning.

The Chinese charcoal burners are very numerous about this range from 1 to 2,500 feet elevation where they are fast destroying all the largest trees.

It seems almost like Vandalism to cut down all the fine *Dipterosarpis*, &c., for the sole purpose of making charcoal, when the timber is so valuable, especially when smaller trees would produce equally good charcoal, but would perhaps not give such good returns to the burners.

November 8th, Left the Chinamen's hut at 6.30 A.M., and after a very stiff climb we got up to 2,600 feet whence we had an easy track for some distance through a jungle of "Bertam," (*Eugenia triste*) and *Calami*.

At 3,000 feet we began to meet with *Selaginellas* *Polypodium platyphyllum*, *Tanitis Lindseæ*, &c., and *Rhododendron javanicum* was blooming on several of the trees.

At 2 P.M., we arrived at the top of a hill which the guide pronounced to be Gunong Bubo, nor would he be convinced of the mistake he had made, until I pointed out Gunong Bubo rising quite 2,600 feet above us to the S. E., and then he found out we were on Gunong Chey which is about 3,600 feet above sea level.

However, it was now too late in the day to remedy the mistake, so the tent was put up and the men got their evening meal, which consisted of roasted rice, as we could get water nowhere near.

Here I found *Nepenthes albo marginata*, some two or three spp. of *Rhododendron* *Gleichenia longissima*, *G. circinata*, *Clitandra neaformis*, *Pteris Horsfieldii*, *Daurara* sp. *Dacrydium* sp. and a *Podocarpus*. Orchids were represented by *Pholidota* some small *Erias* and *Cœlogynes* and the beautiful, though diminutive *Coryanthes fornicata*.

November 9th, Left the top of Gunong Chey at 6.30 A.M., and started down the left side thinking to strike into some path to Bubo; getting down on this side we found rather hazardous several times being obliged to drop over granite rocks 15 to 20 feet high.

After a quarter of an hour's falling and scrambling we reached the bottom of the gorge and found by the aneroid that we had descended 950 feet, and here fell in with a beautifully limpid mountain stream which the men were only too glad to see.

Ferns of several genera were abundant here, and I found one of the curious *Balanophora*.

The guide and I fell out here about the direction we had to go, and as nearly all the coolies took his side I was obliged to give in to him, and we started climbing up a hill through an almost impenetrable mass of *Calamis*.

The guide soon changed his course again and descended 150 feet, and then up another hill 400 feet, and so we knocked about without knowing in the least where we were going until 2 o'clock, when we came across a good sized track which had been made by the Gutta men.

Here another dispute took place ending in our taking the road to Bukit Gantang, and after we had descended about 800 feet the old guide found out he was wrong, so we relegated him to the rear and retraced our steps and eventually came to a place which one of the men recognized as having been a resting place for the Gutta searchers, and here we pitched the tent, four men going on to search for some of the men who collect gutta.

I noticed one thing during the knocking about which puzzled me considerably. Just after leaving the foot of Gunung Chey we came to a lot of rotten bamboos lying on the ground, a few remaining erect, but quite rotten, the rootstocks also were quite rotten, and very few living plants were seen and those very young. No track of any sort could be detected near the place. Can it be that these bamboos have all flowered together and died? but if so where are the young seedlings which one would imagine would be the result?

They extended for quite half a mile in the direction we travelled.

Rain came on at 8.30 p.m., and soon after some large animal, probably a Rhinoceros, struck the tent several times, but beyond breaking one of the ropes he did no harm except perhaps startling us considerably.

November 10th.—My men returned at 5 a.m., having met with four Gutta-men who said that there was a very high hill near, but they knew of no road to it; but would do all they could to help me.

We started at 7.45 a.m., and after an hour climbing we found ourselves at the foot of the final peak at an elevation of 3,900 feet.

We had passed during the morning a great number of gutta tabau trees which had been cut down, and although the men watched pretty closely, very few living trees could be seen below 3,000 feet.

At 10.15 a.m., we reached the spot where Captain Speedy's men fixed a flag in 1875; the rotten pole of which is still remaining, and here the men stopped, while I pushed on for another 200 feet ultimately getting to an altitude of 5,650 feet.

The path we cut from 3,900 feet to the top is a tolerably stiff one, and we found plenty of clear water in the crevices of the granite. The trunks of the trees are all covered with long Musci dripping with moisture.

On the "crown" of the peak the trees are mostly Podocarpi covered with long hanging Usneas.

Nepenthes sanguinea is abundant here, and *Matonia pectinata* is here shown in all its wild luxuriance. Judging by the foliage there must be at least 4 or 5 *Rhododendrons* that are new to me on this hill, but I could find nothing in bloom.

Gleichenia circinata and *Schizea malaccana* were abundant, and also a fern belonging to Blume's Genus *Lecanopteris*.

The native who were with me constructed some small baskets and filled them with various things as propitiatory offerings to the good spirits for invading their domains. Nearly all the natives I have had with me in Perak entertain a great deal of superstition about this hill, and hold it in great veneration.

We left the top of the hill at 1 p.m., by the way we ascended, although I tried very hard to persuade the men to try another path down, in order to get at another peak, but without avail, and arrived at our old camping ground at 4 p.m., thoroughly wet through.

November 11th.—Struck our tent early, and at 7 a.m., started for Bukit Gantang and found the road an extremely vexatious one, as we were unable to get on to a level "shoulder" of the ranges; but for some distance kept up a series of ascents and descents. Directly after leaving our camping ground we descended 200 feet, then rose 100 feet, fell 75 feet, rose 500, fell 200 feet, and then arise of 365 feet to 3,700 feet, leaving us after an hour of hard travelling 300 feet higher than when we started.

From this point the road falls all the way to the foot.

At 2,000 feet we fell in with a hut belonging to the Chinese charcoal-burners who were busy plying their vocation of destruction. We reached the Police Station at Bukit Gantang at 12 o'clock, myself minus boots, &c., which could not be worn in the last hour's walking, owing to mud and water. The rain also made it very unpleasant for botanizing purposes, as it came on at 9 a.m., and kept with us for the remainder of the journey.

I waited at Bukit Gantang until all the men had arrived, and leaving the plants, &c. behind, walked on to Gapis, which I did by way of keeping myself warm, as I had had no dry clothes for three days previous.

From Gapis I sent word to the Resident that I had returned from Gunung Bubo.

November 15th.—Started at 6 a.m., to walk to Kwalla Kangsa, but had only walked about 3 miles when I met a horse kindly sent by the Resident, and reached Kwalla Kangsa at 8 a.m., glad to get a change of dry clothes.

As regards the soil on the Bubo range, that below 3,000 feet consists mostly of a firm yellow soil, closely resembling clay, pretty freely intermixed with granite particles which renders it very gritty and greatly facilitates its being drained. I have seen fairly good coffee produced on much inferior soil than this in Ceylon.

In places where trees have been burned for charcoal the "Attora" grass is growing very densely and all herbaceous vegetation growing luxuriant.

From 3 to 4,000 feet the undergrowth consists mostly of the "Bertam" Palm, "Penang Lawyer" and other Palms and the soil has more vegetable mould in it with a looser sub soil. This altitude would include the tops of the majority of the hills, and embrace a good deal of gently undulating land along the ridges.

Above 4,000 feet there is but little soil, being almost bare granite where the vegetation has been cut away, and moreover the only hill above 4,000 feet viz., Gunong Bubo, is too steep for purposes of cultivation.

The Gutta men informed me that nearly all the trees of Gutta taban and Gutta putih below 3,500 have been cut down, but there are still a good number of plants of Gutta Singgarip remaining; as it is not absolutely necessary to cut down this sort in order to procure the gutta.

A Durio which differs from the common Durian in bearing the fruit on the trunk instead of the branches is abundant, as also are the various Dipterocarpi yielding Dammar batu Dammar mata kuching and Dammar putih, &c.

The charcoal-burners have not, so far as I saw, ascended beyond 2,500 feet, but even below this there are still some very large trees although they are few when compared with the number of small ones.

Numerous streams have their rise in this range, which are utilized below for the paddy-fields. I noticed the paddy about here was ripening a heavy crop at the time of my visit November 13th Packing the plants from Bubo, and the 14th and 15th suffering from the effects of wearing and sleeping in wet clothes.

November 16th left Qualla Kangsa at 9. A.M., with 10 men and proceeded down the Perak river to Blanja, where we arrived at 3 P.M. On our arrival I sent a letter to Mr. Bruce asking for two Elephants to take me and my baggage on to Kinta, as I found that the surrounding country was submerged, and the road for the greater part of the distance under water.

The Elephants did not arrive till the 18th, and I spent the intervening time in searching the jungle about Blanja, but I found nothing worthy of special mention here.

The bank by the river was very pretty with *Aselepias curassavica*, with its bright scarlet and orange flowers, and some patches of a pink variety of *Sesamum* were very ornamental.

Since Blanja has been evacuated by the troops the houses have been left to fall down and the gardens to run wild and a rain-proof house is almost a desideratum just now.

The soil about Blanja grows capital sugar-cane and could doubtless be utilized for other surface rooting crops.

November 19th left Blanja at 6.30 A.M., for Kinta which place we reached at 5 P.M. where I was very kindly received by Mr. Bruce. In the jungle between the two places noticed *Ixora Griffithii* blooming profusely, the Saang palm, several *sterculias* in fruit, *Zingiberads* and *Melastomads* in great variety.

Just before reaching Kinta I met with a new species of *Dammara*, previously met with by Mr. Low, which I may safely say is the largest foliated conifer known, but as I could get no cones I am unable to give a botanical diagnosis of the species. In a swamp close by *Vanda Hookerii* was blooming profusely, a plant hitherto supposed to be confined to Borneo and Labuan.

The plants of the Saang palm between Blanja and Kinta will not bear comparison with those on the Bubo range, where they are truly magnificent, some specimens that I saw on the latter range had over 100 fully developed leaves, the rhomboidal blades of which were over 15 feet long and 4 feet broad mounted on petioles 12 feet in length. The most minute search failed to reveal any young plants and some seeds I brought to Singapore proved on examination to be non-fertilized as no embryo could be found in them. On the Bubo range its limits seem to be between 3,000 feet and 3,900 feet elevation.

Between Blanja and Kinta, however, it grows at only 200 feet and on the Meeru range it grows from the foot of the hills up to 2,400 feet, and on the Sayong up to 2,500 feet. It is invaluable to the Gutta men as two or three leaves are sufficient to cover a house large enough for five or six men.

Owing to the recent heavy rains, and consequent rising of the Kinta river, I found the country flooded for some distance around, about 2 feet of water covering Mr. Bruce's garden where only a week or so before Onions, Lettuces and Tomatoes, &c., gave promise of a plentiful crop of salads, &c.

November 20th.—Ill from the effect of a slight sunstroke which attacked me the day previous at Ayer-puteh.

November 21st.—Still ill, but as the time allotted for my stay in Perak was drawing to an end I thought I had better start for the Kamper district, which the Resident had desired me to visit, and at 7.30 A.M. accompanied by Mr. Bruce, 5 sepoy, 14 coolies, and with 5 Elephants we left Kinta, and at 11 A.M., reached Pankalan Bahru, a little village on the bank of the Sunghie Raya composed of about a score of houses inhabited by Chinese and Malays.

This is the entrepôt for all the tin from Goping and other places E. of Kinta. At 3 P.M. we arrived at a large clearing planted with plantains and finding a fair-sized hut here we put up for the night.

Between Kinta and this place some attempts at cultivation have been made, and some extensive tracts cleared, i. e. trees are cut down at 10 or 12 feet from the ground and left to lie, the jungle burned, which chars the timber and renders it useless, and then paddy is

planted, which in most cases was very unpromising, and would by no means justify the reckless waste of timber cut down to afford space for planting it.

In low wet situations where "paddy turban" had been planted it was yielding a very fair crop, but sugar-cane and plantains looked half starved.

November 22nd, Left at 7.20 A.M., and at 8 A.M., entered Goping the headquarters of the Chinese miners in this district. This is the dirtiest place I ever saw, diffusing a combined odour of pigs, sewage and opium, offensive in the extreme, and the main street,—if such it can be called, was covered by about a foot of slimy mud.

The mines we passed in the neighbourhood were in active work having just enough water for washing purposes without being flooded like those at Kamunting. At 3 P.M. we reached the banks of the Kampar river, having stopped for some time at Gunong Maisa, a limestone hill about 600 feet high, where we found nothing of importance.

We arrived at Qualla Dipang at 5.30 thoroughly wet through owing to the heavy rains, and soon installed ourselves in a large Malay house there, which did not even admit the usual modicum of light usual to these structures.

Rajah Drahman paid us a visit at 7.30 P.M. and stayed some time. His head-dress was a novel one, and gave evidence to a spark of vanity in the wearer, consisting of the fringe of what is generally known as "spanish stripe" wound round his turban, the red, yellow, and white fringe looking very grotesque, as it is evidently kept carefully combed upward.

The soil between Goping and Qualla Dipang is by far the best I have seen in Perak, especially along the right bank of the Kampar river, where the Zingiberacæ are growing over 30 feet high, than which no better criterion could be desired of the fitness of the soil for tobacco cultivation. A small plantation of tobacco has been made at Pancalan Bahru, but the plants were too young at the time of my visit to report on, except that they appeared to be very healthy. Some very large "Waringan" trees (*Ficus retusa*) are noticeable along the Kampar river, and on the left bank a range of limestone or marble hills extend to Qualla Dipang, where two months could be spent very advantageously in searching the numerous crannies and nooks for rare plants.

In the thick jungles *Angiopteris evecta* attains to an immense size, and here also I saw several plants of *Ataccia cristata* with its weird and ghost-like inflorescence also *Clerodendron nutans* beautifully in bloom and ferus in abundance, as well as a number of plants of the "Gutta-singgarip." From Pulo Pisang to Qualla Dipang large patches of "paddy omar" were ripening heavy crops. In the Qualla Dipang valley Durians were ripening very large crops of fruit.

November 23rd, went out with Mr. Bruce to visit the limestone hills on the left bank of the river. As is usual with all limestone hills there are numerous caves at the base of these hills which are very diversified and interesting. Several of the plants growing here I also found on Gunong Pondok, but there were others new to me. The most noticeable plants known to me on this hill were *Alocasia Lowii*, *Impatiens Hookerii*, *Anæctochilus xanthophyllus*, (very small), some *Gesneraceæ*, *Begonia* sp., and a few Ferns, principally *Aspidiums* and *Sagenias*. Epiphytal Orchideæ represented by *Cymbidiums*.

This range of limestone hills is terminated at Qualla Dipang by a sharp precipitous peak, called by the Malays "Nasi Sabut" a perfect gigantic representation of a sugar-loaf, and up this peak I wished to get, although the natives informed me that no one had previously reached the top, and consequently no guides were to be had in whom any reliance could be put. Rajah Dris had at the Resident's request furnished me with letters to Rajah Ahmai and Datu Muda Rasat asking for guides and assistance, and having despatched these on the evening of our arrival at Qualla Dipang, Datu Muda Rasat promptly replied in person, and on returning from our botanizing trip we found him awaiting us with two Sekais who had previously attempted to ascend Nasi Sabut.

November 24th.—Started early accompanied by Mr. Bruce, Rajah Drahman and coolies, &c., and after crossing the Kampar river and an elephant side of half an hour's duration we reached the foot of Nasi Sabut on the North side; rather against my own inclinations as to ascend on the South side appeared to me to be far more practicable.

The caves here are the homes, or at any rate the breeding-places, of numerous wild animals as evidenced by the number of tracks, &c. On the North and N. E. sides the hill is quite perpendicular from base to crown, and up this wall I was told was the only way up, two roots being pointed out to me as those by which the men had previously ascended for some distance, but I declined to attempt to get up by the same means and pushed through the jungle to the West, and having got up 200 feet with Mr. Bruce and Rajah Drahman, I left them, and commenced the ascent in earnest with 4 men. We found this much worse than Gunong Pondok, as we were obliged to construct bridges and ladders of sticks and roots; eventually getting up to an elevation of 950 feet about Qualla Dipang, where our further progress was stopped by an upright wall of rock quite 300 feet high, and after a few vain attempts we very reluctantly gave it up as impracticable and descended—an undertaking which proved more difficult than ascending. Doubtless, in the dry season one might get to the top, but the little soil that rests in the crevices of the marble was so slippery owing to the frequent rains that it made climbing rather dangerous.

Added to this the edges of the marble are so sharp that it is next to impossible for a bare-footed native to walk on it.

One man fell about 15 feet, but luckily was caught in the brushwood and sustained no hurt beyond the shaking and fright.

Epiphytal Orchideae were represented, so far as I saw by two *Phalænopsis*, *Cerides suavissimum*? *Coleogyne ocellata*, *C. Cummingii* and *Pholidota imbricata*, a sp. of *Anæctochilus* formed beautiful patches in some of the crevices of the rocks. I was much disappointed at not being able to get to the top, as I feel certain that another 300 feet would have given much better results in the way of plants. From the hill we saw numerous Sekai clearings on the Bujong Malacca range where "paddy omar" was growing well.

November 25th.—Left Qualla Dipang at 7.30 A.M., and with all our staff of coolies, &c. poled down the river to Palei, intending to go up Bujong Malacca.

This has been attempted before by two Europeans, neither of whom succeeded in getting to the top.

As Palei offered no facilities for camping for the night, being a muddy swamp, and our guides not having arrived, we followed the advice tendered by the natives and poled farther down the river to Batu Karang, where we met Datu Muda Rasat, who treated us very kindly, regaled us with green coconuts, and placed a house at our disposal, but as there was about a foot of water around the house we decided on fixing the tent for the night on higher ground, Datu Rasat very kindly supplied, unsolicited, a lot of mats and necessaries for the coolies, &c., and he amused Mr. Bruce and myself with Malay folk lore tales for two or three hours.

November 26th arose at 4 A.M., and poled up the river to Palei which place we reached at 7 A.M., and leaving two sepoy to guard the boat, we commenced the ascent of Bujong Malacca, accompanied by 4 sekai guides, also furnished by Datu Rasat.

At 9 A.M. we had reached a fine mountain stream at 1,050 feet above Batu Karang, which, farther down is known as Sunghie Palei and flows into the Kamper river above Batu Karang.

The stones, &c., here were covered with *Meniscium salicifolium*, *Davallia affinis*, *D. elegans*, *Globbas*, *Selagnella Wallichii* and a pretty white *Begonia*. At 10 A.M. we reached an elevation of 2,250 feet where I left Mr. Bruce and Rajah Drahman, as it formed a good camping ground for the night, under shelter of a large granite rock about 40 feet high.

Accompanied by 2 sepoy, 2 sekai, and two coolies I proceeded to the top of the range, which I ascertained to be 3,550 feet above sea-level.

We passed several large granite rocks rising 50 or 60 feet above the soil under which some of the sekai, have erected their huts. In other places their huts are placed in most curious places, and unless one was looking for plants or tracking animals, they would not be noticed.

A few trees of gutta taban and gutta putih have been cut down on this range, but gutta singgarip is abundant below 1,500 feet. *Ficus* is represented by several species on this hill, but orchids and Ferns very meagrely, and on the top of the range the finest Rattans are abundant, the undergrowth consisting principally of the Beriam Palm (*Eugeissonia*). I returned and rejoined Mr. Bruce at 3 P.M.

November 27th, Arose at 5.30, and from our camping ground had a splendid view over the Kinta valley, Gunong Bubo N.W. and the range at the Dindings S.W. Descended and reached our boat in the Kamper river at 10.30 and poled up to Qualla Dipang where we arrived at 12 o'clock.

The soil on Bujong Malacca varies but little, being principally a yellow loam very friable and in nearly all the places that I dug I found it to be over 2 feet deep. I would recommend this for Coffee cultivation and as the range is nowhere very steep a large tract could be cultivated.

There is plenty of good water up to 3,000 feet, and the facility with which produce could be sent down the Kamper river to Durian Sabatang and supplies brought up from thence, mark this as one of the most eligible spots for cultivation in Perak.

A sample of soil which Mr. Bruce brought from Chankat Larang is worthy of mention here. It consisted of a black peaty soil mixed with about $\frac{2}{3}$ sand and he informed me that the paddy and Maize he saw growing in it far surpassed any other he had seen in the Native States.

It would doubtless yield good crops of surface rooting plants in damp weather, but probably contains too much sand to successfully resist the effects of a long drought.

November 28th—Left Qualla Dipang at 7.30 A.M., and after a long and wearisome ride on Elephants reached Kinta at 8 P.M. Two elephants which were bringing on the baggage behind were frightened by a Rhinoceros near their path and started for the jungle, in their flight shaking off their drivers and the principal part of the baggage, subsequently reaching Kinta at 9.30 P.M.

November 29th—At Kinta drying and arranging my specimens; three men laid up with swollen feet.

November 30th,—Went out botanizing around Kinta and procured some plants of the new Danomara and some *Eulophias*, &c. *Nepenthes levis*, *N. ampullaria*, *Vanda Hookerii* *Plocoglottia plicatus*, and *Bromheadia* are abundant about this district. Very heavy rain all day.

December 1st.—Left Kinta at 9 A.M. with 3 elephants, an escort of 5 sepoy, and my staff of coolies, and arrived at Epoo at 11 A.M. This place we found quite flooded most of the Chinese shops being tenanted by fowls only. Here we were compelled to unload the elephants and take the baggage across the river in boats, an operation we had to repeat at Sunghie Paray, thus losing a good deal of time, with the result that Jellapong was reached at 3 P.M., instead of 1 P.M. as we had expected.

As it was raining heavily when we arrived here we determined on stopping for the night, the Pungulu here placing a large house at my disposal which accomodated the sepoy and coolies as well.

His Excellency the Governor

STRAITS SETTLEMENTS.

Paper laid before the Legislative Council by command of
His Excellency the Governor.

TUESDAY, 16TH APRIL, 1878.

BOTANICAL AND ZOOLOGICAL GARDENS.
Singapore, 28th February, 1878.

SIR.—I have the honor to submit to you my annual report on the condition and working of the Botanical and Zoological gardens during the year 1877.

General appearance.—It is with great pleasure that I feel justified in reporting the improved general appearance of the gardens, notwithstanding that the year has not been a propitious one for gardening operations generally, in consequence of the severe drought which we experienced during the latter part of the year, which caused the deaths, among others, of some fine specimens of *Dacrydium Horsfieldii* which had been transplanted during the latter months of 1876, and which unfortunately had not become sufficiently well established to resist the effects of such a prolonged drought.

Walks and Drives.—These have been very much improved during the year at considerable expense. The main drive from the band-stand to the principal entrance past the lake has been entirely re-made, and 6 to 8 inches of laterite put on it, as also have the drives leading to Cluny road, and the one leading past the Superintendent's office.

The roads leading to Rogie, to Garden road, and from the centre of the garden to the principal entrance, have been slightly repaired, but these will probably require re-making during the present year.

A new walk has been made between the Aviary and the kangaroo pens, and three new walks have been made to the new monkey-house.

A drive between the office and Cluny road has been dug up and turfed over, which has much improved this part of the garden.

The drives after re-metalling were covered with white sand, which, although causing more glare than the red soil during sunshine, has a much more pleasing appearance at the time when visitors usually frequent the gardens.

Drains.—A complete system of surface and underground drainage has now been established; and but little more remains to be done to complete it.

Side drains built of brick have been made on each side of the principal drives and walks, which it would be needless to enumerate here. One side of the road leading over the hill to the principal entrance, both sides of the road leading from the band-stand to the border, and to Garden road are the only ones requiring it now.

Underground drains have been made in various parts of the garden where they were necessary.

Flower beds.—Very great alterations have been carried out with these, which will doubtless ere long prove to be improvements, as it was found to be almost impossible to keep such a large number of beds in all parts of the garden clean and ornamental with the present number of coolies. As the plants had become old and unsightly, consequently many have been dug up and the beds turfed over.

The beds on the band-stand have been removed for the purpose of giving more space on band-stand and the border around has been removed, thus adding 8 feet to the drive.

The beds near the principal entrance have all been turfed over, those on the hill above the erection of the new monkey-house, and those on the left of the road to the aviary have given place to a palm clump.

The beds on the terrace below the band-stand are now being trenched and re-planted, and have become unsightly, and gave the place a weedy and neglected appearance. The beds around the Orchid house have been very gay during the year, and I have no doubt the superiority of small over large beds in the tropics for the purpose of showing plants; as in this climate where vegetation grows so fast, flowering plants do not retain their beauty unless they are often renewed and constantly attended to.

Small annuals as Balsams, Zinnias, Coreopsis and Phlox Drummondii may also be shown in small beds, whereas they would be lost in large ones, and although their beauty is of short duration, they are so gay while they last that they amply re-pay any little additional attention and trouble in sowing, &c.

During the dry season *Crossandra infundibuliformis* was especially showy and quite equalled some of the Zonal Pelargoniums used for ribbon bedding in England. I have also found *Cyrtanthera Pohliana* and its variety *superba*, the latter by far the best—*Russelia juncea*, *Eranthemum bicolor variegata*, *Angelonia floribunda*, *Sericographis Ghiesbreghtiana*, *Iresine Herbstii*, *Tradescantia zebrina*, *T. discolor*, *Alternantheras* and various spp. of *Colocasia*

to succeed here for ribbon planting and for centres of large beds nothing is better than *Dracœna*, *Aralia Guilfcylyi* or *Abutilon Thompsonii* when kept judiciously pinched.

During the present year one of my principal objects will be to endeavour to introduce new plants suitable for keeping up a succession of bloom for small beds, and I see no reason why, in a few years we should not be able to get a show of flowers equal to the display in European gardens during the summer months. With a view of keeping the garden more ornamental, a large piece of ground N. of the Superintendent's house is being cleared and planted for the purpose of supplying cut flowers to subscribers and so prevent the necessity of cutting them from the gardens.

The little sedge which has been such a pest is now being got under gradually.

Planting.—A number of new and interesting plants have been planted on the lawn from the principal entrance towards the lake, which, while they are small will give it a dotted appearance, but which will disappear as the plants grow larger. The ground around the new monkey house has been laid out and planted with suitable trees: the site of the old Orchid house laid out and planted, and a line of *Hibiscus* has been planted on each side of the road leading to the coolie house, for the purpose of shutting out the view of the house and out-buildings.

The bank around the Aviary has also been finished off and turfed.

Orchid House.—Early in the year a foot of soil was taken out all over it and replaced by red clay which has effectually kept the sedge from appearing above the surface, and the collection of *Orchideæ* has been rebasketed and placed in the new structure, arranged in the order of their genera, and by their growth have clearly demonstrated the superiority of the new over the old structure. By assiduous hand-picking the little *Baridius*, mentioned in my last year's report as being so destructive to certain genera, has been pretty well got under, but new importations have to be carefully watched.

Notwithstanding the long drought we experienced last year the creepers planted then have grown well and the lattice-work is fairly covered.

A great many new species have been introduced during the year: the principal contributors being Dr. Scheffer, Java; J. C. Harlinge, Esq., Rangoon; Major Berkeley, Madras; and W. Boxall, Esq.

Two cases of very rare and valuable Orchids presented to the gardens by Chevalier Linden, Brussels, were unfortunately sent away too early in the season and during their transshipment in England were exposed to the frost, very few reaching Singapore alive.

Ferns.—The collection of Ferns has received some attention during the year and about 150 spp. introduced; and for valuable donations in this department my thanks are due to Sir Wm. McArthur, Sydney; W. Hill, Esq., Brisbane; C. Ford, Esq., Hongkong; and the Royal Gardens, Kew.

A small Rockery has been erected behind the band-stand, which is becoming very ornamental.

I regret, however, that it is my duty to report that some of the rarest and most beautiful Ferns have been stolen from the Rockery; and although a reward of \$25 has been offered for the apprehension of the offenders, and a public notice given that all persons found taking plants will be prosecuted, the thefts still continue, and are not confined to the Rockery, but plants are often missed from the beds and borders.

Great temptations to take plants from the Gardens are often placed in the way of native gardeners by the way they are often encouraged to introduce any thing new or pretty into their employer's gardens without the slightest interference, as from where they received it, and cases have come to my knowledge where the gardener has been pointed out to him and told to get more like it; and as most private gardens are better watched than these, the probability is, that the gardens are favoured with an early introduction.

The erection of the monkey house in its present place has caused the remodelling of that part of the garden, and the larger part of the coolies were employed for two months.

The *Thunbergia* which covers the trees near the bands and which is one of the greatest attractions in the gardens has been supported by poles &c., and the trees formerly supported it are dying and gradually giving way.

Nursery.—This has been removed to the side of the hill opposite the main entrance, and stock of young plants have already been raised to meet the increasing demand for tall flowering and foliaged shrubs. Over 8,500 plants have been supplied to the Nursery during the past year.

Economic garden.—This is now being laid out on the site of the old patches of Liberian, Cape Coast, and Arabian coffee have been planted as well as Assam, tea and *Ipecacuanha*.

Several useful and economic plants have been introduced during the year, the most noteworthy being two new kinds of South American rubbers, viz. *Cassia* and *Manirot Glazioli*. The Dragon's blood tree (*Dracœna Draco*), *Mouster*, *Musa Cavendishii*, *Sarsaparilla*, (*Smilax*), *Alligator Pear* (*Persea gratissima*), *New Zealand Flax* (*Phormium*), *Cubebs* (*Piper Cubeba*), *Salt bush* (*Rhagodia hastata*), *Psidium Cattleyanum*, *Camphor* (*Camphora officinarum*), *Allspice* (*Eugenia Pitenta*), *Matico* (*Armanthe elongata*), *Nux Vomica* (*Strychnos nuxomica*), *Upas Tiente* (*Strychnos Tiente*), *The Down Palm* (*Hyphæne thebaica*), *Carob* (*Ceratonia siliqua*) &c. &c.

Consignments of Liberian coffee and Heveas have been received from Kew, and plants

of Liberian Coffee. Para rubber, Brazil rubber, and the " Ceara scrap " rubber, have been planted at Durian Sabatang and Kwalla Kangsa for trial purposes, and plants of Ipecacuanha have been forwarded to Sungie Ujong as well as plants of Assam and Chinese tea for the same purpose.

The Liberian coffee plants sent to Larut in 1875 are making good growth, with large healthy foliage, forming a great contrast to the Arabian coffee growing beside it.

At the request of Sir J. D. Hooker, C.B., &c. I obtained from Cochin-China plants of " an enormous and apparently little known variety of the sugarcane called the elephant cane " which has been stated to reach a height of 4 feet and a diameter of 7 inches in 6 months.

Plants of this var. have been sent to Kew for forwarding to the West Indies.

I have been very successful during the past year in raising the various species of Eucalyptus, which hitherto have proved very difficult to raise from seed in this climate. A number of plants of Eucalyptus as well as other plants have been supplied to the P. W. Department for planting in the reservoir grounds near Government Hill and also for the reservoir grounds at Thomson road.

As the Salt bush (*Rhagodia hastatata* and *R. parabolica*) may probably be unknown in the Straits Settlements. I extract the following from the report of the Director of the Brisbane Botanical Gardens for 1875:

" These two species of salt bush, possessing wholesome and nutritious qualities and much relished by stock have been tested, and upon account of their easy cultivation, and the rapidity with which (when protected from stock) they grow into large and handsome shrubs, together with their capability of resisting both heat and drought, they are strongly recommended for artificial cultivation. Salt bush might also be advantageously given in a cut state, in conjunction with dry food to sheep and cattle."

In Singapore they seem better able to resist heat and drought than prolonged wet weather, but when the plants become well established they will doubtless survive the wet weather better.

A good deal has lately been written about the prickly comfrey (*Symphytum asperrimum*) as a forage plant for India, but I fear that it will prove of but little use in the Straits, as the climate and temperature of this Colony affords too great a contrast to that of its native habitats in the Caucasus Ints.

Planters in Ceylon are much disappointed with it and some speak in strong terms of the expense they have been put to in introducing and planting it.

The plants at present in Singapore, which have been introduced by Dr. Little, give little promise of being capable of producing 60 tons per acre per annum—the quantity advertisers promise on ordinary soils.

Too much care cannot be exercised when recommending the introduction and cultivation of any plant into a colony, as it has often happened that the vexation and disappointment attendant on the failure of one trial have prevented others being carried out, as for instance, the recommendation to plant *Cinchona* in Province Wellesley, a proposition which would never be carried out if its habits and the temperatures of its native habitats were studied, and more especially since it has been proved not to succeed as a commercial enterprise at 2,000 feet elevation 4° farther north.

The object that will be kept steadily in view, in the working of the new Economic Garden, is the introduction of new plants of economic value, and thoroughly testing their capabilities of production in Singapore, before recommending them for general cultivation, while it will also afford an opportunity to intending planters in the Malay Peninsula of seeing the various plants adopted for their cultivation, and the amount of success or otherwise attending each introduction.

As regards native fruit trees, a good deal could be done with the co-operation of persons possessing improved varieties, as for instance, of the rambutan, durian, &c., which are well known to exist in the Straits: as native gardeners can be instructed in the art of inarching and budding as well here as amongst the Chinese in China, of whose handiwork in grafting fruit trees I have several illustrations.

Several grasses have been tried, as the American rat-tailed and Virginian blue, but severe drought proved too much for them, and they have made but little progress.

I was sent to Johore and Gunong Pulai in August, and although I met with few new or valuable, several interesting plants not previously represented in our gardens were discovered and introduced into the gardens.

Excursions have been made to various parts of Singapore for the purpose of introducing as many of the indigenous plants as possible into the garden—these are evidently not far distant when they will cease to exist in their native habitats if jungles continue to be of such frequent occurrence.

An expedition to Perak was undertaken in October—December, a report of which has already been submitted to you.

A letter was received from the Colonial Secretary, Straits Settlements, in June, suggesting that tracts of Crown land should be selected on the Mount Faber range of hills for tree planting, and an estimate of the probable cost was prepared and forwarded to him, but no further steps have been taken.

I regret that after a lengthened trial with the labels put down last year as described in my last report, I cannot report very favourably of the plan I have adopted, as I find that

the paint is not capable of resisting the combined influences of sun and rain in this climate and, after inquiries from various correspondents, I have arrived at the conclusion that a plan of labelling outdoor plants in the tropics, capable of standing two years is still a desideratum.

A plan of using iron labels and brushing them over with a composition consisting of one part of chloride of copper, one of nitrate of copper, and one of ammoniac dissolved in sixty-four parts of water to which is added one part of commercial hydrochloric acid has been tried in the Adelaide Botanic Gardens with considerable success, but it was found to be of no use in the Calcutta Gardens.

Some little difficulty was experienced with the coolies in August and September last, but they are now working very well, and all signs of discontent have disappeared.

Chinese coolies were tried, but proved almost useless for any work which required any thought or calculation besides being more expensive than Javanese.

Mr. Smith arrived in May to fill the post vacated by the death of Mr. Niven, and to his efforts in a great measure the improved general appearance of the gardens is due.

2,188 baskets of flowers were supplied to subscribers and for public occasions, and 10,460 plants have been distributed in Singapore and to other establishments in England and the Colonies.

The gardens are indebted to the P. & O. Co., Messrs. Hamilton, Gray & Co., Messrs. Sarkies & Moses, Messrs. W. R. Scott & Co., Messrs. A. L. Johnston & Co., and especially to Messrs. Guthrie & Co. for the conveyance of cases of plants by their vessels free of charge.

I have departed from my usual custom in not giving a detailed list of the plants introduced during the year as it is of little local interest, but about 400 new species have been introduced.

A list of the principal contributors of plants and seeds during the year is appended.

I have, &c.,
H. J. MURTON,
Superintendent.

Zoological Department.

Little beyond the ordinary routine has been carried out, as the amount annually voted by the Government would not allow of any extensive additions. The services of the European Manager of this department have been dispensed with for the same reason, and as the cost of keeping the large carnivora was found to be more than could conveniently be devoted to that purpose they were offered for sale, and one viz. the Tiger was sold for \$250.

The new monkey house presented by Mr. Cheang Hong Lin has been erected and the small collection of monkeys placed in it.

Just now it presents rather a naked appearance, a defect which will be remedied as the trees which have been planted around it grow larger.

The enclosure which was originally intended for the kangaroos, has been devoted to the deer after being enlarged.

A wire fence for the deer is much needed on Garden Road side of the lake, as they are continually breaking through the wire netting enclosure where they are now located, but the lowest estimate received for its erection for a length of 485 yard viz \$1,017 places it beyond our present means.

A small iron rod enclosure has been erected near to the wire fence for the apines &c. and the pieces of brick remaining after building the drains have been used to build a basin under the Carnivora cages, to receive all offal and refuse instead of allowing it to be absorbed into the ground, which has considerably lessened the offensive smell previously emitted and which visitors to the gardens justly complain of.

The rhinoceros died in June and the skeleton mounted in the Raffles Museum. In addition to which the following losses by death have occurred 2 kangaroos, 2 goura pigeons, 1 cockatoo, 1 wedge-tailed eagle, 1 emu, 1 red faced macaque, 1 wallaby, 1 pelican, &c. the majority of which were sent to the Raffles Museum.

A list of contributors is appended but special thanks are due to W. F. Smith, Esq. of the Botanic Gardens Brisbane, for his many valuable and interesting donations.

In conjunction with Mr. Krohn I have had labels prepared and placed on the plants bearing the common and scientific names and native country of each, which is much appreciated by visitors.

I have, &c.,
H. J. MURTON,
Sup.

BOTANICAL GARDENS
Singapore May 20th 1878

SIR,

As but little is known about Malay Vegetable Medicines and Poisons I have been induced to take up the subject with a view of investigating their botanical origin, and your assistance is hereby solicited in filling up the accompanying schedule with such information as you may be able to glean in your district.

In addition it is requested that if possible specimens be forwarded of the part of the plant used, which would ultimately be disposed of as you may direct, and to determine their botanical origin it is requested that specimens of the flowers and leaves pressed between sheets of paper, and fruits and seeds loose be forwarded.

In pressing specimens it is only necessary to select a piece with flowers and foliage not very large, nor of extra strong growth, and lay them flat between sheets of paper placing a weight on the paper sufficiently heavy to press without crushing the specimens and the paper should be changed at intervals of 3 or 4 days.

Paper & all if necessary be sent from the Botanical Gardens and any expenses charged will be reimbursed.

Labels corresponding to those in the schedule should be attached to the specimens
fruits.

I have the honor to be

Sir,

Your Most Obedient Servant

H. J. MURTON M. S. A. S. &c., &c.,

Superintendent

Botanical Gardens Singapore

No.	Name in Native Characters.	Part used	For what used	Remarks, mode of preparation, if any &c., &c.

No.	Name in Native Characters.	Part used	For what used	Remarks, mode of preparation, if any &c.

Name in Native Characters.	Part used	For what used	Remarks, mode of preparation, if any &c., &c.

STRAITS SETTLEMENTS.

Paper laid before the Legislative Council by command of
His Excellency the Governor.

BOTANICAL GARDENS,
Singapore, 7th April, 1879.

SIR,—I have the honor to forward herewith my Annual Report for 1878, on the working of this establishment.

I have, &c.,

(Signed) H. J. MURTON,
Superintendent.

To
The Hon'ble Cecil C. Smith,
Chairman of the Gardens Committee,
Singapore.

REPORT.

General Appearance.—The year has not been altogether favourable for maintaining the neat appearance of the Gardens, as the heavy and prolonged rains have caused weeds to grow apace, and necessitated a greater number of men to keep the grass in proper order, besides causing a good deal of extra labour in keeping up the drives and roads.

On the other hand, it has caused the newly planted trees and shrubs to make rapid and healthy growth, and I have not in this report to record the loss of anything from drought, as in 1877.

The white ants have caused the death of some fine specimens of Coniferae, for which class they seem to have a great predilection.

A large specimen of *Dammara orientalis*, one of *Araucaria Cookii*, one of *A. Bidwillii*, and one of *Daerydium Horsfieldii* have fallen preys to their ravages.

All attempts to stop their progress by means of applications of kerosene and gas-tar, in quantities not sufficient to kill the trees, proved useless.

Moreover, the roots and all the vital action of the plant is generally quite destroyed below the surface: before any signs of failing or decay is betrayed in the branches and foliage.

It is generally held, I believe, amongst the majority of Indian horticulturists that the attacks of white ants on trees are attendant on, rather than the cause of, decay; but after three years of careful investigation, I have arrived at the conclusion that the latter is the true state of the case.

Most of the large specimens of the Funeral Cypress (*Cupressus funebris*) are showing signs of decay, although I have had them well manured. I opine that their decay is to be attributed to their roots having penetrated into the cold, clay-subsoil, which has not been improved by the continued wet weather.

The line of *Araucaria Cunninghamii*, planted in 1877 on the side of the Gardens against Cluny Road, has made very great progress, and many are already 20 feet high and very symmetrical: and the clump of young palms near the *Nymphaea* pond are beginning to throw out abundance of fine fronds, as also are the plants of *Livistona* on the side of the road past the office.

Most of the trees that were planted last year around the monkey-house have grown very well, and *Ficus* (*Artocarpus*) *Cannonii* promises to develop into one of the most beautiful trees for ornamental planting that we have, its large brown metallic foliage contrasting finely with the vivid green of the other trees.

Roads and Walks.—The heavy rains have tried these severely, but most of them have been kept in fairly good order by constant attention and repairing; but one or two urgently need re-making. The drive over the hill to the principal entrance has been re-made and metalled.

Drains.—These also have been kept in fairly good condition by regular attendance and repairs when necessary. Several additional ones have been made and others enlarged, where they were found to be too small for the purpose they had to serve.

Fences.—These have been kept in very good order throughout the year. As a change to the bamboo, I have made some of the "shoe-flower" (*Hibiscus rosa-sinensis*) which promise

to answer their purpose effectively, while being very ornamental and less expensive to keep in order than bamboo.

Lake.—This was cleaned out in May, and a large quantity of sand and mud removed, but the rains have washed quantities of weeds down from the higher lands, which easily become established. They have been cleared out twice since.

The Lily pond has been kept in good order, but the *Nelumbiums* are encroaching on the space allotted to the *Nymphaeas* so rapidly that I have found it necessary to make a separate pond for the former, which is now being made on the site of the old rhinoceros house.

To prevent any accidents happening to horses, a number of strong iron gratings have been placed on the drain-holes in various parts of the Gardens.

Flower-beds.—These, with but few exceptions, have been re-planted during the year, and have been rather gay throughout.

As regards the beds on the terraces, I would suggest the propriety of re-modelling them altogether, as they have run out of shape a good deal, owing to repeated trimming with chankols which Javarese coolies will persist in using, although more suitable tools are provided for the purpose.

In addition, the planting in the early part of the year was done rather hastily, in consequence of the previous untidy state of the ground around the band-stand, and it is not quite so satisfactory as I could wish; and to render them a little more interesting, without in any way interfering with their ornamental use, I propose to collect the different species and varieties of the same genus together, as for instance, such large genera as *Ixora*, *Brunselia*, *Clerodendron*, and *Croton*, &c., &c., as this would give opportunities of comparing the species, and they would have a fixed place where they could always be found.

Orchid House.—This is now fairly well covered with climbing plants, but I have not been able to fill it with Orchids as yet.

Most of the Orchids have done well, and made good growth, especially the Assam and Burmese species, so that a good show of bloom may be expected this year.

Over 150 species have bloomed during the year, and some of the best specimens have been sent to Government House while in bloom. The *Baridius* still continues to give us a little trouble with such genera as *Aerides*, *Vanda* and *Saccolabium*.

Fernery.—Little has been done to this, owing to the frequent robberies of the best and rarest kinds that were perpetrated in the early part of the year.

It has been slightly extended and kept well supplied with plants.

Those left alone have grown very well and made good plants.

Planting.—Very little has been done in the Botanic Garden as there is now but little space that can be planted with additional trees. Vacancies have been filled up when they occurred.

A Palm clump has been made near the Cluny Road entrance, and comprises over 70 species already.

A new border is being made behind the band-stand for shade-loving plants, such as *Marantas*, *Zingiberads*, *Aroidea*, &c., &c.

Nursery.—The new nursery and the new way of working it has answered very well. 1,074 plants have been supplied from it during the year. A list of the principal recipients is appended.

A number of plants in bamboo-pots has been supplied to the Principal Civil Medical Officer for planting at Tan Toek Seng's Hospital, where all previous attempts to get the plants to grow had failed.

Replying to my enquiry about those last planted, Dr. Rowell writes, under date 13th January, 1879, that they have done well, and that the majority are now making fine, healthy young trees.

This is doubtless owing to their being transplanted into the bamboos when very small, preventing any injury to their roots when put into permanent positions.

Flower Ground.—This was formed in the early part of the year for the purpose of supplying cut flowers to subscribers, and so obviate the necessity of cutting them from the beds in the Botanic Garden. It is now beginning to prove very useful for this purpose, and if a little more ground was cleared and planted, I think we should soon cease to cut from the beds altogether.

The average number of baskets of flowers supplied per month is above 100.

Economic Garden.—This is now commencing to assume a definite form, and to be interesting, as a good number of Economic plants have been planted out and labelled.

Amongst the new plants introduced, I may mention the Bread-nut of Jamaica (*Brosimum Alicastrum*) Teosinté (*Euchlœna luxurians*), 28 varieties of E. Indian Mangoes, Ebony, Calamander, 25 varieties of Sugar-cane from Saigon and Australia, *Psidium guianense*, Sappan, Divi Divi, &c., &c.

This department of the Gardens will be very important if the land in the Native States is taken up as present appearances promise for planting purposes, as intending planters will doubtless apply to us in a great many cases for plants and seeds.

Cinchona—Seeds of *C. officinalis* have been procured, and sent to some of the Native States, as the temperature of Singapore is too hot to give much chance of success here.

None of the seeds, however, had germinated up to 11th February last.

Fresh seeds of *C. Calisaya* have since been sent.

Cocoa.—The demand for seeds of this plant is steadily increasing, and I would suggest the propriety of planting a large number of plants in the Economic Garden, to enable us to meet the calls for seeds. I am indebted to the Hon'ble Major McNair, and Messrs. W. R. Scott and J. R. Glass for quantities of fruit, from time to time, for our correspondents in New Caledonia, Fiji, and Australia.

Coffee.—The Arabian Coffee that was planted out in January, 1878, have done fairly well, and is now showing abundance of bloom.

I have had a portion of the ground trenched 3 feet deep, but as yet no difference is perceptible between those planted in the trenched ground and those in the untrenched.

I have seen no indication of the presence of the dreaded Coffee disease (*Hemileia Vastatrix*), and as the planters who intend to take up land in the Peninsula have decided to get no seeds from Ceylon, I expect that we shall be called on for a supply.

The Liberian Coffee plants that were received from Kew in 1875 are bearing good crops, although the continued wet weather has caused a large number of flowers to fall off before opening. They have suffered at the root slightly from bad drainage, but a trench has now been dug to 4 feet deep to carry off the stagnant water.

I have found the monkeys and musangs so fond of the berries that I have been obliged to enclose the bearing plants with wire netting.

Two of the plants from the number sent here in August, 1877, from Kew, when they were not two inches high, were setting fruit on 1st January this year. A tin of fresh seeds was received from Kew in May last, packed in moss, and about 50 per cent. have germinated. Mr. Low writes to me from Kwala Kaugsa respecting the plants there under date 3rd February, 1879—

"The Coffee" (Liberian) "is growing well here and also in Larut, but there it is neglected; it was full of fruit a month since, but it has all disappeared." He added that he thought it had been stolen.

This is much to be regretted, as the fruit is yet very valuable, and the cost and labour of getting these plants from England to Larut is thus thrown away.

A few plants were sent to Sarawak, but I have heard nothing about them, except that they arrived in excellent condition. I find this species of Coffee very easy of propagation by cuttings, but the plants appear to grow very slowly after being rooted, and this plan of raising a stock is not, in my opinion, to be recommended.

From Sungei Ujong Captain Murray reports under date 11th February, 1879, as follows:—

"Six plants were received, two planted on hill plantation 1,500 feet above sea level, two at the Residency, and two in the lower Government plantation, about 400 feet above sea level. All are growing vigorously, though I observe that, while the plants on the hill have much larger leaves than those on the lower ground, they grow in a more straggling and irregular manner; this may, however, be entirely an accident. There seems some reason to believe that this description of Coffee will do well in any part of the country, and in any soil; it does not seem to require attention, as the plants on the lower ground are quite unprotected, while those on the hill are in perfect shade. I cannot as yet report on their bearing qualities, but hope to do so by the end of this year."

Some plants that I took to Durian Sabatang in October, 1877, were washed away in a subsequent flood.

India Rubber.—Of the American kinds received from Kew, two seem to have taken to this climate very kindly.

Following the advice given by Mr. Cross, in his report to the India Office, I re-planted the Heveas in the low ground of the Economic Garden, where they have not grown so freely as before. The strongest plant has grown two feet in height since March last. With better drainage they would doubtless grow stronger.

Mr. Low reports as follows on 26th July, 1878:—

"They (9 Heveas and 1 Castilloa) were brought here in October last by Mr. Murton, and planted at the back of the Residency, and are growing very well.

"They were quite small when they arrived here, but the Castilloa is now 5 feet high with branches of equal length, and the Heveas vary from four to eight feet, and are growing vigorously.

"There are many districts in Perak which would, judging from what I have read, be very suitable for the cultivation of these plants. The hill on which they are growing well is of river gravel, and I have, no doubt, they would have been much stronger on alluvial soil."

In a subsequent report dated 3rd February, 1879, Mr. Low writes—

The Heveas are now 12 to 14 feet high. They take to the country immensely. The Castilloa is a large tree, 10 feet high, with branches, 5 feet long.

The Castilloa in the Gardens, of which only one reserve plant was kept is growing into a handsome tree.

As regards their propagation, which Mr. Low seems to have found rather difficult, I find that the half-ripened-shoots with a shield of hard wood are best; but unless kept tolerably dry are very liable to rot off.

I think the cuttings are materially benefitted by having all the leaves retained

With the Ceara scrap rubber we have not been so fortunate. During the dry weather

they grew very well and propagated readily, so much so that I wrote to Sir Joseph Hooker stating my belief what it would eventually become a weed here, but when the wet weather continued for so long they began to show signs of failing—and on examining the roots I found them rotten and infested with white ants, and all the cuttings that were taken soon rotted away. Mr. Low's plant seems to have shared a similar fate.

In accordance with a wish expressed by Sir Joseph Hooker, I forwarded some plants of each of the 3 kinds to the Acclimatisation Society, and Botanical Gardens, Brisbane, which arrived at their destination in very good condition.

Dr. Thwaites has very kindly sent me fresh seeds of the Ceara-Scrap from Ceylon, and I hope to establish it here again—but to prove a thorough success, it should, I think, be planted in light sandy soil.

As regards our indigenous rubber and gutta-producing trees, I have been fortunate in being instrumental in helping to glean some additional information about them, and judging from present appearances they are likely to afford a subject for investigation for some time to come. In the report on my trip to Perak, I stated my disbelief in the report that *Urceola elastica* yielded the Gutta Susu of commerce, Gutta Singgariq (Nom. vulg. Perak), and referred it to the genus *Willughbeia*. My supposition turns out to be correct, as from specimens and materials that I sent to Kew, Professor T. Thiselton Dyer has determined it to be *Willughbeia martabanica*. Specimens and materials of two other allied species that have been collected in Singapore, have since been sent for identification and of these one sample has been submitted by Mr. Thiselton Dyer to competent judges in London, who report that "it is of very fair quality and worth 1s. 3d. per lb."

After careful observation, I have arrived at the conclusion that there are at least five of these rubber-producing trees in the jungle belonging to the Botanical Gardens, and further searches would doubtless bring additional species to light.

Seedlings have been raised in large quantities, and 8,000 plants could be supplied now without difficulty.

As regards the true Gutta-percha, very little has been done beyond proving that the Gutta-putih or Gutta-sundek of the Peninsula is the produce of a different tree from that which produces the Ngiato-putih of Borneo.

One reason that may be assigned for the little that is known of these is, that they are lofty trees with very minute inconspicuous flowers, consequently the bloom is seldom detected.

Under date 17th July, 1878, Sir Joseph Hooker writes to me—"The importance of securing the preservation in the Singapore Botanical Gardens of plants producing the different gutta-perchas becomes more and more apparent".

Of the plants that I brought from Perak with me in 1877, about 75 per cent. survived, but as we had no immediate use for them, and as they must be planted in their permanent positions while small I sent them to some of our N. Australian correspondents.

Eucalyptus.—My anticipations about the Eucalypti, when I wrote my last annual report, have not been verified; for although they germinate freely enough, the majority of the species die soon as they get a few inches high.

E. Globulus appears to be the worst species for this climate.

E. citriodora, *E. amygdalinus*, *E. goniocalyx*, *E. pilularis* and *E. calophylla* do best. I attach very little importance however to this, as the belief in their prophylactic virtues is now considerably weakened and they are quite unsuited, owing to their straggling, ragged appearance for garden ornaments.

Ipecacuanha.—The soil of the Gardens is evidently unsuited to the growth of this plant, and unless they are constantly attended to they soon become sickly and die. Those in the "Economic" ground do not make much progress. Dr. King seems to have found out the same thing in India. He states that "the peculiarly slow growth of this plant tends to prevent the cultivation of it from being taken up with spirit by European planters."

"The insignificant straggling appearance of the plant is, besides, little calculated to excite enthusiasm or even interest, among the planting community."

Considering its importance in Indian medical practice, it is a question whether the Government would not do well in establishing a small nursery in Perak.

If it could be got to produce a fair-sized root in fifteen months, it would doubtless be taken up by Tapioca planters; as it could then be planted between the rows of Tapioca plants after they had begun to grow, where it could get just the requisite amount of shade, &c. There is no difficulty about its propagation, as leaves or pieces of the stem or root, very quickly become plants. Some plants here, that are 9 months old, are only about 3 inches high.

In Perak, on the sides of Gunung Mijau, I am certain that it would thrive, and the labour or cost of planting would be very little indeed.

Captain Murray reports as follows:—

"Six plants received, four planted on the hill and two on the lower ground, the latter died, but the former although very slow of growth are very healthy, and have lately all been in flower. I should be glad of information as to the size this plant grows to, when slips may be taken, &c., at present the largest plant is only 9 inches high."

This may be considered very satisfactory, and I would suggest the propriety of sending the larger part of our stock to Sungei Ujong.

Tea.—This has not succeeded so well as I had anticipated, and no amount of attention

seems to have the least effect on the plants. I have written to Assam and China for some more seeds, which I shall try on another piece of ground as soon as they arrive.

Captain Murray thus describes his experience with it in Sungei Ujong.

"Has done fairly well on the hill, it won't grow on any terms on the low ground, out of some twenty seeds that germinated, fifteen have grown to a good health state, and I think at that elevation tea would do fairly well."

Mr. Low is anxious to try it at Kwala Kangsa.

I think that in the Straits we must build our hopes on Assam tea, as the Chinese tea plant although it grows fairly well here, never, so far as my observation goes, gives a "flush" of young foliage, such as would be requisite to render tea planting a profitable investment.

Teosinté (Euchlœna luxurians).—This has been styled the queen of forage grasses, and so much has been written about it that I was induced to try it here. That it is a useful grass, no one can deny, but I doubt if it is entitled to all that has been said for it. The fact of its being an annual is very much against it: here it only lasts 5 months altogether from the time the seed is sown to the time the plant is dead.

It is also evidently partial to well manured land, where it would perhaps perpetuate itself by self sowing, but if left to itself "lalang" would certainly crowd it out.

Cattle are very fond of it, and it is stated to contain a large amount of saccharine matter.

One seed forms a tuft of from 10 to 20 stems which grow about 10 feet high, reminding one of Maize.

It seeds freely and a good crop of seed has been harvested. I have sent some to the Native States for trial.

Prickly Comfrey.—This has completely lost its reputation in tropical India and Ceylon, and our entire stock has succumbed to the continued wet weather.

Sugar Cane.—25 varieties (named) have been introduced, but it is too soon as yet to attempt any report on them.

Mango.—28 varieties of this much esteemed fruit have been received from Calcutta and Manila, but for some time to come they will be used for furnishing scions for inarching.

Vegetables.—By the kindness of the Hon'ble W. H. Read, we were enabled to make a trial with some English vegetable seeds. A great many of the seeds never germinated at all, although they were all sown within a fortnight of their arrival here.

If grown in pots and carefully nursed and attended to, some amount of success may be obtained, but at a very great cost, such as we are at present unable to defray.

The Peas grew very fairly and produced a fair quantity of pods, considering the temperature, but before they were fairly formed they were bitter and dry. French beans from the Gardens are very inferior to the Dolichos, &c., grown by the Chinese gardeners here.

Of Melons and Cucumbers, as well as Tomatoes, a fair crop was set, but the monkeys rarely left a fruit long enough to get ripe.

Parsley and some other herbs grew freely enough, as did the lettuces, &c. Cabbages and all the family were not worth the trouble and manure.

Mr. Low has got on very fairly with some seeds that I sent him, at Kwala Kangsa.

Library.—No additions beyond the usual periodicals were received last year, except the Flora of British Burmah and the various Forest Reports from the Government of India; and as no list of the books have yet been placed on record, I have annexed a list for future reference.

Herbarium.—I have devoted what leisure time I have been able to spare from the Gardens to the formation of the herbarium, and some progress has been made.

My thanks are due to the authorities at Kew for their promptitude and courtesy in naming the specimens referred to them from time to time.

It has afforded me great satisfaction to find that the Europeans in Singapore are beginning to take an interest in the names of plants; of which the numerous specimens forwarded to me for identification last year are a good evidence.

Labels.—The slate ones are still very unsatisfactory, but labels made of Ballo and Tampenis, or Johore teak, have been ordered, and which, I believe, will be less expensive to keep in order here.

The Gardens sustained a great loss in April, through the sudden death of the Head Gardener, Mr. George Smith, who had scarcely been here twelve months.

Our exchanges continue satisfactory, and the range of correspondence has been considerably enlarged during the year.

42 Wardian cases have been sent away from the Settlement, besides cases and packets of seeds, &c, and plants have been supplied gratis for the grounds at the waterworks.

The usual lists of Contributors, Recipients, and Subscribers are appended, with an abstract of expenditure.

A catalogue of all the plants under cultivation in the Gardens is in the printer's hands, on 31st December, 1878, it comprised upwards of 1,800 spp., as against 490 in March, 1876.

I have to acknowledge, with thanks, the kindness and courtesy of the Agents in Singapore, for the P. & O. Co.; Messrs. Jardine, Matheson & Co.; Messrs. Apcar & Co.; The British India and Netherlands India Steam Navigation Co.; and especially to Messrs.

Guthrie & Co., Agents for the E. & A. Co., in taking and bringing cases of plants for the Gardens free of freight.

Zoological Department.

Little beyond the ordinary routine has been carried out in this Department which is now under the care of two Javanese, instead of three Chinese coolies as in 1877.

The leopard that was presented by H. M. the King of Siam in 1876, died in June last, and the one presented by W. Hargreaves, Esq., has been poisoned, and placed in the Museum, the Committee having resolved to accept no more large animals, and to dispose of those now in the collection as soon as possible.

The rhinoceros-shed has been sold for \$50.

The kangaroo enclosure near Cluny Road is an advanced state of decay, and if the deer are to be kept new fencing is necessary.

A list of contributors to this Department is appended.

H. J. MURTON,
Superintendent.

APPENDIX No. 1.

Abstract of Estimated and Actual Revenue and Expenditure of Botanical and Zoological Gardens, Singapore, for 1878.

REVENUE.		ESTIMATED.		ACTUAL.	
		\$	C.	\$	C.
By Government Grant (Botanical)		7,580	...	7,580	...
" " " (Zoological)		2,400	...	2,400	...
" Subscriptions		500	...	460	...
" Sale of plants, &c.		100	...	212	50
" Balance in hand, 31st December, 1877		...	...	57	73
" Sale of old Rhinoceros shed ... ..		...	...	50	...
	Total...	\$10,580	...	\$10,760	23

EXPENDITURE.		ESTIMATED.		ACTUAL.	
		\$	C.	\$	C.
SALARIES.					
Superintendent's Salary		1,980	48	1,980	48
Head Gardener's do.		960	...	720	...
Bill Collector's do.		180	...	180	...
Manager, Zoological Dept., December, 1877, to February, 1878.		150	...	150	...
CONTINGENT EXPENSES.					
Coolie-hire (General purposes)		2,400	...	2,359	94
" " (Economic and Flower Ground)		1,100	...	512	40
Manure, cartage, turf, &c., &c.		1,000	...	707	70
Food for animals		1,500	...	826	28
Miscellaneous (Botanical)		718	27	1,790	78
" (Zoological)		500	...	359	31
Perak Expedition—Balance		91	25	91	25
Advance to Superintendent for petty expenditure ... ..		...	...	100	...
" to Mr. Swenson, late Head Gardener, struck off as irrecoverable .. ..		...	...	75	...
Messrs. Edmonston & Co. for books and periodicals ... ..		...	...	107	15
	Total ...	\$10,580	...	\$10,165	29

6 48
10

6480
7640

1128

608

15

196 09
176. 48

29 51

146 87

Book
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Handy
to go

How

Longoh
K.

Amount actually expended	\$10,165. 29
Balance	594. 94
				Total... \$10,760. 23

Actual balance including advance of \$100 to Superintendent for petty expenditure ... \$694. 94

The above does not include the amount re-paid to the Crown Agents on account of advance and passage money from England for the late Head Gardener, Mr. G. Smith.

H. J. MURTON,
Superintendent.

APPENDIX No. II.

List of Subscribers to Botanical and Zoological Gardens for 1878.

- | | |
|---------------------------|---------------------------------------|
| Almeida, José de | Maack, H. |
| Basigoiti, J. P. de | Mitchell, R. H. |
| Baumgarten, C. | Mulholland, C. |
| Brasier, P. | Neave, J. |
| Campbell, R. | Purvis, J. M. |
| Cheang Hong Lim, | Read, The Hon'ble W. H. |
| Douglas, The Hon'ble J. | Robinson, His Excellency Sir W. C. F. |
| Edgar, G. | Rowell, T. I., P.C.M.O. |
| Emmerson, C. | Seah Cheo Seah. |
| Fraser J. | Sigfried, W. S. |
| Glass, T. R. | Souza, M. F. de |
| Gunn, A. | Sohst, M. |
| Hartwig, F. von | Suhl, M. |
| Herwig, H. | Tan Beng Swee. |
| Hinnekindt, W. | Tan Eng Quang. |
| Irying, The Hon'ble C. J. | Tan Seng Poh. |
| Katz, A. | Ulloth, H. W. |
| Koek, E. | Vaughan, J. D. |
| Little, R., M. D. | Whampoa, C.M.G., The Hon'ble H. A. K |
| Lloyd, J. | Worsley, Captain F. |

APPENDIX No. III.

List of Contributors to the Botanical Gardens during 1878.

- Armstrong, F., Ornamental foliaged plants.
- Bernays, L. A., Vice-President, Queensland Acclimatisation Society, 4 cases of plants and 3 consignments of seeds.
- Brooke, H. H. Sir J., Grammatophyllum plants.
- Burbidge, F. W., Bornean plants.
- Cantley, N., Assistant Director, Royal Botanical Gardens, Mauritius, 1 case of plants and 5 consignments of seeds.
- Deare, Major R. E., 74th Highlanders, 1 case of Hongkong plants.
- Dickins, Colonel A. S., 28th Regiment, seeds and dahlias.
- Douglas, C.M.G., The Hon'ble J., Tea seeds and tubers of Jerusalem Artichokes.
- Fisher, The late H. T., Rangoon orchids.
- Ford, C. Superintendent, Botanical Gardens, Hongkong, 1 case plants.
- Fulton, A. A., Singapore, Cocoa fruits.
- Head, W. G. Superintendent of Agri-Horti Society of India's Garden, Alipore, 27 vars of Mango and 47 vars of Caladium.
- Hill, W., Director, Botanical Gardens, Brisbane, 8 cases of plants, 5 consignments of seeds, and 20 vars of sugar cane.
- Hooker, Sir J. D., C.B., &c., &c., Kew, 1 box of Liberian coffee seeds.
- Irving, The Hon'ble C. J., plants.
- Jamie, R., Singapore, seeds and plants.
- Jenman, G. S., Botanical Gardens, Jamaica, 4 consignments of seeds.
- King, Dr., Director, Royal Botanical Gardens, Calcutta, 2 cases of Ipecacuanha plants and seeds of Musa superba.
- Leisk, W. R., Singapore, 200 coffee plants.
- Little, Dr., Singapore, varieties of cocoa-nut plants.
- Low, Hugh, Perak seeds.
- Marcaide, Senor F. de, Manila orchids.

Handwritten notes and signatures:
 Jules
 Conifer seeds
 Beddome
 Duchon
 Worsley
 Glass
 seeds of
 plants
 seeds
 seeds
 seeds

Handwritten notes at the top of the page: "All the year over the Pondicherry", "Murray's list", "E. J. Sachs", and "8".

- McArthur, Sir William, Sydney, 1 case of rare Crotons, &c.
- McNair, The Hon'ble J. F. A., Cocoa fruits.
- Murton, J., England, 1 case of American orchidea, and Cape bulbs, &c., &c.
- Piltzer, seeds.
- Read, The Hon'ble W. H., Vegetable seeds, &c., &c.
- Ross, Captain, seeds and plants.
- Rinn, E., French Consul at Singapore, from H. E. the Governor of Saigon, 7 vars of sugar cane.
- Schomburgk, Dr., Director, Botanical Gardens, Adelaide, a large consignment of seeds.
- Scheffer, Dr., do., do., do., Java, seeds.
- Scott, W. R., Singapore, Cocoa fruits.
- Swinburne, Captain, 80th Regiment, Perak, seeds of the "Saang" palm.
- Stephens, T. H., Ceylon, seeds of Cinchona, &c.
- Tan Kim Ching, Singapore, Siamese plants.
- Thwaites, C.M.G., Dr., Director, Royal Botanical Gardens, Ceylon. 1 case of Tea and Cocoa plants, 1 case of ornamental plants.
- Whampoa, C.M.G., The Hon'ble H. A. K., seeds, &c.

Zoological Department.

- Dennys, Dr., 1 Python, 2 Goura pigeons, 2 Nicobar pigeons, 1 Bear, deposited.
- Gomes, The Revd. W. H., 1 Sambur deer.
- Guy, W. O., 4 Gibbons.
- Hill, W. Brisbane, 1 Kangaroo, 1 Wallaby.
- Hong Lim, Cheang, 2 Storks.
- Robinson, His Excellency Sir Wm., 3 Argus pheasants.
- Ross, Capt., 1 Hornbill, 1 Bornean Fireback Pheasant and 1 Gibbon.

H. J. MURTON,
Superintendent.

Handwritten notes: "Vidas nanuwa Ochu 890", "Whampoa", "Water Works Grounds".

APPENDIX No. IV.

List of the principal Recipients of Plants or Seeds from the Botanical Gardens, during 1878:

- | | |
|--|--|
| Armstrong, A., Singapore. | Jenman, G. S. Jamaica. |
| Bernays, L. A., Brisbane. | Kew, The Royal Gardens. |
| Beddome, Lieut. Colonel, Madras. | King, Dr., Calcutta. |
| Beccari, Dr., for Java. | Little, Dr., Singapore. |
| Band, 28th Regt. | McArthur, Sir Wm., Sydney. |
| Bieber, Dr., Singapore. | McNair, The Hon'ble Major. |
| Cantley, N., Mauritius. | Municipal Commissioners, Singapore, for Water Works Grounds. |
| Campbell, The Hon'ble R., Singapore. | Maharaja of Johor, H. H. The |
| Dennys, Dr., Singapore. | Ross, Capt., Singapore. |
| Douglas, The Hon'ble J., C.M.G. | Rowell, Dr., P.C.M.O. |
| Edgar, W., Rockhampton. | Shaw, H. T., Fiji. |
| Fiji Government, Fiji. | Sultan of Selangor, H. H. The |
| French Consulate, Singapore, for Saigon and Pondicherry. | Tan Kim Cheng, for H. M. The King of Siam. |
| Hospital, 28th Regt. | Thwaites, Dr., C.M.G., Ceylon. |
| Head, W. G. Calcutta. | Uloth, H. W., Singapore. |
| Hill, W. Brisbane. | Vaughan, J. D., do. |
| Hose, The Ven. Archdeacon, Singapore. | Whampoa, Hon'ble H. A. K. |
| Irving, The Honble C. J. | |

H. J. MURTON,
Superintendent.

Vertical handwritten notes on the left margin: "Dennys", "Piltzer", "Rinn", "Schomburgk", "Scheffer", "Scott", "Swinburne", "Stephens", "Tan Kim Ching", "Thwaites", "Whampoa", "Dennys", "Gomes", "Guy", "Hill", "Hong Lim", "Robinson", "Ross", "Vidas", "Whampoa", "Water Works Grounds", "List of the principal Recipients of Plants or Seeds from the Botanical Gardens, during 1878:", "Armstrong", "Bernays", "Beddome", "Beccari", "Band", "Bieber", "Cantley", "Campbell", "Dennys", "Douglas", "Edgar", "Fiji Government", "French Consulate", "Hospital", "Head", "Hill", "Hose", "Irving".

Vertical handwritten notes on the right margin: "Jenman", "Kew", "King", "Little", "McArthur", "McNair", "Municipal Commissioners", "Maharaja of Johor", "Ross", "Rowell", "Shaw", "Sultan of Selangor", "Tan Kim Cheng", "Thwaites", "Uloth", "Vaughan", "Whampoa".

STRAITS SETTLEMENTS.

Paper to be laid before the Legislative Council by command
of His Excellency the Administrator.

Annual Report on the Botanical Gardens for the year 1879.

BOTANICAL GARDENS,
Singapore, 25th March, 1880.

SIR,—I have the honour to submit herewith my Annual Report on this department for the year 1879.

To
The Hon'ble
CECIL C. SMITH,
Chairman of the Gardens Committee,
Singapore.

I have, &c.,
H. J. MURTON,
Superintendent.

REPORT.

The extraordinary quantity of rain that has fallen in Singapore during the past year, viz., 114.93 inches, has rendered the task of keeping the Gardens in good order more than usually hard, as weeds have grown with such astonishing rapidity and vigour that a considerable portion of the time and labour that would otherwise have been devoted to carrying out projected improvements has been necessarily taken up by matters of ordinary routine.

It has, however, proved beneficial to all the newly planted trees, &c., and I have not to record the death of one specimen of tree or shrub of value or importance.

One large specimen of *Araucaria Cookii* is showing signs of decay, owing to attacks of white ants, and although various remedies have been applied, I have little hope of its recovery. This, however, will prove a very trifling loss, as the Gardens are rather overstocked with cone-shaped trees of this description already.

A considerable number of alterations have been carried out during the year, which will doubtless prove improvements to the general appearance of the Gardens.

A large clump of trees near the orchid house, which had become covered with coarse-growing climbers and served only to conceal a rubbish pit, has been removed, the pit filled up, and the ground sown with grass seeds. A large quantity of thoroughly decayed leaf-mould was obtained from this place, which has proved of material use for mixing with the compost for plants in pots.

The ground on which the large Carnivora cages formerly stood has been drained, filled with suitable compost, and is now being laid out for the reception of the *Bomeliaceæ*, a very beautiful class of plants, to which, through the generosity of Dr. SCHEFFER, Java, and M. GODEFROY-LEBEUF, Argenteuil, no less than 22 genera and 63 species have been added during the year.

A number of old, unsightly plants of the Pumelow and "Buah Kanarie" (*Canarium commune*) have been removed from the lawn on the side of the Gardens nearest Tyersall, where the soil is of the very worst description.

A great improvement to the general appearance of the Gardens has been made by lifting the turf on the right-hand side of the drive leading past the lake to the Band-stand, and raising it above the level of the side-drains: over 400 carts of soil were used for this purpose.

Roads and Walks.—These have all been gone over during the year, and many of them entirely re-made. 360 cubic yards of laterite were placed on the road around the Band-stand alone, besides which the following roads have been entirely retailed:—Road to Superintendent's Quarters; road from junction near the palm clump past the orchid house to the long border; road past palm clump to Cluny Road; the road from the orchid house past the head of the lake; and the road from the Band-stand to Rogie is now undergoing a thorough repair. The main drive past the lake and over the hill has also undergone extensive repairs.

Owing to the quantity of rain that annually falls in this Colony, and the character of the land on which the Gardens are established necessitating rather steep walks, the amount annually expended for the upkeep of the roads, &c., is very considerable, and I would suggest the propriety of a fixed sum being set apart annually for this purpose.

Drains.—In consequence of the extensive additions under this head during 1877-78, but little was required last year, beyond ordinary repairs. New drains have been put down near the orchid house and the approach to the aviary. A drain on each side of the Oleander walk would prove beneficial.

Fences.—These have been kept in fairly good order by means of monthly clippings, the shoe-flower (*Hibiscus rosa sinensis, vars.*) continues to answer for this work effectively, and the example is being extensively followed in Singapore.

Seeds of plants suitable for fences have been procured from India, and will be tried for that purpose in the Economic Garden.

A new fence has been planted at the back of the plant sheds.

Lake.—This has been cleared out repeatedly as the weeds grow very rapidly, a coarse growing *Utricularia* being particularly troublesome. Perhaps if a few more swans were introduced this nuisance would be lessened.

The Water Lily pond is the gayest part of the Gardens in early morning, but the plants of the *Victoria* are now getting old—over five years—and small, and it seems desirable to remove them, as well as the *Nymphæas*, place a lot of manure in the pond, replant the *Nymphæas*, and replace the *Victoria* by young seedlings.

The *Nelumbiums* have been provided with a separate pond, and are commencing to grow in their new quarters.

Flower Beds—Those near the office were pretty during the early part of the year, but during the heavy rains of the latter part the annuals planted there succumbed to the adverse weather.

Those near the aviary have been remodelled, and were very gay for some time with Dahlias, &c., &c.

The beds below the Band-stand are about to be entirely remodelled and planted, as the shrubs, &c., planted there two years ago have become much too large for the situation, thereby obstructing the view of the surrounding country. Several large *Coniferæ*, &c., have been removed from the upper terrace for the same reason.

Great difficulty is experienced in getting plants suitable for these beds, as none over two feet high are adapted to this purpose, while a fair proportion of flowering plants is indispensable in such situations, by far the greater part of the tropical flowering-plants that will grow in the sun are shrubs like *Ixoras*, *Clerodendrons*, *Eranthemums*, &c.

Orchid House.—This structure would now be more appropriately designated as the Plant House, as the larger part of the *Orchidaceæ* has been removed and fixed on trees in various parts of the Gardens, beyond the reach of visitors, in order to prevent their being stolen. Most of those already put out are doing well, and are evidently far happier in their more natural positions, besides giving a much better chance of their being observed. *Phalænopsis grandiflora*, *Saccolabiums*, &c., &c., and the curious monstrosity *Bolbophyllum Beccarii* are especially noticeable, and various species of *Arides* are always to be found in bloom.

The house is now almost entirely taken up with staging for pot plants, and, considering that this style of cultivation was commenced only nine months since, a very fair collection has been got together, and now form one of the principal features of the Gardens.

A large number of Annuals were grown for this purpose in the early part of the year, but, although they are extremely showy while in bloom, the short time that they remain so was considered by the Committee not enough to repay the trouble and attention necessary to bring them on, and their culture was discontinued.

The Ferns have received more than ordinary attention during the year, and the thanks of the Committee are particularly due to Lady LONGDEN, Ceylon; C. FORD, Esq., Hongkong; W. HILL, Esq., Brisbane; and the Venerable Archdeacon HOSE. I take this opportunity of acknowledging my indebtedness to the latter Reverend gentleman for much useful information about Malayan Ferns and his assistance in clearing up many knotty points connected with their nomenclature.

Upwards of sixty species have been added to this popular class of plants during the year.

The Fernery is worthy of little attention just now, as the trees that supported the screen of *Thunbergia laurifolia*, which so effectively shaded the fernery, have rotted and fallen down, and most of the Ferns are unable to bear the full rays of the sun, and I would recommend that it should be planted with coarse growing kinds; the more delicate ones being reserved for growing in pots.

The screen of *Thunbergia* has hitherto been one of the most attractive parts of the Gardens, and when its fall was foreseen in 1877 a number of supports were placed under it at a cost of upwards of \$70, but these soon succumbed to the attacks of white ants.

Planting.—Little has been done in this line, except in filling up vacancies, and a large number of exotic trees are being starved in pots for want of a safe place for planting them.

Some large palms have been removed from near the Sago Clump to another place near the aviary, an operation which proved unexpectedly successful, and only one—*Areca rubra*—suffered to any extent, although they consisted of large plants of *Cocos flexuosa*, *Cocos plumosa*, *Martinezia granatensis*, *Phytelephas macrocarpa*, &c., &c.

The collection of palms planted in 1878 have made good progress and now require thinning out. This family has been increased by fourteen genera and forty-six species during the year, and some other place must soon be selected for them.

The *Cycadaceæ*, now numbering five genera and twenty species, have been collected and planted together.

The Committee are indebted to W. HILL, Esq., of Brisbane, for a very fine specimen of *Catakidozania Hopeana*. Representatives of this family from the Cape are expected during the current year.

A collection of named varieties of *Nerium Oleander* has been planted on the side of the road leading from the plant house to the lake, and an invoice has been received of upwards of one hundred additional varieties, which will be planted on the other side of the same walk, as soon as they arrive.

A border has been made near the aviary where the *Musaceæ*, *Zingiberaceæ*, *Cannaceæ*, and *Aroideæ* are being planted.

Nursery.—This has been extended during the year, and quantities of plants have been distributed during the year. Dr. ROWELL, P.C.M.O., and Dr. ANDERSON, have been supplied gratuitously for planting near the Hospitals, and also for the Cemetery. Upwards of 5,000 plants (5,023) have been distributed during the year, showing an increase on the number supplied in 1878, when it amounted to 1,074. Numerous packets of seeds have also been sent away. A list of recipients is appended.

A large packing shed has been erected in a convenient place near the Cluny Road and sheds for growing on plants for the show-house, &c. near it.

A number of forest-trees has been raised in the Nursery for roadside planting, and were offered to the Municipal Commissioners in October last, and detailed descriptions of each species forwarded, but no answer has been received, and they will now be used for Dhoby Green and the Raffles Institution grounds.

The number of plants given above does not include those sent to Government House, from time to time.

Flower and Vegetable seeds have been received from Messrs. CARTER & Co. and Messrs. SUTTON & SONS; the latter firm presented a collection through their Singapore Agents, Messrs. JOHN LITTLE & Co.

It is but justice to the first named firm to acknowledge that their seeds were, without exception, faultless, and their strains of flower seeds were really very fine, their Balsams, Colens, Dianthus, &c., &c., being by far the finest that I have seen.

As regards the Vegetable Seeds, I have to report a similar result as in my last.

Peas that under normal conditions would reach six feet in height, here scarcely attained to so many inches, and within two months of their being sown diminutive pods may be picked containing, at most, two peas only.

Lettuces, Radishes, and Endive do well, and even Leeks and Cabbages look better than could be expected.

Economic Garden.—The following economic and interesting plants have been introduced during the year:—

Canella bark (*Canella alba*); Cuba bast (*Paritum elatum*); Baobab (*Adansonia digitata*); Cola Nut (*Cola acuminata*); Triucomalee Wood (*Berrya Annonilla*); Brazil Elemi (*Amyris sp.*); Guarana bread (*Paullinia*); Brazil Iron Wood (*Cesalpinia ferrea*); Mesquit Bean (*Prosopis glandulosa*); Negro Peach (*Sarcoccephalus esculentus*); *Lucuma deliciosa*; Nux Vomica (*Strychnos nux vomica*); Lace-bark (*Lagetta lintearia*); Upas (*Antiaris toxicaria*); Sandal Wood (*Santalum album*); Friendly Isles Vegetable Ivory (*Sagus amicarum*); &c., &c.

A short account of the uses of the various economic plants now in the Gardens is appended.

Cinchona.—All attempts to grow this here have proved fruitless, but *Cinchona calisaya* and *Cinchona succirubra* are likely to do well at 2,000 feet elevation in Pêrak.

Cocoa.—Continual applications are being received from North-Australia, Borneo, and Pêrak; for supplies of seeds of this tree, which have been complied with as far as our limited stock permitted.

A communication has been received from the Right Hon'ble the Secretary of State for the Colonies relative to the advisability of introducing the best varieties from Trinidad.

Mr. CAMPBELL has also promised to get some seeds of the best varieties from Manila.

Coffee.—The Arabian coffee here is severely attacked by the disease (*Hemileia vastatrix*) which has destroyed all hopes of our being able to supply seeds for planters in the Peninsula.

The possibility of the fungus being disseminated by means of the fruit is open to doubt, but if fruits from clean trees can be procured, it would certainly be preferable to that from infected trees.

A discussion is being carried on in Ceylon relative to the value of lime and sulphur as a remedy for this disease, both sides having very strong supporters, but it yet remains to be seen whether the application of these specifics have any permanent effect in checking its ravages. A new remedy, it may be noted, is now being tried in Johor, and the result is looked forward to with much interest.

The Liberian Coffee has not as yet shown any signs of being attacked with the disease, although some Pêrak planters have been scared by the yellow blotches on the younger parts of the branches, but after careful examination I have arrived at the conclusion that this is due to the hardening of the wood only, as it is always found at the base of the green wood next to the riper parts and never scattered irregularly over the branches.

This species is evidently very impatient of deficient drainage to which it is far more sensitive than the Arabian.

The plants raised from seeds received from Kew, in May, 1878, are now blooming profusely.

Eight hundred fruits from our plants have been sent to Government Hill, Penang, and 500 sent to Pêrak.

About 300 plants have been raised in the Gardens, but as the plant is now firmly established in the Colony, the Committee have decided to discontinue planting it.

Very favourable reports have been received from the Native States regarding the progress of the plants of this species there, and there can now be no doubt that the Liberian Coffee has found a congenial home in the Malay Peninsula and adjacent islands, and its future propagation may now be left to planters, &c.

Gum Benzoin or Benjamin (Styrax Benzoin).—Through the kindness of L. WRAY, Esq., and J. G. DAVIDSON, Esq., a quantity of seeds of this valuable tree has been procured and sown, but as they take some time to germinate, no definite report can yet be made on them.

India Rubber.—The plants of the American genera *Hevea* and *Castilloa* in the Gardens are now large plants, but hitherto propagation from the strong growths they are making seems rather difficult, whereas they used to propagate freely from the weak wood produced while in pots. The *Castilloa* is evidently at home here and produces leaves of enormous size, while the *Heveas* make single growths, from two to three feet in length.

Latest information from Pêrak give good accounts of the *Hevea*, but Mr. Low writes as follows respecting the *Castilloa*:—

“This (the *Castilloa*) is now attacked by a worm which bores into the stem, and “must injure it very much, as the holes are quite large, and it still continues its ravages “which began many months ago.”

This is not very cheering news, and the life-history of the borer should be investigated at once, in order to ascertain its origin and progress of development, when some means could doubtless be devised to put a stop to its ravages. I would suggest the propriety of the Government appointing some one with some entomological knowledge to investigate this matter before the plants get extensively circulated, and possibly the borer also.

It would be interesting to learn from Mr. Cross and other South-American travellers whether the *Castilloa* is liable in its native habitats to such attacks as Mr. Low describes.

Ceara Scrap Rubber (*Manihot Glazionii*) must be omitted from the list of rubbers adapted to the climate of the Peninsula, as it has invariably rotted off during continued wet weather.

Specimens of other species of our indigenous rubber-producing trees have been sent to Kew, whence information about their nomenclature is anxiously looked for.

The Right Hon'ble the Secretary of State for the Colonies has directed a report to be drawn up for the India Office, but it must necessarily be incomplete unless the Kew authorities furnish the desired information. The Report is now ready, with the above exception.

Messrs. TREACHER & BURBIDGE have added considerably to our knowledge of the Bornean species by their paper in the 3rd number of the *Journal of the Straits Branch of the Royal Asiatic Society*.

Specimens or plants of the true *Urceola elastica*, (Roxb.) are a desideratum, as all the so called *Urceolas* have proved to be *Willughbeia* or *Chilocarpus*.

About 1,000 plants of the two latter genera have been distributed to the following establishments:—Kew, for the West-Indies and South-America; Brisbane, for more Northern Colonists; Hongkong, Mauritius, Calcutta, Manila, and Rangoon.

Gutta Percha.—Through the kindness of HUGH LOW, Esq., C.M.G., Resident of Pêrak, we have received a consignment of seeds of a species of *Isonandra* producing “Gutta Sundek,” from which, I believe, about 3,000 plants will be produced.

The trees shown to me, when in Pêrak in 1877, as the ones producing “Gutta Sundek” appeared to be *Dichopsis macrophylla*.

As so little is known about the life history of the *Gutta Percha* producing trees, it will be instructive to watch the development of these plants, and ascertain the number of years required to produce a fair sized tree from seed; which, I think, cannot be much, if anything, under 40 years.

The seeds were received here on 11th February last, and sown the same day, and a great number had appeared above ground on 1st March.

A piece of land measuring 102 acres 1 rood and 34 poles has been allotted by Government for the cultivation of economic plants, but principally gutta- and rubber-producing trees, which is now being cleared, where the *Dichopsis* will be placed as soon as they are large enough; and as these will be planted at least 40 feet apart the space between will be planted with smaller growing plants.

Eucalypti.—Seeds of numerous varieties have been procured from Australia and forwarded to the Philippine Islands at the request of the Governor-General of the Colony through the Hon'ble the Colonial Secretary, Straits Settlements, and the Spanish Vice-Consul at Singapore.

When sown *in situ* they seem to thrive fairly well in Singapore, but do not appear to stand transplanting: *Eucalyptus siderophloia*, *Eucalyptus Baileyi*, and one or two other species are growing well in the nursery.

Ipecacuanha.—Our stock at the Gardens is now exhausted, and it is useless to attempt to persuade planters here to take up its cultivation, for reasons mentioned in former reports, and I would strongly urge the Committee to recommend to Government the advisability of sending a lot to Mr. Low for his experimental Garden in Pêrak, as the stiff, tenacious soil of Singapore will not suit its requirements. It does well with Captain MURRAY at Sungei Ujong. If the land on Gânonng Hîjan near Thaipeng in Lârut is not yet taken up, I feel convinced that no better place could be found in the Peninsula for the cultivation of this drug.

Iron Wood of Brazil (Caesalpinia ferrea).—A quantity of seeds of this tree has been received from Kew, and a number of plants raised; but as yet I have been unable to get any information as to its habit, height, or uses. It appears to have a straggling, weedy habit here.

Tea.—A quantity of the Chinese tea is ready to go out on the new land, and Dr. KING has promised to send a large quantity of seeds of Assam hybrid, and promises of plants have been received from Pêrak.

The latter variety, I am convinced, is the only one likely to succeed here, an opinion which is held by all the planters who have tried tea cultivation in Ceylon who have visited the Gardens, and its introduction into Johor promises to turn out most successful, the young plants, now six months old, having made good growth, and they possess every appearance of health.

Teosinté (Euchlœna luxurians).—This grass, although useful, does not bear out its reputation in the Straits. Large quantities of seeds have been distributed, but all accounts from the Native States state that it pays far better to grow maize, as the same ground that will grow *Teosinté* will produce excellent maize.

Maize.—The American varieties introduced by Major STUDER, United States Consul in Singapore, have proved a great success everywhere, and very flattering reports continue to come in from Borneo and the Native States.

Sugar Cane.—Several additional varieties have been introduced from Fiji, the Sandwich Islands, Borneo, and New Guinea, and considerable interest is taken by sugar planters in the collection now at the Gardens. Cuttings have been sent to Pêrak, Klang, Province Wellesley, Penang, Kêdah, and Borneo.

The *Outamite* cane from Fiji is much admired by planters.

Mahogany.—Several plants have been raised from seeds forwarded from Ceylon, and also of the *Star Apple (Chrysophyllum cainito)* from seeds sent from Jamaica.

Mango.—The varieties received from Calcutta and Manila have made good growth, but no applications for inarched plants have been received. The mango does not appear to have a good reputation in the Straits.

BUILDINGS.—The Superintendent's house, the house and out-houses formerly occupied by the Head Gardener, and Superintendent's office, have been repaired, and put in good order; both Javanese coolie sheds repaired and re-attapped, a new shed for the Chinese coolies built on the new reserve, and a new house for the Road-Mandore built; in addition to a packing shed and plant sheds before mentioned.

Library.—Nothing beyond the usual periodicals have been received from England, but a set of Standard Works, the cost of which amounts to upwards of £13, has been ordered and will soon arrive.

The thanks of the Committee are due to the Indian Government for copies of all their Forest Reports, to Dr. O. BECCARI for his valuable "Malesia," so far as yet published, and

to Dr. SCHOMBURGK, Adelaide, and L. A. BERNAYS, Esq., Brisbane, for numerous brochures bearing on botanical subjects.

Herbarium.—This now comprises over 3,000 determined species. Consignments have, from time to time, been sent to Kew for identification, and a large consignment is now ready for forwarding.

A good deal of information has been collected about Malayan plant medicines and poisons, and my thanks are due to Dr. LITTLE and R. JAMIE, Esq., for their kindness in forwarding specimens for identification, with particulars of uses, mode of preparation, &c.

No replies have yet been received to the Circulars sent to the Native States, by order of the Hon'ble J. DOUGLAS, 20th May, 1878.

A collection of one hundred specimens was presented to the *Vega* expedition, a list of which is appended.

Papers are in course of preparation on the Malay and Botanical names of our indigenous fruits, and also on native timbers, of which a good collection is being got together.

It has been suggested by several visitors to the Gardens that if a place for exhibiting these were provided, they would prove very interesting, and add materially to the attractions of the Gardens, and I would suggest that the late Head Gardener's house be converted into an office, and the present office used as a kind of wood museum, as it is much too damp for books and papers.

Labels.—A quantity of wooden labels has been substituted for the slate ones, but they have not yet undergone a sufficiently long trial to justify a report being made on them.

Mr. W. Fox arrived in August to take up his appointment as Head Gardener, and a fresh staff has been engaged to keep the roads and walks in repair.

Our exchanges continue satisfactory, as will be seen by the appendices, and the correspondence in connection with the establishment is steadily increasing.

A list of subscribers is also appended. A subscription of \$12 per annum entitles any Member of the Community to obtain cut flowers from the Gardens.

A catalogue of the plants under cultivation has been published, and an appendix bringing it up to 31st December, 1879, is in the printers' hands. About five hundred species have been added during the year.

The flower ground planted last year has helped to supply flowers to subscribers, but not to such an extent as had been anticipated.

As our collection of plants is now assuming large dimensions, sometimes rendering the task of finding a particular plant, a difficult one, I would beg to suggest to the Committee the propriety of setting apart a piece of land near the nursery, or on the ground near the site proposed for the Head Gardener's house, as a stock ground where one or two plants of each species could be planted in regular order, and so prevent the species being lost altogether.

The thanks of the Committee are due to the Agents in Singapore:—for the P. & O. Co.; Messrs. JARDINE, MATHESON & Co.; Messrs. APCAR & Co.; the British India, Netherlands India, and Burmah Steam-ship Co.s, and specially to Messrs. GUTHRIE & Co., for their kindness and courtesy in taking plants to and from Singapore free of freight.

In May last I took a short trip some miles up the Muar river, and brought back several rare plants not previously represented in our collection.

A Flower Show was held in the Gardens on 30th and 31st December, and a fine collection of plants was brought together, but, in consequence of the unpropitious weather, it proved a financial failure.

ZOOLOGICAL DEPARTMENT.

A deer fence has been erected on Garden Road side of the lake, and a strained wire fence around the lake to prevent the animals crossing over, but it has not answered its purpose, and the deer play sad havoc in the Botanical and neighbouring Gardens.

The old deer enclosure has been taken down, and also the porcupine enclosure. The porcupines have been sent to the Museum, and the bears, orang-outan, a monkey, two deer, one slow-paced loris, and one vulpine opossum have been sent to the Calcutta Zoological Gardens, in exchange for Indian birds.

The aviary is in need of extensive repairs.

A list of contributors to this department is appended, also an abstract of expenditure.

H. J. MURTON,
Superintendent.

APPENDIX No. I.

Abstract of Estimated and Actual Revenue and Expenditure for the Botanical and Zoological Gardens, for the year 1879.

REVENUE.		Estimated.		Actual.	
BOTANICAL GARDENS.		\$	c.	\$	c.
By Government Grant, ...	...	7,580	00	7,580	00
By Sale of Plants, &c., and Subscriptions, ...	...			370	00
ZOOLOGICAL GARDENS.					
By Government Grant, ...	...	2,400	00	2,400	00
Total, ... \$		9,980	00	10,350	00
EXPENDITURE.					
SALARIES.					
✓ Superintendent's Salary, ...	...	2,098	15	2,098	15
✓ Head Gardener's Salary, ...	...	960	00	720	00
✓ Bill Collector's Salary, ...	...	180	00	180	00
✓ Contingent Expenses, ...	...	4,341	85		
✓ Coolie-hire (General purposes), ...	...			3,013	49
Do. (Economic Garden), ...	...			180	00
✓ Road Mandore, ...	...			281	39
Manure, and Cartage, ...	...			616	12
✓ Laterite, ...	...			540	81
✓ Food for Animals, ...	...			1,882	75
Miscellaneous (Botanical), ...	...			679	79
Do. (Zoological), ...	...			
Total, ... \$		7,580	00	10,192	50
Balance in favour, ... \$				\$157	50

APPENDIX No. II.

List of Subscribers to the Botanical and Zoological Gardens, for 1879.

Almeida, Mr. José d'.	Little, Dr. R.
Anson, H. E. Major-General A. E. H.	Lloyd, Mr. J.
Baumgarten, Mr. C.	Maack, Mr. H. F.
Behr, Mr. M.	Miller, Mr. J.
Bishop, Mr. F. C.	Neave, Mr. J.
Brasier, Mr. P.	Purvis, Mr. J. M.
Campbell, The Hon'ble R.	Read, The Hon'ble W. H.
Cheang Hong Lim, Mr.	Remé, Mr. G. A.
Currie, Mr. A.	Richards, Mr. R. P.
Edgar, Mr. G.	Ritter, Mr. E.
Emmerson, Mr. C.	Rowell, Dr. T. I.
Fraser, Mr. J.	Schutze, Mr. A. L.
Gentle, Mr. A.	Seah Cheo Seah, Mr.
Glass, Mr. L. R.	Siegfried, Mr. W. H.
Glinz, Mr. C.	Sohst, Mr. M.
Gunn, Mr. A. B.	Tan Beng Swee, Mr.
Hinnekindt, Mr. H.	Tan Seng Poh, Mr.
Koek, Mr. E.	Whampoa, The Hon'ble H. A. K., C.M.G.

APPENDIX No. III.

List of the principal Contributors to the Botanical Gardens, in 1879.

Agri-Horti. Society, Alipore, Calcutta, ...	Ornamental Plants and Roses.
Basigoiti, Mr. J. P. de, Switzerland, ...	Dahlia Roots, &c.
Beddome, Lieut.-Colonel, Madras, ...	Indian Seeds.
Bernays, Mr. L. A., Acclimatisation Society,) Brisbane, ...)	Large collections of Plants and Seeds.

Appendix No. III., continued.

Bowen Park Reserve Committee,	...	Australian Orchids.
Buchan, Mr. W. M., Johor,	...	Cinchona and Cardamom Seeds.
Cantley, Mr. N., Mauritius,	...	Seeds.
Carter & Co., Messrs., London,	...	Flower and Vegetable Seeds (purchased).
Cock, M. Jules de, France,	...	Seeds of Coniferæ.
Dimsdale, Mr. F. H., Japan, per Mr. R. Jamie,	...	Japanese Coniferæ.
Edgar, Mr. G., Rockhampton,	...	Australian Plants and Seeds.
Ford, Mr. C., Hongkong,	...	Succulents, Ferns, &c., &c., and Seeds.
Glass, Mr. L. R., Singapore,	...	Cacao Fruits.
Godefroy-Lebeuf, M., Argenteuil, France,	...	{ Very large collections of Oleanders, Orchids, Ferns, Bromeliads, Marantas, Begonias, Gloxinias, Lilliums, Gladiolus, Ornament- al Plants, and Seeds.
Hardinge, Mr. H., New Zealand,	...	Plants and Seeds.
Hill, Mr. W., Brisbane,	...	Large consignments of Plants and Seeds.
Hooker, Sir J. D., C.B., K.C.S.I., &c.; Kew,	...	{ Valuable Ornamental and Economic Plants and Seeds.
Hose, The Ven. Archdeacon, Singapore,	...	Ferns, &c.
Isemonger, Mr. E. E., Province Wellesley,	...	Amorphophallus and Ferns.
Jamie, Mr. R., Singapore,	...	Plants and Seeds.
Jenman, Mr. G. S., Jamaica,	...	Palm Seeds.
Kehding, Mr. F., Singapore,	...	Palm Seeds.
King, Dr., Calcutta,	...	{ Numerous consignments of Orchids, &c., and Seeds.
Koek, Mr. E., Singapore,	...	Plants and Seeds.
Longden, Lady, Ceylon,	...	Valuable collection of Ceylon-Ferns.
McNair, The Hon. Maj. J. F. A., C.M.G., Singapore,	...	Seeds and Ferns.
Murray, Captain, Sungei Ujong,	...	Plants.
Murton, Mr. J., England,	...	Plants and Seeds.
O'Brien, Mr. H. A., per H.E. the Administrator,	...	Plants of <i>Tecoma venusta</i> from Penang Hill.
Piltzer, Mr. L. J., Borneo,	...	Seeds.
Read, The Hon'ble W. H., Singapore,	...	Seeds, &c.
Ross, Captain J. D., Singapore,	...	Ferns, Orchids, Rare Palms, and Seeds.
Sachs, Mr. E. F., Sumatra,	...	A tuber of <i>Amorphophallus Titanum</i> .
Scheffer, Dr., Java,	...	Large consignments of Plants and Seeds.
Schomburgk, Dr., Adelaide,	...	A large consignment of Seeds.
Shaw, Mr. H. F., Fiji,	...	Seeds and Ferns.
Siam, H. M. the King of,	...	Two cases of Plants.
Squirrel, Major, 74th Highlanders, Malacca,	...	Bulbs, &c., &c.
Studer, Major, U. S. Consul, Singapore,	...	Seeds of <i>Catalpa</i> , Indian Corn, &c.
Sutton & Co., London, per Messrs. John Little & Co., Singapore,	...	{ Flower and Vegetable Seeds.
Thwaites, Dr. C. M. G., Ceylon,	...	Seeds and Plants.
Veitch & Sons, Messrs. J., Chelsea, London,	...	Two consignments of Rare Plants.
Vidal, Señor Don S., Manila,	...	Orchids, &c.
Whampoa, The Hon. H. A. K., C.M.G., Singapore,	...	Plants and Seeds.
Wickam, Mr. H. W., Townsville,	...	Seeds, &c.

APPENDIX No. IV.

List of the principal Recipients of Plants and Seeds from the Botanical Gardens, during 1879.

Agri.-Horti. Society, Calcutta.	Kew, The Royal Gardens.
Beccari, Dr. O., Florence.	King, Dr., Calcutta.
Bernays, Mr. L. A. Brisbane.	Koek, Mr. E., Singapore.
Bowen Park Reserve Trustees.	Linden, Chevalier, Brussels.
Bull, Mr. W., Chelsea.	Longden, Lady, Ceylon.
Cantley, Mr. N., Mauritius.	Low, Mr. H., C.M.G., Pérak.
Festa, Chevalier, Singapore.	Maharajah of Johor, H. H. the, Singapore.
Fiji Government.	McNair, The Hon. Maj. J. F. A., C.M.G., Singapore.
Ford, Mr. C., Hongkong.	Murton, Mr. J., England.
Gilbert, Mr. R., Rangoon.	Murray, Captain, Sungei Ujong.
Glass, Mr. L. R., Singapore.	Read, The Hon'ble W. H., Singapore.
Godefroy-Lebeuf, M., Argenteuil, France.	Ross, Captain, Singapore.
Government House, Singapore.	Rowell, Dr. T. L., P.C.M.O., Singapore.
Hospital, General, Singapore.	Scheffer, Dr., Java.
Hospital, Tan Toek Seng's, Singapore.	Schomburgk, Dr., Adelaide.
Hardinge, Mr. J. Coles, Rangoon.	Shaw, Mr. H. T., Fiji.
Hill, Mr. W., Brisbane.	Spooner, Mr. E., Lahore.
Hose, The Ven. Archdeacon, Singapore.	Tampassak Experimental Garden, Borneo.
Jamie, Mr. R., Singapore.	Thwaites, Dr. C.M.G., Ceylon.
Jenman, Mr. G. S., Jamaica.	Vidal, Dr., Manila.
Kehding, Mr. F., for Botanical Gardens, Lyons.	Whampoa, The Hon. H. A. K., C.M.G., Singapore.

True Copy

STRAITS SETTLEMENTS.

Paper to be laid before the Legislative Council by Command
of His Excellency the Governor.

Annual Report on the Botanical and Zoological Gardens, Singapore, for 1881.

*The Superintendent of the Botanical and Zoological Gardens, Singapore,
to the Hon'ble the Colonial Secretary.*

[No. 5.]

BOTANICAL GARDENS,
Singapore, 30th January, 1882.

SIR,—As arranged, the Acting Superintendent has handed me a Report on operations carried out in the Botanical Gardens during the year 1881, and an abstract of the expenditure of the preceding year, to be forwarded to you for the information of His Excellency the Governor, and I have the honour to forward it herewith as received accordingly.

2. I have also the honour to forward at your suggestion, a short account of my doings while on leave of absence in England.

I have, &c.,

N. CANTLEY,
Superintendent.

Annual Report on the Botanical and Zoological Gardens, Singapore, for 1881.

1. During the past year the department has had to contend with a serious disadvantage by the unavoidable absence of the Superintendent, who was invalided home in the early part of March last. This is more particularly to be regretted, because previous to his arrival in November, 1880, the Gardens had, for some time, been worked single-handed. The initiatory changes, however, planned out by the Superintendent during his brief administration, have, as far as circumstances permitted, been carried out, and will subsequently be noticed under their respective heads.

2. The year under review has not been characterised by any extreme meteorological phenomena, with the exception of a few weeks' drought in the month of June, which, happily, was not of a sufficiently long duration to cause much harm to the health of planted out specimens. It, however, was the cause of some anxiety at the time, and increased labour was necessary in systematic and copious watering. With this exception, the amount of rainfall has been very evenly distributed.

3. The general neat appearance of the Gardens has been maintained in a very satisfactory manner, due, in a great measure, to the increased attention paid to the lawns and walks, the former requiring the constant attention of six men cutting grass.

4. As usual, the white ants continue to be destructive to the planted out specimens, several of the larger ones having fallen preys to their ravages, notably, three of the tall Norfolk Island Pine, "Araucaria excelsa."

which form such striking features in the Gardens, also a "Dammara robusta" and a fine "Jonesia (Saraca) asoca" having succumbed to their attacks. The line of "Araucaria Cunninghami" against Cluny Road, planted in 1877, begin to shew signs of having exhausted the prepared soil in which they were planted, by the premature decay of some of their branches, and straggly and weak growth; indeed, the soil being so wretchedly poor in all parts of the Gardens, it is almost hopeless to expect introduced trees to become really good specimens, and attain their natural dimensions.

5. The above does not apply to palms, which thrive remarkably well in various parts of the Gardens. The palm clump leading to the Band-stand shewing signs of crowding in the near future, it was resolved to thin out the palms, arranging them in their different genera, according to BENTHAM and HOOKER in the "Genera Plantarum;" as, however, the elaboration of Palmæ in the above-mentioned work was not completed, the arrangement was deferred, with the exception of some plants that were required for a clump at the front entrance, and also one near the monkey house. The fine clump of sago palms near the Nymphæ pond have, for some time, been shewing signs of flowering, the earliest of which the seeds are nearly ripe. These plants, with their bold foliage crowned with dense clusters of fruits, are most interesting.

6. *Flower Beds*.—During the early part of the year, these were entirely re-planted with plants differing in nature from those hitherto used; not only were the old plants rendered unsightly by the constant cutting of their flowers, but they had also grown too tall, thus obstructing one of the prettiest views in the Gardens. It was a matter of some difficulty to find sufficient variety in the few dwarf plants at disposal, but the beautiful deep colour of the small Crotons, the Coleus and Alternanthera, more than amply repaid for their frequent recurrence. The supply of flowers, which had hitherto been mainly supplied from these beds, is now met by the plants, planted for the purpose, close to the nursery.

7. *Lake*.—This has required the usual monthly clearings of weeds, &c., the work being greatly facilitated by the employment of a punt, which was made for the purpose of going about the lake to collect the floating masses of weeds, branches, &c. that collect together. Before the introduction of the punt, the pond was cleared by swimmers.

8. *Lily Pond*.—This also has been cleaned out on several occasions, and the Sacred Lotus, "Nelumbium speciosum," which occupies one end of it, kept in check. In this pond is grown the "Victoria regia," but, as pointed out by the Superintendent immediately on his arrival, unless it can be accommodated by a separate and special tank, it is hopeless to expect that it will ever increase from the diminutive size in which it is at present.

9. *Roads and Walks*.—These have been kept in good order during the year, a work which entailed the constant employment of five men repairing and weeding, where necessary. Two drives stand in need of re-mettaling—the one leading from the front entrance past the palm clumps, the other leading from the Band-stand to Garden Road. A welcome addition to the tools for trimming the edges of turf has been received in the shape of a patent "Lawn Edger," sent out on the recommendation of the Superintendent; this little machine performs its work admirably where the edges are in good order, but owing to the steep gradients of some of the walks, and the heavy rains washing the

sand against the sides, it cannot be used in all cases. Several of the smaller walks stand in need of side drains.

10. *Orchid and Plant House*.—During the past year, the orchids have all been re-potted in more suitable baskets made of galvanised wire, which have the advantage of being both neat and durable. It was with some diffidence at first that I used the galvanised wire, thinking it might have an injurious effect on the tender rootlets which are so abundantly developed in all the family; by experiment I found my fear groundless, and in consequence have had the remaining orchids put in similar baskets.

The remaining plants which are here arranged for effect, as in a conservatory at home, are, I regret to say, not happy in their situation, owing to the low flat roof which is covered with creepers; the superincumbent weight is causing the roof to give way in several places, and the wooden supports are also in a decayed state owing to white ants.

11. *Propagating Department*.—This important department has increased considerably since the inauguration of "sales of plants" by the Superintendent; although only one sale has taken place during the year, the work of propagation has been actively carried on, and a large quantity of plants is now available for sale. In addition to various economic plants, a great demand for our native India rubber plants has sprung up, upwards of 2,000 having been sent to Ceylon alone. Various plants have also been supplied to the Malay College, the Hospitals, new Criminal Prison, Dhoby Green, Government House, and also to Pêrak.

12. *Oranges*.—During the year, two large Wardian cases of selected oranges were received, containing varieties sent by the Director of the Botanic Gardens, Sydney, to His Excellency the Governor, who liberally distributed them between Singapore, Penang, and Pêrak.

13. *Economic Grounds*.—These grounds have occupied by far the greatest amount of time and attention during the past year. For some considerable time back, the question as to how these grounds could be arranged to accommodate the rapidly increasing plants of economic value and interest, has occupied considerable attention, and has resulted in a plan drawn up by the Superintendent before his departure for Europe, in which he proposed to extend the grounds considerably by cutting down jungle (secondary growth), and clearing the slope of one of the hills of Lalang, "*Imperata Kœnigii*," by which the grounds were bounded. In connection, it was also proposed to form an arboretum for our native timber trees; and also have a piece of ground for shewing the various fruits of the Settlements. It will hardly be necessary to say that this work is as yet incomplete, although during the year great progress has been made. The Lalang hill referred to has been dug over, and the roots picked out (a most tedious process); the ground was then levelled and laid down in grass; a walk has also been made parallel to it. A most interesting experiment was tried during the progress of the work, it was found necessary to move 200 Liberian Coffee trees which were just commencing to fruit; the operation being done carefully, only 5 or 6 of the trees died, which goes to prove that, with care, trees may be moved at almost any time, or in any condition. This ground, together with the remaining portion cleared, was subsequently turfed over; considerable difficulty was experienced in finding a sufficiency of turf, whose chief benefit is to prevent the surface soil from being washed away. The intending grouping, either botanically or commercially, such as arranging together in groups plants which produce oils, resins, gums, fibres, medicines, cordage, food, &c., &c., will be a great improvement.

14. *India Rubbers*.—The Central American “*Castilloa elastica*” and the Panama “*Hevea brasiliensis*” have baffled all attempts to strike by cuttings. It is the more remarkable that precisely the same manner and treatment was observed as practised so successfully at Kew. Out of six trials, only one of the first-named species struck; this piece was taken from the base of the trunk with a piece of the old bark. Cuttings being so unsuccessful, it was resolved not to retard the trees by further cutting, but by encouraging them to grow quickly, and look forward to the production of seed. The tallest “*Castilloa*” is now about 30 feet high, and measures 24 inches at the base; while the tallest “*Hevea*” is 25 feet high and 14 inches round the base.

15. *Ceara Scrap Rubber* “*Manihot Glaziovii*.”—The late Superintendent mentioned, in his Report for 1878, his belief that the climate of Singapore was too wet to be suitable for this rubber. Plants, however, raised from seed sent from Ceylon are growing well, the tallest being four feet high; the seeds germinated in August last.

16. *Gutta Percha*.—These plants grow exceedingly slowly, and are, moreover, unfortunately visited by some night flying insect which punctures the leaves, giving them the appearance of having been riddled with shot; all attempts to catch the insects have been unavailing.

17. *Cacao*.—In common with Ceylon and several other Colonial Botanical establishments, we have been supplied with some seedling varieties of the best kinds of the Cacao grown in Trinidad. A Wardian case containing 24 plants arrived here from Ceylon in March last; of these, 3 were dead and 4 doubtful; 12 have altogether died, leaving just half, which are growing well, and the time for their fruiting is anxiously awaited by the local planters.

18. *Liberian Coffee*.—Little has been done in the way of distribution, it being so thoroughly established. The few seeds we have had ripened have found ready customers.

19. *Ipecacuanha*.—These plants, which had hitherto been grown in partial shade under some trees in the economic grounds, were lifted and placed in pots, the change evidently being highly beneficial to them, for from the diminutive and starved appearance, they have developed into nice little shrubby plants. As most people complain of their slow growth, when planted in the ground, it might be found advantageous for planters to try them in pots; the cost could be considerably reduced by making the pots themselves.

20. *Forest Nursery*.—During the year a forest nursery has been formed in connection with the Botanical Gardens, which is intended ultimately to be the base of a series of similar nurseries throughout the Settlements. As, however, the question of Forest Administration is at present under consideration, it will only be necessary here to state that, since the formation of the present nursery, the work of collecting seeds and plants has been actively carried on, so much so that upwards of thirty thousand seedlings (chiefly timber trees) have been pricked off. Of these, about thirteen thousand are Teak (“*Tectona grandis*”), the seeds of which were received from the Conservator of Forests, Pegu Circle, British Burmah through the Hon'ble the Colonial Secretary, Straits Settlements. The seeds were immediately sown in narrow beds, and germinated to the extent of about ninety per cent. In order to enable them to be moved about, when ready for planting, to any part of the island, it was resolved to pot them; advantage was taken of the “*Planter's pot*,” which is simply

and easily made, securing to the plants several advantages. The composition of the pots is about three-fourths cow-shed manure, the remainder being clay, with just a sufficiency of rubble to make the compost binding, the whole being puddled to a consistency similar to that of brick-making clay; the mould is made of stout tin, about six inches in diameter and nine inches deep. About 10,000 pots were made, which were used for Teak. Bukit Timah being the place selected for planting the Teak, a band of twenty men were engaged clearing jungle, holing, &c. About 3,000 trees have already been put out. A small nursery has also been formed there for the reception of further consignments of Teak seeds.

21. *Military Reserve*.—Very few trees have been added to those planted last year; the undergrowth has been cut over, and the health of the trees is very satisfactory, the Mahogany and Dammar growing very freely.

22. *Labelling*.—This important feature has not been kept up so well as could be wished, owing to the small supply of printed labels which have been received. In our moist humid climate the letters become illegible in a few months' time; and I would suggest that, instead of being dependent on one of the convicts at the Criminal Prison, an intelligent Chinaman be appointed, who could reside and work on the place. Some such plan seems the only way to secure that much desired end—"a well labelled Garden."

23. *Buildings*.—These have been repaired where necessary, and three new coolie-houses erected, viz., a coolie-house at Bukit Timah, a Mandor's house, and a Carpenter's house and shed at the Gardens. A small bungalow, formerly occupied by the Manager of the Zoological Department, has been converted into a coolie-house; by these means all the men are located together, behind the propagating sheds and close to Cluny Road, thus preventing the necessity for their being in the Gardens at night. Undoubtedly this is a precaution against theft, for when the coolie-houses were scattered over the Gardens in three places, numbers of men were continually walking about, and if questioned had the ready answer, that they were going to see their friends.

24. *Interchange of Plants and Seeds*.—Our relations with foreign and Colonial Botanical establishments have been maintained, and some valuable additions have been made to the collections, notably those from Royal Gardens, Kew and Mauritius. Consignments have also been received from Calcutta, Ceylon, Hongkong, Jamaica, Trinidad, Demerara, Australia, Manila, Japan, &c. Valuable collections of seeds have been received, especially from Messrs. HAAGE and SCHMIDT, Erfurt, Germany; the Director, Botanic Gardens, Sydney; Mr. J. F. ROBERTS, Nurseryman, Kew, Melbourne; the Director, Public Gardens, Jamaica, &c. Plants and seeds have also been presented by the following gentlemen in the Colony:—

His Excellency the Governor, the Hon'ble the Colonial Secretary, the Hon'ble the Colonial Engineer, the Hon'ble the Colonial Treasurer, H. H. the Maharaja of Johor, Lieutenant RHODES, R.E., Captain ROSS, A. L. DONALDSON, Esquire, Dr. DENNYS and H. A. G. WHAMPOA, Esquire.

25. Sixteen Wardian cases have been despatched outwards, and about fifty packets of seeds distributed between the Botanical establishments mentioned above.

26. Among the more interesting and useful plants from Kew and elsewhere are the following:—

Landolphia Watsonii.	Clavija sp.
Do. Petersiana.	Oxalis cupleurifolius.
Cola acuminata	Cupania mimosæfolia.
Chrysobalanus Icaco, white and purple fruited.	Pleuropetalum Costa Ricense.
Galactodendron utile.	Landolphia Kirkii.
Smilax sp. Caracas	Diospyros discolor.
Bertholletia excelsa.	Holmskioldia sanguinea.
Artanthe elongata.	Lecythis minor.
Nectandra Rodiceii.	Magnolia fuscata.
Zingiber sp.	Tecoma leucoxylon.

and many others too numerous to mention.

27. *Library.*—The following new works have been received during the year:—“Flora Australensis,” 7 vols.; “Flora Trop. Africa,” 3 vols.; “Flora of Mauritius and Seychelles;” “Flora West Indian Islands;” “Select Plants for Tropical Countries.”

28. The Periodicals have also been increased by the “Tropical Agriculturist,” published in Ceylon. Through the courtesy of the Superintendent of the Forest Branch, Home, Revenue and Agricultural Department, Calcutta, we have received the various Forest Reports of the different Provinces of India, which are most valuable for reference.

29. *Zoological Department.*—The following gentlemen have contributed the undermentioned birds:—W. A. BERGHUINS VAN WOORTMAN, Esquire, two Victoria crowned pigeons from New Guinea and also one Sambur deer; Captain PAYNE, two adjutants; C. DUNLOP, Esquire, one large adjutant. I regret to report the theft, in April last, of one of the large white swans from off the lake.

30. An abstract of Revenue and Expenditure for the year is appended, also one for the preceding year.

WALTER FOX,
Acting Superintendent.

Abstract of Revenue and Expenditure of the Botanical and Zoological Gardens, Singapore, for the year 1881.

REVENUE.		EXPENDITURE.	
	\$ c.		\$ c.
By Government Grant,	10,000 00	Superintendent's Salary (9 months on sick leave),	1,353 00
Sales of Plants,	313 77	Acting Assistant Superintendent (9 months Acting Supt.),	1,403 87
Do. Flowers,	40 95	Bill Collector,	179 75
Balance in hand, 1st January,	2,263 22	Road Mandor,	169 91
		Coolie-hire (general purposes),	2,748 17
		Do. (special do.),	1,195 99
		Cartage, Manure, &c.,	219 05
		Birds' Food,	185 75
		Laterite...	156 25
		Office Contingencies & Transport,	457 13
		Miscellaneous.	1,651 21
	<u>\$12,617 94</u>		<u>\$9,720 08</u>

WALTER FOX,
Acting Superintendent.

Abstract of Revenue and Expenditure, for the year 1880.

EXPENDITURE.

				SALARIES.	
				\$	c.
Superintendent,	...	...	...	865	66
Assistant Superintendent,	...	...	...	}	1,140 00
Acting do.,	...	...	...
Bill Collector,	...	...	...	180	00
Road Mandor,	...	...	...	180	00
Garden Labourers,	...	...	...	2,840	45
Extra do.,	...	...	...	561	68

OTHER ITEMS.

Manure and Cartage,	...	...	...	416	95
Laterite,	...	...	...	483	00
New Buildings,	...	...	...	255	00
Repairs to Buildings,	...	...	...	57	10
Food for Animals,	...	...	...	218	52
Purchase of Plants,	...	...	...	16	10
Do. Garden Tools,	...	...	...	314	69

CONTINGENT EXPENDITURE.

Travelling Expenses of Superintendent, &c.,	...	...	...	71	25
Do. Assistant Superintendent,	...	...	...	136	15
Do. Bill Collector,	...	...	...	37	02
Repairs to Garden Tools,	...	...	...	65	58
Purchase of Stationery and Sundries,	...	...	...	35	50
Do. Books,	...	...	...	123	77
Miscellaneous,	...	...	...	1,160	49
				<u>\$9,158 91</u>	

REVENUE.

GOVERNMENT GRANT FOR THE YEAR:—					
Botanical,	...	...	...	\$8,000	00
Zoological,	...	...	...	2,000	00
Other Receipts,	...	...	...	1,191	41
				<u>Total, \$11,191 41</u>	
				Expenditure, 9,158 91	
				<u>Balance, \$2,032 50</u>	

WALTER FOX,
Acting Superintendent.

Report by Mr. Cantley on a short Visit to England in 1881.

1. Having obtained six months' leave of absence, I proceeded to England direct *viâ* the Cape of Good Hope and took with me for identification about two thousand Botanical specimens, collected from trees in the Botanical Gardens and jungles in the neighbourhood, which being packed and sent on board in a green state, afforded me constant employment in pressing and drying for a considerable part of the voyage.

2. This, however, was scarcely completed, when a storm, met with at the Cape of Good Hope, caused the destruction of about five hundred of them.

3. On arriving in England, I was readily granted permission by Sir J. D. HOOKER to compare what specimens remained with those in the Kew Herbarium, a work which occupied me some considerable time.

4. While thus engaged in the Herbarium, I received from the Hon'ble Major J. F. A. McNAIR, R.A., C.M.G., Lieutenant-Governor of Penang, and HUGH LOW, Esquire, C.M.G., H. B. M.'s Resident in Pêrak, several consignments of dried Botanical specimens of the forest trees of those countries, and to which I drew their special attention before leaving Singapore, but unfortunately all of those sent could not be botanically identified.

5. Among those determined, however, were many of great interest, such as Gutta-producers, &c., and notoriously so among those specimens collected from trees in the jungle in the Botanical Gardens, Singapore, which seem to have remained unrecognised since the formation of the Gardens: their identification has, however, greatly added to the Garden Catalogue published in 1880.

6. Of the above, two proved entirely new to science—one of these, a *Dracæna* with ornamental foliage and of some commercial value, is being propagated with the intention of introducing it into England.

7. Having finished with the above, I set about an inspection of the Herbarium itself, and noted carefully its construction and general working, together with the excellent Library attached.

8. This examination led to my recommending the establishing of an Herbarium and Library, on the same principle, but smaller scale, in connection with the Gardens here, and I rejoice to think the Government has so far approved of the plan as to have the work already in hand.

9. It is proposed to confine the Herbarium thus commenced to the local flora or plants of the Peninsula and adjacent Islands. The Garden flora will also form a part of its contents, but in a separate arrangement.

10. This latter will include all plants at present growing in the Botanical Gardens, and introductions from time to time, and will thereby maintain a distinct line of demarcation between introduced and indigenous species, and be particularly useful for reference when labels get misplaced or lost.

11. An Herbarium being chiefly for reference, a written description of its contents should always be at hand, and when this description is scattered over many books, the establishment of a suitable Library becomes a necessity, but it is not always easy to hit upon the precise works which are likely to prove most useful, I therefore asked the aid of Sir J. D. HOOKER to assist me in making a suitable selection to recommend, to which he readily consented. The selection made has been submitted, and its purchase approved of.

12. With the provision thus made, unnamed timber trees and plants of the peninsula generally will soon be a thing of the past, and the garden, it is hoped, will become what it is now called, but what it has never been, namely, a "Botanical Garden," and one capable of dealing with the flora of the peninsula in a scientific and practical manner.

13. Sir J. D. HOOKER having kindly relieved me of the work mentioned, I lost no time, previously obtaining the sanction of the Director, in setting about making a selection from the Kew green-houses of such economic and other plants which I considered would be of use in Singapore.

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14. The selection made number two hundred and sixty in all, chiefly economics, and includes many American and West African species difficult, if not impossible, to obtain otherwise at Singapore.

15. This work took some time, as I had to go over the houses one by one, and consider the likely merits of each plant as I went on.

16. Plants of a rare, and chiefly ornamental nature, which are not kept in stock at Kew for exchange, I chose from the nurseries of Messrs. BULL & VEITCH, where I found many of a very ornamental and interesting character well worth securing, and the purchase of which has been already approved of by Government.

17. Before quitting the Gardens at Kew, I had the pleasure of looking over the fine Economic Museums which have greatly helped to raise the Gardens to their present fame, and which are universally acknowledged to be the finest of the kind in the world. To these I gave special attention, going over the cabinets in detail.

18. The inspection of these occupied me nearly two months, and to one who took less interest in the science of which these Museums are intended to illustrate the practical application might well think it a rather tedious process, but I felt the opportunity might not soon again present itself.

19. The collections in these Museums are really grand, and I confess I learned a great deal during the time I spent in them, but in this direction I had the advantage over most visitors in having the ready explanation and advice of the obliging Curator, Mr. JACKSON, A. L. S., at command, and with whom I went fully into the construction of the cabinets, the methods of mounting, curing, preserving, distilling, and setting up specimens, and the general working of the place.

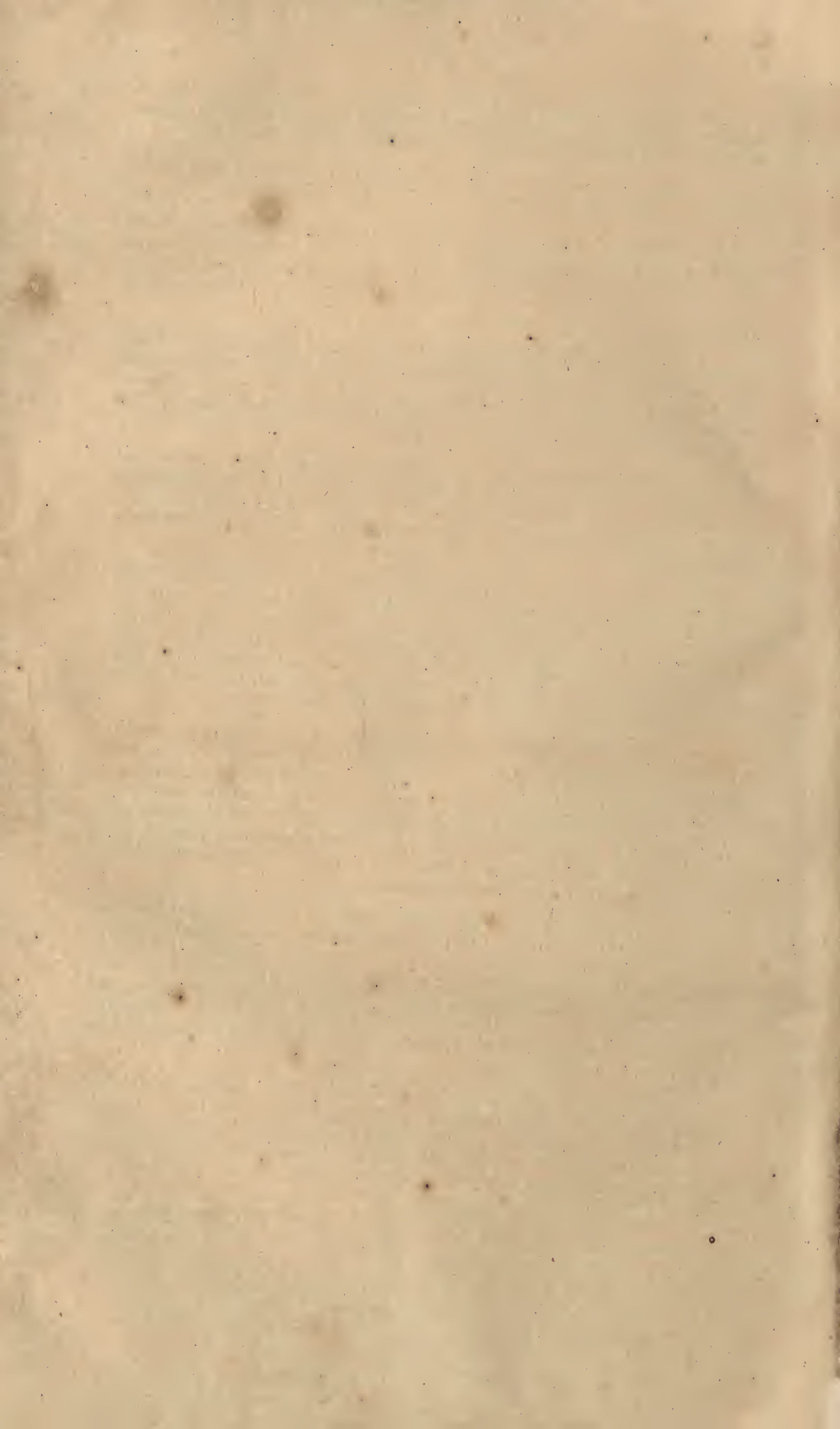
20. When in charge in the Mauritius, the Government readily granted, on my representation, a suitable building for a Museum of such botanical objects as cannot be preserved in an Herbarium, such as large fleshy fruits and many other objects too numerous to mention, and I hope the time is not far distant when the Botanical Gardens of Singapore will also possess a Museum of this kind, without which they must remain shorn of a great and important part of their utility; but this subject will be better treated in a separate document.

21. Having left Kew, the British Museum and Zoological Gardens next claimed my attention. In the former I was able to obtain the names of the birds in the Garden Aviaries here, and in the latter I learned something in the construction of aviaries and their protection from rats and vermin, I was surprised to find, however, that the mortality among the birds there is nearly, if not quite, as great as at Singapore, especially among the pheasants, which appear difficult to keep in a confined state anywhere.

22. I need hardly allude here to the selection of tools I made choice of for the Gardens while in England, although their use are likely to prove highly economical when compared with those previously in use, this is especially the case as regards Adie's Patent Lawn Edger, which has completely revolutionised this part of the work since its introduction.

N. CANTLEY,

Superintendent.



Annual Report on the Botanic Gardens, Singapore, for the year 1882.

[No. 100.]

SIR,—I have the honour to forward herewith my Report on operations carried out in the Botanic Gardens during the year 1882.

I have, &c.,

N. CANTLEY,
Superintendent.

R E P O R T .

This being my first Report on the Botanic Gardens, Singapore, I would beg to preface the details of work accomplished during the year by a few general remarks which will lead to a clearer understanding of what has been done.

2.—On assuming charge of the Gardens, in November, 1880, I set about a careful enquiry into all the circumstances and details affecting them. Their contents, their inward organization, capabilities and scope, with reference to public utility—a task which my just previously having relinquished charge of a Botanic Garden in full working order rendered comparatively easy.

3.—After due consideration, I recommended to the Committee the following, which being approved, has since been my aim and object to effect and which I hope will lay a foundation for general usefulness not hitherto laid, viz. :—

- 1st. The formation of a suitable Nursery for the propagation of trees and shrubs.
- 2nd.—The formation of a Nursery for the propagation of ornamental foliage plants, and delicate plants generally, under shade.
- 3rd.—The construction of a suitable Plant-house in a convenient part of the Garden for the general collection of pot plants of every description.
- 4th.—The erection of a suitable Office for the general clerical work of the Gardens and for the accommodation of the Gardens books, in a position convenient to visitors, &c.
- 5th.—The erection of an Herbarium, or Hortus Siccus, to contain a general dried named collection of plants arranged in their natural families for reference.

- 6th.—The formation of a Library of useful books on Horticultural and Botanical subjects.
- 7th.—The erection of a Store-house for the accommodation of the Garden Tools and general Stores.
- 8th.—The sale of plants from the Gardens to the public at nominal rates, or such as will cover cost of propagation.
- 9th.—The establishment in the grounds of a named collection of Herbaceous plants and trees arranged in their natural orders for the purpose of instruction.
- 10th.—The naming and better arrangement of trees and shrubs on the lawns.
- 11th.—The revision and alteration of the Garden Bye-Laws and Regulations.
- 12th.—The establishment of day and night Police for protection, and the location of the Constables within the Gardens.
- 13th.—A complete revision of the working staff, and the appointment of additional Officers of the lower grade.
- 14th.—The completion of the Economic Garden commenced by the late Mr. MURTON, but on a modified plan.
- 15th.—The location of the Garden Coolie-houses in a certain secluded position in the back grounds, and the removal of the Coolie-sheds scattered over the Gardens.
- 16th.—The institution of a proper system of book-keeping and office work generally.
- 17th.—Also the following:—The appointment of a Clerk for assistance in the Office; a Chief Mandore able to write and read; a Propagator with the same accomplishments; a Mason, a Printer, a Carpenter, and a Plant Collector to assist in the general work of the Gardens.

4.—I will now detail how far I have been able to carry out the above during 1882, and as attention has been mainly directed to these, I need hardly observe that the work of the year has been chiefly of a departmental nature.

5.—**Visitors.**—The number of Visitors to the Gardens during the year cannot be correctly stated, but they have been very numerous, the Gardens being very popular and a favourite place of resort.

6.—**Buildings.**—The permanent buildings connected with the department are in good order.

NEW INSTITUTIONS.

7.—**Erection of an Office and Herbarium.**—A new Office and Herbarium have been erected at a cost of \$1,500. The Office has been fitted up with desks, tables, and book-cases and the walls hung with useful maps and time-tables. On the principal table is fixed a large map of the Island on rollers, which is found very useful for reference.

8.—More urgent work has prevented money being spent on Herbarium fittings further than the purchase of four small cabinets after the Kew pattern, which have been sufficient to accommodate the specimens collected during the year. The paper for the mounted specimens and

cabinet shelves is the same size as that of the Kew Herbarium, which admits of exchanges being made without inconvenience. The internal areas of these new structures are as follows:—Herbarium, 650 square feet; Office, 300 square feet; Drying-room, 200 square feet.

9.—**Construction of Propagation Plant-House.**—A space of 1,500 square yards has been levelled on the edge of the jungle on the North side of the Garden. The ground having previously a gentle slope, about 500 cubic yards of soil had to be excavated in the levelling. Over this ground three lines of staging, each 183 feet long by 10 feet broad, have been put down. Between the rows of staging, paths six feet in width have been made and metalled with laterite. On each side of the staging a table has been placed. These tables are about 160 feet long by 9 feet broad.

10.—The stage supports in this house are composed of masonry over which planks of Singapore Cedar have been laid for the accommodation of the pot plants. Along the centre of each line of staging, trees have been planted 20 feet apart for the purpose of shade, which does away with the necessity of a roof and consequently saves expenditure on roofing.

11.—The area of the house is sufficient to accommodate from 4,000 to 8,000 plants in pots according to size. Such of the old collection of pot plants as were considered advisable to retain have been deposited in this house, where the additional light and air have very much revived them. These, however, were only sufficient to fill but a small proportion of the house, which has been completely stocked, during the year by the aid of propagation, introduction of new plants, &c.

12.—In the construction of this house, and that of all other works of the year, permanency and the suppression of up-keep expenses have been kept in sight, as far as possible, with which view parts of the staging and all the tables have been cut out of the soil and bricked over, thus giving the work a solidity and permanency which reduces up-keep expenses to a minimum.

13.—When finished, the house was enclosed by 230 yards of unclimbable iron fencing selected by the Hon'ble Captain H. E. McCallum, R.E., and obtained from England.

14.—**Construction of an Exhibition House.**—The Committee having decided that accommodation for the annual Flower Show should be provided within the Gardens, I drew up a plan of a house, and the work was proceeded with on a spot selected near the aviaries, where paths and staging have been cut out in the soil (sunk work).

The staging thus formed has been bricked over with flooring tiles laid in cement, and everything in the shape of wood-work done away with.

15.—The area of this house is 4,200 square yards. In its formation, about 6,000 cubic yards of soil had to be excavated. It contains 4 large triangular blocks of staging; one round centre piece, 4 tables, and 3 lines of staging round the outside path.

16.—The breadth of the paths separating the stage work is 6 feet, and of these the house contains 300 yards. The whole work, as far as completed within the year, costs \$617.

17.—It is intended to fill this house with the more choice, interesting specimens of pot and basket plants. Where they will remain all the year round except on the days required for the general exhibition.

18.—This house, together with that previously mentioned, gives the Gardens an immense additional accommodation for plants, which, if properly taken advantage of, cannot fail to raise them to a position of great public utility, the want of accommodation and system being heretofore the chief impediments to progress.

19.—**General Store-house.**—A Tool Store and general Store-house has been procured by arrangements which admitted of the Garden Mandore's quarters being converted into a store-room and the Mandore quartered elsewhere.

20.—**Formation of a Nursery for Ornamental Foliage and Delicate Plants generally.**—The utility of the Gardens has been much enhanced by the creation of a Nursery for the propagation of fancy and delicate plants. Such plants were, up to the date of my arrival, propagated only to a limited extent, chiefly in wine cases and pots.

21.—The Nursery created for their propagation adjoins the plant-house first mentioned, is about an acre in extent, and was formerly under jungle.

22.—In the formation of this Nursery, care was taken to open out the leaf canopy of the jungle so as to admit the requisite amount of light without admitting the direct deteriorating rays of the sun. Paths have been made through the ground, and beds formed edged with moss. In these beds plants of all the more delicate kinds have been propagated throughout the year with great success, and the Nursery being of a kind new to the Gardens has been much admired by visitors.

23.—In this Nursery plants are found to take root in nearly half the time required in the more open ground, and even Crotons and the more hardy plants follow the same rule.

24.—About 10,000 plants have been reared during the year in this Nursery alone and disposed of in various ways, see para. 75.

25.—**Forest Tree Nursery.**—During the year, the Forest Tree Nursery has been extended over the greater portion of the marshy land lying below the Nursery formed last year, which being composed for the most part of vegetable matter washed down from the surrounding hill slopes has proved better suited to the growth of seeds and plants than the land previously cleared.

26.—The number of trees raised and sent out from this Nursery is given at para. 74.

27.—**Formation of a Reserve for Cut Flowers.**—A flower reserve has been created at the extreme west corner of the Gardens. The area of this reserve is about 3 acres, and has been planted with about 3,000 selected flowering shrubs. The reserve has been found useful in meeting the demand for cut flowers, and preventing the flower beds on the lawns being denuded.

28.—Propagation in the houses has almost ceased, owing to the better accommodation for such work elsewhere, except in the case of a few particularly delicate plants, for which a wooden frame covered with glass has been made by the Garden Carpenter. This frame has three large moveable glass sashes and covers a space of about 110 square feet and has been found very useful during the year in dealing with the class of plants just named.

OFFICE!

29.—**Garden Bye-Laws and Regulations.**—The Garden Bye-Laws and Regulations have been, at my request, entirely revised and made sufficiently flexible to cover all the altered circumstances and conditions under which the Gardens are being now worked.

30.—**Prosecutions under the new Bye-Laws.**—There have been three prosecutions during the year, one for theft and two for cutting and destroying plants. In each case the parties were convicted.

31.—**Protective Staff.**—A great improvement has been effected in the efficiency of the protective staff by the quartering of three special Police Constables within the Gardens, instead of their having to walk all the way from the Orchard Road Police Station and arriving at the Gardens late in the evening for night duty, the Garden being unprotected during the day.

32.—These three Constables, being now quartered on the spot, take each 4 hours on duty day and night, thus admitting of one man being constantly on guard. Since the inauguration of this system, the Gardens have been but little disturbed by depredators.

33.—**Office Work.**—A better system of office work has been instituted. To the three books formerly in use (Expenditure and Wardian Case Books) the following have been added :—

1. Garden Ledger.
2. Cash-Book.
3. Subsidiary Cash-Book.
4. Day Book
5. Home Correspondence Book.
6. Foreign " "
7. Store Book.
8. Propagation or Stock Book ; and several minor accessories.

34.—The three books found in use were kept without any system, but have now been reduced to a practicable form which has both shortened and simplified the work.

35.—The Committee have been good enough to sanction the services of a Clerk to assist in the office work and make himself generally useful in the Herbarium. Also a Chief Mandore, Propagator, Printer, Carpenter, Plant Collector and Mason—all of whom have worked well during the year.

36.—**Printer's Work.**—The Printer was quite ignorant of his duties when he joined the Gardens, but observing he took an interest in the work, I persevered in my instructions, and he now prints in a very creditable manner and has gone over most of the labels of the collection.

37.—**Carpenter's Work.**—The Carpenter has been fully occupied during the year in the construction of plant cases, labels, and the fitting up of the staging in the new plant house, in which work he was assisted by an additional carpenter for some time.

38.—**Mason's Work.**—The Mason has been occupied in the construction of the masonry in the new plant houses.

39.—**Collector's Work.**—The Plant Collector has brought in some hundreds of herbarium specimens from the jungles, but has taken some considerable time to learn how to dry them properly, but having at last got his hand-in, he now performs his work very satisfactorily.

40.—**Library.**—The Garden Library is contained in one large case with glass doors which I had constructed for the purpose at a cost of \$35, and has been placed for the present in the Garden Office. For list of books added during the year, see Appendix B.

41.—**Sale of Plants, &c., from the Gardens.**—The opening of sale of plants from the Garden at nominal rates is much appreciated by the public, who have largely availed themselves of the privilege. For the number of plants sold during the year, see para. 75 and for receipts of sales, see Appendix A.

IMPROVEMENTS IN THE GROUNDS.

42.—**Clearing and Levelling.**—The chief improvements to the grounds during the year have been the clearing away of the old plant house erected in the centre of the Garden, a Coolie-house, and another old building from same quarter which had been condemned as unfit for use as well as occupying a very objectionable position.

43.—These being removed the sites were found very uneven and had to be cut down and remodelled over a space of 9,000 square yards. The whole of which being got into the necessary shape of slope and terrace was turfed over with grass, a work which occupied the majority of the effective staff for several months.

44.—This work has removed one of the most objectionable features of the Gardens, and opened up to view at the same time some fine clumps of Mascarine palms and other objects of interest previously hidden; while the addition made to the grass lawn has been an extensive one and affords room for the formation of a Rosary which has been made during the present year.

45.—**West Entrance.**—The corner shrubbery at West Entrance which always presented an unsightly spectacle was taken in hand about the middle of the year, a grass verge laid down in front, behind which the soil was raised about 1 foot over a superficies of 50 square yards and mostly planted with ferns—plants which the heavy shade afforded by the surrounding trees made particularly suitable. The ferns have grown well and the corner from being one of the most unsightly has now reverted to the opposite extreme.

46.—**Improvements to Lawn North of North Boundary Walk.**—The lawn north of North Boundary Walk which passes the aviary has been slightly raised over its whole surface, and closely turfed over. The area of the ground thus covered is about 400 square yards, and extends the whole length of the walk.

47.—**New Shrubberies.**—Behind this lawn a shrubbery border has been made to form a back ground and line the edge of the jungle passing between the lawn and plant houses. This shrubbery has been planted with a variety of introduced trees and shrubs.

48.—**Planting out of Specimen Plants.**—On the removal of the collection of foliage plants from the old plant house, advantage was taken to plant out one specimen of each kind of Croton contained in the collection. These form a line on each side of the terrace walk near the Bandstand, and have been labelled with printed slate labels. The plants have taken away the bare unfurnished appearance which this walk previously presented, and their bright coloured leaves make a pleasing contrast with the heavy dark green of their surroundings.

49.—Many other trees which the late Superintendent reported were being “starved in pots for want of some safe place to plant them” have been planted out in the shrubberies and lawns—a course which has been rendered safe by the present system of protection.

50.—The progress made by the majority of these trees has been very great, some of them having already attained a height of over 15 feet.

51.—**Flower Beds.**—The extension of floral ornamentation which the Gardens so much required, has received careful attention, and a general system of flower beds has been planned. These commence at the old croquet lawn in front of the aviaries and extend along the Terrace immediately below the Bandstand as far as the West Entrance, but as more urgent work had to be first undertaken, little more than a commencement could be effected before the close of the year; this consisted in laying down a neat design on the old croquet lawn just mentioned. The carpet bedding which has been so much admired is the work of 1883, and does not, therefore, fall to the share of this Report.

52.—**Ornamental Lakes.**—The ornamental lakes have several times been cleared of weeds during the year, and otherwise maintained in good order. The small lake has been given up entirely to the Nymphæas and smaller Water Lilies; and the Victoria Regia Lily has been accommodated in a special lake where it has grown and flowered very freely.

53.—**Labelling.**—The Garden collection has been labelled nearly throughout during the year with large labels carrying white letters on a black ground. The printing has been done chiefly by the Garden Printer.

54.—**Bandstand.**—In no part of the Garden perhaps, are improvements more noticeable than on and in vicinity of the Bandstand, which occupies the top of a hill in the centre of the Garden and from which the grounds fall in a series of terraces and gentle slopes till the main lawn adjoining the ornamental lake is reached. These terraces as well as the ground plan of the Gardens are the work of the late Mr. NIVEN and do much credit to his horticultural skill.

55.—Improvements to the Bandstand and surroundings was a desire early expressed to me by the Gardens Committee, and I commenced the work by removing some large Crotons and other plants which had been placed on the stand in tubs, most of which had fallen into a dilapidated condition. A suitable place for these being found on the opposite side of the broad walk which surrounds the stand, they were replaced by handsome vases ordered from China, these have been filled with plants of an ornamental and suitable description.

56.—Between the vases at suitable distance young Auricarias and Crotons have been planted, which being in keeping with the size and nature of their surroundings have presented a pleasing and graceful appearance.

57.—The flower-beds which the stand previously possessed have been considerably modified and planted with interesting flowering plants received from abroad.

58.—These improvements being completed, garden seats of an ornamental and comfortable nature were placed on the stand. These

seats were specially selected for the Garden by me when on leave of absence in England and are after the pattern in use in Battersea Park, London.

59.—**Aviaries.**—The Aviaries have been painted during the year to preserve the wood and iron work, and in each cage a square of grass of about 18 square feet has been planted, which the birds seem to much enjoy. Several birds have been killed during the year by snakes, especially by *Python reticulatum*. For the names of birds added to the collection during the year, see Appendix B.

60.—**Grass Lawns and Hedges.**—The grass lawns have been kept closely mown during the year and the boundary bamboo hedges neatly cut.

61.—A logwood hedge has been raised from seed sown along 100 yards of west boundary which until now has remained unprotected. Logwood when raised from seed closely sown makes an excellent hedge, compact and prickly, and in every way superior to the bamboo hedge so much in use for defensive purposes in Singapore.

62.—Several trees which had become ant-eaten and dangerous have been removed from the lawns and replaced by others of an ornamental nature.

63.—**Walk leading to Aviary.**—A great deal of hard work has been got through during the year in improving the condition of the walks and roads. The 10-foot broad walk which bounds the Garden on the north side has been raised about one foot over its whole surface for a length of about 127 yards and closely metalled with laterite. A large tree—*Castanopsis* sp.—which occupied its centre opposite the west entrance has been removed and thus some fine plants of *Caryota Wallichii* have been brought into view which were formerly hidden behind this worthless tree.

64.—This walk was previously impassable in wet weather; its low situation brought down upon it mud and other debris from the adjoining grass slopes and having no side drainage it soon got into a puddle. In its new formation a catchment drain has been put down to carry off surface water. Its direction, too, with respect to curve, had to be much altered for the sake of ornamental effect, and in this alteration the adjoining grass banks had to be brought forward, which necessitated a good deal of labour.

65.—**West Entrance Walk.**—The 24 feet broad West Entrance Walk which the heavy rains had washed out of shape has been remodelled, and the sides laid down with rough laterite over a distance of 150 yards.

66.—**Walk by Lake.**—The 8 feet walk which runs by the ornamental lake to where the old plant house stood has been raised about 6 inches over its whole surface for a length of about 150 yards and covered with fine laterite.

67.—The other principal Walks and Roads have been extensively repaired. Such patchwork may be estimated at about 400 square yards, and the whole work accomplished at about 16,000 square yards.

68.—**Vegetable Garden.**—An experimental Vegetable Garden was opened during the year on Bukit Timah, but funds becoming exhausted shortly after its commencement, operations were suspended in consequence.

69.—During the present year, another Vegetable Nursery has been opened on Crown land near the Botanic Gardens, and is now in working order.

Details of results will be given in next year's Report.

INTRODUCTION AND PROPAGATION OF PLANTS.

70.—**Exchange of Plants and Seeds.**—The exchange of plants and seeds with Botanic Gardens and other Establishments abroad has been well attended to, as will be seen from the list of contributors and introductions in Appendix C, the more important plants being marked with an asterisk. The plants received number 310, and packets of seeds 450.

71.—**Number of Plants and quantity of Seeds sent abroad.**—The number of plants sent abroad during the year number 1,160, in 28 Wardian cases, and the number of packets of seeds 560, weighing approximately 82 lbs. For list of Recipients, see Appendix C.

72.—**Plants brought in from the Jungles.**—The number of plants brought in from the various forests and jungles of the Settlements, and chiefly collected by myself while travelling on forest duty, may be roughly estimated at 2,000.

73.—**Plants purchased.**—The plants purchased in the Colony during the year include Ferns, Orchids, Chrysanthemums, Begonias, Dahlias, Geraniums, Anthuriums, Eucharis, Selaginellas, &c., &c., &c. Purchases made in England include many plants of Economic value, and useful plants generally, see Appendices.

74.—**Number of Plants propagated in the Garden Nurseries.**—The number of plants propagated during the year in the various Nurseries of the department may be roughly estimated as under:—

Forest Tree Nursery, forest trees,	...	...	30,000
General Nursery, various kinds,	...	...	18,000
Fancy Plant Nursery, do. do.,	...	...	10,000
Plant Houses, do. do.,	...	...	2,260
		Total,	60,260

75.—These have been disposed of as follows:—

Sold to the Public, assorted kinds,	...	...	2,000
Planted in Forests, forest trees,	...	...	20,000
Supplied to Government Institutions, various kinds,	...	...	7,000
Given in exchange (Colonial),	...	...	100
Sent abroad in exchange, assorted kinds,	...	...	1,160
Used in ornamenting the Gardens, flowering kinds chiefly,	...	...	5,000
Retained as Nursery Stock, various,	...	...	20,000
Retained as Stock for new plant houses, ornamental and economic plants,	...	...	5,000
		Total,	60,260

76.—There has been one Auction sale during the year, when about 800 surplus plants were sent into the Town of Singapore and sold to the highest bidder. The sale realised \$163.00 which left the Gardens a sufficient margin of profit to cover propagation and other expenses.

77.—**Economic Plants.**—The chief economic plants which call for a brief reference are the following:—

The new varieties of Cacao received from the West Indies have grown well, and are now bushes of about 3 feet in height with large crowns. They have been pruned during the year and everything to encourage rapid growth has been attended to.

78.—Plants of the old varieties have been raised from seed and are in demand among planters in Singapore and Johor, where large plantations have been made, and where, under proper treatment, the plant thrives well and gives good returns to the cultivators.

79.—**Liberian Coffee.**—Seed of Liberian Coffee has been much in demand during the year, and the Garden has disposed of the whole crop.

80.—The plant thrives admirably on some of the adjoining islands and in many places on the mainland.

81.—Some planters advocate shade for this plant, but I have not heard of its having proved beneficial in the wide sense of the term. My experience goes to prove that the plant is better without shade, which only seems to retard the ripening of the fruit, and planting at too high elevation has the same effect.

82.—**Arabian Coffee.**—The planting of Arabian Coffee has almost ceased except at high elevation in the Native States, where at about 3,000 feet it thrives well and is remarkably free from the Hemileia or leaf-disease.

83.—**Maragopie Coffee.**—While I write I have before me seed of a new Coffee from Brazil (Maragopie Coffee) upon the qualities of which I am informed the Brazilian Minister has very favourably reported, the plant being now largely cultivated in that country.

84.—From a drawing of leaf forwarded me, it would seem about the size of the Liberian variety. The cherries, however, are not so large. This coffee will form the subject of future experiment and report.

85.—**Café Nain.**—Café Nain is an exceedingly dwarf and very prolific variety of Coffee from the island of Réunion where it is believed to be a hybrid raised by a Mr. NAIN. The cherries are much less in size than those of *Coffea Arabica*, but are produced in greater abundance. The plant is largely grown in Mauritius, where its qualities are held in high repute.

86.—Seeds of this variety were received during the year, but did not germinate. A further supply has been requested.

87.—**Tea.**—Tea was for some time largely planted on Gunong Pulai hill on the Johor side, and the quality of the produce equalled the best Siam production, but the plant was found to yield leaves in too limited quantity to sufficiently remunerate planters.

88.—**Paraguan Tea.**—The plants of Paraguan Tea planted in the Gardens some three years ago continue to grow well. This plant does not belong to the Tea family, but is a Holly (*Ilex*). The plant is largely cultivated in Paragua for the Tea produced from the leaves. Dr. BYASSON states that the prepared leaves contain as much coffeine as the best Chinese tea, and is used in Brazil by about 12,000,000 people, the annual consumption being about 8,000,000 lbs.

89.—**Pepper.**—Pepper plants, especially Cubebs, have been much in demand during the year. Several cases of *Piper nigrum* have been sent to Ceylon at the request of the Director of the Gardens there, the Singapore variety being considered the best.

90.—**Cardamums.**—Requests for supply of Cardamums have been received from home planters and others in the Colonies, but our stock being very low, we were unable to fully meet the demand.

91.—**Nutmegs and Cloves.**—Spice trees, Nutmegs and Cloves especially, have been much in request during the year and have been largely supplied. The inhabitants of Penang have taken to planting these trees extensively, the plantations made look well and people are in hopes of the Island regaining its former position among the spice producing islands of the world. The other Settlements would do well to try a similar experiment, see para. 54 of Report on Forests where the cause of the nutmeg failure in years past is discussed.

92.—**Cinchona.**—Orders for Cinchona plants and seed have been received, but the temperature at the Gardens here being much too high for the cultivation of the plant it is not kept in stock, but this will be remedied as soon as the new Garden in Penang is opened, where an elevation of over 2,550 feet can be had, and where many useful plants not now in our collection can be grown and acclimatised for cultivation on the lower plains.

93.—**Cinnamon and Allspice.**—Cinnamon and Allspice grow admirably in the Gardens, but are not much in demand.

94.—**Cassia Bark.**—During the year, a Wardian case of plants said to be the true Cassia Bark of commerce (*Cassia lignea*) was received from the Botanic Gardens, Hongkong, accompanied by an able report on the cultivation and propagation of the plants.

95.—These plants have been planted out, have grown well, and may ultimately add to the commercial products of the Settlements.

96.—**Bread-nut Tree.**—Plants of the tree which produces the Bread-nut of Jamaica have been planted out in soil of average quality, in which they have made admirable growth and shew every sign of becoming acclimatised in the Colony.

97.—**Other Fruit Trees.**—Among other fruit trees introduced during the year have been the Mauritius variety of Mangoes which are supposed to be the best procurable; the Madagascar Grape; the Litchi of China; Queensland Nut; Star Apple; Mabola fruit; Chinese Apricot and Oranges in variety.

98.—**Sago.**—The large Sago trees (*Sagus Rumphii*) growing near the Lake have produced seed in abundance, which have been supplied in quantity to various planters, and a considerable number sown for stock purposes.

99.—**Malay Camphor.**—Several cases of the tree which produces the Malay Camphor have been supplied to the Government of Mauritius chiefly for the production of timber, of which the tree produces an excellent quality. The Camphor produced by the tree is chiefly in demand in China where it fetches a high price. A collection of young plants of our best forest trees has also been forwarded to Mauritius.

100.—**Sugar Cane.**—The collection of Sugar Cane has been replanted during the year in order to preserve the varieties. Sugar Cane for planting purposes is not much in demand in Singapore; and it is proposed to remove the collection to the Penang Garden where they can be more conveniently inspected by the sugar planters of Province Wellesley.

101.—**Calumba Root.**—Plants of the Calumba Root have been obtained from the Mauritius and have grown with great vigour.

102.—**Caoutchouc and India-rubber Plants.**—For information regarding the introduction to the Gardens of foreign and native rubbers, see Appendix C. The trees of *Hevea Braziliensis* have grown well considering the soil in which they have been planted by the late Superintendent and an early crop of seed is looked forward to.

103.—The Panama Rubber (*Castilloa elastica*) has flowered during the year, but did not produce fruit. The African Landolphas introduced have also grown well and have been extensively propagated from cuttings. *Manihot Glaziovii* has also made fair progress. *Cyrtostegia grandiflora* introduced some years ago grows remarkably well. Seed of *Hancornia speciosa* received from Mr. CHRISTE, London, did not germinate in the Garden nor with planters who also received a supply.

104.—**Fibre producing plants.**—The growth made by various introduced fibre producing plants is very encouraging and would seem only to await manufacturers. The growth of Mauritius Hemp, *Fourcraia gigantea*, is especially good.

105.—**Ipecacuanha.**—This valuable medicinal plant has been kept in pots during the year. It is not much in demand, being very difficult to manage in almost any situation, but prefers a moist shady position with a still atmosphere. Its cultivation in this part of the world is looked upon by planters with disfavour.

106.—**Bois Immortelle.**—Plants of *Erythrina umbrosa*, or Bois Immortelle, received last year from the Botanic Gardens, Ceylon, have been largely propagated, as it is said to be an excellent shade tree for chocolate, coffee, &c. The Gardens are now in a position to meet demands for this tree.

107.—**Cow Tree.**—Plants of *Pola de Vaca*, or Cow Tree, (*Galactodendron utile*) which is said to produce milk of as good a quality as that from the cow, were received from the Royal Gardens, Kew, and have been kept in pots up to date, the plants not being considered strong enough as yet to plant in the open ground.

108.—**Rain Tree.**—Seeds of the Rain Tree (*Inga Saman*) have been received in quantity and made very rapid growth, completely outstripping all other kinds.

109.—**Pilocarpus pinnatifolius.**—In this tree, some plants of which have been planted in the Gardens, a new substance called Pilocarpine has been discovered and said to be very efficacious as a cure for snake poison. The plants planted have made very slow progress.

110.—**Chinese Camphor.**—The plant of Chinese Camphor (*Camphora officinarum*) planted in the Economic Garden some three years ago has made very fair growth; apart from its utility as a camphor producing tree, it also yields excellent timber of large dimensions, and its growth has been watched with a view to its taking part in the afforestation of the waste lands of the Settlements now commenced.

111.—**Cotton.**—Seeds of varieties of Cotton forwarded me, have been planted in pots and have produced fine ball of cotton, but the heavy rain of the Settlements will, I am afraid, prove too much for the successful cultivation of this plant.

GENERAL.

112.—**Work in the Herbarium.**—On taking over charge of the Gardens, one of my first duties was to ascertain the nature of their contents; a catalogue purporting to be a list of plants contained in the Gardens was published in 1879, and a supplement in 1880; and on taking over charge in November of year last named, it might have been expected that I should have but little trouble in arriving at a correct idea of their contents. But on my referring to the Catalogue for the names of the trees they could not to be found: I next sought for the plants contained in the list, and with the exception of a few was equally unsuccessful. B-7

113.—Of the few plants labelled on the lawns fully one half were wrongly named; many of them being labelled with names of plants not to be found in the Gardens. Having enquired as to the manner in which the Catalogue of 1879 had been compiled, I have been informed that it was drawn up from list of plants contained in the record of Wardian cases received, which contains the list of receipts, but does not account for the plants that may have died, or seeds which may not have grown. 777

114.—The supplement published in 1880 was founded chiefly upon lists of names of specimen received from Kew, and my since having found the great number of these, not in the Gardens, but in the outside jungles, there is strong reason for believing that the specimens sent to Kew had been collected there.

115.—The work which thus presented itself as necessary to be undertaken before the Garden collection could be placed on a satisfactory footing as regards labelling was certainly not of a trifling nature. My first attack was to grub up all the labels of plants which I knew to be wrongly named, and next to determine microscopically the remainder of the collection as far as possible. The Garden contents have been now labelled almost throughout; the few not yet named are those which have not flowered and consequently not supplied the necessary material for their determination.

116.—As the work of naming of the plants progressed, every day revealed some new discovery of plants not hitherto known to exist within the Garden boundary, and these have now multiplied to such an extent, that it has been considered advisable to suppress altogether the catalogues mentioned and to issue a new and more reliable production. The compilation of which is in hand.

His Excellency the Governor having ordered early in the year, that a Report on the Forests should be drawn up with as much despatch as possible; the work was early proceeded with; during its progress 300 herbarium determinations were made of plants from the hitherto little known jungles of the Settlements, the names of which will be found in Appendices to forest report, with corresponding local names as far as possible. This work led to the discovery of some new plants, as also did the naming of the Garden collection.

117.—The New Herbarium, however, was at this time not yet erected, the work was chiefly accomplished in a room in the Superintendent's quarters which I had converted into an Herbarium. The Director of the Royal Gardens, Kew, also kindly sent a list of names of things forwarded him during my forest inspection tour, many of which, from the nature of the circumstance at the time, were but very roughly prepared.

118.—The report on forests being completed, an investigation into the source of the Rubber supply of the Peninsula was next taken in

hand, to which my attention was specially drawn by Professor DYER, C.M.G., of the Royal Gardens, Kew. This work was commenced as the year closed and has been prosecuted with vigour during 1883. Much new information has been got together and will early appear in a separate report on the subject.

118.—**Government House Grounds, Improvements.**—During the year, the Government House Grounds have been placed under the direction of this department and the improvements effected have been those planned chiefly by His Excellency the Governor, and which consist mainly in the removal of the shrubbery designs from the two squares of grass lawn in front of the house, which had become overgrown, unsightly and otherwise inappropriate for the position. The plants being removed, the lawn was levelled and closely grassed over over an extent of 1,000 square yards.

119.—This work was in progress when Prince ALBERT and Prince GEORGE OF WALES paid the Colony a visit, and at the request of His Excellency the Governor each planted a plant of the beautiful Peru Palm, *Martinezia caryotaefolia*, one in the centre of each of the grass squares just mentioned. These plants have grown well, suit the position and have been surrounded by strong iron protectors.

120.—The next chief improvements lie to the east of the house where the long grass slope on that side has been terraced. The first of which consists of a walk 70 yards long and 2 yards broad. This walk has been metalled with laterite, provided with side drains in brick, and covered with wooden trellis work its whole length. The trellis is covered by a selection of flowering creepers, the colours of which have been so arranged in the planting as to bring the flowers in bloom in bouquet order. The creepers have now covered the trellis work and form a shady bower in which one can walk during any hour of the day protected from the scorching rays of a tropical sun.

121.—Immediately below this bower comes a design in coloured leaves on the carpet bedding style; below this a small walk, 3 feet broad, and behind this again a mixed border of flowering shrubs backed by a bamboo hedge which forms the boundary and outline of the whole system. The design has looked well throughout the year.

122.—Several other improvements have been made throughout the lawns in the way of planting specimen plants and removing unsightly objects. The lawn tennis grounds have been top-dressed.

123.—To receive the various plants removed in the course of these improvements as well as to assist in keeping up a supply of cut flowers, a nursery has been formed in an excluded position near the Coolie-houses.

124.—The grass lawns and walks have been kept in good order throughout the year. But there is still much room for improvement in the way of grouping trees and shrubs in landscape order, and destroying the straight monotonous lines which form the Malay ideal of picturesqueness.

125.—**Forests.**—A grant of \$1,200 for tree planting and other expenses was passed by the Government during the year. Of this sum about \$500 were expended in travelling and procuring information for forest report published in July of the present year.

126.—In planting young Teak trees at Bukit Timah, \$228 were expended in putting down about 18,000 plants, and \$42 in nursery work. About 2,000 young native Forest trees were planted on Military Reserve, Tanglin, at an approximate cost of \$30, leaving an unexpended balance of \$400. The money being granted late in the year it could not be fully taken advantage of before the year closed, but has been expended in planting various trees for experimental purpose early in the present year.

127.—Forest operations will in future be detailed in a separate Report.

128.—**Revenue and Expenditure.**—A statement of the Revenue and Expenditure of the year under review is given in Appendix *A*, from which it will be seen that the Revenue from sale of plants and flowers has amounted to \$627.96, the largest amount ever reached and which has been received during the year in small sums requiring much careful attention in book-keeping and otherwise.

129.—The total expenditure of the year has been \$13,583.80, and the total receipts \$15,027.90, which leaves a balance of \$1,444.10 on the side of receipts. This balance is owing to the salary of the establishment for December having been paid in January, 1883, instead of on 31st December, 1882, as was at one time intended.

N. CANTLEY,
Superintendent.

APPENDIX A.

Expenditure of the Botanic Gardens during the year 1882.

RECEIPTS.		EXPENDITURE.	
	\$ c.	SALARIES.	\$ c.
Balance in Bank 1st January, ..	3,094.64	Superintendent, (a) ..	2,512.93
Government Grant, ..	10,000.00	Head Gardener, (b) ..	1,039.19
Grant for Tree-planting, ..	1,200.00	Clerk, ..	30.00
Sale of Plants & Flowers, ..	627.96	Chief Mandore, ..	115.06
Other Receipts, ..	105.30	Printer, ..	93.80
		Plant Collector, ..	180.19
		Mason, ..	180.19
		Extra Mason, ..	45.08
		Carpenter, ..	161.15
		Extra Carpenter, ..	102.69
		Propagator, ..	79.41
		Chinese Mandore, ..	66.33
		Aviary Keeper, ..	83.95
		Garden Police, ..	165.00
		Javanese Coolies, ..	1,582.65
		Chinese Coolies, ..	1,225.70
		Coolies employed planting Trees, Bukit Timah, ..	228.84
		Coolies employed in Forest Tree Nursery, ..	339.89
			<u>8,232.05</u>
		GENERAL EXPENDITURE.	
		Erection of Office and Herbarium, ..	1,500.00
		Construction of Propagation Plant House, ..	230.35
		Construction of Exhibition Plant House, ..	617.00
		Repairs to Buildings, ..	72.88
		Purchase of Plants and Seeds, ..	208.92
		Purchase of Botanical Books, ..	234.10
		Purchase of Tools, ..	253.50
		Repairs to do., ..	34.00
		Manure and Cartage, ..	215.15
		Food for Animals, ..	209.05
		Office and Herbarium Fittings, ..	25.00
		Construction of Wardian Cases, ..	72.59
		Freight on cases of Plants, ..	76.88
		Purchase of Birds, ..	6.75
		Purchase of Flower Pots, ..	88.34
		Superintendent's Transport Expenses, ..	164.50
		Head Gardener's Transport Expenses, ..	181.56
		Wood for Constructive Purposes, ..	136.20
		Petty Expenses, ..	298.83
		Travelling Expenses on Forest Duty, S.S., ..	469.40
		Miscellaneous, ..	255.75
			<u>5,351.75</u>
			13,583.80
		Balance on 31st Dec., 1882,	1,444.10
			<u>\$15,027.90</u>
			<u>\$15,027.90</u>

(a) Includes half Salary while on leave of absence in previous year.

(b) Includes \$419 drawn while Acting Superintendent.

N. CANTLEY,
Superintendent.

APPENDIX B.

List of Additions to Garden Aviaries in 1882.

LOCAL NAME.	SYSTEMATIC NAME.	REMARKS.
Argus Pheasant,	Argussianus giganteus,	.. Presented by Mr. N.
Purple-capped Lory,	Lorius domicella,	.. Purchased. [DENISON.
Java Sparrow,	Loxia ovygiorra,	.. Do.
Rose-crested Cockatoo,	Ptyctolophus rosaceus,	.. Do.
Red-crested Quail,	Rollulus Roul Roul,	.. Presented by Mr. N.
Rhinoceros Hornbill,	Bucherus rhinoceros,	.. Do. [DENISON.
Helmet Hornbill,	Bucherus galeatus,	.. Do.
Common Hornbill,	Bucherus gracilis,	.. Do.
Pêrak Pheasant,	Pheasantus Sp.	.. Do.
Peacock Pheasant,	Polyplectrou Malaccense,	.. Do.
Bronze Ground Dove,	Chalcophaps Indica,	.. Purchased.
Sulphur-crested Cockatoo,	Cacatus sulphurea,	.. Do.
Lesser do. do.,	Cacatus sulphurea minor,	.. Presented by Mr. Fox.
Blue-banded Lorikcet.,	Trichoglossus cyanogrammus,	.. Purchased.
Guinea Fowl, vars.,	Numida meliagris,	.. Do.
Fan-tailed Pigeon,	Columbo liviæ,	.. Do.
Common Quail,	Coturnix communis,	.. Do.
Long-billed Partridge,	Rhizothera longirosteres,	.. Do.
Pencilled Pheasant,	Euphreomus nycthemerus,	.. Do.
Rufous-tailed Pheasant,	Alectrophasis erythrophthalmous,	Do.
Purple-necked Lory,	Electus Linnae,	.. Do.
Indian Fruit Pigeon	Carpophaca sylvatica,	.. Do.
Malayan Dial,	Copsyclus musicans,	.. Captured.
Chattering Lory,	Lorius garrulus,	.. Purchased.

*List of Books purchased for the Botanic Gardens Library
during the year 1882.*

BLUME'S Rumphia, complete.
 BLUME'S Floræ Javæ, complete.
 Plantæ Javanicæ Rariores, by HORSFIELD.
 GRIFFITH'S Works, complete.
 Flora van Nederlandish Indië, by MIGUEL, complete.
 BLUME'S Museum Botanicum, vols. I & II.
 Sumatra Zifne Plantenevereld, by MIGUEL.
 A Manual of Indian Timbers, by GAMBLE, 1881.
 Flora of Tropical Africa, by OLIVER, vols. I, II, & III.
 Monographiæ Prodromi Continuatio, vols. I & II, by DE'CANDOLLE.
 Flora of British India, by Sir J. D. HOOKER, K.C.S.I., &c., as far as published.
 ROXBURGH'S Flora Indica, (presented by C. B. CLARKE, Esquire, Kew, to Garden Library.)

*List of Books received from Raffles Library with permission
of the Government.*

Select Orchidaceous plants, by WARNER WILLIAMS, vols. I & II.
 Annales Musei Botanice Lug. Bat. by MIGUEL, 3 vols.
 Illustrations of Indian Botany, by WRIGHT, 2 vols.
 Bamboo and its Use, by KURZ.
 Domestic Botany, by SMITH.
 HOOKER'S Flora of British India as far as published.
 BENTHAM'S Flora Hongkongensis with Supplement, by H. F. HANCE.

APPENDIX B.—Continued.

List of Books received from Raffles Library, &c.,—(Continued.)

Plants Indigenous to the Colony of Victoria, by MUELLER.
 Flora Sylvatica of Southern India, by BEDDOME, vols. I & II.
 The Ferns of Southern India, by BEDDOME.
 MIER'S Illustrations, vols. I & II.
 HOOKER'S Botanical Miscellany.
 HOOKER'S Niger Flora.
 HOOKER'S Icones Plantarum.
 MIER'S Contributions to Botany, vols. I, II & III.
 Orchids and How to Grow Them, by JENNINGS.
 Index to Names of Eastern Plants and Products.
 Species Filicum, by HOOKER, vols. I, II, III, IV & V.
 The Forester, by JAMES BROWN.
 DRURY'S Useful Plants of India.
 LINDLEY'S Vegetable Kingdom.
 Vegetable Teratology, by M. T. MASTERS.
 Laws of Botanical Nomenclature, by DE CONDOLLE.
 OLIVER'S Indian Botany.
 Flora Indica, J. D. HOOKER and T. THOMPSON, vol. I.
 The Timber Trees of India, by BALFOUR.
 Flora of British Burmah, by KURZ.
 Flora Australiensis, by BENTHAM.

APPENDIX C.

List of the Principal Recipients of Plants and Seeds in 1882.

	PLANTS. No.	SEEDS. Packets.
Director, Botanic Gardens, Hongkong, ...	100	31
" " " Ceylon, ...	40	30
" " " Calcutta, ...	...	30
" " " Kew, London, ...	13	8
" " " Cambridge, England, ...	...	29
" " " Jamaica, ...	...	28
" " " Trinidad, ...	...	25
" " " British Guiana, ...	...	29
" " " Cape of Good Hope, ...	...	30
" " " Natal, ...	...	29
" " " Mauritius, ...	600	30
" " " Melbourne, ...	...	29
" " " Sydney, ...	...	34
" " " Adelaide, ...	...	31
" " " Brisbane, ...	...	30
The Imperial Gardens, Berlin, ...	50	20
The Chief Civil Commissioner, Seychelles, ...	30	19
The Hon'ble The Colonial Secretary, Fiji, ...	...	23
The Acclimatisation Society, Mauritius, ...	...	26
H. B. M.'s Consul, Amoy, ...	30	2
Under-Secretary, Lands Department, Brisbane, ...	30	1
The Right Revd. Bishop of Singapore and Sarawak, ...	24	...
L. Von DONOP, Esquire, Borneo, ...	141	1
W. BULL, Esquire, Chelsea, London, ...	17	1 box
The Royal Society of Arts and Science, Mauritius, ...	...	30
Messrs. HAAGE AND SCHMIDT, Erfurt, Prussia, ...	7	1
Mr. J. F. ROBERTS, Nurseryman, Australia, ...	42	...
Mr. CHATERJEE, Nurseryman, Calcutta, ...	31	...
His Highness the Maharaja of Johor, ...	5	...
Total, ...	1,160	560

APPENDIX C.—Continued.

List of the Principal Contributors of Seeds and Plants in 1882.

The Gardens are indebted to the undermentioned for contributions of Seeds and Plants during the year, viz. :—

	PLANTS. No.	SEEDS. Packets.
Director, Botanic Gardens, Melbourne, ...	...	200
" " " Adelaide, ...	...	69
" " " Brisbane, ...	13	...
" " " Mauritius, ...	85	...
" " " Kew, London, ...	20	...
" " " Natal, ...	...	12
" " " Trinidad, ...	...	7
" " " Jamaica, ...	...	3
" " " Calcutta, ...	...	1
" " " Java, ...	...	20
" " " Ceylon, ...	...	12
" " " Hongkong, ...	28	10
J. CAMERON Esq., Bangalore, ...	...	40
The Hon'ble the Colonial Secretary, Fiji, ...	...	5
Mr. ROBERTS, Nurseryman, Kew, Australia, ...	30	5
Conservator of Forests, British Burmah, ...	...	47
Conservator of Forests, Seychelles, ...	...	5
India Forest Department, ...	...	1
Mr. CHATTERJEE, Nurseryman, Calcutta, ...	50	...
HOME CONTRIBUTORS.		
Resident Councillor, Malacca, ...	50	...
F. KOEK, Esquire, ...	...	3
The Hon'ble Major McNAIR, C.M.G., Penang, ...	...	1
Sir HUGH LOW, K.C.M.G., Pêrak, ...	...	...
Colonel DEARE, ...	10	...
Late Mr. CHESTERTON, ...	...	3
R. RICHARDS, Esquire, ...	...	1
J. D'ALMEIDA, Esquire, ...	...	1
R. JAMIE, Esquire, ...	10	...
R. LIDDLELOW, Esquire, ...	...	1
KENG SWEE, Esquire, ...	4	...
Dr. N. B. DENNYS, ...	10	...
J. LARKEN, Esquire, Johor, ...	...	3
Totals, ...	280	445

List of the Principal Caoutchouc and India-Rubber plants introduced during the year.

LOCAL NAME.	SYSTEMATIC NAME.	NATIVE COUNTRY.
Para Rubber, ..	.. Hevea brasiliensis,	.. Brazil.
Ceara Rubber, ..	.. Manihot Glaziovii,	.. Brazil.
Panama Rubber,	.. Castilloa elastica,	.. Central America.
Gětah Limah Kitam	.. Streptocaulon Wallichii,	.. Kědah.
Gětah Cherei Morei,	.. Willoughbeia Sp. (?)	.. Province Wellesley.
Gětah Singgarip Getan,	.. Willoughbeia firma,	.. Malacca & Singapore.
Gětah Singgarip Puteh,	.. Asclepiadaceæ, ..	.. Malacca & Singapore.
Gětah Singgarip Hitam,	.. Willoughbeia martabanica,	.. Malacca & Singapore.
Gětah Singgarip Merah,	.. Leuconotis Sp., ..	.. Malacca & Singapore.
Gětah Jelutong,	.. Dyera costulata, ..	.. Malacca & Singapore.
Gětah Pulei, ..	.. Alstonia scholaris, Var.,	.. Malacca & Singapore.
Gětah Ujil, ..	.. Chilocarpus Sp. (?)	.. Malacca & Singapore.
Gětah Sundek or Puteh,	.. Isonandra, or Payena.	.. Pêrak.
Gětah Rambong,	.. Ficus elastica, ..	.. Pêrak & Siam.
Gětah Taban or Percha,	.. Dichopsis gutta, ..	.. Malay Peninsula.
Gětah Akar Garroh,	.. Leuconotis eugenifolius,	.. Kědah.
Gětah Susu, ..	.. Ficus Sp., ..	.. Pêrak.
Gětah Kledang,	.. Artocarpus Sp., ..	.. Malacca & Singapore.
Gětah Kledang Hitam,	.. Artocarpus Sp., ..	.. Malacca & Singapore.
Gětah Trap, ..	.. Artocarpus Sp., ..	.. Malacca & Singapore.
Gětah Kapor, ..	.. .. ..	.. Malacca & Singapore.

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS.		
ORD. RANUNCULACEÆ.		
Virgin's Bower, ...	<i>Clematis aristata</i> , <i>R. Br.</i> , Australia. Do. <i>microphylla</i> , <i>D. C.</i> , S. Australia.	
ORD. MAGNOLIACEÆ.		
Magnolia, ...	<i>Magnolia fuscata</i> , <i>Andr.</i> , China.	
Tulip Tree, ...	<i>Liriodendron tulipiferum</i> , India.	
Champac, ...	<i>Michelia champaca</i> , <i>Rheed</i> , Moluccas.	
ORD. MENISPERMACEÆ.		
Calumba Root, ...	* <i>Cocculus palmatus</i> , <i>D. C.</i> , Mozambique.	
ORD. NELUMBIACEÆ.		
Sacred Lotus, ...	<i>Nelumbium Leichardtii</i> .	
ORD. CAPPARIDACEÆ.		
	<i>Cratœva Roxburghii</i> , <i>Linn.</i> , India.	
	<i>Cleome speciosa</i> .	
	<i>Capparis Mitchellii</i> .	
ORD. PITTOSPOREÆ.		
	<i>Hymenosporum flavum</i> , <i>T. Mull.</i> , E. Australia.	
	<i>Pittosporum Buchanii</i> .	
	Do. <i>Colensoi</i> , <i>Hook. fil.</i> , N. Zealand.	
	Do. <i>crassifolium</i> , <i>Banks</i> , N. Zealand.	
	Do. <i>eugenoides</i> , <i>Cunn.</i> , N. Zealand.	
	Do. <i>Ralphii</i> .	
	Do. <i>revolutum</i> , <i>Ait.</i> , Australia.	
Australia Box, ...	<i>Bursaria spinosa</i> , <i>Car.</i> , Australia.	
ORD. GUTTIFEREÆ.		
Iron Tree, ...	<i>Mesua ferrea</i> , <i>Linn.</i> , East Indies.	
Prickly Mangosteen,	<i>Garcinia echnocarpa</i> .	
ORD. DIPTEROCARPEÆ.		
	<i>Shorea obtusa</i> , <i>Wall.</i> , East Indies.	
Sal, ...	Do. <i>robusta</i> , <i>Gaertn.</i> , East Indies.	
ORD. MALVACEÆ.		
Shoe Flower or Bun- ga Spatu, ...	<i>Hibiscus discolor</i> .	
	Do. <i>eriocarpus</i> .	
	Do. <i>mutabilis</i> , <i>Linn.</i> , East Indies.	
	Do. <i>Huegelii</i> .	
	Do. <i>splendens</i> , <i>Fras.</i> , E. Australia.	
	Do. <i>Colleri</i> .	
	Do. <i>zebrinus</i> .	
	Do. <i>cannabium</i> .	
	Do. <i>Sp.</i>	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. MALVACEÆ,—Continued.		
	Abutilon asiaticum, <i>G. Don.</i> , Asia.	
	Lagunaria Patersonii.	
	Lavateria arborea, <i>Linn.</i> , S. Europe.	
Ribbon Tree of Otago,	Plagianthus betulinus, <i>A. Cunn.</i> , New Zealand.	
ORD. STERCULIACEÆ.		
	Sterculia ramiflora, <i>Benth.</i> , N. Australia.	
	Do. trifida.	
Victorian Bottle Tree,	Do. diversifolia, <i>Don.</i> , N. S. W.	
	Do. guttata.	
	Brachychiton acerifolium, <i>R. Br.</i> , N. S. W.	
	Lasiopetalum Bauerii, <i>Steck.</i> , Australia.	
Nagyes, ...	Pterospermum semisagittatum.	
Cotton Tree, ...	Bombax malabaricum, <i>D. C.</i> , East Indies.	
Cola Nut, ...	*Cola acuminata.	
Dungun, ...	Heritiera littoralis, <i>Ait.</i> , East Indies.	
Jamaica Bastard Cedar, ...	Guazuma tomentosa, <i>Humb. & Bonpl.</i> , S. America.	
	Abroma augusta.	
ORD. LINACEÆ.		
Coca Leaf, ...	Erythroxylon coca, <i>L.</i> , Peru.	
ORD. TILIACEÆ.		
Victorian Olive-berry Tree, ...	Elæocarpus cyaneus, <i>R. Br.</i> , Australia.	
Bracelet Tree, ...	Do. dentatus, <i>Vahl</i> , New Zealand.	
	Grewia columnaris.	
ORD. MALPIGHIACEÆ.		
	Malpighia coccifera, <i>L.</i> , Trop. America.	
Laiza, ...	Lagerstrœmia tomentosa.	
Bongor, ...	Do. Reginœ, <i>Roxb.</i> , East Indies.	
	Do. indica alba, East Indies.	
ORD. ZYGOPHYLLEÆ.		
Lignum Vitæ, ...	*Guaicum officinale, <i>Linn.</i> , Trop. America.	
ORD. POLYGONEÆ.		
Sea-side Grape, ...	Coccoloba ovigera.	
ORD. RUTACEÆ.		
	Correa speciosa, <i>Ait.</i> , Australia.	
	Melicope ternata. <i>Forstr.</i> , New Zealand.	
Cape Chestnut, ...	Calodendron, <i>Thun Capense.</i>	
	Murraya Sp.	
Australian Orange Tree, ...	Citrus australasicus, <i>T. Mull.</i> , E. Australia.	
Bæl, ...	Ægle marmelos, <i>Corr.</i> , India.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. SIMARUBEÆ.		
	Spathelia simplex, India.	
	Harrisonia Bennetii, India.	
ORD. MELIACEÆ.		
White Cedar,	... *Melia azederach, <i>Linn.</i> , East Indies.	
Rasp Pod,	... Flindersia australis, <i>R. Br.</i> , E. Australia.	
Toon,	... *Cedrela toona, <i>Roxb.</i> , India.	
	Turrea heterophylla.	
Mahogany,	... *Swietenia mahogani, <i>Linn.</i> , S. America.	
ORD. ILICINEÆ.		
Holly,	... Ilex aquifolia, <i>Linn.</i> , Europe.	
	Do. cassanoides, <i>Link.</i> , Carolina.	
	Do. opaca, <i>H. K.</i> , Carolina.	
	Do. verticillata.	
ORD. CELASTRINEÆ.		
Olive Wood,	... Elæodendron australe, <i>Forst.</i> , E. Australia.	
	Do. orientale, <i>Jacq.</i> , India.	
ORD. SAPINDACEÆ.		
Soap Berry,	... Sapindus trifoliatus, India.	
	Nephelium lencocarpum.	
Litchi,	... * Do. Litchi, <i>Desf.</i> , China.	
Longan,	... Do. Longan, <i>Lam.</i> , China.	
Gyoo,	... *Schleichera trijuga, India.	
Bladder Tree,	... Dodonaea viscosa, <i>R. Br.</i> , Tropics.	
ORD. ANACARDIACEÆ.		
Hog Plum,	... Spondias mangifera, India.	
Mango,	... *Mangifera Vars, Mauritius.	
Sitsei,	... Melanorrhœa usitatissima.	
Sumah,	... Rhus discolor.	
ORD. LEGUMINOSEÆ.		
Logwood,	... * Hæmatoxylon campechianum, <i>L. S.</i> , America.	
Honey Locust Tree,	Gleditschia horrida, <i>Willd.</i> , China.	
Jerusalem Thorn of Jamaica,	... Parkinsonia aculeata, <i>Linn.</i> , West Australia.	
	Cæsalpinia coriaria, <i>Willd.</i> , S. America.	
Sappan,	... Do. Sappan, <i>L.</i> , Tropics.	
Burton's Pea Bush,	Burtonia scabra, <i>R. Br.</i> , Australia.	
Victorian Lilac,	... Hardenbergia monophylla, <i>Benth.</i> , Australia.	
	Do. alba, <i>Hort.</i>	
Butca,	... Butea superba, <i>Roxb.</i> , Asia.	
	Kennedyia prostrata, <i>R. Br.</i> , Australia.	
	Do. Comptoniana, <i>Link.</i> , Australia.	
Large-leaved Bean Flower,	... Do. macrophylla, <i>Benth.</i> , Australia.	
	Milletia pulchra, <i>Kz.</i> , India.	
	Do. megasperma, <i>F. Muell.</i> , Australia.	
Pongam,	... Pongamia glabra, <i>Vent.</i> , India.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
	DICOTYLEDONS,—Continued.	
	ORD. LEGUMINOSEÆ,—Contd.	
	Mucuna Sp.	
	Dalbergia glauca, <i>Wall.</i>	
	Do. Sp.	
	Barkleya syringifolia, <i>F. Mull.</i> , N. Australia.	
	Indigofera australis, <i>Willd.</i> , Australia.	
Glory Pea, ...	Clianthus punicens, <i>Soland.</i> , N. Zealand.	
Stuart's Pea, ...	Do. Dampieri, <i>A. Cunn.</i> , S. Australia.	
	Hovea celsi, <i>Bonpl.</i> , W. Australia.	
	Bossinea cinerea, <i>R. Br.</i> , N. S. Wales.	
	Goodia lotifolia, <i>Salisb.</i> , Australia.	
	Brachysema subcordata, <i>Benth.</i> , Australia.	
	Do. latifolium, <i>R. Br.</i> , Australia.	
	Oxylobium callistachys, <i>Benth.</i> , Australia.	
	Chorlizema cordata, <i>Lindl.</i> , N. Australia.	
	Do. scandens, <i>Smith.</i> , Australia.	
	Do. varium, <i>Benth.</i> , W. Australia.	
	Dillioynia mollissima.	
	Cassia grandis, <i>L. fl.</i>	
Indian Laburnum, ...	Do. fistula, <i>L.</i> , E. Indies.	
	Do. siamica, <i>Lam.</i> , Siam.	
	Do. eremophylla, <i>A. Cunn.</i> , Australia.	
	Do. marginatus, <i>Willd.</i>	
	Petalostyles labichoides, <i>R. Br.</i> , India.	
Banhinia, ...	Banhinia racemosa, <i>Lam.</i>	
	Do. Richardsonia, India.	
	Do. Hookerii.	
	Do. tomentosa, <i>L.</i>	
	Do. purpurea, <i>Linn.</i> , India.	
Gum Copal, ...	Hymenæe courbaril, <i>Lim.</i> , S. America.	
	Schotia latifolia, <i>Jacq.</i> , C. Good Hope.	
Australian Coval Bush, ...	Templetonia retusa, <i>R. Br.</i> , S. Australia.	
Irapu, ...	*Cynometra ramiflora, <i>Linn.</i> , S. India.	
Andaman Redwood, ...	*Pterocarpus indicus, <i>Willd.</i> , India.	
	*Pithecalobium saman, <i>Willd.</i> , S. America.	
	Do. dulcis, <i>Benth.</i> , Trop. America.	
Bois Noir, ...	*Albizzia lebbek, <i>Benth.</i> , India.	
	Do. lophantha, <i>Benth.</i> , W. Australia.	
Burda, ...	Do. procera, <i>Benth.</i> , India.	
Kabal, ...	Do. stipulata, <i>Boiv.</i> , India.	
Manjati, ...	Adinandra pavonina, <i>L.</i> , India.	
Catechu, ...	Acacia Catechu, <i>Bedd.</i>	
	Do. concinna, <i>D. C.</i> , Mauritius.	
	Do. neriifolia, <i>A. Cunn.</i> , S. Australia.	
Wattle, ...	Do. pycnantha, <i>Benth.</i> , S. Australia.	
Victorian Wattle, ...	Do. melanoxyton, <i>R. Br.</i>	
	Do. salicina, <i>Lindl.</i> , Australia.	
Black Wattle, ...	Do. decurrens, <i>Willd.</i> , Australia.	
	Do. cyanophylla, <i>Lindl.</i> , W. Australia.	
	Do. saligna, <i>Wendl.</i> , W. Australia.	

ORD. SAXIFRAGACEÆ.

Ceratapetalum gumniferum, *Sm.*, Australia.

ORD. BREXIACEÆ.

Brexia heterophylla.

B. madagascariensis, *Thouars.*, Madagascar.

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. HAMAMELIDÆ.		
	<i>Rhodoleia championæ</i> , <i>Hook.</i> , Hongkong.	
ORD. COMBRETACEÆ.		
	<i>Combretum densiflorum</i> , India.	
	<i>Terminalia belerica</i> , <i>Roeb.</i> , India.	
	Do. <i>tomentella</i> , <i>Kz.</i> , India.	
	Do. <i>pyrifolia</i> , <i>Kz.</i> , India.	
	Do. <i>alata</i> , <i>Rob.</i> , India.	
ORD. MYRTACEÆ.		
Victorian Bastard Box,	<i>Eucalyptus bicolor</i> , <i>A. Cunn.</i> , Australia.	
	Do. <i>longifolia</i> , <i>F. Mull.</i> , Australia.	
Spotted Gum of Towof- old Bay, ...	Do. <i>goniocalyx</i> , <i>F. Mull.</i> , Australia.	
Stringy Bark, ...	Do. <i>obliqua</i> , <i>D. C.</i> , Australia.	
Yellow Box, ...	Do. <i>melliodora</i> , <i>A. Cunn.</i> , Australia.	
	Do. <i>pilularis</i> , <i>D. C.</i> , Australia.	
Blue Gum, ...	Do. <i>viminalis</i> , <i>Labill.</i> , Australia.	
Do. " ...	Do. <i>globulus</i> , <i>Labill.</i> , Australia.	
Red Gum, ...	Do. <i>calophylla</i> , <i>R. Br.</i> , W. Australia.	
	Do. <i>hæmiphloia</i> , <i>F. Muell.</i> , Australia.	
	Do. <i>Gunnii</i> , <i>Hook. fil.</i> , Australia.	
Black Butt, ...	Do. <i>hæmastoma</i> , <i>S. M.</i> , E. Australia.	
Den Tree, ...	Do. <i>polyanthemos</i> , <i>Johan.</i> , Australia.	
Yellow Gum, ...	Do. <i>Stuartina</i> , <i>F. Mull.</i> , Australia.	
Peppermint Tree, ...	Do. <i>piperita</i> , <i>S. M.</i> , E. Australia.	
Red Gum of Queens- land, ...	Do. <i>tereticornis</i> , <i>S. M.</i> , Australia.	
Swamp Mahogany,	Do. <i>robusta</i> , <i>S. W.</i> , Australia.	
Yarra, ...	Do. <i>marginata</i> , <i>S. M.</i> , W. Australia.	
Sugary Eucalypt, ...	Do. <i>corynocalyx</i> , <i>F. Mull.</i> , Australia.	
Iron Bark, ...	Do. <i>paniculata</i> , <i>S. M.</i> , Australia.	
	Do. <i>saligna</i> , <i>S. M.</i> , Australia.	
Spotted Gum, ...	Do. <i>citriodora</i> , <i>Hook.</i> , Australia.	
White Gum, ... *	Do. <i>rostrata</i> , <i>Schl.</i> , Australia.	
Queensland Iron Bark *	Do. <i>siderophloia</i> , <i>Benth.</i> , Australia.	
Weeping Gum, ...	Do. <i>urnigera</i> , <i>Hook. fil.</i> , Australia.	
	Do. <i>resinifera</i> , <i>S. M.</i> , Australia.	
Yeit, ...	Do. <i>cornuta</i> , <i>Dum. Cours.</i> , Australia.	
Yarra, ...	.....
White Gum, ...	Do. <i>coriacea</i> , <i>A. Cunn.</i> , Australia.	
Port Jackson Red Gum, ...	Do. <i>ficifolia</i> , <i>F. Mull.</i> , Australia.	
	Do. <i>punctata</i> , <i>D. C.</i> , Australia.	
Victorian Iron Bark,	Do. <i>leucoxyton</i> , <i>F. Mull.</i> , Australia.	
	Do. <i>Lehmannii</i> , <i>Preiss.</i> , Australia.	
Giant Tree, ... *	Do. <i>amygdalina</i> , <i>Schau.</i> , Australia.	
	Do. <i>diversicolor</i> , <i>Boul.</i> , Australia.	
	Do. <i>platypus</i> , <i>Borh.</i> , W. Australia.	
West Australian Blue Gum, ...	Do. <i>megacarpa</i> , <i>F. Mull.</i> , Australia.	
Bottle Brush, ...	<i>Callistemon calliandrus</i> .	
	Do. <i>coccineus</i> , <i>F. Mull.</i> , Australia.	
	Do. <i>lanceolatus</i> , <i>D. C.</i> , Australia.	
	Do. <i>linearis</i> , <i>D. C.</i> , Australia.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. MYRTACEÆ,—Continued.		
Bottle Brush,	... Callistemon rigidus, <i>R. Br.</i> , Australia.	
	Do. rugulosus, <i>D. C.</i> , Australia.	
	Do. salignus, <i>D. C.</i> , Australia.	
	Do. speciosus, <i>D. C.</i> , Australia.	
Australian Tea Tree,	Melaleuca armillaris, <i>S. M.</i> , Australia.	
	Do. ericifolia, <i>S. M.</i> , Australia.	
Iron Wood of Queens- land,	... Do. genistifolia, <i>S. M.</i> , Australia.	
	Do. hypericifolia, <i>S. M.</i> , Australia.	
	Do. densa, <i>Colla.</i> , Australia.	
	Do. incana, <i>R. Br.</i> , Australia.	
	Do. parviflora, <i>Sindl.</i> , Australia.	
	Eugenia Smithii, <i>Poir.</i> , Australia.	
Australian Rose Ap- ple,	... Do. myrtifolia, <i>Ker</i> , N. S. W.	
Jambo,	... Do.	
	Do. fruticosa, Australia.	
Allspice,	... Pimenta vulgaris, <i>Sindl.</i> , W. Australia.	
	Leptospermum ericoides.	
	Do. flavescens, <i>S. M.</i> , Australia.	
Coast Tea Tree,	... Do. lævigatum, <i>F. Mull.</i> , Australia.	
Broom Tea Tree,	... Do. scoparium, <i>Forst.</i> , Australia.	
	Metrosideros florida.	
Rata,	... Do. robusta, <i>A. Cunn.</i> , New Zealand.	
Queensland Box Tree,	Tristania conferta, <i>R. Br.</i> , Australia.	
Gum Myrtle,	... Angophora lanceolata, <i>Car.</i> , Australia.	
Willow Myrtle,	... Agonis flexuoso, <i>Schau.</i> , Australia.	
N. S. W. Turpentine Tree,	... Syncarpia laurifolia, <i>Ten.</i> , Australia.	
Net Bush,	... Calothamnus quadrifidus, <i>R. Br.</i> , Australia.	
	Do. var. suberosus, <i>Schau.</i> , Australia.	
	Do. sanguineus, <i>Labill.</i> , Australia.	
Hair Cup Flower, ..	Calytrix tetragona, <i>Labill.</i> , Australia.	
New Zealand Broom,	Carmichaelia australis, Australia.	
ORD. LECYTHIDACEÆ.		
	Lecythis minor, Brazil.	
Cannon-ball Tree, ...	Couripita guineensis, British Guiana.	
ORD.—BARRINGTONACEÆ.		
Showy Barringtonia,	Barringtonia speciosa, Seychelles.	
Great Gustava, ...	gustavia augusta, <i>Linn.</i>	
ORD. MELASTOMACEÆ.		
	Melastoma repens, Hongkong.	
	Bertalonia Van Houttei.	
ORD. PASSIFLOREÆ.		
Passion Flower, ...	Passiflora macrocarpa.	
Do.	Do. scandens.	
Do.	Do. tetrandra.	
ORD. FLACOURTIACEÆ.		
Madagascar Grape,	Flacourtia ramontchi, <i>L'Herit.</i> , Madagascar.	

*List of Plants and Seeds introduced during the year 1882,
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LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,— <i>Continued.</i>		
ORD. MORINGACEÆ.		
Horse-radish Tree,...	Moringa pterygosperma, India.	
ORD. BEGONIACEÆ.		
Begonia, ...	Begonia lucida.	
Do.,	Do. malabarica, India.	
Do.,	Do. metallica, <i>W.</i> , Jamaica.	
ORD. FICOIDEÆ.		
Edible Fig Marigold,	Mesembryanthemum edule, <i>Lin.</i> , C. Good Hope.	
ORD. ARALIACEÆ.		
Angelica Tree, ...	Aralia crassifolia.	
	Do. papyrifera.	
	Panax elegans.	
Umbrella Tree, ...	Brassia actinophylla.	
Elderberry Leca, ...	Leea sambucina.	
ORD. RUBIACEÆ.		
Burning Bush, ...	Ixora bella.	
Do.,	Do. eximia.	
Do.,	Do. illustris.	
Do.,	Do. picturatus.	
Do.,	Do. splendens.	
	Gardenia globosa, <i>Hook.</i> , Natal.	
	Do. Thunbergia, <i>Linn.</i> , C. Good Hope.	
Manja Kadambe, ...	Nauclea cordifolia, <i>Roxb.</i> , E. Indies.	
Buta Kadambe, ...	Do. parviflora, <i>Roxb.</i> , E. Indies.	
	Do. rotundifolia, <i>Roxb.</i> , E. Indies.	
	Do. sessiflora, <i>Roxb.</i> , E. Indies.	
	Randia Kraussii.	
Wagatta, ...	Do. uliginosa, <i>D. C.</i> , E. Indies.	
	Caprosma hirtella, <i>Labill.</i> , Australia.	
	Do. lucida.	
	Do. robusta.	
	Pavetta laurifolia.	
	Psychotria cyanococcus.	
	Mussaenda frondosa, <i>Linn.</i> , E. Indies.	
ORD. COMPOSITEÆ.		
	Hebeclinum ianthinum, <i>Hook.</i> , Brazil.	
ORD. EPACRIDEÆ.		
Carrot Wood, ...	Leucopogon Richei, <i>R. Br.</i> , Australia.	
ORD. MYRSINEÆ.		
'Tipan, ...	Myrsine D'Urvillei, <i>De Candolle</i> , Australia.	
	Theophrasta imperiales, <i>Lindl.</i> , New Granada.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,— <i>Continued.</i>		
ORD. SAPOTACEÆ.		
Illipi,	... * <i>Bassia longifolia</i> , E. Indies. <i>Cargillea australis</i> , Australia.	
Iron Wood,	... <i>Sideroxylon tomentosum</i> , <i>Roeb.</i> , E. Indies.	
ORD. EBENACEÆ.		
Mabolo,	... * <i>Diospyros discolor</i> , <i>Willd.</i> , Madagascar. Do. <i>burmanica</i> , Burmah. Do. <i>chrysophyllus</i> , <i>Poir.</i> , Mauritius. * Do. <i>versicolor</i> , Mauritius.	
ORD. OLEACEÆ.		
Olive,	... <i>Olea europea</i> , <i>Linn.</i> , Europe. Do. <i>verrucosa</i> <i>Thunb.</i> , C. Good Hope.	
Ash,	... <i>Fraxinus excelsior</i> , <i>Linn.</i> , Europe. Do. <i>ornus</i> , <i>Linn.</i> , S. Europe. Do. <i>quadrangulata</i> .	
ORD. APOCYNACEÆ.		
	<i>Beaumontia grandifolia</i> , <i>Wall.</i> , E. Indies. <i>Tabernæmontana pubescens</i> , <i>R. Br.</i> , Tropics. * <i>Landolphia florida</i> , <i>Beauc.</i> * Do. <i>Watsonii</i> . * Do. <i>Petersiana</i> .	
Madagascar Rubber,	* <i>Valhea madagascariensis</i> , <i>Lam.</i> , Madagascar. <i>Dipladenia carissima</i> . <i>Carissa grandiflora</i> .	
Dye Wood,	... <i>Wrightia tinctoria</i> , <i>Roth.</i> , E. Indies. <i>Jasminium Sambac</i> , <i>Ait.</i> , E. Indies.	
Gëtah Garroh,	... <i>Leuconotis eugenifolius</i> .	
Do. Singgarip Me- rah,	... Do. Sp.	
ORD. ASCLEPIADACEÆ.		
Wild Ipecacuanha,	... <i>Asclepias curassavica</i> , <i>Linn.</i> , S. America. <i>Gonolobus condurango</i> .	
Gëtah Lemah Kitam,	<i>Streptocaulou Wallichii</i> , Kedah.	
ORD. CORDIACEÆ.		
Thanai,	... <i>Cordia grandifolia</i> , <i>Dosc.</i> , Tropics.	
ORD. LAGANIACEÆ.		
Strychnine,	... <i>Strychnos nux-vomica</i> , <i>Linn.</i> , Ceylon.	
ORD. CONVULVULACEÆ.		
	<i>Ipomæa tuberosa</i> , <i>Linn.</i> , Jamaica.	
ORD. SOLANACEÆ.		
Datura,	... <i>Solandra grandiflora</i> , <i>Sw.</i> , S. America. <i>Datura arborea</i> , <i>L.</i> , Tropics.	

*List of Plants and Seeds introduced during the year 1882,
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LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. SCROPHULARIACEÆ.		
	Lophospermum scandens, <i>G. Don.</i> , Mexico.	
ORD. CRESCENTIACEÆ.		
Trinidad Candle Tree,	Parmentiera cerifera, <i>Seem.</i> , T. America.	
ORD. BIGNONIACEÆ.		
Bignonia or Trump- et Flower, ...	Bignonia chelonides, <i>Linn.</i> , E. Indies. Do. magnifica. Do. indica, <i>Lour.</i> , E. Indies. Do. xylocarpa, <i>Roxb.</i> , S. America.	
Spathodea. ...	Spathodea, Hongkong. Sterospermum fimbriatum.	
Tecoma, ...	Tecoma australis, <i>R. Br.</i> , E. Australia. Do. leucoxylon, <i>W.</i> Indies. Do. rosea, <i>H. et B.</i>	
ORD. ACANTHACEÆ.		
	Dipterocanthus Herbstii, <i>Hook.</i> Thunbergia lutea, <i>Hort.</i> , S. America. Do. laurifolia, <i>Lindl.</i> , E. Indies. Mackaya bella, <i>Harc.</i> , S. Africa.	
ORD. VERBENACEÆ.		
	Gmelina arborea, <i>Roxb.</i> , India. Do. Rheedi. Clerodendron orientale. Do. coccineum, Madagascar. Do. inerme, <i>L.</i> Do. speciosum, <i>Hort.</i> , China.	
Sky Flower, ...	Duranta Ellisii, <i>Jack.</i> , Mexico. Holmskioldia sanguinea, <i>Retz.</i> , Java.	
Chaste Tree, ...	Vitex leucoxylon, <i>L. fil.</i> , Tropics.	
Teak or Jati, ...	*Tectona grandis, <i>L. fil.</i> , Burmah.	
ORD. AMARANTHACEÆ.		
Immortelle, ...	Gomphrena globosa, <i>Willd.</i> , E. Indies.	
ORD. NYCTAGINEÆ.		
Bougainvillea, ...	Bougainvillea braziliensis, <i>Willd.</i> , Brazil.	
ORD. CHENOPODIACEÆ.		
	Chenopodium oleracea, <i>F. Mull.</i> , Australia. Atriplex nummularia, <i>Lindl.</i> , Australia.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. ARISTOLOCHIACEÆ.		
Birthwort,	.. <i>Aristolochia ornithocephala</i> , Brazil.	
ORD. PIPERACEÆ.		
Cubebs,	.. * <i>Piper Cubeba</i> , <i>L. Fil.</i> , E. Tropics.	
ORD. MYRISTICÆÆ.		
Long Nutmeg,	.. * <i>Myristica madagascariensis</i> , <i>Lank.</i> * <i>Do.</i> <i>Sp. from Banda</i> , <i>Hort.</i>	
ORD. MONIMIACEÆ.		
Australian Mulberry,	<i>Hedycarpa angustifolia</i> , <i>A. Cunn.</i> , Australia.	
ORD. LAURINEÆ.		
Sweet Bay,	.. * <i>Laurus nobilis</i> , <i>Linn.</i> , S. Europe.	
Camphor,	.. * <i>Camphora officinarum</i> , <i>Willd.</i> , Japan.	
Ravensana,	.. * <i>Agathophyllum aromaticum</i> , <i>Willd.</i> , Madagascar.	
Cassia Bark,	.. * <i>Cinnamomum Cassia</i> , China. <i>Cassytha melantha</i> , <i>R. Br.</i> , Australia.	
ORD. PROTEACEÆ.		
	<i>Hakea aricularis</i> , <i>R. Br.</i> , Australia.	
	<i>Do. laurina</i> , <i>R. Br.</i> , W. Australia.	
	<i>Do. multilineata</i> , <i>Meisn.</i> , S. Australia.	
	<i>Do. pugioniformis</i> , <i>Cav.</i> , E. Australia.	
	<i>Do. saligna</i> , <i>Knght.</i> , S. Australia.	
	<i>Grevillea Banksii</i> , <i>R. Br.</i> , N. Australia.	
	<i>Stenocarpus salignus</i> , <i>Cunn.</i> , E. Australia.	
	<i>Dryandra floribunda</i> , <i>R. Br.</i> , N. Australia.	
Silver Tree,	.. <i>Lencadendron argentea</i> , C. Good Hope.	
Queensland Nut,	.. <i>Macadamia ternifolia</i> , <i>Linn.</i> , Queensland.	
ORD. SANTALACEÆ.		
	<i>Leptomeria aphylla</i> , <i>R. Br.</i> , Australia.	
ORD. ARTOCARPEÆ.		
Para Rubber,	.. <i>Hevea braziliensis</i> , <i>Mull.</i> , Brazil.	
Myank Loak,	.. <i>Artocarpus Lokoocha</i> , <i>Roxb.</i> , Burmah.	
ORD. EUPHORBIACEÆ.		
	* <i>Codiaeum</i> , (Fifty-one new varieties.)	
Croton Oil Plant,	.. * <i>Croton tiglium</i> , <i>L.</i> , Australia & E. Indies. <i>Trewia nudiflora</i> , <i>Rottlera tinctoria</i> , <i>Roxb.</i> , Australia.	
Physic Nut,	.. * <i>Jatropha podagrica</i> , <i>Hook.</i> , S. Australia.	
Box Tree,	.. <i>Buxus sempervirens</i> , <i>Linn.</i> , Europe.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
DICOTYLEDONS,—Continued.		
ORD. CASUARINEÆ.		
	Casuarina stricta, <i>Ait.</i> , Australia.	
	Do. quadrivalvis, <i>Labill.</i> , Australia.	
	Do. tephrosperma, <i>Hort.</i> , Australia.	
ORD. CUPULIFEREÆ.		
Oak Tree,	.. Quercus solicina, <i>Bl.</i> , Hongkong.	
Beech,	.. Fagus sylvatica, <i>W.</i> , Europe.	
Chestnut,	.. Castanea perma.	
ORD. GUETACEÆ.		
	Guetum edule.	
ORD. CONIFEREÆ.		
Bunya Bunya Pine,	Aracuaria Bidwellii, <i>Hook.</i> , E. Australia.	
Norfolk Island Pine,	Do. excelsa, <i>R. Br.</i> , Norfolk Island.	
Moreton Bay Pine,	Do. Cunninghamii, <i>Ait.</i> , Australia.	
Rueli's Pine, ..	Do. Rulei, <i>F. Mull.</i> , New Caledonia.	
Cook's Pine, ..	Do. Cookii, <i>R. Br.</i> , New Caledonia.	
Californian Red-wood,	Taxodium sempervirens.	
	Frenela columellaris, <i>F. Mull.</i> , Australia.	
Australian Pine, ..	Do. robusta, <i>Cunn.</i> , Australia.	
	Glyptostrobus heterophylla.	
Chinese Pine, ..	Pinus sinensis, China.	
	Ostrya virginica.	
Cypress, ..	Cupressus aromaticus.	
	Podocarpus neriifolia, <i>G. Don.</i> , E. Indies.	
Queensland Kauri Pine, ..	Dammara robusta, E. Australia.	
ORD. CYCADACEÆ.		
Sago, ..	.. Cycas circinalis, <i>Linn.</i> , Madagascar.	
	Do. media, <i>R. Br.</i> , E. Australia.	
	Do. revoluta, <i>Thumb.</i> , Japan.	
	Bowenia spectabilis, <i>Hook.</i> , N. Australia.	
MONOCOTYLEDONS.		
ORD. ORCHIDEÆ.		
	Cypripedium barbatum, <i>Lidl.</i> , Kedah.	
	Phalaenopsis Luddemanniana, <i>Rehb.</i> , Philippines.	
	Saccolabium Harrisonii, <i>Rehb.</i> , Malay Islands.	
ORD. BROMELIACEÆ.		
Pine Apple, ..	Ananassa sativa Var.	
	Pitcairnia alata.	
	Do. platyphylla.	
	Tillandsia Lindenii vera, S. America.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME. SYSTEMATIC NAME AND ORDER. REMARKS.

MONOCOTYLEDONS,—*Continued.*

ORD. IRIDEÆ.

Ixia amoena,

Pardanthus chinensis, *Ker.*, China.

Marica Northiana, *Gaert.*, Brazil.

ORD. MUSACEÆ.

Banana, ... *Musa uranocospes*.

Manila Hemp, ... *Musa textilis*

Heliconia sanguinolenta.

ORD. AMARYLLIDEÆ.

Bomarea Carderi, S. America.

Doryanthes palmieri, *Hill*, N. Australia.

Eurycles Cunninghami, *Ait.*, N. Australia.

Mauritius Hemp, ... *Fourcroya gigantea*, *Vent.*, S. America.

ORD. MARANTACEÆ.

Maranta Massangeana.

Do. *Kerchoviana*.

ORD. LILIACEÆ.

Dracæna. (Seventeen new varieties.)

Hemerocallis flava, *Ait.*, Siberia.

Agapanthus umbellatus, *L. Rint.*, C. Good Hope.

Eucharis candida.

New Zealand Flax, *Phormium tenax*, *Forst.*, New Zealand.

Adam's Needle, .. *Yucca gloriosa*, *Linn.*, S. America.

Do. *filamentosa*, *Linn.*, Virginia.

Do. *alocifolia*.

ORD. JUNCAGINACEÆ.

Lattice Leaf Plant, *Ouvirandra fenestralis*, Madagascar.

ORD. PALMEÆ.

Palmyra Palm, .. *Borassus flabelliformis*, *W.*, W. Indies.

Dæmonorops marginatus.

Cocos plumosa.

Do. *oleracea*.

Heterospathe alata.

Arenga Wendlandiana.

Livistona subglobosa.

Pinanga Kechlii.

Areca glandiformis.

Syagurus sancona.

Calyptrocalyx spicatus, *Bl.*, Banka.

Ænocarpus bacaba.

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

LOCAL NAME.	SYSTEMATIC NAME AND ORDER.	REMARKS.
MONOCOTYLEDONS,—Continued.		
ORD. PALMEÆ,—Continued.		
	Kentia costata.	
	Ptychosperma Sp. from Fiji.	
	Kentia exorrhiza.	
Coco de Mer or Double Cocoa-nut, ...	Lodoicea seychellarum, <i>Labill.</i> , Seychelles. Thrinax parviflora, <i>Sm.</i> , West Indies. Licuala horrida.	
Asia Palm, ...	Euterpe edulis, <i>Mart.</i> , S. America. Ænocarpus Sp. from Java. Calyptronomia Swartzii.	
Cabbage Palm, ...	Oreodoxa regia, <i>Humb. & Bonpln.</i> , Cuba. Latania glaucophylla, <i>Duncan</i> , Mauritius. Cocas australis, Australia. Sabal umbraculifera, <i>Mart.</i> , West Indies. Seaforthia elegans, <i>R. Br.</i> , N. S. W.	
Fan Palm, ...	Livistona sinensis, China. Phoenix reclinata, <i>Jacq.</i> , S. Africa. Diplothemium caudescens. Areca lutescens, <i>Bory</i> , Mauritius. Acanthophoenix monostachya. Do. crinita, <i>Wendl.</i> , Mauritius. Areca sapida, <i>Forst.</i> , New Zealand. Stevensonia grandifolia, <i>Duncan</i> , Seychelles. Cocos flexuosus, <i>Mart.</i> , Brazil. Diplothemium maritimum. Ptychosperma alexandrae, <i>T. Mull.</i> , N. Australia. Pritchardia pacifica, <i>Seem.</i> , S. S. Islands. Livistona humilis, <i>R. Br.</i> , Australia. Hyophorbe amaricaulis, <i>Mart.</i> , Mauritius. Acanthophoenix rubra, <i>Wendl.</i> , Mauritius. Hyphæne Sp. from Zululand. Verschaffellia splendida, <i>Wendl.</i> , Seychelles.	
ORD.—PANDANEÆ.		
Screw Pine, ...	Pandanus odoratissimus, <i>Lim.</i> , Mauritius.	
Vacoa, ...	Pandanus javanicus variegatus.	
Sugar Mat Plant, ...	*Pandanus utilis, <i>Bong.</i> , Madagascar.	
ORD.—AROIDEÆ.		
	Anthurium Andreanum.	
	Do. candidum, <i>Hort.</i> , Columbia.	
	Do. Dechardii.	
	Do. magnificum, <i>Lmdl.</i> , S. America.	
	Do. nymphæ folium.	
	Do. nobile.	
	Do. Warogueanum.	
	Do. insigne.	
	Alocasia gigantea, <i>Work</i> , E. Indies.	
	Do. hybrida, <i>Hort.</i>	
	Do. illustris, <i>Hort.</i>	
	Do. Johnsonii.	

*List of Plants and Seeds introduced during the year 1882,
arranged in their Natural Families,—Continued.*

MONOCOTYLEDONS,—Continued.

LOCAL NAME. SYSTEMATIC NAME AND ORDER. REMARKS.

ORD.—AROIDEÆ,—Continued.

Dumb Cane,	...	Dieffenbachia costata.	
		Do. insignis.	
		Do. nitida.	
		Do. Carderi.	
		Do. Leopoldi.	
		Do. splendens.	
		Philodendron daguense, <i>Lindl.</i> , Brazil.	
		Do. Carderi.	
		Phyllotaenium Lindeni.	
Yellow Pothos,	...	Pothos aurea.	

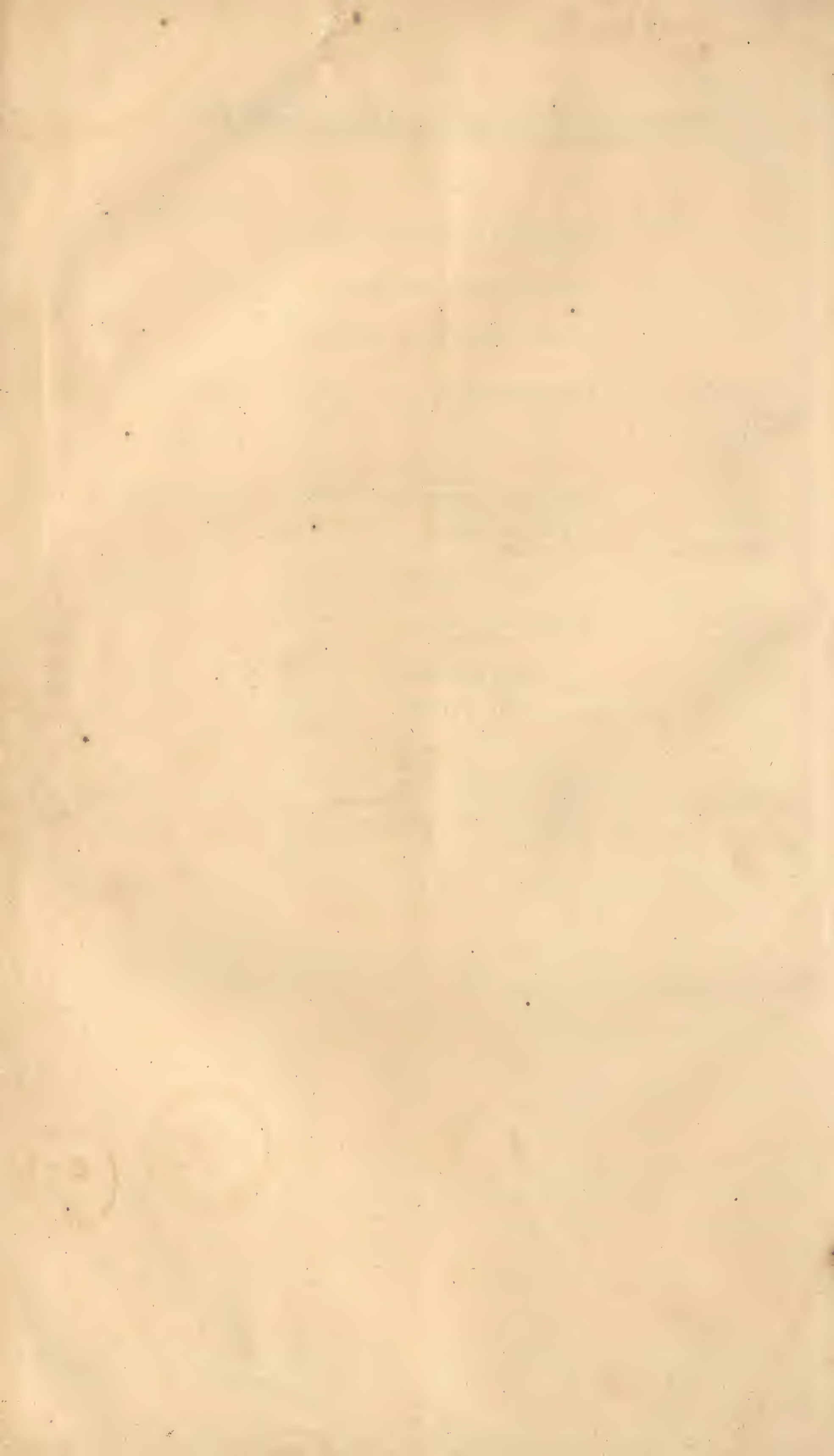
ORD. GRAMINEÆ.

Bamboo,	...	Bambusa affinis, India,	
Thaikwah,	...	Do. tulda, India.	

ACOTYLEDONS.

ORD. FILICES.

Golden Fern,	...	Gymnogramma chrysophylla.	
		Do. Peruviana.	
		Cibotium barometz, China.	
Elk's Horn Fern,	...	Platynerium alaicorne, Madagascar.	
		Lomaria Australis, Australia.	
New Zealand Tree Fern,		Cyathea dealbata, <i>Sm.</i> , New Zealand.	
		Pteris albo-lineata, Siam.	



July(?) 1883

STRAITS SETTLEMENTS.

Paper to be laid before the Legislative Council by Command
of His Excellency the Governor.

Report on the Forests of the Straits Settlements.

INTRODUCTION.

1. Having received instructions from His Excellency the Governor to draw up a Report on the Forests and Forest Lands of the Colony, and make recommendations for their better management, I commenced, in March 1882, a tour of inspection of the various districts comprised within the Settlements in order to make myself fully acquainted with the special circumstances and conditions prevailing in each.

2. With a view to giving a clear idea of these conditions, I have divided my Report into two parts; in the former will be found detailed the present state of the forests and circumstances which affect forest growth; and the latter contains my recommendations.

3. It is apparent that no sufficient attempts have been made to conserve the Government forest lands, and that nothing has been done towards utilising the extensive grass wastes that are to be seen throughout the Settlements. The present state of affairs is the result of a reckless, migratory cultivation carried on by the Chinese, and this extensive deforestation has brought with it its attendant evils. Our Timber supply has fallen far short of the demand, and the climate of the Colony is becoming sensibly affected.

4. It is not contended that the total Rainfall of the year has decreased, but owing to the removal of the tree covering—that great equaliser of Rainfall—showers have become less frequent and more local than formerly; and droughts of unprecedented length have occurred, thereby increasing the possibility of epidemics. Those fertilising showers which once watered the whole surface of the Settlements are now confined more frequently to the hill tops and higher elevations, the soil and the prospects of agriculture being thus impaired, and the temperature of the plains being raised. The hill streams run with greater irregularity and many of the smaller streams have become entirely dried up.

5. It has been said that, at home as well as in their Colonies, other nations pay earlier attention to the conservation of forests, than the English; and it is hard to conceive a more short-sighted policy than that which has suffered these Settlements to drift into their present condition of scarcity of forest and forest produce.

6. It has, however, remained for His Excellency the Governor to propose the inauguration of those remedial measures

which have proved effectual in other countries where similar evils have been dealt with, namely, the formation of plantations of forest timber, the re-wooding of waste lands, the establishment of well defined Reserves, and the protection of such patches of forest as are now existing.

7. It will be by these means that in years to come the climate and soil of the Colony will be improved; that a supply of Timber will be provided when those sources of supply now open are closed to us; and that the Settlements, through afforestation, will present a totally different aspect.

8. Many foreign species of trees have been recently introduced which, it is hoped, will prove to be admirably adapted for the re-forestation of waste lands, and the collection and cultivation of these, together with the best of the indigenous species, will form plantations all over the Settlements.

DESCRIPTIVE.

Topographical Features.

1. The island of Singapore lies at the southern extremity of the Malayan Peninsula, from which it is separated by a narrow strait of about three quarters of a mile in width, and it is situated in latitude $1^{\circ}16'13''$ north, and east longitude $103^{\circ}53'15''$. There are several small islands adjacent to it forming part of the Settlement which comprises an area of 145,000 acres. Its greatest length is 27 miles, and greatest breadth 14 miles.

2. For administrative and general purposes, the island is divided into twenty-nine districts, which will be seen on the annexed map. *See Appendix F.*

3. It may be roughly stated that about half of the island is under cultivation of all sorts, and the articles produced are chiefly gambier, pepper, tapioca, indigo, cocoanuts, pine apples, areca-nuts, Liberian coffee, cocoa, sago, lemon grass, native vegetables and fruits of all sorts.

4. The surface of the island is very irregular, being little other than a series of small hills with narrow alluvial valleys between, there being nowhere any large flats. The hills stretch in ramified systems in various directions. The highest, which is Bukit Timah, rises to an elevation of 530 feet above sea level, and occupies a position in the centre of the island, where, with Bukit Panjang and Bukit Kalang, a triangle is formed within which rests the chief highland of the Settlement, and from which, with two exceptions, the elevation gradually falls to the coast. The chief exception to this rule commences at Bukit Panjang, on the west of which the general elevation suddenly falls almost to sea level and forms the valley which stretches across the districts of Pandan, Jurong, West Bukit Timah and Lim Chu Kang, and through the bottom of which the Kranji and Jurong rivers (creeks) almost meet and form a separate Island. On the west of this valley at Peng Kang and Tengeh, the elevation gradually rises and attains its maximum height in a series of hills which stretch along the coast line in the extreme west of the island, and where some of the highest sea cliffs in the Settlement occur. The other exception is chiefly constituted by the Mount Faber range, which commences at the coast line a little to the west of the town of Singapore and runs for about three miles in a westerly direction. The highest land of this range rises to an elevation 291 feet above sea level, while 100 feet may be taken as a fair average of the smaller hills of the Island.

5. Of the less hilly districts, may be mentioned those which occupy the east end of the island, and those which occupy the Jûrong valley.

6. Of the numerous watercourses which have been dignified by the term river, none are worthy of that name except, perhaps, the Kalang River, which is about seven miles in length and has its source on the highland which occupies the centre of the island; the others are more properly speaking creeks, and often terminate suddenly, receiving only a scanty rivulet of fresh water: they are numerous along the coast, the principal of them being the Jûrong, Pandan, Singapore, Saranggong, Ponggol, Sêlêtar, Sêmbâwang, Kranji, and Brih Rivers. The more useful fresh water streams are those which have their sources on the central highland of the Settlement and flow seaward; such streams are very numerous, but mostly run dry after a few days' absence of rain. Few of them have obtained names, and many of them are muddy and otherwise impure.

7. The island contains some good roads metalled with common laterite—a substance which enters very abundantly into the composition of the soil of the island and is found in great plenty in the small hills and surrounding islands. This substance, when properly applied, consolidates readily and makes a good durable road with a smooth surface. The chief highway stretches across the island from south to north, namely, from Singapore town to Kranji, which is only separated from Johor by the Straits. Along this road the greater bulk of the traffic from the mainland of the peninsula is conducted. The other principal roads lead to Changi, Saranggong, Pâsir Panjang and Sêlêtar.

8. For the purpose of this report, it is only necessary to give a general and rapid sketch of the Geology of the island; several districts in it, as well as the large island of Pûlau Ubin are composed, for the most part, of decomposed plutonic rock: these, consequently, contain the best soils with a greater depth than elsewhere, and are, therefore, better adapted for the growth of large timber.

Geology

9. Sandstone clays chiefly occupy the coast line districts. The shale tracts include Tanjong Gul, part of Lim Chu Kang, West Bukit Timah, Jûrong, and Tanglin, while the districts of Kalang, Saglap, and Pandan are almost wholly alluvial.

10. Of the secondary minerals, the most abundant is felspar, which occurs largely throughout the plutonic area associated with hornblende, quartz, mica, &c. In the ferruginous rocks red coloured lamina, chiefly iron ore, is much developed, associated iron ore and quartz are occasionally found in large quantity, and localities where the iron predominates over the quartz are very numerous. A good instance is the laterite portion of Government Hill. The iron rock is generally a hydrous peroxide and different forms of hematite, compact and ochry. In most localities the proportion of iron varies much and is generally too small to entitle the rock to be called an ore, but patches and masses of ore occur abundantly.

11. The chocolate, violet and many-tinted clays of the sedimentary tract (a good example of which may be seen exposed on the side of Fort Canning hill in the town of Singapore) occupy a breadth of about one mile, and stretch from the town right across the island in the direction of North West by West. The plutonic clays, on the other hand, form a compact tract, of about sixty square miles, occupying the main body of the island as already mentioned, and have a remarkable uni-

formity of character. In some places, and particularly in the bottom of valleys where it is covered by vegetable mud, and has undergone a natural bleaching, is a pure white kaolin, as may be observed at the commencement of the new road now being made up Bukit Timah hill, but it generally imbeds quartz, granulates to some extent, and, at a few feet below the surface, is mottled with red and other colours with various degrees, but it is sometimes altogether of a dark-red hue; where this is the case, masses of half decomposed iron rock are found in it.

12. Iron rock is also found over the surface in amorphous cellular blocks and small pebbles, or below the surface at depths varying from a few inches to a few feet in layers and similar pebbles. Frequently, however, lumps of decomposing granite, patches of visicular jaspideous rock, procellaneous rock, &c., are also found in it, the only unchanged constituent of the original rock being the quartz, and even that, is sometimes penetrated by the iron.

13. The upper soil, or that which has been completely subjected to the influence of the atmosphere, is a clay with a greasy lustre, but oftener inclining to a dry friable appearance, in colour generally yellowish-brown; this, with the small proportion of quartz, distinguishes it from the granite clays of Penang.

14. The surface soil of the sandstone tract is a clay of a more sandy nature and poorer, owing to its containing a less proportion of iron in a free state. Clay soils absorb much water during showers, and contract and crack with dry weather. This contraction often tears asunder the roots of plants and free currents of dry air are admitted by the cracks and rents, which also injure the roots. To keep such soils in an equable condition, frequent showers are absolutely necessary, and anything which has a tendency to diminish the frequency of showers has consequently an injurious effect on the agriculture of the country.

15. All the valleys are alluvial, the bulk of which deposit has been formed by the action of salt water. These valleys contain, therefore, the best soil of the island, and are everywhere squatted upon by cultivators of vegetables, indigo, &c.

16. The climate of Singapore is remarkable for its uniformity of temperature and general salubrity, there is no hot or cold season, though it is observed that the months of November and December are generally a degree or so below the average temperature of the other months, which is due, in a great measure, to the increase of rainfall at that season.

Meteorology.

17. By the kindness of Dr. M. F. Simon, Colonial Surgeon, I have been put in possession of some valuable Meteorological Records. From those for 1876 it appears that the mean annual temperature of the air is 81.1° F., approximate temperature 79.9° , mean temperature of dew point 74.1° , highest temperature observed 91° , lowest 66° . See Appendix D.

A knowledge of these two latter is most important to the Forester, as it is the extremes of temperature which affects the possibility or otherwise of a plant succeeding. What is most striking, however, is the great humidity contained in the atmosphere, which, counting saturation at 100° , falls only to 78° during any month of the year, while it is often as high as 80° , and gives an annual average of 79.4° . It is this high state of humidity, and the heavy night dews, which chiefly maintain the luxuriant vegetation of the island in its present condition.

18. The island is subject to strong squalls at all times, but more frequently after the monsoons have fairly set in. These squalls often do much damage, although seldom of long duration. Native houses are frequently blown over by a strong wind of this description, which, as a rule, comes on very suddenly and gives but little time for preparation. The number of fallen trees and branches everywhere strewn about strongly remind me of what I have observed in Mauritius after a mild hurricane.

19. The mean annual Rainfall of the ten years preceding 1879, averages 91.66 inches, which shows no appreciable difference when compared with averages taken 30 years previously. I append an abstract of Rainfall observations taken at several stations within the town district, which show that as much as 6.25 inches fall in 24 hours, while a fall of from four to five inches in the same time is quite common, and the satisfactory sanitary condition of the island, and of its towns and villages in particular, depends upon these heavy rains, which flush the sewers and ditches, and wash away all pestilential matter; hence the saying amongst the inhabitants that dry weather is unhealthy.

See Appendix D.

20. Annexed also are tables shewing the number of rainy days in each month and year for over a period of twelve years from records kept at the Criminal Prison in the Town of Singapore and for a period of seventeen years from a gauge kept by Mr. Knight, at Thompson Road, about three miles from town. This latter gives an average of seventeen rainy days per month all the year round; smallest number in one month, fifteen days, in June; greatest, twenty-three days, in November; smallest number of rainy days in one year, one hundred and twenty-four, in 1877; greatest, two hundred and forty-four, in 1879; while at the Criminal Prison's gauge is found an annual average of fourteen-and-a-half rainy days for each month of the year; least number in one month, twelve days, namely, in June; greatest, twenty days, in November; smallest number in one year, one hundred and nine days, in 1877; greatest two hundred and twelve, in 1871. *See Appendix D.*

21. It will be observed, therefore, that Mr. Knight's gauge gives an average of thirty-four more rainy days in the year than has been recorded at the Criminal Prison, which may be accounted for by the fact of its being at a greater elevation above sea level than the other, and to its position being three miles nearer the hills or common watershed of the island.

22. It is very desirable that Rainfall records should be procurable from stations distributed over a greater extent of country, as, by such means, a fair estimate of the annual fall over the whole island could be obtained, more especially as showers are now well known to be more local than formerly, and to fall most abundantly in the districts of Bukit Timah, Upper Kalang and Amokiah.

23. Whether the extensive denudation of the primæval forests in Singapore has had any marked effect on the climate of the island, is a question of considerable interest to all concerned. That such clearings have had a decided effect, and often a disastrous one in other countries, is a fact which does not admit of any difference of opinion. Considering, however, the small area of Singapore and its being closely surrounded on two sides by the wooded territory of Johor, not to mention its insular position, it is to be expected that the effect of such clearings would be less felt than on a continent.

24. The position of the rain gauges from which the records at my disposal have been compiled, is badly selected for the determination of the phenomena of this nature, and there is reason to believe that the observations contained in the tables show but imperfectly the real extent of change which has taken place in the more remote districts. And, as the presence of forests considerably modifies the distribution of rainfall and economises the water supply after it has fallen, and as agriculture is principally dependent on these conditions, the presence of a certain amount of forests in a country is not only necessary, but of the first importance for this, and those climatic considerations which naturally follow.

25. Turning now to the tables in which are recorded the total Rainfall and number of rainy days throughout the year, and dividing the twelve years, over which the observations extend, into periods of four years each for the sake of comparison, by setting off the total Rainfall and number of days on which rain fell against each period, any change which may have taken place since the first period will become apparent; and, if apparent, it will be difficult to find any cause to which it can be ascribed other than to some local disturbance, or influence, which has been at work; and equally difficult to find any such disturbing agent except that which has been effected by man in the removal of the natural covering of the surface of the island, which is known to have taken place within the period in question, *viz.* :—

	Years.	Total Rainfall.	Number of days on which rain fell at Thompson Road.	Number of days on which rain fell at Criminal Prison.	
		Inches.	Days.	Days.	
First period ...	{ 1869 1870 1871 1872 }	393.62	901	787	
Second period,	{ 1873 1874 1875 1876 }	356.52	829	689	
		42.10	72	98	Decrease over first period.
Third period ...	{ 1877 1878 1879 1880 }	369.32	820	624	
			9	65	Continued decrease over second period.
		29.30	81	163	Total decrease over first period.

26. The above records shew a steady decrease in the number of rainy or showery days, and what is further remarkable is that, although the Rainfall of the last period shows a slight increase (12.80) over the second, the number of rainy

days has nevertheless steadily decreased throughout the whole of the three periods, thus shewing that the fall of the last period must have taken place in heavier showers, or torrents; or, to be still more explicit, that the fall of 398 inches of the first period seems to have been subject to some influence which distributed it over 717 days; while that of the last period, which is found to be only 10 inches less, seem to have lost this influence in a great measure and fell only on 624 days. The total loss in number of wet days, since the commencement of the first period is equal to about the average number of rainy days in one whole year.

27. In my description of the soil of Singapore, I have pointed out that it is of a peculiar nature, absorbing large quantities of water during showers, and having a strong tendency to crack and rent after even a short period of dry weather, and that frequent showers evenly distributed are necessary to keep it in a state fit for the growth of plants or agriculture, and this fact should not be lost sight of in connection with the great loss in the number of rainy days as shewn above.

28. There is yet another item, which I will refer to before closing my observations on the Meteorology of the Island, namely, the condensing power of forests on atmospheric vapour. Reliable experiments have shewn that more rain would be the result of greater shade and tree-covering, and this is accounted for by the fact that when a cloud containing vapour comes in contact with the cool air over the forest or woodland, contraction takes place, the aqueous particles are forced together and fall in the shape of rain; whereas, were such a cloud to pass over the heated air over bare land, it would dissolve itself and vanish, and the chances of rain would be lessened.

29. The primæval forests of Singapore belong to that class known as evergreen tropical forests, which chiefly lie within the tropics and in countries subject to heavy annual rainfall, and a high state of atmospheric moisture. Many of the trees contained in these forests are, nevertheless, deciduous for a very limited period, which, in most cases, extend over a few days only. The island appears to have been covered with forests of this nature till quite recently.

Forests

30. From what can be judged from some old trees which still remain on the island, and from what I have seen of the primæval forests in the adjacent territory of Johor, the forests of the island must have been very fine. Some of the old trees have trunks several feet in diameter, straight as arrows, and 60 to 70 feet to the first ramification of the branches. It is also observed that many of the districts of the island have derived their names from the abundance of the valuable kinds of timber found in them. Serayah-wood was abundantly produced, a species which always finds a ready market. In Australia its excellent qualities have obtained for it the name of "Singapore Cedar," and in Mauritius, where it is annually imported to the value of about £10,000, it is known as "Bois de Singapore," and for house-fitting and constructive works generally, where not exposed to the weather, it is one of the most easy to work and most durable of woods. This with most other valuable kinds is only to be found in very diminished quantities on the island.

31. Those species which are chiefly to be met with in the patches of forest remaining on the island, I have divided into lists, according to their importance or peculiarities. Where

the systematic name is not given, I have not met with a tree in blossom, and where the local name is omitted, it is owing to none of my guides being able to furnish me with the name. See *Appendix A*.

32. Such Crown forests as remain uncut are widely distributed in isolated patches over the island. These forest patches or clumps are of various sizes, from half an acre or so to about twenty-five acres, and of no particular shape; their distance from each other may average a quarter of a mile, though often exceeding a mile. The interspace is generally waste grass land which supports, as a rule, only strong-growing grass locally known as "*lalang*," (*Imperata Koenigii*), which chokes any seedlings of forest trees which might otherwise spring, and ultimately reforest such lands. The area of forest of this description is difficult to estimate, but I think that 5,000 acres would be about the proper figure to be termed approximate. Little timber of any particular value remains in the Government forest; some patches contain a few trees of fair size, but they produce wood of indifferent quality. Frequently, however, a tree of *serayah* or *meranti* may be met with in the larger forest clumps, where they have been spared owing to their occupying inaccessible positions, or to accident.

33. Around such trees may be found seedlings of the same kinds in limited numbers, and also at some little distance to which the winds have wafted the seed, but these constitute only a small proportion of the seedlings to be found in these forests; the majority being inferior species, and as these are preparing to form the forests of the future, it need hardly be said that they will not be very valuable when grown, unless assisted by regeneration cuttings, or, where that is likely to prove ineffectual, by artificial sowing or planting to the requisite extent.

Waste Lands.

34. This condition of things is not, I believe, generally understood in the Colony, where the opinion prevails that the waste lands only require attention; but much of the secondary growth which forms the greater proportion of the present forest of the island is, from a Forester's point of view, nearly as worthless as the waste lands themselves.

35. It is indeed difficult to properly account for the degenerate state in which the remaining forests of the island are found, and I can only surmise that the valuable trees which once covered the surface of the island must have been removed before they had made provision for reproduction by seed-shedding, and that the condition of the land when denuded must have been unfavourable to the growth of their progeny. I observed in one forest a band of men eagerly searching for young trees of *Tampinis* which were believed to grow there, and a little later I saw several trees cut over close to the ground. These were small plants not more than three inches in diameter, a fact which would seem to show that the destruction of the saplings in this way by natural selection, has been, perhaps, the chief agent in bringing about the present unsatisfactory condition of growth.

36. The trees, some of which are only now made known to science as growing in the Straits Settlements, and which compose such forest as remains uncut on the island, are given; but some are now so scarce that they may be looked upon as extinct for any useful purpose they now serve. There is yet another class to describe, viz., auxiliaries. These are the small trees and shrubs which form the undergrowth, and which, though

of little commercial value, are nevertheless important as keeping the forest in a compact state, and thereby preventing an over free circulation of air, which would be injurious to the germination of seeds, and even to the proper growth of the trees themselves. This undergrowth also assists in keeping the forest floor in a proper state for the reception of seed, and maintains the general humidity of the air by preventing too rapid absorption, and those species peculiar to the forests of the Settlements, so far as they have come to my notice, I have added to the Appendix with the names of the principal palms and plants of the fern tribe met with during my forest tour. *See Appendix A.*

37. I also give a list of creepers and other plants injurious to forest growth. The first of these which I will mention are those most commonly found, the stronger of which climb to the tops of the highest trees, and ultimately cover and kill them. Others grow less strongly, and are dangerous to the trees only during the first ten or twenty years of their existence. Others, again, are found chiefly on the outskirts of woods where they hang only to the lower branches. Others are peculiar as finding their way quickly upon land, which has been cultivated and lately abandoned. These latter generally give most trouble, as they lay hold of the young trees which spring from seed or such as are planted, and soon choke and kill them if not speedily removed by the Forester. *See Appendix A.*

38. There is also a tribe of plants very common in the forests of the island which are sometimes epiphytal, but more often parasitical, the roots of which penetrate the branches of the trees and feed upon the sap intended for the nourishment of the legitimate leaves and branches. I noticed some trees covered with these parasites in the forests of the island, sometimes to the exclusion of every leaf except those of the parasite itself. Trees so covered soon die. It is curious, too, to witness the great rapidity with which parasites of this nature travel from tree to tree; their rapid distribution is said to be facilitated by birds which feed upon the seeds and drop them undigested upon the branches. *See Appendix A.*

39. Having already made mention of the area of waste lands and the nature of their distribution, I refer to them here only to show how far protection without artificial planting is likely to be effectual in the afforestation of them. A list of the young trees found to have crept into some waste lands abandoned about five years ago is given, but I may mention that of the species enumerated only two kinds are worth protecting, and these occur but rarely. The only thing which seems to grow freely for sometime after gambier cultivation is simply grass (*lalang*), and the result is that there is hardly to be found any land, the forest growth on which would grow into a serviceable plantation with the aid of protection only. This is a great drawback, and shews the sad condition into which a wild and unrestrained cultivation has brought the island. But on the other hand, I have further examined these waste lands with a view to finding out the depth to which the impoverished soil extends, and found it to be only the surface covering of a depth of about a foot or so. Below this, the soil is of ordinary good quality, and when turned up grows crops satisfactorily, and there is, therefore, every hope of forests being established on such lands, and of the plants growing with their usual vigour, after the roots have penetrated beyond the surface covering, and with such a mode of cultivation, as would turn down the exhausted surface soil, and turn up that which underlies it, as is done in

See Appendix A.

Europe, ordinary agricultural crops might be grown much longer on the same spot than is now the case; nor is the *lalang* grass so formidable an opponent of cultivation, as it is generally considered to be. It is easily destroyed by the shade of plants taller than itself when planted sufficiently near each other, and may, if desired, be grubbed out altogether. This grass may be looked upon as a valuable provision of nature in shading and protecting the waste lands which it covers from the deteriorating influence of the sun until suitable crops can be planted on them, or they are otherwise stocked by nature.

Diseases, Insect and Animal Life.

40. The forest trees of the Island are remarkably free from fungoid disease and fungi generally. The climate seems unfavorable for the development of this tribe of plants, and I have no recollection of having met with any tree which could be called diseased, although many were attacked by insects.

41. Insect life is very numerous in this part of the world, the family of beetles and boring insects specially so; but white ants, with which some lands swarm, are perhaps the most destructive, and seem to prefer wood of a light open-grained nature. In the Botanical Gardens of the Colony they have shewn a decided preference for pine trees and Australian trees generally. In the forests I have noticed trees of *Litscea*, *Campnospermum*, *Quercus*, *Castanopsis*, &c., eaten over by them. It is most difficult to suggest a remedy for their ravages, but, in this direction I have used gas tar with most success. They dislike any strong-smelling thing, and I have known them frightened away by a dose of guano water. There are, indeed, many substances and liquids which will kill them, but the difficulty is to get one that will destroy the ants without destroying the tree also, and one that will prevent their returning, and I believe no such remedy is at present known.

42. The Forests of this Colony are, as has been often remarked, singularly devoid of animal life; but of those animals and birds enumerated in the Appendix, all, except the Deer, which are not plentiful, are the cause of much injury or annoyance to the Forester. See Appendix D.

Regulations.

43. There are in Singapore absolutely no Forest Rules or Regulations, or Forest law of any kind. And it is most difficult to bring offenders to justice. The Forest Ranger staff of the island consists of two men only, who live in the town of Singapore, and visit such districts as the Collector of Land Revenue, under whose orders they are, sends them to, and at such times as he thinks proper.

44. Considering, therefore, the isolated nature of the forests, no attempt can be said to be made at protection, but only for the punishment of such offences as come to light. This is, I believe, the opposite to what should be aimed at, as it is opposed to the rules of good forest conservancy. There should always be a sufficiency in the Protection force to enable it to aim at prevention, as it is not the number of cases on the Magistrate's list which shew that the forests are being well-looked after, but rather the paucity of such. The amount of fines for forest destruction received in 1881 amounts to no less than \$2,653, which in itself will give some idea of what is going on in the way of forest clearing, and this sum, there is reason to believe, represents but a small part of the value of what is really destroyed. With this exception and that of the fees paid for cutting firewood, there is at present no revenue from forests properly so called, or expenditure on them.

45. I have endeavoured, by many means, to arrive at an approximate estimate of the amount of timber annually used in the island for constructive and other purposes, and give below the results of my enquiries. According to a rough estimate, the figures may be stated as under:—

Timber Consumption.

Used by the Public Works Department ...	80,600	c. ft.
Used by the Public	200,000	„
Used by Pepper Cultivators	530,400	„
	<hr/>	
Total ...	811,000	„
	<hr/>	

46. None of the above is the produce of the Settlements, but is reported to have been brought chiefly from Johor and the neighbouring Dutch islands. I am unable, as I should have wished, to give statistics of the Timber exports and imports: because as the Returns for the Colony deal with a passing trade I should not be able to produce accurate figures.

47. From figures supplied by the Land office, the number of permits issued for firewood-cutting in 1881 numbered 1,009, of which 609 were for a term of three months each, and 400 for two months each, which is equal to about 218 men cutting all the year round; but it is generally believed that from 300 to 400 men are annually engaged in this work. The Revenue received from permits of this description amounted in 1881 to \$1,020. It is difficult to arrive at correct figures of the annual amount of firewood used in the Settlement, but if it be assumed that 2lbs. per head of population are daily used as fuel—a quantity believed to be considerably under the actual consumption—there will be a total annual consumption of about 45,000 tons: of which amount 32,000 tons are consumed in the town of Singapore alone.

Firewood.

48. To the quantity used by the inhabitants in the country must be added the requirements of the gambier plantations, of which there are some 20 in the Island, each of which is believed to consume on an average 2,500 lbs. daily during the crop, which lasts for about six months of the year; and into this may be thrown the requirements of the pepper crop, the poles for new plantations excepted, as it must be understood that for the sake of keeping the coolies employed all the year round, and as a guard against a fall in prices, the gambier cultivators are also largely cultivators of pepper; and as the latter has a proper season for ripening its fruits, and the gambier no such season, the cultivators take the precaution to have the gambier plantations stripped by the time the pepper crop is ready to gather, so that no sooner are the boiler fires of the gambier preparers extinguished than those of the pepper kilns are lighted up. But again some cultivators prepare gambier all the year round when they possess a large plantation of such plants.

49. Much fuel is also used by the small coasting steamers and numerous steam launches, thirty-one of which burn wood exclusively, and others occasionally. These thirty-one boats have an average tonnage of 228 tons each, and consume monthly about 1,240 tons of wood.

50. The supply for this demand is drawn almost exclusively from the Dutch islands on the opposite side of the Straits, and is sold in the harbour of Singapore at an average

price of \$6½ per 1,000 pieces, or per 7,000 lbs. Ten years ago the same quantity could be obtained for \$4, but as wood is yearly becoming more difficult to procure, the price is also on the increase. The above figures may be tabulated as under. Approximate total annual consumption of firewood in Singapore:—

Drawn exclusively from the Forest of Singapore.	Drawn chiefly from Singapore and Dependencies.	Drawn almost entirely from Dutch Islands.	Total.	REMARKS.
Tons.	Tons.	Tons.	Tons.	
...	33,000	...	33,000	Consumed by inhabitants of chief town.
13,000	...	...	13,000	Consumed by inhabitants of country.
...	...	15,000	15,000	Consumed by coasting steamers.
40,000	...	...	40,000	Consumed by gambier planters.
53,000	33,000	15,000	101,000	

51. In addition to what has been stated, it should also be observed that gambier cultivators destroy annually about 10,000 tons of firewood in clearing for new plantations, the forest being cut down and set fire to. The average acreage annually cleared in this way is said to be about 390 acres.

Experimental Plantations.

52. Little has as yet been done to create plantations of young forest trees on the island, but the growth made by some introduced trees planted in an irregular way on some ground near the Botanical Gardens has far outstripped that of the better indigenous kinds and give results as under:—

	Age in years.	Height in feet.	Girth at one foot above ground.
Brazilian Iron-wood ...	2	7	8 ins.
Indian Teak ...	0½	3	3 "
Dammara Robusta ...	2	8	5 "
South American Mahogany ...	2	11	8 "

53. I wish to make a passing reference to the general collapse of the nutmeg trees on the island some years ago, when nearly all the plantations disappeared which had for years before succeeded admirably; I have been informed that the cause of this sudden blight remains a mystery until this day.

54. It is believed, nevertheless, that it is one of the laws of nature that, when a plant is introduced into a climate or soil which is not altogether congenial to its wants, although it may appear to flourish for a time, it will produce seed of a kind slightly inferior to that which the parent was raised from; and that that seed, if sown, will produce a tree still further degenerate, though still imperceptibly so to the eye, and so on until a general collapse ensues. The cure for this state

of things is, of course, to raise new plantations from introduced seed, and to avoid creating them from seed grown in the Settlement, and where this has been already done, a plant seems to grow with all its usual vigour.

55. The area of private forest land has been computed at about 5,000 acres scattered over the island in small holdings, and chiefly as firewood reserves in connection with gambier and pepper plantations. The largest private forest I have seen is situated a little to the west of Mount Faber range, and is owned by a Chinaman. This plantation is believed to be about 500 acres in extent, but contains only a small proportion of good timber. Owners of private forest in districts, where the Government forest has disappeared and plundering stopped in consequence, make good returns by the sale of timber, but such forests being of very limited extent, and no provision being made for reproduction, they will soon disappear.

Private Forest.

MALACCA.

56. Malacca is situated on the western coast of the Malayan Peninsula, at a distance of about 120 miles from Singapore, and has an area of 659 square miles. Its greatest length is 42 miles, and breadth from 8 to 21 miles. The chief town called Malacca is in 2.11" North Latitude, and 102.14 East Longitude.

Topographical Features.

57. For administrative and general purposes, it is divided into 34 districts, which, like those of Singapore are not properly defined. The number of acres under cultivation may be roughly stated at about 150,000, the chief agricultural products being tapioca and padi; quantity not known.

58. Malacca may be ranked among the flat countries of the Peninsula, broken only here and there by bold ranges of hills. The chief hills are the Bukit Punggor range at Nyalas, which forms a spur of the Ophir group, and which dips into the side of the forest reserve of Jus; the Panchor range which occupies a position in the centre of the territory and has a length of about three miles; the Rambau mountains which form part of the north-boundary; the Bukit Brûang range near the town of Malacca, which has a length of about three miles, and is somewhat curvilinear in shape; there are also smaller hills at Sungei Têbong and Pâlau Sêbang. The average height of which may be computed at 200 feet.

59. The chief rivers which traverse the territory are as under:—Sungei Batang Malacca, which passes through the centre of the Settlement and town of Malacca, and has a length of 35 miles. The Dûyong river, which joins the sea point about three miles to the south of the latter, and is about eight miles in length. The Kêsang river, which separates the territory of Malacca from that of Muar, takes its rise in the Bukit Singgeh range, and has a length of about 27 miles. The Chohong River, which rises from the Mount Ophir range. The Linggi river, which separates the territory on the west sides from that of Sungei Ujong, and is about seven miles in length; this river differs from most of the others in being navigable for boats for nearly its whole length. There are numerous smaller streams along the coast, but none that call for particular mention.

60. Malacca is upon the whole well provided with roads. There are about 135 miles of first class, and 80 miles of second class roads in the Settlement.

Geology.

61. The rocks composing the Malacca hills are the same as those throughout the Peninsula generally, and are chiefly plutonic, together with quartz-ferruginous rock, sandstone rock, &c. At the lower elevations shale enters largely into their composition.

62. The surface soil is more sandy than that of Singapore, specially in the more elevated portions, hence the preference given to it by tapioca cultivators. The greater extent of the surface being alluvial is more or less swampy, and on such lands *padi* is the general crop. Below the surface tin-ore abounds and is being worked in some places. Hot springs exist near the centre of the Settlement, which show that the volcanic action that formed the Peninsula is not yet extinct.

Meteorology.

63. The temperature of the air, the direction and prevalence of the monsoons, &c., are for all ordinary purposes the same as in Singapore. The atmosphere is, however, believed to be less humid. From observations taken in Malacca during 1881, it appears that the total annual rainfall for that year amounted to 103.23 inches. The highest temperature was 88°.4 F. and the lowest 71°.02.

Forests.

64. The quantity of Government forest land remaining may be put in round numbers at say 40,000 acres. From what I have observed in the existing forests there is reason to believe that, with the exception of a very limited number of species, the primæval forests of Malacca were similar to those of Singapore. The species found peculiar to Malacca are the following, but they, too, may prove indigenous to Singapore on a closer inspection—

Local name.	Systematic name.	REMARKS.
Kayu Gaharu ...	Gonystylos Miquelianus) Aquillaria ovata ...) Aquillaria agallocha ...)	Yield the garu resin of commerce.
Kayu Manis ...	Cinnamomum Javanicum Dehasia media Medinella venosa ...)	
Rotan Scemambu	Calamus ...)	
Salak ...	C. edulis ...	Fruit edible.
	Myristica Sp. ...	Bears very large fruit.

65. Gaharu is known generally in commerce as Garu de Malacca, and the "Rotan Scemambu" as Malacca cane. It is more than probable that Malacca has, for a long period, supplied these in greater quantity than any of the other Settlements, or indeed than any other part of the East, and it still exports them to some small extent, but cane is now only found in anything like quantity in the jungles at Nyalas near the boundary, and is on the verge of extinction in the Settlement, while of old gaharu trees only one is said to remain within the boundary line.

66. The chief features in Malacca are its Forest reserves, which are six in number and of the undermentioned approximate areas, viz. :—

Jus Reserve ...	25,000
Paya Gēmok ...	2,000
Malaka Pindah ...	2,500
Kēsang ...	2,000
Sungei Siput ...	4,000
Sungei Udang ...	2,000
	37,500

There is also a large amount of unreserved Crown Forest.

67. The distribution of these reserves will be best understood by a reference to the annexed map of Malacca, the Jus reserve is found to contain comparatively little timber except in immediate vicinity of the Bukit Punggor Hill range. There is also a clump of high forest about the position of the word Jus as printed over the reserve on the map annexed. The North East side which fronts the cultivated land contains comparatively few trees of good size and quality. The amount of well-wooded land in the reserve does not exceed, I believe, one-third of the total area. Within the reserve boundary there are a large number of squatters, whose houses are thickly dotted over the comparatively denuded portions. They are allowed to cultivate *padi* in the swampy land of the reserve, and to plant fruit trees on more elevated portions, privileges of which they seem to have extensively availed themselves. The greater portion of the Késang reserve has been under tapioca cultivation with the exception of a narrow belt along the outside, which seems to have been left as a screen. There is, therefore, but little timber of value left in this reserve, and as the denuded portion contains only stray plants of tapioca, it will have to be re-stocked artificially by planting. Gâdek reserve has also been under cultivation to a large extent at a comparatively recent date, and has been much denuded, the remaining trees being chiefly secondary growth, and brush-wood, but I am of opinion that they require little else than protection to form a good forest. The Sungei Siput reserve at Brîsu was cultivated over the north half within the memory of the presents quatters who are found within the reserve in considerable numbers; the remainder of the reserve is stocked with good timber in fair proportion to the area. The reserve at Sungei Udang once famous for its arang trees and still known to the natives as the Kâyu Arang reserve contains at present but few ebony trees. This is another example of that location of certain species which is a peculiarity of Malayan forest, and the numerous localities that bear the names of trees further instance this peculiarity. The centre of the Sungei Udang reserve is found well stocked with trees of fair size, but they grow less in number as the outside of the reserve is approached. In some parts of Jus, Paya Gêmok and Sungei Udang reserve I found the state of reproduction from seed of useful timbers in fair condition; but the reserves at Késang, Gâdek and Sungei Siput are not satisfactory in this respect.

68. The extent of waste land in Malacca is very small when compared with Singapore, and may amount to 10,000 acres. These lands do not remain in that bare condition which is so common in Singapore, and therefore I conclude that tapioca cultivation does not destroy as much as gambier the chances of reproduction of trees from seed. I have given considerable attention to this subject, and I give a list of trees, creepers, &c., observed to occur on those waste lands. See *Appendix A*.

Waste Lands.

69. The system of protection in Malacca is as meagre as in Singapore. The forest rangers are under the control of the Collector of Land Revenue and like those in Singapore reside in the chief town; but Malacca is peculiar as being the only Settlement in which I found any forest rules or regulations. These consist of a Government notice posted up in the streets and villages prohibiting the removal of timber and mineral produce from the forest reserves. The amount of fines imposed for breaches of these rules amounted in 1831 to \$1,536, which contrasts favourably with the sum received in Singapore during the same year. Payment is made to the Government of 10ths from wood oil, and there is a royalty on timber; but, besides

Regulations.

this there is at present no revenue from forests properly so called, or expenditure on them.

Private Forest.

70. It would be very difficult to estimate correctly the extent of private forest in Malacca, but from what I have seen I consider 8,000 acres would about cover what exists. Little of this contains timber of any value, the general custom being to work out as early as possible such timber as is worth removing, and next to cut down a certain proportion annually for the extension of cultivation. In this operation the trees are generally cut over about four feet from the ground and then set fire to and burnt off.

PENANG.

Topographical Features.

71. The island of Penang is situated on the West coast of the Malayan Peninsula in 5° North latitude and 100° 21' east longitude. Its greatest length is about 15 miles and breadth about 9 miles, area 107 square miles. Penang has not been, so far as I am informed, regularly divided into districts. Penang is the most hilly of all the Settlements, the ranges ramify from near the centre of the Island in all directions. West hill is situated in the interior of the island and has an elevation of 2,713 feet above sea-level; Government Hill, better known as Flagstaff hill, situated immediately behind George Town has an elevation of 2,550 feet; Mount Olivia which is a spur of the latter, lies three miles to the East of George Town, and has an elevation of 819 feet; Mount Elvira situated in the interior of the Island rises to 2,384 feet; "The Highlands" lying between Government Hill and George Town is 819 feet high; these mountain ranges are traversed by narrow passes, bold valleys stretch from the coast into the interior and terminate in the general axis of the hill system. On the West and North patches of flat land occur, interrupted only by occasional small hills or abrupt spurs of the smaller hill chains. The most extensive plain is that in which George Town is situated, and which with the others are believed to be recent formations and not to have belonged to the island originally. The elevation of these plains is only slightly above sea level.

72. The mountainous nature of the surface does not admit of a proper series of good roads throughout the island, and those which exist are connected in some places by bridle paths. The chief roads are those which traverse the plain behind George Town and are kept in excellent order.

73. None of the water courses of the island are sufficiently large to earn the name of rivers, though they are generally so called, the most important is that which traverses the plain near George Town and from which the town supply of water is procured; but the volume of water of this river has been of late much reduced, and is in no small degree polluted by extensive removals of the natural covering of its watershed and by cultivation.

Geology.

74. The island is generally and rightly looked upon as a mass of granite rock, with granite soil as a necessary consequence, and which with a slight coating of vegetable humus, formed of decayed branches and leaves, clothes all the highlands and upper portions of the valleys, the alluvial soils being confined entirely to the plains and bottoms of the valleys. In some places where landslips have exhibited sections of the hill sides, soils of various colours are seen to occur; where quartz predominated in the original rock a sandy gritty soil is the result; where felspar prevailed a whitish clay is produced, and where mica was in excess a reddish or brownish soil is to be

observed. In some places these soils have a great depth even on steep hill sides, as may be seen from cuttings made in the formation of a road up Government Hill, where the soil is of a reddish yellow or brownish colour, the path being covered by a large number of felspar pebbles showing that the granite which formed this soil contained felspar and mica in abundance. Decomposed rock of this description forms the best soils; and this is apparent from the luxuriant forest growth which clothes this hill side.

75. The climates of Penang and Province Wellesley differ in some respects, but both are adapted to all the purposes of intertropical agriculture. Hurricanes have never visited either of these places, though strong squalls have occasionally done much mischief in plantations. Droughts of considerable duration occur at intervals. The atmosphere of Penang is more loaded with aqueous vapour than that of Province Wellesley, owing to the latter being more removed from proximity to the hills. The average temperature of Penang is about a degree higher than the Province: the dews are heavier perhaps in the Province. The northern half of the Province is swept by a strong wind during the day and generally by a cool land wind at night. The climate of Province Wellesley is generally believed to be more healthy than that of Penang plain, which is attributed to its being more ventilated. The temperature in Province Wellesley has been known to fall to 65° F., mean temperature of Penang plain about $80\frac{1}{2}^{\circ}$; Province Wellesley $79\frac{1}{2}^{\circ}$. The mean annual rainfall of Penang plain during the three years prior to 1882 was 107.72 inches. The mean temperature for the same period 88.8° and the mean minimum 75° .

Meteorology.

76. The composition of the primæval forests of Penang differs but little from the other Settlements with the exception of a few species which are also found to occur in British Burmah. And in reference to this it is to be noticed, that as we proceed northward, the Burmese and East Indian species gradually become more plentiful in the Malayan forests. The hill ranges formerly contained some very fine timber, but little of this now remains, though secondary growth of considerable size, and even patches of good forest, still clothe some of the ravine sides. Here a tree of *Dyera Costulata* recently existed, known as the great tree, and, from its position on the hill top, was a landmark to Mariners. This tree had a clear stem of 110 feet to the first branch, its base was 30 feet in circumference, and 20 feet at a height of 110 feet above ground. There are still several good sized trees of this species in the same neighbourhood, one of which measures 77 feet to the lower branches and 18 feet in circumference. The wood of this species is white, light, easily worked and chiefly used by undertakers for coffins and by shoe-makers for clogs. The island contains also those valuable species of the Singapore and Malacca forests which I have already described.

Forests.

77. I estimate the area of existing Crown forests at about 12,000 acres, the greater bulk of which is distributed over the hill ranges in isolated patches, being most plentiful in the vicinity of Government Hill and the centre of the island generally. The hills and hill slopes adjoining the coasts contain but few trees, except such as belong to private parties. I would, however, except the neighbouring islands; Pulau Jërâjak, for instance, on which is situated the Leper Asylum, having an area of about nine square miles, is densely clothed with timber of small size.

78. On some hills, which have been completely denuded to their summits, landslips have occurred, and they illustrate on a small scale what has taken place in the Alps and other mountain chains in Europe, where similar deforestation has been effected. In some positions the roots of the trees form the natural binding which keeps the soil together, and which, when removed, exposes it to being swept into the valleys by heavy torrents of rain, and the underlying rock being thus laid bare afforestation becomes almost or altogether impossible either by natural or artificial means.

Consumption of Timber and Firewood.

79. It would be very difficult to make even an approximate estimate of the amount of timber and fuel annually used in Penang and Province Wellesley, but the amount is well known to be considerable; I would, however, only remark that the supply of firewood is said to be still abundant in the jungles along the coast of Province Wellesley. Timber is also observed to be brought in rafts down the chief rivers of the Province, and is said to come chiefly from beyond the Kedah boundary. As cultivation extends, however, these jungles will diminish and the supply will become exhausted.

Regulations.

80. Penang has one forest ranger and Province Wellesley two for the protection of the forests, but they reside in the chief town and are under the direction of the Land Officer. As in the other Settlements there is no forest revenue or expenditure properly so called.

Private Forest.

81. The estimated extent of private forest throughout the island is 8,000 acres, and, like the Crown forest, this is widely distributed, and is fast being cleared.

PROVINCE WELLESLEY.

Topographical Features.

82. Province Wellesley is separated from Penang by a narrow strait of from two to ten miles in breadth. The Settlement is forty-five miles in length, including ten miles of newly acquired territory to the south of the Krian river, and about eight miles in breadth; total area about 170,000 acres. The Province is divided into five districts, and the cultivation is chiefly padi and sugarcane.

83. With few exceptions, the whole Province is one vast plain, the principal exception being the Bukit Mertajam hill range, which, situated near the centre of the territory, runs in from the Kedah boundary for a distance of about three miles, and rises to an elevation of 1863 feet above sea-level. Near this range is situated a peculiar circular group of small hills about three miles in diameter, and about the same distance north of these the Ranjau hills occur; they also run in from the Kedah boundary for a distance of about three miles. In the extreme south are situated the Panchor hills, which form a club-shaped range, and are part of the boundary separating the Province from the territory of Kedah. In addition to these only a few isolated hills of little elevation or importance are met with.

84. The Province contains the largest rivers which occur in any of the Settlements, such as the Krian, Junjong, Juru, Prai, and Muda rivers, all of which are navigable for large vessels for many miles, and through which boats may pass to the Kedah boundary, or even further. These rivers traverse the Province from west to east and are distributed with wonderful regularity along its whole length.

85. In the northern half of the Settlement roads are generally good, but in the south their condition is less satisfactory. The total extent of roads may be put down at about 100 miles.

86. The composition of the hill ranges is, with little exception, the same as that of Penang, but the soil which covers them is generally considered to be of a more friable nature. The flat country (and it is mostly flat) is all alluvial deposit, and is said to have been at one time covered by the sea, the action in the tidal current, to which its elevation is due, is still going on. Its coast line receives from the sea annually an increment of mud, and in some places more than others the coast line is gradually being extended. These deposits are sometimes the cause of those peculiar phenomena on the south bank of the Krian River, which I was for some time much puzzled to account for. Looking over the tops of the mangrove trees at this point they seem to be clipped into terraces which descend by gradual steps towards the sea. The tops of the trees of the first, second and third series are all quite level with each other, as if cut over with great care, so as to have the top of each tree on a dead level with its neighbour. The breadth of these terraces may average 80 feet, their height is about six feet. The explanation of this phenomenon is, I presume, given in the fact that the silting up of mud along the outer edge of the swamp is continually going on; but as the seed crop of the trees is only once a year, there is an annual stocking of the new formations of mud with seed which causes about twelve months' difference in the age and height of the trees, and so gives a peculiar terrace-like appearance.

Geology.

87. The good forest remaining may be taken as amounting to about 20,000 acres, and this is to be found in the southern districts near the boundary which separates the Province from the territory of Kedah.

Forests.

88. There is less waste land in the Province than in any of the other Settlements; but I do not include the mangrove swamps, which contain too great a depth of water for the cultivation of rice.

Waste Lands.

RECOMMENDATIONS.

89. From what has been already said it will be obvious that the first important step to be taken towards bringing forest matters in the Settlements to a more satisfactory issue, is to secure the preservation of such forests as are worth retaining, especially such as occupy positions affecting the wood and water-supply. In Singapore no better position can be chosen for a forest reserve than the central ridge or high land which covers the interior of the island, and which contains the sources of all the more important streams, as shewn within the dark line on the annexed map. The growing scarcity of fuel and the exhaustion of the Bakau jungles along the coast, necessitate the formation of a reserve purpose for a permanent supply, and I would propose for this the reserve marked A, which is close to the chief town, and, therefore, to the centre of demand. This land comprises a series of hills and swamps, and is suitable for the growth of every variety of wood used for fuel, as well as of timber trees for general purposes. Included also within its area are more Bakau trees and jungle than can be found anywhere else in the island; wood from this reserve could be moved with facility along the road marked H, as well as by boats along

Singapore.

the coast. Its area would be about 6,000 acres, and it is, I believe, almost entirely Crown land.

90. I have referred to the absence of protection to the streams and water-courses of the island, the result of which is that, after even slight showers, they become discoloured and muddy. Belts of a few feet of thick jungle along their banks would prevent this in a great measure, by keeping back cultivation now carried to the water edge, and by acting as a natural filter for rainfall.

91. In regard to the present condition of the proposed reserves I have to remark that they contain very little timber, and will have to be stocked by artificial planting over the greater portion of their areas, a work that will occupy an active planting staff for some considerable time.

92. The advantages of protecting the spontaneous growth in the formation of forests so exceed those of artificial planting that the latter should only be resorted to when there is no hope of land becoming properly stocked without it. For the proper protection, working and general management of the forests, it is necessary that a small Forest Department be formed, and placed under a trained and responsible officer. Under him there should be a small Forest Police Force, who might be allotted quarters in the numerous police stations close to nearly all the existing and proposed reserves. By this means the cost of erecting quarters for a new force would be reduced to a minimum. A working staff of men employed in active forest operations, such as planting, weeding, felling, &c., and in nursery work, would also be necessary in such numbers as the annual plan of operations calls for. These men would be told off in gangs and would have to be provided with quarters, in the shape of atap-covered sheds costing but little. Over them should be placed overseers, the chief of whom would receive his instructions direct from the executive head of the department.

Malacca.

93. Having already described the condition of the various forest reserves throughout the Settlement of Malacca, I will now detail the particular treatment each should receive to make them useful in the production of timber. At present the reserves require a thorough overhaul, and in most cases re-adjustment, and much depends on the co-operation of the Land Office in putting a stop to exhaustive cultivation, and in preventing reckless destruction.

94. The first of the old reserves which claims attention is the extensive one covering the Jus and Bukit Singgeh districts, the immense area of which is certainly now more of an impediment to progress than an aid to it. Squatters have crept into the reserve in hundreds and have built villages and planted orchards to so great an extent that the southern half contains possibly more fruit trees than forest trees. The swampy land within the reserve boundary is under *padi* cultivation, and, excluding tapioca, there is really little or no difference between the lower half of the reserve and the unreserved country outside. I therefore strongly urge the re-adjustment of the reserve so as to throw the majority of the squatters and their villages outside such portions as it is necessary to retain. My modifications, which are shewn on the Map, will give the Government a reserve of sufficient size and of better timber than they have at present.

95. I have shewn that the Késang forest reserve is compa-

ratively worthless at present, having only a crust of forest around its boundary. To make this a good forest, its interior must be planted with useful young trees artificially. At the same time I would propose adding to it about 2,000 acres on the town side marked M; as this portion contains already some good trees. The position of this reserve is good, and every effort should be made to stock it with the trees most in demand.

96. The reserve at Merlimau contains at present an area of 2,000 acres of good forest, but this is much too small and the reserve should be doubled, and should cover, if possible, the portion marked N, on annexed map; but, if that be impracticable, it should be extended in the direction O and run back as far as the river. Both these portions contain good timber, and one or both should be reserved.

97. The Gading reserve is also comparatively worthless in its present state and position. It should take in Bukit Panchor Hill range, which is covered by forest to some extent, and the spontaneous growth on which should be encouraged as much as possible. Good water is scarce in this district, but, with the re-adjustment of the reserve as mentioned, it is hoped that springs of good water will be created near the foot of the hills, and that the sanitary condition of the district will be thereby improved.

98. The Sungei Siput reserve only requires protection, and I would propose adding to it the land marked V, which contains some good forest, and also that marked J, some of which is at present under tapioca cultivation, but which, looking to the natural configuration of the country, would be better retained under wood, as it contains many hills not shewn on the map. This reserve should be extended over the land marked I, and also for about half a mile over its north boundary to cover some valuable timber in that direction, and in the former to utilize the waste lands which lie on its western boundary, and to give the reserve a better sea-frontage for water carriage of timber.

99. Notwithstanding all that has been accomplished in the way of establishing convenient and useful forest reserves in Malacca, inconvenience is experienced in having to bring timber for the supply of town wants from long distances, but this would be remedied by the presence of a suitable reserve near town. I am of opinion that such a reserve must have existed at one time, and, if so, it must have covered the Bukit Bruang range, as it is scarcely possible that such a favourable and useful position for a reserve could have escaped the Dutch. In any case I would recommend the formation of a town reserve here, as it is only about three miles from the chief town, and covers an area of nearly 2,000 acres or thereabouts. This land appears to have been lately under cultivation, but it is fast becoming re-wooded by the spontaneous growth of young trees, especially over the Hill range which covers its interior. On the more level portions young trees are less numerous and would have to be assisted by planting to some extent to give the forest the necessary compactness and to fully utilize the land.

100. The rivers and principal streams should have a border of forest left along their banks or be planted to a breadth of from 25 to 50 feet according to the size and importance of the streams.

101. Many of the waste lands in Malacca will re-wood them-

selves by spontaneous reproduction if only properly protected, but few will become valuable forest owing to the preponderance of useless species among the growth mentioned, and they will therefore have to be assisted by artificial planting to some extent.

102. I cannot end my remarks upon this Settlement without referring to those valuable products found in its forest, *viz.*, Gaharu and Malacca cane. Gaharu, which is also known as Garu de Malacca, Calumbar, Aloe wood and Agallochum, is the most valuable product of the Malacca forest, and is yielded by at least two distant species of trees, *viz.*, *Aquillaria Malaccensis* and *A. Agallocha*. There is also a tree in Cochin China named *Alcexylon Agallochum* which yields a similar resinous aromatic wood, and which is believed to have been carried from Malacca to Cochin China, or, as some consider, from Cochin China to Malayan territory. Gaharu fetches in the market about \$188 per picul (133½ lbs), which, according to the Straits Blue Book for the year 1881, is about thirty-seven times greater than the price paid for a similar quantity of Sandal wood. Gaharu producing trees should therefore find a liberal place in the planting operations of the present and future. Malacca cane, which, like Gaharu trees, is on the verge of extinction in the Settlement, has been hunted down all over the country, and is now only found in small quantities in the district of Nialas, and near Mount Ophir. The modifications I have proposed in the Jus reserve will take in a good many of these canes and so conserve them.

Penang.

103. The topographical features of Penang differ so much from the other Settlements that I have not attempted to show on the annexed map of the island any proposed forest reserves. The first thing that calls for attention in Penang is the proper distribution and regulation of the mountain forest reserves. Some of the hill slopes are very steep, while others again after being so for a certain height lose this character, and grow comparatively flat, causing as it were double tableland, one at a low elevation and the other higher up; other slopes extend from near the interior with considerable steepness to the sea-edge; having no level ground whatever at the bottom. It is not, therefore, possible to lay down any hard and fast rule as to the amount of forest which should be retained on each mountain crest. I think, however, that about one-third of the higher mountain slopes of the island should be kept under jungle. Such reserves once established should be kept clearly demarcated and constantly watched by the Forest Police.

104. Many of the denuded hill tops require to be planted or sown with seeds in contouring bands, and this is the cheapest and quickest mode of establishing forests, and it can be largely acted upon on Penang Hill.

105. Nothing, however, requires more urgent attention than that portion which acts as the catchment area of the river feeding the town reservoir. The watershed has been allowed to be over-run by cultivation to a deplorable extent; but this must be put a stop to and the cultivators with their pigs and other "barang-barang" turned off. The watershed should be closely re-wooded by the encouragement of spontaneous growth, seed sowing, &c. The same remarks apply to the catchment areas of all important streams which should be kept under dense jungle in order to protect the purity of water. Such streams should also be protected by a belt of reserve jungle along their banks. Should any portions of the watershed be found to have been sold or granted away by the Land

Office, they should be resumed and handed over to the Forest Department.

106. I also recommend the formation of a series of nurseries for the propagation of forest trees.

107. Apart from the consideration of mountain and stream reserves, wood-supply, &c., I must urge that all possible efforts be made to stop the felling operations now going on in the private forests which clothe the hills, and by which the town is surrounded on two sides. If these forests are removed, the temperature of the town will be raised and made drier, and a change for the worse in its sanitary condition will be the result.

108. On the annexed map I have shewn which I consider the best positions for forest reserves under *present circumstances*, and of these Bukit Mertajam, as the most central, the most easy of access, and the nearest to the chief sources of demand, may be looked upon as the most important, though the reserves marked S and V may contain upon the whole more timber. Reserve R is only shewn as occupying a convenient position for the creation of a reserve or plantation. This land is at present under padi cultivation, but I think it should be planted up as timber is scarce in the locality, and its want will be more felt by and by. To stock these reserves properly, a great deal of planting will be required in addition to what can be done in the way of protection and encouragement of spontaneous growth, but I will not deal with details here.

Province Wellesley.

109. Looking at the position of these reserves, it will be seen that they are approached by rivers which will facilitate transport of timber and other forest produce. The rivers of Province Wellesley are constantly flooded by the tide of the Straits, and it is therefore considered unnecessary to retain a reserve of jungle along their banks, and, as the mountain ranges lie wholly within the reserve boundaries, all consideration of mountain reserve lines are done away with.

110. I also recommend that the road sides in the Province which are bare of trees, and all similar roads in other Settlements, be planted with roadside trees at distances of about thirty feet apart, and with a view to this I give a list of trees suitable for roadside planting—See Appendix B.

111. The greater amount of timber shipped from the Straits of late years has been the produce of the Johor forests, but even there timber has now to be brought from long distances and, according to a statement made by the proprietors of the Johor Steam Saw Mills, it is yearly becoming more difficult to obtain. The reason of this is apparent, when it is considered that according to figures supplied by the Gambier and Pepper Society, there are no less than 4,000 Gambier and Pepper plantations in Johor, and that this number is being constantly added to. Under these circumstances it will be seen that the timber supply from Johor is, like most other sources of supply over which the Government has no control, very precarious.

CONCLUSION.

112. The measures which have been recommended in the foregoing pages may be briefly summarised thus:—

(a.) Preventing the felling of forests and the clearing of forest lands.

Preventing the falling of Forest and the
clearing of Forest Lands

out
 out with reference to dem-
 arca still required
 d. Out and under
 ...
 out, so far as Reserves are
 d. and land interest
 ...
 out. The ...
 in ...
 out
 out, and trial made
 ...

- ✓ (b.) The redemption, by exchange or otherwise, of such land as is selected for planting with forest trees.
- ✓ (c.) The survey and demarcation of such Crown forest lands as are still undetermined, and the preparation of good and reliable maps shewing the forests and the topographical features of the various lands throughout the Settlements. This is a desideratum that should be looked upon as a first duty of the Survey Department.
- ✓ (d.) The formation of local forest reserves for the supply of wood for general purposes; and mountain and river reserves for protection where necessary.
- ✓ (e.) The establishment of a Forest Department to take charge of all Crown Forests whether proclaimed as reserves or otherwise.
- ✓ (f.) The marking of certain blocks of forest near the chief towns of each Settlement of a sufficient size to serve as reserves for the supply of fuel and small building wood.
- ✓ (g.) The appointment of a body of Forest Police for protective purposes, to be quartered in the country districts throughout the Settlements.
- ✓ (h.) The immediate collection of seeds of the best indigenous timber trees, and the formation of nurseries for the propagation of such seeds.
- ✗ (i.) The introduction of an ordinance for the better conservation of the Crown forests.

Experimental Nurseries
 " " □
 (Pres)
 (fut)
 herbarium on
 arrangements of plants
 for the ...
 ...
 and regulations

113. In order to admit, however, of an immediate commencement being made, and as all great things have small beginnings, I would propose the taking up next year (1884) of a certain area of the denuded land in each Settlement as detailed below, viz.:-

	Area in acres.	Cost of planting operations and additional protection for existing forests.
Singapore	200	\$7,000
Malacca	200	6,000
Penang and Province Wel-lesley	100	7,000
	TOTAL	\$20,000

No skilled assistance is considered necessary to aid in carrying out work next year, but as the work will annually gain in importance, the assistance of trained officers will be required later. It is not, I consider, necessary to detail here the particular manner in which the sum above-mentioned will be expended; such details fall more properly under the annual report on working operations.

APPENDIX A.

I.—List of large Indigenous Trees, a few of which are still to be found in Singapore.

Local Name.	Systematic Name.	
Tembésu	... } <i>Fagraea peregrina</i>	... Used for piles and foundations.
Temūsu	... }	
Damar laut	... <i>Canarium dichotomum</i>	... " Constructive purposes.
Dûrian Bûrong	... <i>Durio oxleyanus</i>	... " Masts for ships.
Merbau	... <i>Azelia</i> sp.	... " For furniture.
Jelutong	... <i>Dyera costulata</i>	... " Constructive purposes.
Sênâ	... <i>Pterocarpus indicus</i>	... " "
Bûnut	... <i>Urostigma</i> sp.	... " "
Kayu kûlim	... <i>Scorodocarpus Borneensis</i>	... " "
Kayu kâpor	... <i>Dryobalanops camphora</i>	... " "
Klédang	... <i>Artocarpus</i> sp.	... " "
Berangan	... <i>Castania</i> and <i>Castanopsis</i>	... Not much used.
Changi	... <i>Daphniphylopsis capitata</i>	... Used for constructive purposes.
Kweng	... <i>Dipterocarpus</i> sp.	... Produces wood oil.
Kafapang	... <i>Terminalia catappa</i>	... Constructive purposes.
Smarum	... <i>Mimusops indica</i>	... " "
Jambu utan	... <i>Eugenia</i> sp.	... " "
Têrentang	... <i>Castanespermum auriculatum</i>	... " "
Tengau	... <i>Bruguiera parviflora</i>	... " "
Bâlau	...	The best wood for sleepers.
Pêtâling	... <i>Strombosia Javanica</i>	... For constructive purposes.
Rêsak	... <i>Vatica Russah</i> ?	... " "
Tampînis	... <i>Sæltia sideroxylon</i>	... Used for nearly all purposes.

II.—List of small Trees, very few of which now remain in Singapore.

Local Name.	Systematic Name.	
Meranti	... <i>Hopea Meranti</i> and <i>Shorea</i>	Used for constructive purposes.
Serâya	... <i>Shorea</i> sp. and <i>Hopea</i> sp.	... do.
Glam Tikus	... <i>Eugenia</i> sp.	... Constructive purposes.
Brûas	... <i>Garcinia</i> sp.	... do.
Rêngas	... <i>Gluta velutina</i>	... Furniture, &c.
Penâga	... <i>Calophyllum inophyllum</i>	... Masts and spars of ships.
Kemûning	... <i>Murraya exotic</i>	... Used by turners.
Kêlat	... <i>Eugenia Zeylanica</i>	... Constructive purposes.
Klédang	... <i>Artocarpus</i> sp.	... " "
Pâsal	... do. <i>echinatus</i>	... " "
Nipis Kulit	...	... " "
Pûlei	... <i>Alstonia scholaris</i> var.	... " "
Rumania	... <i>Bouea macrophylla</i>	... " "
Medang Sêrei	... <i>Litsaea lancifolia</i>	... " "
Srian	... <i>Canariopsis hispida</i>	... " "
Jambu-Jambu	... <i>Inocarpus edulis</i>	... " "
Daru-Daru	... <i>Sideroxylon lanceolatum</i> var.	... " "
Tampang	... <i>Artocarpus rigidus</i>	... " "
Chêmpedak Ayer	... " <i>varians</i>	... " "
Mahang Wangi	...	... " "
Bakau	... <i>Rhizophora mucronata</i>	... " "
Têngau	... <i>Heritiera littoralis</i>	... " "
Lêban	...	... " "
Rambeï daun	...	... " "
Medang Kunyiit	...	... " "
Medang Lêlin	...	... " "
Klapa laût	...	... " "

III.—List of Trees found growing on Hilly ground.

Local Name.	Systematic Name.	
Kayu Kélat	... <i>Eugenia zeylanica</i>	... Rare.
Serâya	... <i>Shorea, Hopea, Vatica, &c.</i>	... do.
Meranti	... <i>Hopea Meranti</i>	... do.
Mërbau	... <i>Azalia</i> sp.	... do.
Rëngas	... <i>Gluta velutina</i>	... do.
Klédang	... <i>Diospyros fruticosus</i>	... do.
Pâsal	... <i>Artocarpus echinatus</i>	... do.
Changi	... <i>Daphniphylopsis capitata</i>	... do.
Mëdang Sërei	... <i>Litsæa lancifolia</i>	... do.
Kayu Kûlim	... <i>Scorodocarpus Borneensis</i>	... do.
Rësak	... <i>Vatica Russah</i>	... do.
Kemûning	... <i>Murraya exotica</i>	... do.
Kayu Manis	... <i>Cinnamomum</i> of sorts	... do.
Jelutong	... <i>Dyera costulata</i>	... do.
Pûlei	... <i>Alstonia scholaris</i> var.	... do.
Minyak Jantan	... <i>Dipterocarpus</i> sps.	... do.
Brangën	... <i>Castania</i> and <i>Castanopsis</i>	... Common.
Bëlutu	... <i>Randia anisophylla</i>	... do.
	... <i>Artocarpus</i> sps.	...
	... <i>Elæodendron glaucum</i>	... do.
Langut	... <i>Rhodammia trinervia</i>	... Very common.
Tiup-Tiup	... <i>Canarium rufum</i>	... Common, fruit eaten by Chinese.
Damar Utan	... <i>Canarium parvifolium</i>	...
	... <i>Cratoxylon polyanthum</i>	... Very plentiful.
	... <i>Evodia Roxburghiana</i>	... do.
Mapaga ?	... <i>Ixonanthes icosandra</i>	... do.
	... <i>Dillenia scabrella</i>	... Rare.
	... <i>Dillenia indica</i>	... do.
Jëring	... <i>Pithecolobium lobatum</i>	... Common, fruit eaten.
	... <i>Phyllanthus superbus</i>	... Very plentiful.
Nasi-Nasi	... <i>Buecharia sapida</i>	... Common in Malacca.
	... <i>Aperosa lepidostachya</i>	... do.
	... <i>Aperosa</i> sp.	...
	... <i>Vitex pubescens</i>	... Very common.
	... <i>Meliosma lanceolata</i>	... do.
	... <i>Cupania fuscidula</i>	... do.
	... <i>Antidesma pubescens</i>	... do.
Pulut	... <i>Barringtonia racinosa</i>	... Rather rare, cultivated.
Mahang Utan	... <i>Rottleria montana</i>	... Very plentiful.
Makapas	... <i>Xanthophyllum obscurum</i>	... Somewhat rare fruit eaten by
Sënâ	... <i>Xanthophyllum vitellinum</i>	... do. [Chinese.]
Mâta Këli	... <i>Gynotriches axillaris</i>	... Very plentiful.
Merbau Pâsar	... <i>Sindora Siamensis</i>	... Rare.
Blalang	... <i>Pithecolobium angulatum</i>	... Very plentiful.
Mampat	... <i>Hypericaceæ</i> , sp.	... do.
Mërbau Pâsir	... <i>Gironniera celtidifolia</i>	... do.
Simpon	... <i>Kurrimia paniculata</i>	... do.
Katâpang	... <i>Terminalia catappa</i>	... Rare fruit much esteemed by
Mësâwa	... <i>Symplocos pedicellata</i>	... Very common. [natives.]
Mongol	... <i>Gordonia Singaperiana</i>	... Common.
Trentang	... <i>Castanospermum auriculatum</i>	... do. on Bukit Timah.
Mërambong	... <i>Nauclea cadamba</i>	... Rare.
	... <i>Commersonia platyhylla</i>	... Very common near chief town.
Satebal	... <i>Phyllanthus surperba</i>	... do. do. everywhere.
Rando Kapok	... <i>Eriodendron anfractuosum</i>	... Common.
Merapal	... <i>Mæsa</i> sp.	...
Berangan Utan	... <i>Cratoxylon</i> sp.	... Common on hilly ground.
Meranti Utan	... <i>Aromadendron elegans</i>	... Very rare.
Jëlei	... <i>Elæocarpus</i> sp.	... Several kinds very common.
Gëtah Percha	... <i>Dichopsis gutta</i>	... Very rare.
Bëranngan Bâbi	... <i>Quercus</i> sps.	... Very common.

	Bignonia sp.	... Common, leaves eaten.
Médang	... Tetranthera Roxburghii	... Common.
Kayu Darah	... Myristica fatua	... do.
	... „ sesquipedale	... Rare.
Bûta <i>bula</i>	... Euphorbiaceæ sp.	... Common.
Sapetei	... Albizzia sp.	... Rare.
Sâga Laut	... Adenantha bicolor	... Rather rare.
Médang Jâti	... Pithecolobium confertum	... Very rare.
	Dysoxylon binectariferum	... Rare.
Kâyu Arang	... Maba ebenus. Diospyros fruticosus	Common.
	Alstonia macrophylla	... do.
	„ scholaris	... do.
	Pittosporum ferrugineum	... do.
Pênaga Purga	... Adinandra dumosa	... do.
Mahang	... Macaranga hypoleuca	... do.
	Macaranga sp.	... do.

IV.—List of Trees growing in Swampy ground.

Local Name.	Systematic Name.		
Kayu Laut	.....	House posts	... Common as small trees.
Bântangor Batu	Calophyllum inophyllum &	Ship's masts &	... Not common.
Bântangor	... C. spectabile	... General purposes	... do.
Rambei	... Pierardia dulcis	... Fruit edible	... Common in a cultivated state only.
Têmûsu	... Fagraea peregrina	... A valuable resinous wood, very durable under-ground.	do. do.
Manggis	... Garcinia mangostana.	The well-known Mangosteen.	do. do.
Manis	... Garcinia of sorts	...	} Timber small, used for various purposes. Common. do.
Kâsîh	... Cinnamomum sp.	...	
	... Symplocos sp.	...	
	Podocarpus polystachya	...	Not common.
Smârum	... Mimusops Indica	... Large tree timber useful for constructive purposes.	do.
Pênaga Purga	.. Adinandra dumosa	.....	Common.
	Thespesia populnea	... Wood hard & durable, used for cart-wheel, &c.	Common near the sea.
	Elæocarpus stipularis.	.....	Rather common.
Tampinis	... Scleria sideroxylon	... Extremely durable, used for beams, piles, &c.	Very rare.
Médang Jâti	... Pithecolobium confertum.	Timber for constructive purposes.	Rare.
Jambu	... Rhodamnia trinervia..	.....	Common as small trees.
	Eugenia jambolana	... Wood hard, heavy; bark slightly-astringent.	Common as small trees
	E. acuminatissimum	.....	do.
	E. jambosa	.....	do.
	E. molucciana	.....	do.
	E. aquea	.....	do.
Kayu Kêlat	... E. zeylanica	.....	} Fruit eaten by Chinese only. Wood said to be durable.
	Xanthophyllum obscurum.	ob-	

	Xanthophyllum vitellinum.		Rare.
Rumania	... Bouea microphylla	} Yields edible fruits ...	Common in a cultivated state.
	B. macrophylla		
Binjei	... Mangifera caesia		Cultivated for its fruit
Pulei	... Alstonia scholaris var.	} Yields a Gutta; wood soft & white.	Common.
Gëtah Jelutong	Dyera costulata.		
	Sterculia foetida		Wood light. Exudes gum. Rare.
	Sterculia sp.		
Jâwi-jâwi	... Ficus nitida		Common.
Buah Pâla	... Myristica fatua		Not common.
Do.	M. furfuracea		do.
Do.	M. sesquipedale		Rare.
Cajeputi or Kâyu Pûteh.	Melaleuca leucodendron.	Yields a valuable oil.	Common in Malacca.
Nam-Nam	... Cynometra cauliflora	Yields a fruit.	Timber of ordinary quality.

NOTE.—It is to be observed that some trees grow both in marshy and hilly ground. These appear on both lists.

V.—List of Trees found in Salt Water Marshes.

Local Name.	Systematic Name.	
Api-Api	... Lumnitzera coccinea	... Extensively used for firewood.
Bâkau	... Bruguiera sp.	do.
do.	Rhizophora mucronata	do.
Lënggâdei		do.
Mërbâtu		do. and charcoal.
Merpuan		do. do.
Nyëreh Bunga		House-building, &c.
Bâru	... Rhizophora conjugata	... Bark used for caulking seams of boats.
	Heritiera littoralis	... Wood tough and durable.

VI.—List of Trees chiefly used as Fuel.

Local Name.	Systematic Name.	
Bâkau	... Bruguiera and Rhizophora.	} Common as small trees in the swamps along the coast.
Lënggâdei		
Mërbâtu		
Chëndërei		
Api-Api	... Lumnitzera coccinea.	
	do. alba.	
Cajeputi or Kâyu Pûteh	Melaleuca leucodendron	

VII.—List of valuable Trees, very few of which still remain in Singapore.

Local Name.	Systematic Name.
Tampinis	... Slætia sideroxylon
Kayu Kulim	... Scorodocarpus Borneensis
Meranti	... Hopea Meranti and Dipterocarpeæ generally.
Tëmûsu	... Fagraea peregrina

Smarum	...	Mimusops Indica	...
Medang Serei	...	Litsæa lancifolia	...
Klêdang	...	Artocarpus sp.	...
Gêtah Jelutong	...	Dyera costulata	...
Pênâga	...	Calophyllum inophyllum	...
Bêntângor	...	Callophyllum spectabile	...
Pâsal	...	Artocarpus Ehinatus	...
Kîmyan putih	...	Mabba buxifolia	...
Kayu kelat	...	Eugenia Zeylanica	...
Pulei	...	Alstonia scholaris var.	...
Klêdang	...	Diospyros sp.	...
Jambu-jambu	...	Inocarpus edulis	...
Serâya	...	Shorea and Hopea	...

VIII.—List of valuable Indigenous Trees believed to be extinct in the Forests of the Straits Settlements.

Local Name.	Systematic Name.	
Bâlau	...	I know of no wood so durable as this under all circumstances and that can be used for more general purposes.
Kranji	... Leguminosæ	... Wood close-grained, heavy and durable.
„ hîtam	...	
„ dârah	...	
Kweng or Minyak Jan-tan.	... Dipterocarpus sp.	... Yields the kruing oil of commerce, One or two trees observed.
Mêdang lebar daun	...	House posts, &c.
Kayu Laut	...	Used in making masts and spars for vessels, paddles, &c.
Dûrian bûrong	... Durio oxleyanus	...
Kayu chichan	...	
Nangka Pîpit	...	
Bêlian Wangi	...	As beams for house building boat planking, &c.
Mêdang Kunyet	...	
Daru Daru or Dêdâru	... Sideroxylon lanceolatum var.	For building purposes; One tree seen.
Chêmpêdak ayer	...	For boat building.
Kayu Kâpor	... Dryobalanopsis camphora	... Do. constructive purposes.
Pêtâling	... Strombosia Javanica	... Wood close-grained of a light colour; used for general purposes.
Rêngas	... Gluta velutina	...
Nîpis Kulit	...	
Merambong	...	
Rambei Daun	... Dichopsis Gutta	... Yields gutta-percha.
Têmbêsû	...	Used by natives for rafters.

IX.—List of undergrowth in Singapore.

Local Name.	Systematic Name.	
Rêmpêdal Ayam	... Holoragis distica	...
	... Leea sambucina	... Very common.
Mahang Utan	... Mallotus paniculatus	... do. ...
	... Ardisia paniculata	... do.
	... Ardisia solanacea	... do.

Bixa	... Bixa orelliana	... Naturalised.
	Callicarpum longifolium	...
	Cassia auriculata	...
	Olea maritima	...
	Rhodomyrtus tomentosus	Common in woods near the sea.
	Uvaria hirsuta	...
	Uvaria purpurea	...
	Uvaria reticulata	... } Rather rare.
	Aglaia odorata	...
Nasi-Nasi	... Sponia Amboinense	... Very common.
	Ixora congesta	... do.
	Ixora Griffithii	... do.
	Gardenia campanulata	... do.
	Psychotria sp	... do.
Jûlong-Jûlong	... Gartneria obesa	... do.
	Scaveola Koenigii	... Common in marshy ground.
	Curculigo Sumatrana	... do. everywhere.
	Pavetta indica	...
	Thevetia nerifolia	... Naturalised.
	Dracæna Cantleyii	... Rather rare.
	Dracæna angustifolia	... Common in open parts.
	Dianella ensifolia	...
	Callicarpum macrophyllum	... } Common in swamps.
	Costus speciosus	...
	Sponia virgata	... Common everywhere.
	Marumia muscosa	...
	Clerodendron sp.	...
	Crotolaria striata	...
	Urania sinuata	...
	Melastoma malabathricum	... } In more open places.
	Indigofera sp.	...
	Tephrosia candida	...
	Clerodendron velutinum	...
	Mimosa sepiaria	...
	Pandanus sp.	...
	Nipa fruticans	...
	Freycinetia angustifolia	...

X.—List of the more remarkable of the Fern tribe, Singapore.

	Alsophila cymosa.
	Alsophila latibrosa.
	Dicksonia Barmetz.
	Gleichenia dichotoma.
	Gleichenia flagellaris.
	Blechnum orientale.
	Dipteris Horsfieldii.
	Marattia, Lomaria, Angiopteris, &c.

XI.—List of the more remarkable of the Palm tribe, Straits Settlements.

Local Name.	Systematic Name.	
Lontar	... Borassus flabelliformis	... The Palmyra palm, not plentiful.
Nibong	... Areca nebung	... Common, near the seashore on west coast.
Klâpa	... Cocos nucifera	... Several curious varieties observed.

	Arenga obtusifolia	...	
	do. saccharifera	...	Sugar palm.
Sâgu	... Sagus lœvis	...	Sago palm, common in marshy ground only.
	do. Rumphii	...	
Daun Daun	... Orania macrocladus	...	
	Caryota urens	...	Toddy palm.
	do. Cummingii	...	Rare.
	do. obtusa	...	do.
	do. sobolifera	...	do.
	Pinanga maculata	...	do.
	Ptychosperma Singaporensis	...	Common.
	do. coccinea	...	Rather rare.
	... Zalacca edulis	...	Common.
	Calamus sp.	...	do.
Malam waren	... Cyrtostachys Reindah	...	Getting scarce. The most ornamental of all the palms seen.

XII.—List of the chief Creepers, Singapore.

Local Name.	Systematic Name.	
	Entada scandens	... Very plentiful.
Akar	... Fibraurea tinctoria	... Root yields a dye, very common.
	Sphærostema marmorata	... Rare.
	Vitis elegans	... Very common.
Akar Ubi Utan	... Vitis Hookeri	... do.
	* Vitis semisagittifolia	... do.
Gôtah Gitan	... Willoughbeia firma	... Common.
Gôtah Hitam	... Willoughbeia Martabanica	... do.
Akar Ara	... Willoughbeia flavescens	... do.
	Vanilla albida (?)	... Rather rare.
	Pothos sps.	... Common.
	* Modecca obtusa	... do.
Rôtan	... Calamus sps.	... do.
	* Cocculus sps.	... do.
	* Passiflora fœtida	... do.
	* Passiflora molucciana	... do.
	Melodorum sps.	...
	Hiptage madablota	...
	... * Lygodium scandens	... Everywhere abundant.
	Bignonia Ungua	... do.
	* Tristellitia australasica	... Common in Sërangûn district only.
	* Cocculus glaucescens	... Common, fruit eaten, very refreshing.
	Grewia umbellata	... Not common.
	* Hexacentris mysorensis	... Common.
	* Derris elliptica	... do. used for intoxicating fish.
	* Derris thursiflora	... Not very plentiful.
Pina-Pina	... Smilax sp.	... do.
	* Convolvulus reptans	... do.
	Hoya pratense	... do.
	Hoya imperialis	... do.
	Hoya lacunosa	... do.
	Hoya carnosâ	... do.
	Strychnos colubrina	... Everywhere abundant.
Gambir	... Uncaria gambir	... do.
	Uncaria ferruginea	... Rather rare.
Kait-Kait	... Uncaria sp.	...
Rêsâm	... * Gleichenia flagellaris	... Common.
	Rhynosperrnum fragrans	... do.

XIII.—*List of Parasites, Singapore.*

Loranthus chrysanthus.
 Do. sphærocarpus.
 Do. tetragonus.
 Do. lepidotus.
 Viscum compressum.
 Do. ramosissimum.
 Ficus, several species.

About 20 more species are said to occur of the first named, among which are Loranthus formosus and Loxanthera speciosa.

XIV.—*List of spontaneous growth on Waste lands, Singapore.*

Cinnamomum platyphylla.
 Rottlera montana.
 Ficus sp.
 Eugenia, several sp.
 Mæsa do.
 Adinandra dumosa.
 Myristica furfuracea.
 Fagræa peregrina.

And as undergrowth the following.

Clerodendron velutinum.
 Melastoma malabathrica.
 Mimosa sepiaria.
 Solanum, several species.

XV.—*List of spontaneous growth on Waste lands, Malacca.*

Rottlera montana.
 Eugenia zeylanica.
 Simplocos lucida.
 Ficus Sps.
 Rhodammia trinervia.
 Macaranga hypoleuca.
 Do. Sp.
 Artocarpus echinatus.
 Ixonanthes icosandra.
 Alstonia scholaris var.
 Aralia Sp.

And as undergrowth the following.

Melastoma malabathrica.
 Lantana mutabilis.
 Solanum species.

XVI.—List of Exotic Trees, Singapore.

Native Name.	Systematic Name.	Native Country.	
Jâti ...	Tectona grandis ...	India ...	This has grown to a large size in the Colony. Young plants look well. <i>Failure</i>
	Dammara robusta ...	Australia ...	Very fair progress.
Rain tree ...	Inga saman ...	S. America ...	Grows well.
	Inga dulcis ...	India ...	Do.
Sênâ ...	Pterocarpus indicus ...	Do. ...	Said to grow in the Peninsula.
Flamboyant ...	Poinciana Regia ...	Madagascar ...	Grows well.
	Casuarina sumatrana ...	Sumatra ...	Do.
Mahogany ...	Swietenia Mahogani ...	W. Indies ...	Very rapid growth, should be planted extensively.
Gum tree ...	Eucalyptus piperita } E. rostrata }	Australia ...	Make fair progress.
Tecoma ...	Tecoma leucoxylon ...	India ...	Looks promising.
Green heart ...	Nectandra Rodiceï ...	Demerara ...	Only lately planted. <i>Failure</i>
Gêtah sundek ...	Ficus sp. ...	Perak ...	} The growth made promises well.
Para rubber ...	Hevea brasiliensis ...	America ...	
Panama do. ...	Castilloa elastica ...	Do. ...	
Ceara scrap do. ...	Manihot Glaziovi ...	Do. ...	
	Adenantha pavo- niana.	India ...	
Queensland nut ...	Macadamia ternifolia	Australia ...	Grows slowly. Not long introduced.
Nutmeg ...	Myristica moschata ...	Moluccas ...	Cultivated.
Brazil nut ...	Bertholletia excelsa ..	Brazil ...	Grows well. Lately introduced.
Satin wood ...	Swietenia chloroxylon	India ...	Very fair growth. <i>Failure</i>
Pongam ...	Pongamia glabra ...	Do. ...	Grows well said to be indigenous in Penang.

APPENDIX B.

I.—*List of valuable Indian Timber Trees recommended for planting
in the Straits Settlements.*

Names.	
Chickrassia tabularis	... Considered native in Penang.
Pongamia glabra	
Heritiera macrophylla	
Mesua Coromandelina	
Putranjiva Roxburghii	... Introduced, doing well.
Tectona grandis	Do.
Bassia latifolia	
Bassia longifolia	
Terminalia chebula	
Terminalia arguna	
Terminalia tomentosa	
Albizzia Lebbek	... Introduced, growth satisfactorily.
Albizzia stipulata	
Albizzia amara	
Xylia dolabriformis	... Said to be found in the forests of the Settlements, but I have not met with it.
Hardwickia binata	
Anogeissus acuminata	
Pterocarpus marsupium	
Pterocarpus santalinus	
Dalbergia latifolia	
Dalbergia sissoo	
Soymida febrifuga	
Michelia champaca	
Nauclea cadamba	... Introduced, grows well.
Nauclea parvifolia	Do. do.
Stereospermum chelonoides	... Do. do.
Adenanthera pavoniana	Do. do.
Podocarpus latifolius	Do. do.
Cedrela serrata	
Ougeinia dalbergioides	

II.—*List of Burmese Trees.*

Name.	
Pinus longifolia	
Fraxinus floribunda	
Cedrela Toona	
Afzelia bijuga	... Said to occur in the forests of the Settlements.
Gmelina arborea.	... Introduced.
Schilecheria trijuga	Do.

III.—*List of Valuable Australian Trees.*

Name.	REMARKS.
Castanospermum Australe	... Introduced and doing well.
Casuarina equisetifolia	... Do. do.
Dammara robusta	... Do. do.
Eugenia eucalyptoides	...
Eucalyptus calophylla	... Do. do.

Names.	REMARKS.
Eucalyptus rostrata	...
„ amygdalina	...
„ piperata	...
„ marginata	...
„ corymbosa	...
Pinus australis	...
„ edulis	...
Grevillea robusta	... Introduced.

IV.—*List of African and Mascarene Trees.*

Names.	REMARKS.
Vatica africana	...
V. seychellarum	...
Barringtonia speciosa	...
Diospyros bicolor	...
Imbricaria maxima	...
Stadtmannia sideroxylon	... Introduced and doing well.
Elæodendron orientale	...
Canarium colophania	...
Sideroxylon grandiflorum	...
Fœtida mauritiana	...
Diospyros mauritiana	...
Oldfieldia africana	...
Noronhia Broomiana	...

V.—*List of American trees.*

Swietenia Mahagoni	... Introduced and doing well.
Nectandra Rodiaei	... Do.

VI.—*List of Trees suitable for Road-side planting.*

Ficus religiosa
Pterocarpus indicus
Sterospermum chelonoides
Do. suaveolens
Eugenia densiflora
Lagerstroemia reginae
Ficus nitida
Do. terebrata
Elæodendron Roxburghii
Poinciana regia
Tecoma leucoxylon
Sindora indica
Do. siamensis.
Kurrimia paniculata
Albizzia malacciana
Aromadendron elegans
Rhus sp—a large tree found in Singapore
Vatica grandiflora
Eugenia—several sps.

APPENDIX C.

1910년 10월 10일

List of Birds observed to feed on Forest Fruits.

Large Fruit Pigeon	Carpophasia sylvatica.	91
Imperial Fruit Pigeon	Carpophasia Cenea.	91
Lesser do. do.	Osmobeiron olax.	tree
Java Sparrow	Loxia Ovygiorra.	oryzivora
Bul Bul	Ixos analis.	
Tree-fare	Caloritis chalybæus.	n]

Bats.

I must not forget the Bat tribe. These nocturnal birds or winged-rats are most destructive to fruits, and are very numerous in the Straits, living more abundantly on the Johor side, whence clouds of them may be seen in the evening proceeding towards Singapore.

Pigs.

The Hog tribe, too, do incalculable mischief. There is, perhaps, no country in the world, in which, looking at the size of the place, so many of these animals are to be found as in this Colony; every little jungle swarms with them. They eat everything, but show a decided preference for acorns, which fall in great plenty from the numerous varieties of oaks (*Quercus*) with which the forests abound. The Malays name these nuts "*Barangan Bâbi*," or pigs' nuts.

Deer.

Local Name.	Zoological Name.	
Rusa	... Rusa Tunjuc	... Common Java Deer. } <i>Rusa equina</i>
Sambur	... Sambulo rufus	... Of large size.
Kangil or Plandok	... Moschus Javanicus	... The Napu Musk Deer.

The two first named do much harm to young trees at the season when they shed their horns, to get rid of which they rub them against stout saplings and destroy the bark, but deer are not sufficiently numerous on the island to be reckoned among forest exterminators.

Monkeys.

Local Name.	Zoological Name.	
Brök	... Cynocephalus	... Large Grey Monkey.
Monyet	... Macacus Cynomologos	... Small do. do.
Lotong	... Macacus	... Do. Black do.

Squirrels.

Local Name.	Zoological Name.
Small Brown Squirrel	... Tamias Lysteri.
Large two-coloured do.	... Sinrus bicolor.
Do. Yellow do.	... (?)

APPENDIX D.

Comparative Annual Abstract of Rainfall for the years 1869 to 1881—SINGAPORE.

MONTHS.	MEAN REGISTERED RAINFALL.															REMARKS.
	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	Mean of 10 years.	1879	1880	1881		
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	
January	3.93	18.25	11.05	2.37	7.16	3.88	2.91	3.97	2.89	13.57	7.00	18.17	5.17	13.35	Rainfall was registered at During the year 1869 1 Station. do. 1870 1 do. do. 1871 4 S'tions. do. 1872 5 do. do. 1873 5 do. do. 1874 6 do. do. 1875 8 do. do. 1876 7 do. do. 1877 7 do. do. 1878 7 do.	
February	3.23	7.80	7.69	7.72	9.57	2.34	7.02	1.84	5.74	7.29	6.02	9.16	9.36	2.00		
March	3.37	3.15	12.95	3.43	9.74	3.20	16.92	4.60	5.01	2.17	6.45	9.80	8.46	9.03		
April	9.23	8.81	4.85	4.15	10.54	6.54	6.47	7.23	1.37	8.04	6.72	6.60	11.12	5.20		
May	9.19	5.01	3.96	5.12	5.50	5.78	4.09	7.86	4.05	11.59	6.21	10.85	8.88	9.39		
June	6.81	11.51	4.59	4.89	4.81	6.37	9.53	10.58	11.47	4.07	7.46	7.07	6.81	4.03		
July	5.43	5.11	12.42	6.43	3.55	6.32	4.26	4.46	5.70	6.33	6.00	5.53	9.83	6.34		
August	12.31	11.36	6.69	7.12	6.08	10.58	8.36	9.32	4.00	19.33	9.52	8.94	9.75	5.77		
September	3.13	12.62	8.97	10.79	3.00	11.02	8.24	7.19	2.74	5.01	7.27	5.54	7.19	5.51		
October	5.11	9.99	12.36	5.74	7.93	7.09	8.29	10.67	2.09	7.38	7.67	14.96	9.95	10.54		
November	8.24	11.50	11.36	11.54	12.56	16.37	11.37	12.06	5.24	8.47	10.87	8.37	15.81	9.47		
December	20.66	18.13	12.56	6.00	5.16	7.56	6.50	10.13	8.07	9.91	10.47	10.14	8.56	13.32		
TOTAL	90.63	123.24	109.45	75.30	85.60	87.05	93.96	89.91	58.37	103.16	91.66	116.13	110.89	93.95		
	5.61	6.25	4.20	3.10	4.40	4.15	4.25	5.16	5.20	5.40						
Greatest Rainfall in 24 hours.	31st Augt.	26th Dec.	8th Jan.	12th Sept.	21st May	28th Nov.	26th Oct.	26th May	16th June.	27th Augt.						

D 1

Annual Abstract of Meteorological Observations for the year 1876—SINGAPORE.

MONTHS.	BAROMETRICAL READINGS CORRECTED AND REDUCED TO 32° F.					THERMOMETERS.								HYGROMETRICAL RESULTS.			SELF-REGISTERING THERMOMETER.					REMARKS.	
	9 A.M.	3 P.M.	9 P.M.	Diurnal range.	Means.	9 A.M.		3 P.M.		9 P.M.		Means.		Mean temperature of dew point.	Mean elastic force of vapour.	Mean degree of humidity saturation and = 100.	Maximum in Sun's rays (in vacuo.)	Minimum on grass.	Maximum in shade.	Minimum in shade.	Diurnal range.		Approximate temperature.
						Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.										
	Inches.	Inches.	Inches.	Inches.	Inches.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	Inches	° F.	° F.	° F.	° F.	° F.	° F.	° F.	
January...	29.930	29.826	29.928	.110	29.895	80.2	75.7	82.4	76.2	75.3	73.8	79.3	75.2	72.4	0.796	79.8	147.7	63.4	85.3	71.6	13.7	78.4	
February..	.939	.834	.925	.106	.899	80.6	75.8	84.2	76.9	76.2	74.2	83.3	76.6	72.4	.796	76.8	150.	66.3	87.7	71.	16.7	79.8	
March ...	.937	.816	.911	.122	.888	82.2	77.2	84.4	78.1	76.7	75.4	81.1	76.9	74.	.840	79.2	150.	68.1	87.6	72.3	15.	80.1
April ...	.883	.773	.865	.111	.840	83.6	78.4	85.	78.9	77.9	76.8	82.2	78.	75.2	.874	79.2	150.	70.9	88.	74.2	13.8	81.1
May ...	.909	.804	.893	.109	.869	83.9	79.3	86.1	79.8	79.2	77.5	83.1	78.9	76.1	.900	79.2	154.	72.	88.4	75.	13.4	81.7
June ...	.913	.822	.908	.098	.881	81.9	77.7	84.8	77.9	79.1	76.9	81.9	77.5	74.5	.854	78.9	144.	71.3	86.6	73.8	12.8	80.2
July ...	.919	.839	.913	.085	.890	82.4	78.	84.7	78.8	80.	77.3	82.4	78.	75.	.868	78.4	145.	72.2	86.6	75.3	11.3	80.9
August ...	.911	.829	.917	.093	.886	82.4	77.6	82.5	77.1	78.6	76.2	81.2	77.	74.2	.846	79.2	148.	71.6	86.	74.6	11.4	80.3
September	.937	.836	.928	.107	.900	81.5	77.3	84.6	78.2	78.6	76.5	81.6	77.3	74.4	.851	79.1	151.	69.9	86.5	73.4	13.1	79.9	
October ...	.934	.839	.942	.109	.908	81.3	77.	83.8	77.4	77.5	75.9	80.9	76.8	74.	.840	80.	149.9	70.	86.2	73.2	13.	79.7
November.	.923	.829	.900	.097	.851	80.1	76.8	82.9	77.5	76.7	75.5	80.1	76.6	74.2	.846	82.6	148.7	71.1	85.2	73.2	12.	79.2	
December.	.947	.859	.923	.089	.910	80.	75.7	81.1	75.9	75.6	74.3	78.9	75.3	72.8	.807	81.	148.	69.8	84.9	71.7	13.2	78.3	
MEAN ...	29.924	29.825	29.913	0.103	29.845	81.7	77.2	83.9	77.7	77.6	75.8	81.1	76.9	74.1	0.843	79.4	148.8	70.2	86.6	73.3	13.3	79.9	

Highest reading of Barometer during the year 30.029 inches. | Highest Temperature observed 91°
 Lowest do. do. do. do. 29.711 do. | Lowest do. do. do. 66°
 Greatest Rainfall in 24 hours516 do.

Annual Abstract of Meteorological Observations for the year 1881, Lat. 2.°10, Long. 102.°14—SINGAPORE.

MONTHS.	BAROMETRICAL READINGS CORRECTED AND REDUCED TO 32° F.					HYGROMETER.								SELF-REGISTERING THERMOMETER.							MEAN DIRECTION OF THE WIND.	
	9 A.M.	3 P.M.	9 P.M.	Diurnal range.	Means.	9 A.M.		3 P.M.		9 P.M.		Means.		Maximum in sun's rays (in vacuo).	Maximum in sun's rays (exposed).	Minimum on grass.	Maximum in shade.	Maximum in shade.	Diurnal range.	Approximate temperature.		Rainfall in 24 hours.
						Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.									
January	29.981	29.909	30.080	0.171	29.990	79.4	76.6	76.	76.	78.8	76.6	77.4	76.4	133.	...	68.4	82.0	72.	10.	77.	4.02	North.
February	.846	30.052	30.010	.206	.966	81.4	70.2	84.4	80.4	80.	74.4	82.2	75.	143.4	...	70.6	85.2	73.8	11.4	79.5	2.29	N. N. East.
March	.885	29.845	29.869	.116	.833	81.6	77.2	83.4	73.6	81.	79.2	82.	78.4	146.	...	70.6	85.4	71.2	14.2	78.4	2.54	S. East.
April	.913	.963	.853	.110	.909	84.2	80.	85.8	81.	82.8	78.	84.2	79.4	152.	...	69.4	87.2	75.8	10.4	81.6	3.26	Southerly.
May	.920	.743	.755	.177	.806	86.4	80.	85.8	81.8	82.4	78.8	84.8	80.2	152.	...	61.	85.2	75.8	9.4	80.	8.43	Do.
June	.979	.730	.745	.249	.818	84.	78.	86.	80.8	83.	79.8	84.2	79.6	151.	...	64.	85.	78.	7.	81.2	7.91	S. West.
July	.749	.742	.750	.018	.744	83.	78.6	86.	80.8	83.	82.	84.	80.4	157.	...	79.	88.	75.	13.	81.2	5.18	Do.
August	.786	.759	.742	.044	.762	83.2	80.	85.4	81.4	82.6	77.8	83.8	79.8	157.	...	68.	88.4	75.5	13.	82.	8.06	N. N. West.
September	.992	.789	.857	.203	.879	81.	79.4	83.8	81.	79.8	79.	81.6	79.8	157.	...	74.	86.	79.	7.	82.2	18.25	Do.
October	.860	.769	.859	.091	.829	80.6	78.2	83.	80.	79.8	78.	81.2	78.8	156.	...	71.	81.	74.	11.	72.2	17.94	N. East.
November	.872	.808	.882	.094	.854	79.8	79.	81.6	79.	78.	77.	79.8	78.6	156.	...	75.	85.	74.	11.	79.	11.68	Do.
December	.983	.748	.988	.005	.973	80.	71.	82.	76.8	79.	77.	80.	75.0	150.	...	71.	81.	71.6	9.4	71.	13.67	Do.
MEANS	29.897	29.988	29.866	0.124	29.905	82.	77.4	83.6	79.8	80.2	78.2	82.8	77.6	151.2	...	70.2	84.9	82.9	10.6	78.8	...	

Highest reading of Barometer during the year ... 30.080
 Lowest ditto ditto ... 29.742
 Highest Temperature observed ... 88.°4
 Lowest ditto ditto ... 71.°2
 Total... 103.23

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Table shewing the number of Rainy days according to the Register noted below.

MONTHS.	REGISTERED AT THE CRIMINAL PRISON, SINGAPORE.												AVERAGE.
	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	
January ...	12	24	19	6	18	16	9	11	4	21	24	15	15
February ...	12	21	21	20	18	10	13	7	10	13	14	13	14
March ...	8	14	22	11	18	15	22	9	9	5	15	16	14
April ...	16	17	8	13	18	12	16	11	7	13	13	15	13
May ...	16	10	14	12	14	13	16	10	10	17	15	13	13
June ...	11	17	13	16	13	10	14	17	12	8	8	12	12
July ...	13	11	19	17	11	16	9	7	13	12	10	13	13
August ...	18	17	20	14	13	15	14	11	6	16	13	15	14
September ...	12	18	20	17	11	14	12	14	2	7	11	18	13
October ...	15	17	20	19	22	12	14	16	8	11	18	14	16
November ...	21	25	20	23	23	22	18	18	12	17	16	19	20
December ...	26	18	16	18	20	17	15	15	16	21	18	16	18
TOTAL ...	180	209	212	186	199	172	172	146	109	161	175	179	175

Smallest number in any year, 109 days in 1877.
 Greatest do. 212 „ 1871.

Table shewing the number of Rainy days from 1864 to 1880, as recorded by A. Knight, Esq., at Mount Pleasant, Thompson Road, Singapore.

MONTHS.	1864	1865	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	AVER- AGE.
Jany.	19	14	21	15	15	15	25	24	4	16	19	11	14	7	22	28	21	17
Feb.	2	12	17	19	9	12	25	21	17	19	15	14	7	20	18	17	14	15
March	12	9	14	8	13	15	17	26	11	19	20	24	18	14	6	25	18	16
April	11	22	17	22	22	22	18	15	16	20	21	21	15	5	22	18	16	18
May	13	15	19	12	16	24	12	14	13	14	18	17	17	15	22	20	20	17
June	13	15	9	15	11	14	20	18	20	13	16	13	17	13	20	15	18	15
July	16	16	17	19	24	13	9	20	19	13	20	9	12	10	15	20	13	16
Aug.	16	22	18	11	15	20	19	20	20	15	19	15	14	9	21	21	18	17
Sept.	17	13	11	18	14	15	24	21	18	7	16	13	16	7	13	13	20	15
Oct.	24	20	18	25	17	15	15	18	27	18	18	23	22	8	14	27	15	19
Nov.	25	19	22	24	26	26	27	23	27	22	25	24	23	15	18	19	24	23
Dec.	24	24	11	21	26	29	21	18	19	23	23	19	25	21	24	21	20	21
TOTAL	192	201	194	209	208	220	232	238	211	199	227	203	200	144	215	244	217	209

Smallest number in any year, 144 days in 1877.
 Greatest do. 244 „ 1879.

Annual Abstract of Meteorological Observations for the year 1881—PENANG.

MONTHS.	BAROMETRICAL READINGS CORRECTED AND REDUCED TO 32° F.				HYGROMETERS.								SELF-REGISTERING THERMOMETERS.						REMARKS			
	9	3	9	Means.	9 A. M.		3 P. M.		9 P. M.		Means.		Maximum in Sun's rays.	Minimum on grass.	Maximum in Shade.	Maximum in Shade.	Diurnal Range.	Approximate Temperature.		Rainfall during the month.		
	A. M.	P. M.	P. M.		Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.										
January	30.032	29.987	30.030	30.016	81.1	78.1	86.2	79.2	79.4	77.5	82.2	78.2	356.2	65.8	89.5	73.1	16.4	81.3	1.22			
February	30.032	29.970	30.030	30.010	83.1	79.6	86.9	80.6	80.9	79.0	83.6	79.7	158.8	65.8	92.9	75.0	17.9	83.9	2.09			
March	29.994	29.900	30.035	29.976	83.7	80.1	87.0	82.2	81.1	79.0	83.9	80.4	159.6	63.5	92.7	75.1	17.6	83.9	5.44			
April	30.011	29.934	30.032	29.992	84.0	80.7	87.4	82.8	80.5	78.5	83.9	80.6	155.9	65.5	91.4	78.1	13.3	84.7	8.97			
May	29.978	29.948	29.980	29.968	82.7	80.3	86.2	83.6	79.2	77.3	82.7	80.4	152.9	...	90.7	79.6	11.1	85.1	9.03			
June	29.974	29.934	29.994	29.967	84.3	82.0	86.4	83.8	80.7	78.3	83.8	81.3	147.9	...	89.5	77.0	12.5	83.2	4.85			
July	29.968	29.914	30.025	29.969	83.0	80.0	85.7	80.8	80.8	78.5	83.1	79.7	148.1	...	89.1	75.4	13.7	82.2	9.63			
August	29.957	29.895	29.970	29.940	83.0	80.8	85.8	83.3	80.0	77.9	82.9	80.6	155.8	...	89.2	75.1	14.1	82.1	5.44			
September	29.965	29.931	30.014	29.970	83.0	80.6	84.6	82.2	80.5	77.9	82.7	80.2	146.6	...	87.3	75.3	12.0	81.3	14.57			
October	30.003	29.928	30.024	29.985	82.3	79.7	84.4	81.8	80.5	77.2	82.4	79.5	144.8	...	87.1	74.4	12.7	80.7	21.54			
November	29.901	29.887	30.000	29.929	83.6	81.2	86.3	82.9	80.8	78.0	83.5	80.7	154.1	...	89.1	74.4	14.7	81.7	9.36			
December	29.941	29.903	30.014	29.952	83.7	80.9	85.7	82.6	80.3	77.3	83.2	80.2	147.2	...	89.3	74.1	15.2	81.7	9.46			
MEANS			30.012		83.1	80.3	86.0	82.1	80.3	78.0	83.1	80.1	152.3	65.1	89.8	75.5	14.2	82.6				
																		TOTAL	...	101.60		

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Comparative Annual Abstract of Meteorological Observations for the years 1869, 1870, 1871, 1872, 1873, 1874 and 1875—SINGAPORE.

Lat. 1° 17' N.—Long. 103° 51' E.

MONTHS.	BAROMETRICAL READINGS CORRECTED AND REDUCED TO 32° F.							MEAN READINGS.																											
								MAXIMUM THERMOMETER IN THE SHADE.							MINIMUM THERMOMETER IN THE SHADE.							DAILY RANGE.													
	1869	1870	1871	1872	1873	1874	1875	1869	1870	1871	1872	1873	1874	1875	1869	1870	1871	1872	1873	1874	1875	1869	1870	1871	1872	1873	1874	1875							
	In.	In.	In.	In.	In.	In.	In.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.							
January	29.922	29.779	...	29.869	29.831	29.934	29.889	84.8	84.1	84.3	86.1	85.6	84.2	85.7	72.4	71.9	71.4	71.7	71.3	71.3	71.3	12.4	12.2	12.9	14.4	14.3	12.9	14.4							
February	.912	.814	...	.850	.845	.904	.893	88.3	83.9	86.0	84.5	85.2	86.2	85.7	73.9	72.5	72.6	71.7	71.6	70.6	70.1	14.4	11.4	13.4	12.8	13.6	15.6	15.6					
March	.867	.802	...	.853	.832	.847	.902	89.2	87.1	85.6	87.3	87.1	88.0	85.8	74.6	73.0	72.6	72.0	72.3	71.4	72.0	14.6	14.1	13.0	15.3	14.8	16.6	13.8					
April	.862	.777	...	.799	.806	.864	.852	87.3	87.9	88.5	87.6	87.1	89.9	87.2	75.6	74.6	74.0	74.3	72.8	72.5	73.6	11.7	13.3	14.5	13.3	14.3	17.4	13.6					
May	.804	.778	...	.816	.786	.843	.846	88.0	87.8	88.6	88.6	88.7	87.3	86.5	75.9	74.6	74.5	74.6	74.4	74.0	72.3	12.1	13.2	14.1	14.0	14.3	13.3	14.2					
June	.806	.796	...	.796	.807	.848	.866	87.1	85.8	87.0	87.1	88.3	87.3	86.0	76.8	74.1	74.3	74.9	75.7	75.0	72.8	10.3	11.7	12.7	12.2	12.6	12.5	13.2					
July	.818	.803	29.842	.818	.820	.850	.871	86.9	86.9	84.5	86.5	86.9	85.9	86.4	76.1	74.3	73.1	74.4	76.1	73.1	73.3	10.8	12.6	11.4	12.1	10.8	12.8	13.1							
August	.828	.759	.836	.818	.828	.879	.891	84.7	85.7	85.8	85.6	86.1	85.3	86.2	74.4	74.0	74.0	74.7	75.5	73.6	73.5	10.3	11.7	11.8	10.9	10.6	11.7	12.7							
September	.846	.824	.833	.834	.847	.879	.903	87.4	85.8	85.4	86.4	87.8	85.5	87.2	74.8	73.7	73.7	73.0	75.6	73.2	73.5	12.6	12.1	11.7	13.4	12.2	12.3	13.7							
October	.833	.826	.824	.824	.833	.882	.882	87.0	86.4	85.8	86.9	86.2	85.7	86.4	74.6	73.1	73.8	73.4	74.8	73.0	73.1	12.4	13.3	12.0	13.5	11.4	12.7	13.3							
November	.836	.830	.820	.789	.864	.905	.914	84.5	86.2	85.2	86.5	84.8	84.9	86.1	73.2	73.6	73.1	73.3	74.1	73.0	72.7	11.3	12.6	12.1	13.2	10.7	11.9	13.4							
December	.816	.841	.860	.810	.850	.916	.896	84.6	83.8	84.6	85.5	85.1	84.6	83.6	73.3	72.1	72.0	72.5	72.9	71.3	71.7	11.3	11.7	12.6	13.0	12.2	13.3	11.9							
MEANS	29.846	29.802	29.836	29.824	29.829	29.879	29.884	86.6	85.9	85.9	86.5	86.6	86.3	86.0	74.6	73.5	73.2	73.4	74.0	72.7	72.5	12.0	12.4	12.7	13.1	12.6	13.6	13.5							

Comparative Annual Abstract of Meteorological Observations for the years 1869, 1870, 1871, 1872, 1873, 1874 and 1875—SINGAPORE.
 Lat. 1° 17' N.—Long. 103° 51' E.—Concluded.

MONTHS.	MEAN READINGS.							RAINFALL.							
	APPROXIMATE TEMPERATURE.							MEAN RAINFALL.							
	1869	1870	1871	1872	1873	1874	1875	1869	1870	1871	1872	1873	1874	1875	
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	
January ...	78.6	78.0	77.8	78.9	78.4	77.7	78.5	3.93	18.25	11.05	2.37	7.16	3.88	2.91	
February ...	81.1	78.2	79.3	78.1	78.4	78.4	77.9	8.23	7.80	7.69	7.72	9.57	2.34	7.02	
March ...	81.9	80.0	79.1	79.6	79.7	79.7	78.9	3.37	3.15	12.95	3.43	9.74	3.20	16.92	
April ...	81.4	81.2	81.2	80.9	79.9	81.2	80.4	9.23	8.81	4.85	4.15	10.54	6.54	6.47	
May ...	81.9	81.2	81.5	81.6	81.5	80.6	79.4	9.19	5.01	3.96	5.12	5.50	5.78	4.09	
June ...	81.9	79.9	80.6	81.0	82.0	81.2	79.4	6.81	11.51	4.59	4.89	4.81	6.37	9.53	
July ...	81.5	80.6	78.8	80.4	81.5	79.5	79.8	5.42	5.11	12.42	6.43	3.55	6.32	4.26	
August ...	79.5	79.8	79.9	80.1	80.8	79.4	79.8	12.31	11.36	6.69	7.12	6.08	10.58	8.36	
September ...	88.1	79.7	79.5	79.7	81.7	79.3	80.3	3.13	12.62	8.97	10.79	3.00	11.02	8.24	
October ...	80.8	79.7	79.8	80.1	80.5	79.3	79.7	5.11	9.99	12.36	5.74	7.93	7.09	8.29	
November ...	78.8	79.9	79.1	79.9	79.4	78.9	79.4	8.24	11.50	11.36	11.54	12.56	16.37	11.37	
December ...	78.9	77.9	78.3	79.0	79.0	78.0	77.6	20.66	18.13	12.56	6.00	5.16	7.56	6.50	
MEANS ...	80.6	79.7	79.5	79.9	80.3	79.5	79.3	7.55	10.27	9.12	6.27	7.13	7.25	7.83	
								TOTAL...	90.63	123.24	109.45	75.30	85.60	87.05	93.96

Year	on the 31st Augt.	on the 26th Dec.	on the 8th Jany.	on the 12th Sept.	on the 21st May.	on the 28th Nov.	on the 26th Oct.
1869	30.017	29.983	29.973	29.985	29.991	30.065	30.010
1870	29.664	29.611	29.684	29.645	29.629	29.700	29.706
1871	92°	93°	91°5	92°	92°5	91°5	90°5
1872	69°	69°	69°	67°	68°5	65°	66°
1873	5.61	6.25	4.20	3.10	4.08	4°15	4.25
1874	30.017	29.983	29.973	29.985	29.991	30.065	30.010
1875	29.664	29.611	29.684	29.645	29.629	29.700	29.706

APPENDIX E.

Report by the Colonial Engineer on the Timber Forests in the Malayan Peninsula.

COLONIAL ENGINEER'S OFFICE,

Singapore, 21st June, 1879.

SIR.—In obedience to the instructions of Government communicated in your letter, Colonial Secretary, ³⁶¹⁰/₇₆, of the 16th May last, I have now the honor to transmit a Return (marked A) of the principal forest trees, indigenous to the Straits Settlements and Native States of the Malayan Peninsula.

The preparation of this Return has unavoidably taken some time, owing to the limited amount of data at my disposal, but with the assistance of Mr. Bayliss and Officers of the Works Department, and Captain Douglas, H. B. M.'s Resident at Selangor, and others, together with a reference to Colonel Low's dissertation, and the result of experiments made by this Department in the various woods in the Settlement, some valuable information has been got together in the Return, though it is as yet, I am aware, far from being as complete as could be desired. The botanical names of the trees have been for the most part entered by Mr. Murton, Superintendent of the Botanical Gardens.

When the densely wooded forests of the Peninsula are opened up, and this is now taking place by the advent of planters from Ceylon, we shall then doubtless become acquainted with much valuable timber which, like the 'Johor Teak,' will be found useful for exportation to India, the Mauritius, and other places less favored.

On the further points regarding which the Right Hon'ble the Secretary of State has requested information, I have deemed it better to throw the whole into a series of answers to the questions put, which will be found in Return B.

I have, &c.,

J. F. A. McNAIR, Major, R. A.,

Colonial Engineer and Surveyor-General,

Straits Settlements.

To The Hon'ble

The Colonial Secretary.

Copy of Colonial Engineer's Minute on Survey, ⁴⁰⁵⁵/₇₈, dated 27th August, 1878.

His Excellency refers to the question of our rainfall, and the relation that it bears to the retention or otherwise of our forest land. This is a point of so much general interest that I may be pardoned if I suggest that if it be taken up by the Principal Civil Medical Officer, who now possesses some very valuable meteorological records, which can be further supplemented from data at the disposal of the Municipal Commissioners.

Briefly, one would say that we depend for our supply almost entirely from the ocean, and a preponderance of winds across it at a certain temperature gives us an additional allowance as at present; we get little or nothing from re-evaporation.

The distribution of rain depends a good deal on position, height, direction of mountain ranges and the like, and if there happens to be great condensation at a particular point, then the winds come to it from every quarter.

In looking at some tables taken thirty years ago, I find that our average rainfall has not in any way diminished, though the land has been largely denuded of forest.

There is, however, one method by which we may sustain a loss by permitting the indiscriminate felling of our jungle trees on hill tops, I allude to that by evaporation; and it is perhaps to this that His Excellency more refers. Doubtless if the land is laid bare to the full power of a tropical sun, evaporation will go on at an enormous rate, and this would be an appreciable factor in a climate such as ours. In this view it might seem to His Excellency advisable to reserve the hill of Bukit Timah, and a considerable distance round its base as a "Crown" reserve absolutely.

J. F. A. McNAIR.

A.

Native Name.	Botanical Name.	Uses.	Soil in which they thrive.	Height	Girih.	Whether of rapid growth.	Weight per cubic foot.	Value per cubic foot.	Abundant or otherwise.	REMARKS.
Damar Laut	Not known.	Beams for house building.	Hilly ground, light clayey soil.	80 to 100 ft.	6 to 12 ft.	Slow ...	70 lbs. ...	35 to 50 cents.	Scarce in Singapore and Malacca, but is brought into Penang from the Native States in fair quantity.	Damar Laut is a very resinous close-grained, heavy and durable wood much used in Penang for building purposes; next to Tampinis is the best wood in the Straits Settlements for beams.
Temsu ...	Fagraea peregrina.	Piles of bridges and bridge building generally, sometimes used for tapioca barrels.	Marshy, or light soil on low ground with clay.	80 to 100 ft.	4 to 10 ft.	Very slow.	75 lbs. ...	35 to 50 cents.	Very scarce in Singapore and Penang, but at Malacca it is more readily obtained.	Temsu is a very resinous wood, very durable, but not much used, it has a strong acid smell. Breaking weight of a specimen 2' x 1' x 1", 4 cwts. 28 lbs.
Tampinis ...	Artocarpus sp.	Beams for house building and piles.	Hills, and light clayey soil.	100 to 120 ft.	5 to 10 ft.	Slow ...	67 lbs. ...	40 to 60 cents.	Very scarce now in Singapore and Penang, but is obtained at Malacca.	Hard and durable, is of a light reddish colour becomes very dark with age, used for bridges and Telegraph posts, or for any use where constant exposure to weather is necessary; is liable to warp and twist in seasoning, sinks in water. Breaking weight of a specimen 2' x 1' x 1', 6 cwts. 56 lbs.
Meranti ...	Hopea Cernea & H. Meranti.	House building, and boat building purposes as planks.	On the plains and in light soils and on river banks.	100 to 200 ft.	6 to 10 ft.	Rapid ...	38 lbs. ...	25 to 40 cents.	Getting scarce ...	Very useful for house building, planks 3 feet broad can be obtained; it is also good for boat building, floats in water, yields a gum.

Chengei ...	Not known.	Ship and boat building.	Sandy grounds	100 to 200 ft.	18 to 25 ft. circumference.	Rather slow.	70 lbs.	30 to 56 cts.	Scarce ...	Very useful for ship and boat building stands the salt water well, fracture rather short.
Medang Lè-bar-daun.	Do.	House building chiefly for floor-boards.	Plains, sandy and light soil.	100 to 180 ft.	10 to 20 ft.	Rapid ...	40 lbs.	30 to 50 cts.	Getting scarce ...	Fracture fibrous, white colour, large spars may be obtained. Breaking weight of a specimen 2' x 1" x 1", 4 cwts. 60 lbs.
Glam Tikus	Do.	House building...	On the plains, light and sandy soil.	80 to 100 ft.	7 to 10 ft.	Middling	Not ascertained.	Not ascertained.	Not very plentiful.	This is a middle sized tree, colour brownish yellow, its red bark is much used for tanning, fishing netts, fracture, strong and fibrous. The wood is not prized, liable to dry rot. Breaking weight of a specimen 2' x 1" x 1", 6 cwts. 7 lbs.
Dungun ...	Do.	In stockades the planks are used as a defence against musketry by the Malays.	Banks of rivers and near the sea-shore.	100 to 200 ft.	10 to 20 ft.	Rather slow.	Do.	Do.	Plentiful, but none in the market.	Colour dark-brown, timber crooked and tough, not very liable to dry rot. Breaking weight of a specimen 2' 1" x 1", 6 cwts. 28 lbs.
Kayu Laut...	Do.	Used for house posts.	Grows in brackish water.	80 to 150 ft.	7 to 15 ft.	Slow ...	Do.	Do.	Do.	Colour yellowish, lasts five or six years when exposed. Breaking weight of a specimen 2' x 1" x 1", 3 cwts.
Api-Api ...	Do.	Very good firewood.	Marshy grounds.	50 to 80 ft.	3 to 9 ft.	Rapid ...	Do.	Do.	Plentiful, but seldom brought to market.	Is very good for firewood, grows to a good size, colour white. Breaking weight of a specimen 2' x 1" x 1", 3 cwts.
Bruas ...	Bruguiera sp.	Used for house building, by natives for making oars.	Marshy ground.	30 to 50 ft.	2 to 5 ft.	Slow ...	Not ascertained.	Not ascertained.	Moderately plentiful.	Moderately sized tree, the wood sinks in water. Breaking weight of a specimen 2' by 1" by 1", 6 cwts. 22 lbs.

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Durian Durian bu-rong.	Duno Zibethinus D. Oxleyanus.	Excellent masts and spars for vessels.	On the plains and light and sandy soils.	80 to 120 ft.	4 to 8 ft.	Do.	Do.	Do.	Very scarce	The spars and masts of this wood are excellent. Breaking weight of a specimen 2' by 1" by 1", 3 cwts. 21 lbs.
Rengas (Red wood)	Gluta velutina.	For furniture...	Clayey soil ...	80 to 100 ft.	Do.	Do.	Do.	Do.	Plentiful	Prettily veined, and takes a good polish.
Petaling ...	Strombosia	House building for rafters and flooring joists.	Plains and undulating land in light soil.	Do.	6 feet.	Rather slow.	56 lbs.	...	Not known	In Malacca there is a fair supply. A good sized tree, the wood is close-grained, of a light red or brown colour. Breaking weight of a specimen 2' by 1" by 1", 4 cwts. 28 lbs.
Kilim or Kulim.	Scorodocarpus borneensis (Becc.)	Piles and beams in bridge building.	Hilly ground, clayey soil.	Lofty tree	10 to 12 ft.	Slow	67 lbs.	...	30 to 50 cts.	A fair supply ... This wood has a strong smell of garlic, and is called by the Natives from India "Lahsun." Breaking weight of a specimen 2' by 1" by 1", 3 cwts. 56 lbs.
Busak ...	Not known	Making paddles and oars and carrying sticks by the Chinese.	Do.	Middling sized tree.	4 to 5 ft.	Rather slow in coming to maturity.	Sinks in water.	Not known	Not very plentiful	The tree is red; for about $\frac{2}{3}$ rds. of its diameter is very tough.
Kayu Chichak.	Not known	Making paddles by the natives.	...	...	...	...	...	...	Not much known, is said to be very durable.	
Kayu Penaga.	Calophyllum sp.	Ship building, house and bridge building.	On the seashore in sandy places.	Lofty tree	6 to 7 ft.	Slow	72 lbs.	...	30 to 40 cts.	A fair supply in Malacca only at present. Penaga is a very useful tree, it yields durable timber for ship and boat building, an infusion of its leaves is used, for inflammation of the eyes on the Malabar Coast, where it is called the Alexandrian laurel. In Bengal it is called "Poorlange; yields a resin.

Limpong or Lampong.	Not known	Used for planks.	S w a m p y ground.	Do.	Do.	Quick ...	Not ascertain- ed.	Not ascer- tained.	Not very plentiful	Not much used as it is not durable.
Giam ...	Inocarpus edulis.	Boat and ship building.	S w a m p y ground and on the sea-shore.	Do.	6 to 8 ft.	Not very rapid.	Very heavy, sinks in water like iron.	50 cents ...	Fair supply in Penang.	It is very hard and durable wood, very difficult to work, it is objected to by carpenters on this account, it stands salt water well, and resists both in water and out for a very long time. Used for sheathing piles, yields a resin.
Kayu Ru- or Aru.	Casuarina littorea; Cassia sp. is given for this by an old wood- man (Malay.)	Not much used for any pur- poses.	High ground, clayey soil, prefers a sandy soil.	Lofty ...	5 to 6 ft.	Rapid ...	Light wood, floats in wa- ter.	Not known	Scarce ...	This is a species of fir, it is a graceful tree, some- what tapering, wood is hard but not much used, very liable to attack by white ants, yields a resin.
Tumus or Tumbus.	Not known	Used by the Malays for raf- ters.	Grows in man- grove jungle on the sea- shore or salt water creeks.	50 to 80 ft.	10 to 28 inches.	Do. ...	Not ascertain- ed.	Not ascer- tained.	Not very plentiful	Does not stand exposure. Breaking weight of a specimen 2' by 1" by 1", 5 cwts.
Medang Kun- jib.	Sapotaceæ...	Boat planking..	Plains and light soil.	80 to 100 ft.	3 to 5 ft.	Pretty rap- id.	Not ascertain- ed.	Not ascer- tained.	Not very plentiful...	Fibrous fracture, seldom brought to market. Breaking weight of a specimen 2' by 1" by 1", 6 cwts. 84 lbs.
Bintangor...	Calophyllum Inophyl- lum.	Masts and spars of vessels, housebuilding, scaffolding, poles and vari- ous purposes.	Low grounds, clayey soil.	80 feet and upwards.	2 to 4 ft.	Rapid ...	Do.	Do.	Plentiful. ...	At present there is a fair supply of this timber, but it is rapidly grow- ing scarce on account of the great demand. There are several spe- cies, but the only last- ing one is that known as Bintangor Batu, it is a very durable wood. Breaking weight of specimen 2' by 1" by 1", 5 cwts.

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or

Nunka Pipit.	Not known.	Used by the Natives for house building.	On the plains and light and sandy soil.	50 feet ...	20 to 30 inches.	Rather slow.	Do.	Do.	Not very plentiful...	This is perhaps the lightest of the durable woods, its habitat is on high lands. It is difficult to saw. It is the sparrow jack, sinks in water, yields a gum. Breaking weight of a specimen 2' by 1" by 1", 2 cwts. 56 lbs.
Kranji Laut	Do.	Piles, beams for bridges and house building generally.	Hilly ground.	Lofty tree.	10 to 14 ft.	Slow ...	77 lbs. ...	40 to 64 cts.	Plentiful ...	This is a very hard and durable wood, but it is very difficult to work, sinks in water. A specimen 3" by 1½" by 1½", broke with 980 lbs.
Merbau ... Do. Hitam Do. Darah Do. Rengkong.	Not known	General purposes, house building, boat and ship building, furniture, gun carriage.	High ground, light clayey soil.	Lofty tree, say 140 feet.	15 to 20 ft.	Slow ...	67 lbs. ...	40 to 60 cts.	Getting scarce, especially large old timber.	Somewhat similar in appearance to old English oak, a very superior wood, polishes well, and is very durable. Used for furniture and cabinet work. The average breaking weight of a specimen 3' by 1½" by 1½", was 578 lbs.
Kladang ...	Artocarpus sq. This and Kladang confused most probably.	Used in boat building.	Clayey soil...	Lofty tree	...	Moderately rapid.	Not ascertained.	Not ascertained.	Not very plentiful.	Dark colour, something like Honduras Mahogany, takes a good polish, it is excellent for house fitting, buoyant in water.
Nibong ...	Areca Nibung, Mart	House posts, rafters, lath, &c., and as floors to Native huts.	Marshy ground	Lofty but not very large.	1 to 2 ft.	Do.	Do.	Do.	Plentiful ...	Is a species of Palm, the wood is valuable, it is very hard and fibrous in its facture, durable.
Ibuah ...	Orania, macrocladus.	...	High ground	Do.	Do.	...	Much superior to the preceding.

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Makomzi ...	Not known	Moderate sized tree.	...	Rather slow.	Do.	Do.	Very scarce	...	Is a good durable wood but never used.
Kemuning...	Murraya exotica.	Kris handles ...	Rocky ...	20 to 30 ft.	2 to 3 ft.	Very slow	60 lbs.	...	Rather scarce.	...	Handsome grained wood takes a fine polish.
Angsana ...	Pterocarpus indicus.	Superior furniture.	Clayey and sandy soil.	100 feet ...	24 feet ...	Rapid ...	Not ascertained.	Not ascertained.	Abundant	...	...
Bâlau or Am-bâlau.	Not known	Sleepers beams and files.	Do.	60 feet ...	10 feet ...	Slow ...	Do.	Do.	Scarce	...	...
Bahan Wanji.	Do.	Beams for house building.	Do.	100 feet ...	30 feet ...	Do.	66 lbs.	...	Not known	Abundant	Very strong and durable.
Daru or Daru-Daru.	Not known	Beams for house building.	Clayey and sandy soil.	80 feet ...	12 feet ...	Slow ...	61 lbs.	...	Not known	Abundant	This is useful timber for building purposes and is abundant in the market of the Straits Settlements. It is very resinous and suits better when not exposed.
Glam ...	Melaleuca leucadendron.	Firewood and fishing stakes, bark used for caulking boats	Clayey soil ...	60 feet ...	9 feet ...	Rapid ...	Not ascertained.	Not ascertained.	Do.	...	...
Klat ...	...	Firewood ...	Do.	70 feet ...	12 feet ...	Do.	66 lbs.	...	Not known	Do.	Used in Singapore for planks, but inferior in quality.
lédang ...	Diospyros fruticosus.	Shipbuilding and used chiefly by Chinese for coffins.	Do.	80 feet ...	14 feet ...	Do.	43 lbs.	...	Do.	Do.	...
Bakau ...	Buguiera sp.	Piles for formation of bridges, houses or embankments.	Salt water swamps on the seashore.	Not very large tree.	6 to 9 inch diameter.	Do.	Sinks in water.	Do.	Do.	Do.	This is also called "Mangrove" and is used in large quantities as fuel for steamers and burning bricks, and the bark is used in tanning.

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Kayu Jati (Teak) ...	Tectona grandis.	...	Clayey soil	Now to a very large tree.	Now to a very large size.	This tree is not indige- nous to the Straits Set- tlements, though found in Burmah and Siam; it was introduced into the Straits Settlements, by David Brown, Esq., many years ago; it thrives well, and some trees of respectable dimensions were cut down, but no pains have been taken to extend its cultivation.
Chempedar Ayer.	Artocarpus varians Miq.	It is used in making boats.	On the banks of rivers and in marshes.	Lofty tree...	Moderate- ly rapid.	...	Wood 25 to 30 cts. to cubic foot.	Not known	Fair supply	...	Is a yellowish wood. floats in water, bark is flexible and strong, and is used for walls of native houses, grana- ries, &c., yields a gum. Breaking weight of a specimen 2' by 1" by 1", 3 cwts. 14 lbs.
Nipis Kulit	Not known	Used in house building for posts and raf- fers and for handles to oars and tools.	Plains sandy soil.	50 feet ...	6 feet ...	Rather slow.	Not known...	20 to 30 cts.	Fair supply to Ma- lacca.	...	Bark is very thin and vertically straited hard, fawn colour, sinks in water, yields a resin. Breaking weight of a specimen 2' by 1" by 1", 5 cwts. 42 lbs.
Tampang ...	Artocarpus rigidus.	Good for house posts.	Marshy ground	Lofty tree...	Do.	Slow ...	Do.	Do.	Scarce	...	Next to Temsu for dura- bility, yields a gum.
Pulei ...	Leguminosae	Used for planks only.	High land ...	Do.	10 feet ...	Moderate- ly rapid.	...	20 to 30 cts.	Fair supply	...	White wood, buoyant, not very durable, yield a resin.
Jelutong ...	Alyxia sp.	Used much by undertaker, large planks can be obtain- ed, it is also used for mak- ing clogs.	Marshy ground	Do.	...	Rapid ...	Do.	Do.	Do.	...	Do.

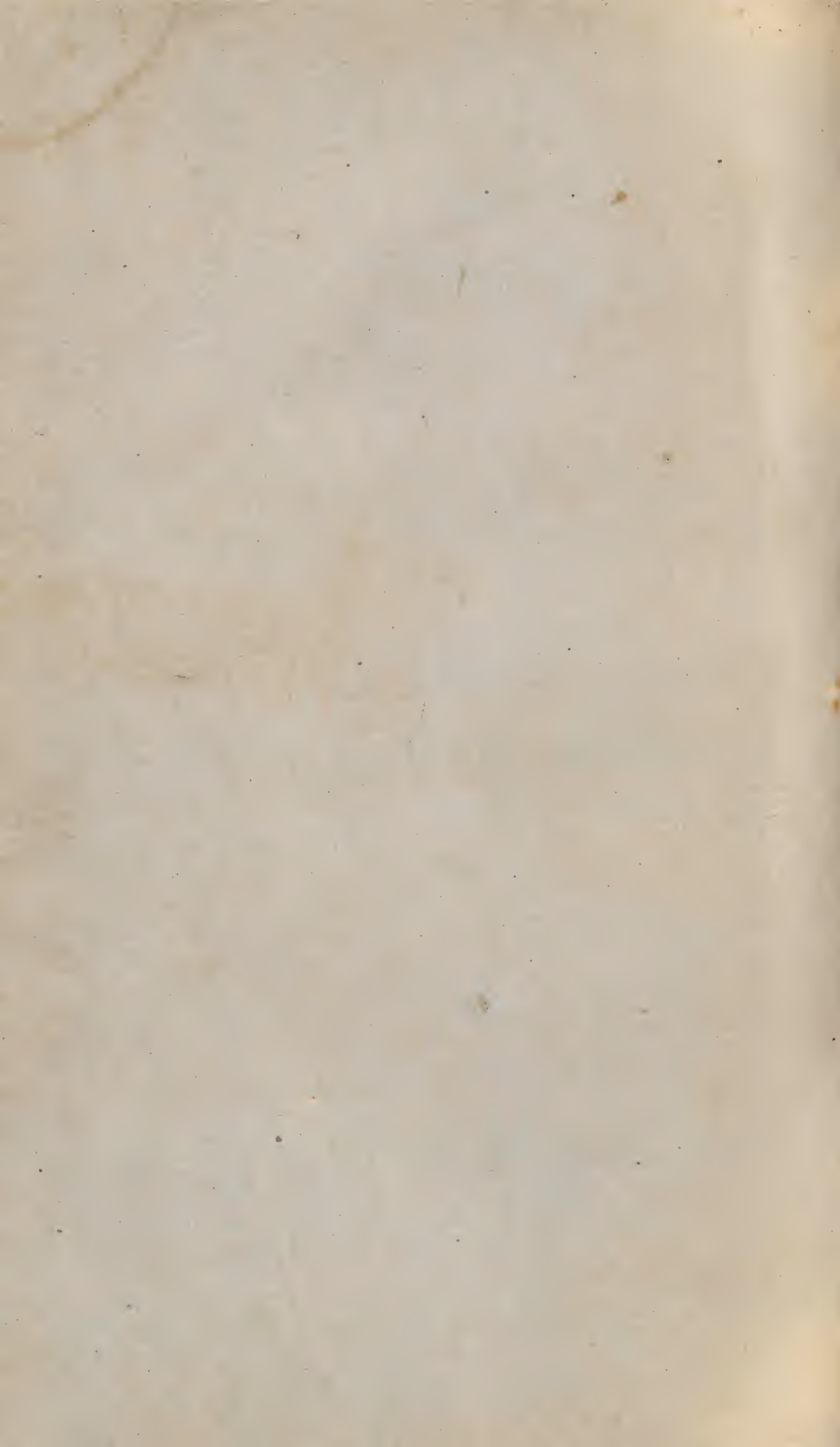
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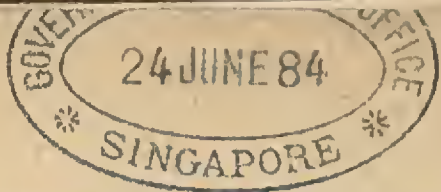
Lengâdei ...	Not known	Excellent fire-wood.	On the plains and sandy soil.	Do.	Not ascertained.	Not ascertained.	Getting scarce ...	Breaking weight of a specimen 2' by 1" by 1", 2 cwts.
Leban ...	Do.	Ship-Kemstones, carriage wheels.	Clayey soil ...	30 feet	... 6 feet ...	Do.	57 lbs. ...	Not known	Abundant ...	...
Merbâtu ...	Do.	Fishing stakes, piles, and makes the best fuel for steamers and best charcoal for a blacksmith's forge.	Do.	50 feet	... 14 feet ...	Slow ...	Not ascertained.	Not ascertained.	Do.	...
Merpuan ...	Not known	Fishing stakes, piles, and makes the best fuel for steamers and best charcoal for a blacksmith's forge.	Clayey soil ...	50 feet	... 14 feet ...	Slow ...	Not ascertained.	Not ascertained.	Abundant ...	...
Miniak Jantan.	Dipterocarpaceae.	...	Do.	150 feet	... 15 feet ...	Do.	Do.	Do.	Do.	The wood oil of commerce is tapped from this tree.
Meranbong	Not known	Fencing ...	Do.	80 feet	... 6 feet ...	Do.	47 lbs. ...	Not known	Scarce ...	...
Rasah ...	Do.	House building	Do.	Do.	10 feet ...	Do.	70 lbs. ...	Do.	Do.	...
Red Mangrove.	Do.	Cart-wheels and other purposes.	Do.	70 feet	... 6 feet ...	Rapid ...	Not ascertained.	Not ascertained.	Do.	...
Rambai Dam.	Bruguiera sp.	House building for natives.	Do.	150 feet	... 10 feet ...	Do.	Do.	Do.	Do.	Yields a gum.

B.

<i>Questions.</i>	<i>Replies.</i>
I. What are the kinds of timber trees produced in the country, and to what uses, are they generally applied? (State the botanical name where known.)	I. <i>Vide</i> Return A.
II. Are the forests or lands producing the trees owned by the Government or by private persons?	II. Owned by the Government chiefly.
III. What is the approximate extent of timber-producing forests or lands at the present time?	III. In Singapore... Acres. In Penang & P. Wellesley, 130,000 In Malacca ... 45,000
IV. Is this area increasing or diminishing?	IV. Diminishing.
V. If diminishing, from what cause?	V. From the sale of land and extension of cultivation and too often from illicit felling, and from charcoal burning.
VI. Are any steps taken for the prevention of waste or for re-planting any area which has been cleared?	VI. The Government has one Forest Ranger at Singapore and two at Penang, and frequently men are brought before the Police and punished for felling trees on Government land, but no steps are taken to re-plant any area with fresh trees which has been cleared. The Eucalyptus and Acacia of Australia are being tried at Singapore on a small scale.
VII. What is the quantity of timber which might fairly be cut every year without permanent injury to the forests?	VII. The Government can spare no more in either of the Settlements. At Singapore a reserve is kept round the principal hill for climatic purposes, and at Penang, Province Wellesley and Malacca there are also belts reserved for the same purpose, but it is feared that trees are often felled by Chinese, for want of a larger staff for supervision.
VIII. What is the quantity actually cut every year?	VIII. It is impossible to say.
IX. What is the proportion for home consumption and for export?	IX. None for export; mangrove is used for firewood, of which there is an abundant supply, but all timbers for building purposes are imported into the Settlements. Mangrove bark is exported to a limited extent.
X. What have been the annual exports of each kind of timber during the last ten years; stating the proportions to each country, and the value of such exports?	X. No exports during the last ten years.
XI. What are the reasons for, or causes of, the increase or diminution of quantity or value in the exports?	XI. Do.
XII. (If it be so), what are they causes of the small exportation in comparison with the capability of production?	XII. Do.
XIII. Have any observations been made or conclusions arrived at as to the climatic influence of forests or the effect of their clearance on the rainfall, floods, &c.?	XIII. It is found at Singapore that although the Crown lands have been greatly denuded of trees, there has been no marked diminution in the rainfall. I attach a minute, sent in by me to Government last year, when the subject was under consideration.
XIV. Forward any reports made by departments or societies, or any Acts of Legislature bearing on the subject.	XIV. There are no Acts of the Legislature bearing on this subject, but there can be no doubt that it would be desirable that there should be attached to the Land Department, a small Forestry Department, for the purpose of preserving our reserves, and restoring our forest by the establishment of nurseries for young trees.

APPENDIX F.





*Please refer to
before 2 P.M.*

GOVERNMENT NOTIFICATION—No. **—**

THE following Annual Report on the Botanic Gardens, Singapore, for the year 1883, is published for general information.

By His Excellency's Command,

A. M. SKINNER,
Acting Colonial Secretary.

COLONIAL SECRETARY'S OFFICE,
Singapore, 26th June, 1884.

Annual Report on the Botanic Gardens, Singapore, for the year 1883.

THE year has seen considerable progress made towards the completion of the extensive improvements begun last year, and the commencement and completion of others as detailed below.

2.—**Visitors.**—The number of visitors to the Gardens during the year has not been ascertained. The number of entrances to the Gardens are too numerous to make any attempt at counting the number of visitors and carriages practicable.

3.—**Buildings.**—The permanent buildings connected with the Gardens are in good repair. A new house for the Chinese labourers was erected during the year, on Crown land adjoining the Gardens, at a cost of \$58.50.

4.—**Construction of Exhibition House.**—The construction of the Exhibition House, commenced last year, has been completed, with the exception of the roof, which will be undertaken by the Public Works Department. The work of the year chiefly comprises the levelling of the surrounding ground and covering the staging with Chinese tiles laid in with cement. Cost, \$547. The expenditure on construction last year was \$617, which makes the total cost of construction, so far as the work falls to the share of the Botanic Gardens Department, \$1,164. For details, the size and use of the house, see last year's report.

5.—**Propagation Plant-House.**—The under line of staging in this house has been removed and laid down in tiles, as it was found that white ants attacked strongly the lower planks. This permanent improvement cost \$35, and I look forward to having all the staging some day done in this manner, and the wood-work, which requires considerable up-keep, done away with.

6.—The trees planted along the centre of the staging have grown remarkably well, and have fully realised what was expected of them.

7.—The Orchid collection, which now numbers some thousands, has so encroached on this house as almost to exclude every other kind, and it seems plain that, if the house is not to be given up to Orchids altogether, but retained for its original purpose as a propagation house, new quarters for the Orchids will have to be found.

8.—A suitable and convenient position for a house of this kind (Orchid House) could be placed mid-way between the Exhibition House and Propagation House, with which it would form an interesting con-

necting link. The ground now occupied by the Carpenters' shop and jungle near this position would make a suitable site for an Orchid Garden, while the adjoining Rambei trees would afford the more delicate plants the requisite amount of shade.

9.—**Formation of a Rosary.**—A Rosary has been made on the site of the old Plant House and Office on the second terrace below the Band Stand, where the ground was levelled and put in order last year, and consists of a series of ten beds with grass verges, separated by six feet wide paths which have been covered with blue granite chips obtained from the Municipal Work-yard.

10.—The total area covered by the Rosary is 1,125 square yards. The beds have been planted with a selection of the best Roses obtainable in the Colony. Among the beds, and in the general design, fourteen vases, each about four feet in height, have been worked in and filled with suitable plants. The design is a success, and makes a pleasant addition to the Gardens. The Roses have grown and flowered freely.

11.—**Flower Beds and Borders.**—The series of flower beds mentioned in my last year's report as having been begun on the old Croquet Lawn in front of the Aviaries, have been extended along the terraces immediately below the Band Stand, which surround the Stand on two sides. It consists of twelve designs worked into an harmonious whole, and contains about 20,000 plants in variety.

12.—The more showy portion of this floral series has been copied largely by native gardeners and others, each apparently selecting what seemed to meet his own views.

13.—A new shrubbery border six yards long has been made along the bamboo hedge below the new Office and Exhibition House, and planted with ornamental trees and shrubs. The other borders have been dug over several times during the year and maintained in good order.

14.—**Fernery.**—Next to the work connected with the formation of the Exhibition House, the excavations for a Fernery have been the hardest work of the year. The ground selected for this purpose lies beneath the large trees to the East of the Band Stand, and in a corner formerly under jungle and rubbish of all sorts. The area of the ground here cleared was 17,000 square feet. Soil to the amount of 11,520 cubic feet has been excavated from the paths made in the ground. This soil has been thrown up in heaps, forming figures of all shapes, in which it is intended to work stones, tree stumps, &c., to keep up the soil and retain moisture for the plants.

15.—About one-third of this work was completed when materials suddenly ran out, and, through want of funds, we have been unable to finish the rock work up to date. The portions finished, however, have been planted with Ferns, Mosses, Palms, &c., and the stems of the trees covered with Mexican Creepers, Orchids, &c. The work, as far as completed, looks well. The sudden running short of funds, however, is disheartening, and, I think, the Garden vote (\$10,000) is now manifestly too small for the demands made upon it, however well suited it may have been to the wants of the times when first granted.

16.—**Herbaceous Garden.**—A Herbaceous Garden has been laid out on the land formerly used as a deer paddock, on the West side of the main lake. This land has always been overrun with scrub, lalang, &c., which have been cleared off and the ground turfed over and laid out in beds labelled with the names and orders of the plants they contain.

17.—It is intended to plant in this Garden a collection of all Herbaceous plants, native and otherwise, within reach; it will consequently include plants to be found in Singapore, by the wayside, in the fields, ponds and ditches, and form a purely Botanical arrangement for the purpose of instruction.

18.—The grounds, so far as laid out, will suffice to accommodate the first great division of plants (Dicotyledons), while the second and third divisions (Monocotyledons and Acotyledons) will find a place on the lawn lying between the Band Stand and the property of His Highness the Maharaja of Johor.

19.—**Band Stand.**—Additional accommodation has been made on the Band Stand by the provision of seats for the Bandsmen, which have been long wanted. The plant vases and flower beds have received the usual attention.

20.—**Lakes.**—The lakes have been cleared of weeds and of the sand washed into them by the heavy rains—a work which sometimes takes up much valuable time and retards more important works.

21.—The two smaller lakes which occasionally fell to a low ebb, have been connected by an under-ground pipe by which means they are now kept full.

22.—**Aviaries.**—But little has been done to the Aviaries during the year. A new Aviary is much wanted, and until this be secured, it is almost useless repairing the old structure, the wood-work being very rotten and irreparable.

23.—**Roads and Walks.**—The Roads and Walks have been maintained in good order throughout the year, by applications of laterite where required, but more extensive repairs will have to be undertaken next year.

24.—**Work in Plant Houses.**—The potting of the collection of pot plants has taken up a good deal of time in the Plant Houses. Large consignments of Orchids received from the Native States have been put on blocks and prepared for despatch in Wardian cases. Many Crotons, *Dif-fenbachias* and ornamental foliage plants generally in demand in the Colony have been potted for sale, and many have been disposed of.

25.—**Plant Nursery.**—Propagation of plants in the various Nurseries made last year have been pushed on with vigour, and a large collection of useful and ornamental plants is now on hand.

26.—Activity in the Forest-tree Nursery considerably decreased towards the close of the year, owing to the removal of the site of planting operation to a distance, and it being found necessary to open new Nurseries in connection with these operations on the spot.

27.—**Experimental Garden.**—An Experimental Garden was open during the year on a portion of Government land near the Botanic Gardens, chiefly with a view to experiments in vegetable cultivation, but also with economic plants. The results obtained during the year will be found in Appendix E. The land selected contains a variety of soils, and is well adapted for experimental purposes, but it will take considerable time to stock this Nursery with the requisite plants for experimental pur-

poses, as these have mostly to be introduced from abroad. In this Nursery, the new varieties of Sugar-cane are being propagated, and will soon be ready for distribution.

28.—Collections of Roses and common shrubs have also been set in for trial in the dark alluvial ground of this Nursery, and some of these are observed to play peculiar freaks; some which seldom flower in the common soil of the Colony, here persists in flowering all the year round; and others which do flower well in the ordinary soil, seem here to have abandoned flowering altogether. The Log Wood introduced from the Mauritius makes admirable progress in the swamp soil of this Nursery, where it makes a most effective hedge plant.

29.—Plants of the Para Rubber (*Hevea Braziliensis*) have grown with great vigour in the Nursery, and I am confident that, had the plants first introduced of this Rubber been planted in this situation, they would have taken precedence of all others in the East in flowering and seed-producing.

30.—Plants of the African Mangosteen, African Rubbers, Queensland Nuts, have also grown satisfactorily. Experiments in vegetable cultivation, so far as they have gone, have been attended with considerable success. Many of the seeds, however, obtained from Europe, had evidently lost their vitality before reaching the Colony, and many things consequently still remain untried, as also may be said of many kinds of Strawberries, Grapes, Peaches, Oranges, Olives, Artichokes, Asparagus, &c., &c.

31.—His Excellency Sir FREDERICK A. WELD, K.C.M.G., takes a great interest in the work of this Nursery, and I am indebted to him for many valuable hints regarding the results of experiments tried by himself in different parts of the world.

32.—**General Grounds.**—The lawns and grounds generally have been maintained in good order throughout the year, seven men being constantly kept at grass-cutting, and a band of five men have been kept constantly weeding and repairing walks. Several dead trees becoming dangerous have been removed, and some of the walk sides have been planted up with Palms with a view to creating shady Palm Avenues after the kind so much admired in the Mauritius.

33.—**Propagation and Distribution of Plants.**—The number of plants propagated during the year in the various Nurseries of the Garden may be roughly estimated at 100,000, and have been disposed of as follows:—

Sold to the Public, ...	4,000
Put out in plantations and on the roadsides, ...	30,000
Sent abroad in Exchange, ...	1,298
Supplied to Public Institutions, ...	2,028
Used in ornamenting the Gardens, ...	20,000
Retained as Nursery Stock, ...	43,000

Total, ... 100,000

34.—The plants sold include Fruit-trees, Flowering Shrubs, Orchids, Fancy-foliage plants such as Crotons, Dieffenbachias, Marantas, &c., &c.

35.—**Foreign Exchanges in Plants and Seeds.**—As will be seen from the above statement, the Plants sent abroad number 1,298 ; the number received, 484. Number of Packets of Seeds received 1,517 ; the number sent 19.

36.—**Plants purchased.**—Plants to the value of \$220 were purchased during the year and include the following :—

Orchids,	...	...	2,000
Ferns,	...	...	140
Crotons,	...	...	50
Mixed Plants,	...	...	1,000
Total,			3,190

37.—The Seeds purchased were :—

Vegetables,	...	149	packets	Assorted.
Flowers,	...	137	"	"
Grass,	...	13	"	"
Total,			299	

38.—The Orchids purchased comprised chiefly the collection of Mr. JAMIE, who devoted a large portion of his time to the collecting and study of Orchids during a period of thirty years' residence in the Colony, and on his retirement, in November last, the Committee determined on securing his collection for the Gardens. The addition thus made to the Garden collection has been an extensive one, and we now possess possibly the largest collection of Orchids in the East, and a climate well adapted for their easy cultivation, but not for their flowering freely.

39.—**India Rubber and Gutta Percha Plants.**—About \$100 was spent during the year in collecting the juice and specimens of Gutta Percha and India Rubber plants. The entire collections made has been sent to the Royal Gardens, Kew, for report.

40.—Of Gutta juice, thirty-four bottles of thirty-four kinds have been obtained through the kind aid of the Hon'ble D. F. A. HERVEY, Resident Councillor, Malacca, and several specimens of plants and Gutta from Mr. BELL, Superintendent of Police, Province Wellesley. His collection contained Gutta Akar Lemah Ketam (striptocaulon Wallachi), Gutta Akar Garroh (Leuconotes eugenifolius), and Gutta Cherrimorei, which last I take to be Willoughheia.

41.—The produce of the three last-mentioned Guttas have been favourably reported on by Mr. D'SILVA, and I am anxiously awaiting report on the large collection sent.

42.—The cultivation of many of our native Rubbers would, I think, well reward the cultivator. At present I am unaware of any being under cultivation, except Gutta Taban or Percha (Dichopsis Gutta), but this is owing, no doubt, to a want of information among planters, as to what kinds are really good Gutta-producers.

43.—The plants of introduced Rubbers mentioned in last year's report, continue to grow well. A Wardian case of healthy young plants of the Panama Rubber (Castelloa elastica) was received during the year from the Botanic Garden, Ceylon, and as there is now no fear of losing the plant, the produce of the large plant which we have on hand might be tested and its quality ascertained.

44.—**Additions to the Library.**—A list of the Books added to the Library during the year will be found in Appendix *D*. Three additional book-cases with glass doors have been procured and placed in the Herbarium in permanent positions.

45.—**Herbarium.**—Herbarium fittings have been purchased to the value of \$160, and principally consist of plant cabinets, tables and the book-cases just referred to.

46.—The Herbarium now contains about half of the fittings required, which will be sufficient to accommodate our collections for some considerable time. In connection with the Herbarium, I may add that the services of an intelligent Plant Collector is still a desideratum; the collections made, so far, have been chiefly got together by the Garden Peon, who has nearly exhausted the jungle within a mile or two of the Gardens.

47.—**Government House Grounds.**—Improvements to the Government House ground have been continued during the year, though on a less extensive scale than in the previous year. The chief improvements have been the remaking of the flower border surrounding the Champac tree behind the Ball Room; to prevent the roots of this tree penetrating the border, a sunk brick wall three feet in depth has been built around the tree; the soil of the old border has been replenished, and planted with suitable plants which have grown well. The shrubs on the lawn on the right of the East approach leading to the house have been overhauled, the unsightly objects thrown out and replaced by plants in greater variety and of a more becoming description. The shrubs on the West of the other approach have received similar treatment. The shrubberies and flower beds near the Lawn Tennis Court have been remodelled and some planted with coloured-leaved plants after the carpet bedding style, and others with flowering and foliage shrubs.

48.—The park lying between the House and Grange Road has been gone over and cleared of undergrowth. The lawns and walks have been maintained in good order throughout the year.

49.—**Revenue and Expenditure.**—The total receipts of the year amount to \$10,799.30, of which sum \$251.51 are for special receipts. Balance in Bank on January 1st amounted to \$1,435.10, which fell in as a balance owing to the difference in time of a day in paying the coolies, as explained in my last year's report, and can hardly be looked upon as a true balance.

50.—The total sum on the side of Revenue figures at \$12,234.40, and the total Expenditure \$12,217.12, which leaves an unexpended balance on the side of Revenue of \$17.28.

N. CANTLEY,
Superintendent.

BOTANIC GARDENS,
Singapore, June, 1884.

APPENDIX B.

List of the Principal Contributors of Plants and Seeds, 1883.

The Gardens are indebted to the undermentioned for contributions of Plants and Seeds, during the year 1883 :—

	PLANTS. No.	SEEDS. Packets.
Director, Botanic Gardens, Melbourne, ...	...	1,300
" " " Kew, ...	...	...
" " " Mauritius, ...	300	...
" " " Ceylon, ...	...	35
" " " Trinidad, ...	...	24
" " " Jamaica, ...	...	3
" " " British Guiana, ...	...	27
" " " Java, ...	28	112
" " " Hongkong, ...	...	2
The Hon'ble the Colonial Secretary, Fiji, ...	...	1
The Conservator of Forests, Moulmein, ...	...	4
The Right Revd. Bishop Hose, Borneo, ...	2	2
The Agri-Horticultural Society, Madras, ...	...	1
Messrs. WILLIAMS & Co., Ceylon, ...	...	6
Mr. VAN GEERT, Belgium, ...	87	...
F. F. MOET, Esquire, Java, ...	5	...
ED. DAVIES, Esquire, Borneo, ...	24	...
Mr. VANKIERBILSK, Mauritius, ...	14	...
Mr. WALKER, Borneo, ...	24	...
N. DENISON, Esquire, Pêrak, ...	650	...
F. A. SWETTENHAM, Esquire, Sêlângor, ...	10	1
The Hon'ble Major J. F. A. McNAIR, C.M.G., Penang, ...	...	1
The Hon'ble D. F. A. HERVEY, Malacca, ...	37	...
H. H. The Maharaja of Johor, ...	35	...
José d'ALMEIDA, Esquire, Singapore, ...	12	...
E. KOEK, Esquire, Singapore, ...	3	...
Total, ...	1,231	1,519

APPENDIX C.

List of the Principal Recipients of Plants and Seeds, in 1883.

	PLANTS. No.	SEEDS. Packets.
Director, Botanic Gardens, Hongkong, ...	100	1
" " " Ceylon, ...	198	1
" " " Calcutta, ...	...	1
" " " Kew, London, ...	...	1
" " " Cambridge, England, ...	...	1
" " " Jamaica, ...	50	1
" " " Trinidad, ...	...	1
" " " British Guiana, ...	120	1
" " " Cape of Good Hope, ...	...	1
" " " Natal, ...	...	1
" " " Mauritius, ...	353	1
" " " Melbourne, ...	...	1
" " " Sydney, ...	...	1
" " " Adelaide, ...	...	1
" " " Brisbane, ...	...	1
Imperial Gardens, Berlin, ...	...	1
" " Vienna, ...	...	1
Carried forward, ...	821	17

APPENDIX C.—Continued.

List of the Principal Recipients of Plants and Seeds, in 1883.

		PLANTS. No.	SEEDS. Packets.
	<i>Brought forward,</i> ...	821	17
Botanic Gardens, Regent Park,	... ..	...	1
" " Glasgow,	... ..	...	1
F. A. TENISON-WOODS, Esquire, Brisbane,	... ..	60	...
Government of Réunion,	... ..	50	...
" " Saigon,	... ..	50	...
VAN DONOP, Esquire, Borneo,	... ..	9	...
E. P. GUERITZ, Esquire, Borneo,	... ..	162	...
The Hon'ble Major J. F. A. McNAIR, C.M.G.,	... ..	20	...
The Hon'ble the Resident Councillor, Malacca,	... ..	24	...
British Resident, Sélângor,	... ..	24	...
B. Low, Esquire, Borneo,	... ..	50	...
G. L. DAVIES, Esquire, Borneo,	... ..	28	...
	Total, ...	1,298	19

APPENDIX D.

List of Books received for the Garden Library, in 1883.

1. LOUDON'S Encyclopædia of Plants.
2. OLIVER'S Illustrations of Botany.
3. GAMBLE'S Timber Trees of India.
4. Flora of British India. (HOOKER).
5. Thesaurus Lit., Botanicæ (DRITZEL).
6. Laws of Botanical Nomenclature.
7. BENTHAM & HOOKER'S Genera Plantarum.
8. BRULLON'S Natural History of Plants.
9. BAKER'S Botanical Geography.
10. BALFOUR'S Cyclopædia of India.
11. Report on Gums, &c.
12. Student's Latin Dictionary. (WHITE).

APPENDIX E.

List of Vegetables which grew during the year 1883.

Cabbage,...	... Large White Erfurt.
" ...	... Early Blood-red.
Celery, ...	... Cole's Defiance.
" ...	... Williams' Matchless:
" ...	... Major Clarke's Red.
Turnip, ...	... American Strap Leaf.
" ...	... Carter's Extra Early French.
Kale, ...	... Jersey Tree.
Lettuce, ...	... Cabbage.
" ...	... Cos Carter's Giant White.
" ...	... " " Brown.
Endive, ...	... Batavia.
" ...	... Round-leaved.
" ...	... Carter's Superb.
Raddish, ...	... White Turnip.
Carrots, ...	... Earliest French forcing.
" ...	... Carter's Early Horn.
Parsley, ...	... Carter's Fern-leaved.
Beet, ...	... Dell's Flower Garden.
Tomato, ...	... Large Red.
" ...	... Trophy.
Pea, ...	... Best of All.

Annual Report on the Botanic Gardens, Singapore, for the year 1884.

The principal works carried out during the year in the Botanic Gardens and in other places connected with the gardens are, with some additional items of interest, detailed below.

2.—**Visitors.**—Visitors during the year have been apparently as numerous as in previous years. The precise number has not been ascertained,*but carriages and riders on horse-back are seen to be most numerous in the mornings and evenings, and strangers upon Mail days.

3.—**Buildings.**—The permanent buildings connected with the Department were observed, towards the close of the year, to require some petty repairs, and have been taken in hand by the Public Works Department.

4.—The following new quarters have been erected, viz.:—One large coolie house, which accommodates all the Javanese employés; a station for the garden constables; a small shed for the Chinese coolies; a carpenter's shop; and a large potting shed. The quarters erected some time ago for the accommodation of a European employé have been put in order and made available for the Garden Clerk. The construction of a new aviary was commenced before the year closed.

5.—**Introduction and Propagation of Plants.**—The great demand for plants during the year has prevented any auction sales of surplus stock. Orders for plants to the number of half a million were received as the year closed, chiefly for Mauritius hemp.

6.—The numbers of plants propagated, during the year were approximately as under:—

Forest tree nursery,	...	... 70,000
General do.,	...	... 50,000
Fancy plant do.,	...	... 40,000
Plant-house, ...	...	... 3,000
		163,000

7.—These have been disposed of as follows:—

Sent to the Forests, Singapore,	... 60,000
" " Malacca,	... 4,000
" P. W. D., Province Wellesley,	... 6,000
" British Resident, Pêrak,	... 6,000
" Resident Councillor, Malacca.	... 1,000
Sold to the Public,	... 38,000
Retained as Nursery Stock,	... 48,000
	Total, ...163,000

8.—The trees sent to the forest consisted of Teak, Mahogany, Serayah, Gum Copal, Merbau, Toon, Illipi, Rain tree, and mixed native trees. Of the plants sold to the public, a large number were *Fourcroya gigantea* or Mauritius hemp: the remainder were principally ornamental trees, shrubs, orchids, &c.

9.—**Plant and Seed Exchanges.**—The foreign exchanges in plants and seeds were as under:—

Received, ...	{ 1,000 plants
	{ 200 lbs. seeds
Forwarded, ...	{ 1,500 plants
	{ 150 lbs. seeds

The plants brought in from the jungles numbered about 3,000, collected chiefly by myself when travelling on forest inspection duty, and have been utilised in various ways.

10.—Of the plants introduced in previous years, the following shew signs of accommodating themselves to the soil and climate of the country viz.:—"Coca" (*Erythroxylon coca*) which has flowered and fruited freely during the year. From this plant is produced an alkaloid called "Cocaine," used in the treatment of asthma, &c., and at present attracting much attention among medical men. I think it might be grown in the Colony with profit.

11.—The plant which produces the so-called Mauritius hemp is a native of South America, and is well adapted for cultivation here. Some planters who have tried it have sent large orders for a further supply, and have, I believe, ordered machinery from England for its manufacture.

12.—The plants of *Cinnamomum cassia*, which produces the Cassia bark of commerce, grow very freely in the experimental nursery, and will probably become one of the Colonial products in course of time.

13.—One of two varieties of Cardamum, introduced during the year from Java, has flowered and fruited very freely, and would no doubt pay cultivation well. Liberian coffee has now been carried by cultivators beyond the limit of experiment, and I refer to it only as among the plants introduced into the Colony by this establishment. The Panama rubbers, so admirably cultivated by Sir HUGH Low, were also first introduced by the Botanic Gardens.

14.—Plants of the African "Kola nut," planted in the experimental nursery, have grown well in the alluvial soil there. The plants of

“Avocada pear,” planted out in the Economic Garden some years ago, where their growth stood almost stationary, have been removed to the nursery just named, and have grown with extraordinary rapidity.

15.—Plants from seed of the Lima Bean of Brazil have been grown in the nursery with great success, and form a desirable addition to our vegetable supply. The names of other vegetables which have succeeded in the nursery were given in last year’s report and need not be repeated here.

16.—A number of useful and interesting economic plants were received during the year from the Royal Gardens, Kew, but as these are still small and have so far been kept in pots for safety, it is too soon to make any special reference to their likely merits.

17.—A quantity of nutmegs and cloves have been introduced from their native habitat as fresh stock for experimental purposes. Plants of Peach, Apricot, Grape Vine, Olives, and Figs in variety have been ordered from Sydney, but the season of the year there when the order arrived not admitting of the despatch of the plants, they were not received within the year, and therefore fall to the share of next year’s report.

18.—I may be permitted to mention in this connexion that, although there are some good specimen plants in the gardens, a point is not being made of growing such plants to the exclusion of propagation, the object of the gardens being to introduce desirable plants into the Colony and cultivate them for such length of time only as will demonstrate their adaptability or otherwise for cultivation in the soil and climate of the Settlements, and to propagate such as appear suitable, for distribution to cultivators and specimen growers.

19.—**Improvements in the Grounds.**—Having, under this heading, to refer to the Exhibition House, I would make brief mention of the Flower Show held in January of the year under report, the plants and other objects sent to which, were, for the first time, accommodated here. The ground design of the house looked well when filled with the various exhibits.

20.—The show was in itself a great success, notwithstanding the inclement state of the weather which prevailed during the Exhibition. The illumination of the show by electric and other lights was very effective.

21.—After the show, the roof put up for sheltering the exhibits was so modified as to admit of the house being temporarily filled with pot plants, and although these are now being removed to make way for the construction of a permanent roof, it is sufficiently proved that the design meets well the double purpose for which it was made.

22.—**Roads and Walks.**—Early in the year, the new approach to the Exhibition house was heavily coated with laterite over its whole surface and rolled to solidity by the aid of a heavy four-bullock roller, kindly lent by the Municipality. The paths in the house were also metalled in the same way. A temporary stair, partly in wood, has been put down in the grass bank opposite the entrance to the house. The unclimbable iron railing which surrounded the propagation nursery has been removed and placed around the exhibition building, being substituted in its former position by a bamboo hedge.

23.—The front entrance walk, which has a breadth of twenty-two feet, has been dug up, levelled, remodelled and well laid with laterite over an area of 7,800 square yards.

24.—About 1,100 square yards of the public road which passes through the garden has been levelled. A water channel on each side put down in brick, and the adjacent land reduced to a regular gradient. The laterite used in re-modelling this road was supplied by the Municipality as well as the labour in putting it down. The cost of the bricks and labour of levelling were borne by the Gardens. The levelling being finished, ornamental palms were planted fifteen feet apart on each side of the road, with a view to shading and improving its appearance.

25.—The broad walk leading from the office towards the Band-stand has undergone extensive repairs and the smaller walks have received attention where required.

26.—**Lakes.**—The Lily lake was thoroughly cleaned out during the year, deepened, manured, and re-planted. In this operation a great deal of mud had to be removed, which occupied all the coolies for about a month.

27.—The Victoria lily, planted in the small lake last year, has grown and flowered well, and seems to enjoy its new quarters.

The ravenous and worthless fish with which the large lake teems prevent any ornamental water-plants growing there. These fish should, I think, be destroyed, and a more useful or ornamental kind substituted, and such as will not prevent some portion of the water being decorated with lilies, &c.

28.—**Flower Beds and Fernery.**—The flower beds throughout the grounds have several times been planted during the year; time could not be found to alter the design of the previous year, but as it is intended at an early date to overhaul the grounds generally, any alteration for the sake of change or effect will be considered.

29.—The sale of flowers keep the beds denuded as usual. Until such sales are abolished, the gardens will always wear a flowerless appearance. The small sum annually received for flowers is, I think, but a poor compensation for the amount of pleasure a denuded public garden must deny a whole community.

30.—A number of large trees, especially in the vicinity of the Band-stand, have been pruned into pyramidal shape, chiefly with a view to ridding them of parasitical growths. A good many dead trees and shrubs, killed chiefly by white ants, have been removed from the grounds. On examination, the ants were found to have attacked the roots first, and when a tree shewed signs of being attacked, it was generally too late to apply a remedy. The trees lost in this way include some fine specimens of Araucaria, which grew near the front entrance.

31.—The Fernery which remained unfinished from last year has been completed, but not fully planted. I anticipate much trouble from the roots of the jungle trees which absorb the soil intended for the nourishment of the ferns.

32.—The forest tree nursery was closed during the year, owing to the removal of forest operations to a distance.

33.—**Economic Gardens.**—Through want of funds, the planting in the economic garden was not gone on with, and I have had to content

myself up to the close of the year with getting plants together for planting. I believe a portion of next year's vote will be specially set aside for this work.

34.—**Herbaceous Garden.**—The Herbaceous Garden referred to in my last year's report has been planted with as large a variety of plants as could be got together. The plants are arranged in their natural families and will be a great convenience to all interested in plant classification as well as to the employés of the gardens themselves.

35.—**Labelling.**—The plants on the lawns and grounds have been kept well labelled. The work has had the constant attention throughout the year of one man, and labelling is now possibly better attended to than it has ever been previously.

36.—**Lawns.**—The grass lawns which occupy about two-thirds of the total area of the gardens has been maintained in good order at the expense of much cutting and sweeping. The leaf fall in the gardens is particularly heavy, but notwithstanding this, I venture to think that a little less sweeping might be done with a view to making available a larger share of the small annual grant furnished by Government.

37.—**Office and Herbarium.**—After a good deal of difficulty, a suitable Clerk has at last been found for the Garden Office in the person of Mr. EDWARD BREWER, who entered upon his duties on the 1st September of the year under report. He has given me much satisfaction.

38.—The Garden Police have attended well to their duties throughout the year, nothing having been stolen to my knowledge, and there has been no prosecution.

39.—The Printer has been occupied as explained under paragraph 35.

40.—The Carpenter has been fully occupied in works of a very miscellaneous nature, such as making plant-cases, plant-labels, painting garden seats, &c.

41.—The Herbarium Keeper has been employed curing herbarium specimens, mounting specimens, and attending to the wants of the Library.

42.—The Herbarium, which occupies the largest portion of the building which contains the office, has received during the year an addition of eighteen cabinets and two tables. The plant-cabinets have nearly all been filled with specimens collected during the year, chiefly by the Collectors working under the supervision of the Forest Department. (See Forest Report.) A book is kept in the Herbarium, in which is entered the number of every specimen received, its native name, and purpose for which used.

43.—Herbarium Specimens sent to the Gardens to be named should be forwarded in duplicate or numbered when not required to be returned.

44.—The additions made to the Library during the year is shewn in Appendix E. Twenty-five volumes comprising various books and reports received in previous years have been bound and put in place. It is found that a small stove is required to keep away damp from the books, as well as from the herbarium specimens.

EX-ESTABLISHMENT.

45.—**Government House Grounds.**—The year has seen a complete transformation of the old plant-houses and system of housing plants, so long practised at Government House.

46.—The whole plant collection has been transferred to a new nursery opened at a reasonable distance from the House. In this nursery, four new plant sheds have been erected, on an improved principle, and in these the ferns and other plants thrive well.

47.—The nursery made is about an acre in extent and has been filled with a variety of plants useful for cut-flowers, ornament, &c. Small walks have been made through the nursery connected at certain points by terrace stairs in brick. A walk about thirty yards in length and six feet in breadth has been made to connect the nursery with the approach leading to Government House from the back entrance and planted on each side with Bidwell's Pine. This walk, together with the principal walks throughout the nursery, have been coated with laterite.

48.—A large assortment of Chinese green-ware pots has been purchased, and the whole collection of plants re-potted. A considerable number of crotons and other ornamental foliage plants suitable for internal decoration have been purchased, in addition to collections of similar plants supplied from the Botanic Gardens.

49.—The flower-bed design below the bower has been re-modelled.

50.—A number of shrubs which had become overgrown and leggy have been removed from the lawns, and re-placed by more ornamental specimens. The lawn tennis grounds have been top-dressed and the adjoining flower beds re-planted and re-designed. Two large fig trees on the lawn which obstructed the view of the harbour from the house have been topped. The walks and lawns have been maintained in good order throughout the year.

51.—During the visit of H. R. H. Prince OSCAR of Sweden, he planted, at the request of H. E. the Acting Governor, a palm tree (*Caryota urens*) near the position of those planted last year by Princes EDWARD and GEORGE OF WALES.

52.—**Esplanade.**—That portion of the Esplanade lying between the road and the sea, and extending from near Raffles Institution to Cavenagh Bridge, has been levelled, reduced to a regular slope seawards, and closely laid with turf. In this work, upwards of 2,000 cart-loads of soil were used, and 1,000 cart-loads of grass. The levelling being completed, the pillars along the footpath were removed and placed further back to widen the path and thereby render it a more useful and agreeable promenade. To finish, a number of garden benches were distributed in shady positions beneath trees over the lawn.

53.—**Public Offices.**—The grounds surrounding the extension of the Colonial Secretary's Office and new Harbour Office have been levelled, turfed, and decorated with flower-beds involving considerable work.

54.—**Dhoby Green.**—Dhoby Green has undergone a complete change during the year. Its condition had for some time been considered unsatisfactory, and in the early part of the year the Government

ordered it to be taken in hand by the Botanic Department. Owing to the damp nature of the site, thirty-two drains were run transversely across the ground, and laid with four-inch tile pipes. These have removed the superfluous water which checked the growth of plants and gave the place a dreary appearance.

55.—After filling in the drains and levelling the surface, the necessary authority was obtained by the "Ladies' Tennis Club" to occupy the ground. The design as modified is composed of lawn, flower-beds, and curvilinear walks, and although considerable ornamental effect had to be sacrificed in order to leave sufficient space for a number of tennis courts, the place has been greatly improved.

56.—**Revenue and Expenditure.**—The receipts and expenditure of the year will be found detailed in Appendix *A*. The total receipts amounted to \$10,809.78, and the expenditure to \$10,608.83; this leaves a balance on the side of receipts of \$200.95.

N. CANTLEY,
Superintendent of the Botanic Gardens.

APPENDIX B.

*List of Contributors of Plants and Seeds, in 1884.**Foreign Contributors.*

	PLANTS.	SEEDS. lbs.
Director of Botanic Gardens, Java, ...	{ 250 } { 500 }	20
" " " Jamaica, ...	...	25
" " " Ceylon, ...	...	1
" " " Hongkong, ...	34	16
" " " British Guiana, ...	...	12
" " " Adelaide, ...	...	11
" Royal Gardens, Kew, London, ...	45	3
" " " Trinidad, ...	35	51
" " " Cape Town, ...	...	1
" " " Durban, Natal, ...	...	...
" " " Mauritius, ...	25	60
H. ALABASTER, Esquire, Siam, ...	20	...
T. VARMBOLD, Esquire, Buitenzorg, ...	...	...
E. E. ABRAHAMSON, Esquire, Borneo, ...	40	...
Mr. CONOLLY, ...	30	...
Mr. R. ROBERTS, Kew, Australia, ...	...	...

Home Contributors.

H. E. the Acting Governor, ...	...	...
H. H. the Maharaja of Johor, ...	1	...
The Hon'ble H. TROTTER, ...	...	...
The Hon'ble J. M. B. VERMONT, Penang, ...	1	...
The Hon'ble the Resident Councillor of Malacca, ...	...	...
Dr. LITTLE, Singapore, ...	19	...
Total, ...	1,000	200

APPENDIX C.

List of the Principal Recipients of Plants and Seeds, in 1884.

	PLANTS.	SEEDS. Packets.
Director of Botanic Gardens, Hongkong, ...	33	10
" " " Ceylon, ...	...	7
" " " Calcutta, ...	...	7
" " " Kew, London, ...	105	10
" " " Cambridge, England, ...	...	5
" " " Jamaica, ...	...	7
" " " Trinidad, ...	150	10
" " " British Guiana, ...	...	5
" " " Cape of Good Hope, ...	...	6
" " " Natal, ...	...	7
" " " Mauritius, ...	...	20
" " " Sydney, ...	...	10
" " " Adelaide, ...	...	7
" " " Melbourne, ...	...	7
" " " Brisbane, ...	...	7
The Agri-Horticultural Society, Lahore, ...	...	1
Carried forward, ...	288	126

=150 lbs.

APPENDIX C.—Continued.

List of the Principal Recipients of Plants and Seeds, in 1884.

	PLANTS.	SEEDS. Packets.
<i>Brought forward,</i>	288	126
J. C. BROWNING, Esquire, Forest Farm, Windsor,	45	...
The French Consul, Singapore,	600	...
H. ALABASTER, Esquire, Siam,	45	...
Major-General SARGEANT, Hongkong,	20	...
Lady WELD, England,	24	...
Lady BOWEN, Hongkong,	25	...
H. B. M. Consul, Amoy,	45	...
W. BULL, Esquire, London,	207	...
J. ALLEN, Esquire, Penang,	100	...
C. MARIES, Esquire, India,	31	...
E. E. ABRAHAMSON, Esquire, Borneo,	11	...
E. PRYOR, Esquire, Borneo,	20	...
	<u>1,500</u>	<u>126</u>

APPENDIX D.

List of Books received during the year 1884.

Medical Botany, (W. WOODVILLE, M.D.).
 Transactions of the Highland Society of Scotland, } Presented by Mr.
 Journal of Agriculture, } ROBERTS, Kew,
 Philosophical Magazine, } Australia.
 Paradisus Batavus, (PAULUS HERMANNUS, M.D.).
 Thesaurus Literaturæ Botanicæ, (PRITZEL).
 Monographie de la Famille des Lycopodiacees, (A. SPRING).
 Ferns of British India, (BEDDOME).

GOVERNMENT NOTIFICATION—No. 297.

THE following Annual Report on the Forest Department, Straits Settlements, for the year 1884, is published for general information.

By His Excellency's Command,

A. M. SKINNER,
Acting Colonial Secretary.

COLONIAL SECRETARY'S OFFICE,
Singapore, 21st May, 1885.

*Annual Report on the Forest Department, Straits Settlements,
for the year 1884.*

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IN the organization and working of the Forest Department during the year, the ^{Introduction.} recommendations contained in my preliminary report (see paragraph 112) on the Forests of the Straits Settlements have been closely adhered to.

2.—Following the plan of that report, details are here given of the work accomplished and the expenditure incurred in each Settlement. The work has been entirely separate from that carried out in connection with the Botanic Gardens during the year.

3.—It having pleased His Excellency Governor Sir F. A. WELD, to accord me the honour of organizing the Forest Department throughout the Colony, the following executive officers have been appointed and, although some of these are still new to their work, the Department may now be said to be established and will yearly become more efficient and useful.

(1st.)—Superintendent, N. CANTLEY, Singapore.

(2nd.)—Assistant Superintendent, C. CURTIS, Penang.

Staff.

This officer assumed his duties towards the end of July, and has been placed in charge of the Penang and Province Wellesley forests.

(3rd.)—Overseer 1st grade, V. JACKSON, Malacca. Assumed his duties on the 1st January.

(4th.)—Overseer 2nd grade, D. C. YOUNG. Was appointed in July to be Overseer in Singapore.

(5th.)—Overseer 3rd grade, PETER NENKEY. In charge of the Penang experimental nurseries.

4.—The Assistant Superintendent in Penang and Overseers in Malacca and Singapore have each a separate staff of subordinate officers for the supervision of forest watchmen and coolies engaged in forest work.

5.—The number of labourers employed during the year has varied greatly, ranging between two and six hundred, according to the nature of the work in hand.

6.—The forest watchmen are a body separate from the ordinary employés. They wear uniform, and their chief duties are to protect the forest reserves and keep open the boundary paths. They work under special regulations which have been drawn up for their guidance.

SINGAPORE.

7.—In Singapore there are eight reserves, the two largest being the Jurong and Bukit Mandi reserves; the total area to be reserved is about 8,000 acres (or about ^{Selection of forest reser-} one-twentieth of the total area of the island). About sixteen miles of boundary line ^{ves.} have been demarcated, and about 12 miles planted with fast-growing trees.

8.—In selecting these reserves, every effort has been made to obtain as much forest and forest growth within their boundaries as possible, but, as trees generally occur in small patches widely scattered over the island, it has been impossible to avoid the inclusion of a large extent of waste land.

9.—Among the Singapore reserves I have classed the Bakau or Mangrove jungle, which extends along most of the coast line of the island. The preservation of this jungle, which includes wood useful for many purposes, is a very important matter. Its great length renders it difficult of protection and, so far, I have had to content myself with merely pointing out to the Land Department what extent of it might be leased for cultivation.

A paper on the sanitary disadvantages arising from the destruction of mangrove jungle has been already laid before Government, and the subject is worthy of further careful enquiry.

Erection of
quarters.

10.—Quarters for the accommodation of the Overseer have been erected at Bukit Timah, within the reserve, and near the same position the central station of the forest watchmen has been constructed.

Two houses have been put up at each of the Jurong and Bukit Mandi reserves, one for the forest watchmen and one for the coolies employed in the work of demarcation. Two houses have also been erected for the coolies at each of the nurseries at Bukit Timah and the Military reserve.

Demarcation
of reserves.

11.—The demarcation of the Bukit Timah reserve was one of the first works that occupied my attention. The line cleared around this reserve is 6 miles in length and 16 feet in width and has been planted along its outer edge with fast-growing trees, 14 feet apart, over its whole length. The width of this line will prevent a jungle fire, under ordinary circumstances, from crossing into the reserve and injuring the young plantations and natural growth.

12.—The Jurong reserve has been demarcated with an eight-foot path over a distance of three miles and has also been planted with trees.

13.—The boundary of the Bukit Mandi reserve has been opened over a distance of about seven miles, three miles of which have been planted with trees.

The cutting of the boundary line of this reserve presented much difficulty, owing to the irregularity of the surface and the heavy covering of jungle.

Formation of
nurseries.

14.—A nursery for the propagation of trees has been opened at Bukit Timah, and comprises an area of about 3 acres. There is also one at the Military reserve for propagation and experimental purposes, about 4 acres in extent. The number of young trees propagated in these two nurseries may be roughly set down at about 300,000; this number was supplemented by about 60,000 from the forest nursery opened in the Botanic Gardens in 1883, but since closed, owing to its being inconveniently distant from the seat of operations.

About 148,000 plants, of the number given above, were planted out within the year. It was not advisable to plant out the rest, as they had not gained sufficient strength to enable them to cope with obstructive vegetation in the open.

Planting of
waste lands.

15.—It being desirable to perfect the Bukit Timah reserve as early as possible, about 50 acres of the waste land within its boundary have been planted with young trees at about 2,000 to the acre. Twenty acres of the Military reserve have also been planted in the same way, and about eight acres of the latter have been gone over and the plants cleared of weeds and grass.

Introduced
trees.

16.—The kinds of trees planted on these waste lands are chiefly as under:—

Teak.—*Tectona grandis*, has grown well only on the low lands in the better kinds of soil.

African Gum Copal.—*Hymenia verrucosa*, has thriven well.

American Rain Tree.—*Inga saman*, makes very rapid growth.

Mahogany.—*Swietenia mahogani*,
Brazilian Iron Wood, *Cæsalpinia ferrea*, } thrive exceedingly well.

Illipi.—*Bassia longifolia*, looks promising.

50
20
70

Australian Dammar.—*Dammara robusta*, grows moderately well.
 Albizzia.—*Albizzia stipulosa* and *A. moluccana*, grow very rapidly.
 Indian long-leaved Pine.—*Pinus longifolia*, plants small as yet.
 Toon.—*Cedrela Toona*,
 Pride of India.—*Lagerstræmia reginæ*, } grow fairly well.
 Cassia florida, grows with remarkable vigour.
 Sissoo.—*Dalbergia Sissoo*, grows slowly and appears unsuited to the climate.
 Inga dulcis, grows slowly.

Bintangor.—*Calophyllum inophyllum*, grows well.
 Serayah.—*Hopea cernua*,
 Wood oil tree.—*Dipterocarpus Sps.*,
 Mirabu.—*Afzelia palembanica*,
 Petaling.—*Strombosia javanica*,
 Kulim.—*Scorodocarpus bornensis*,
 Meranti.—*Hopea meranti*,
 Malacca Iron Wood.—*Kumpassia malaccana*,
 Kêlat.—*Eugenia zeylanica*,
 Eugenia Sps.,
 Těmpinis.—*Sloetia sideroxylon*,
 Kayu Arang.—*Diospyros discolor* } grow slowly.
 Incense Tree.—*Elæodendron Sps.*,
 Kayu Ru.—*Casuarina equisetæfolia*, } very rapid growth.

Native Trees.

17.—The rate of growth of the various trees planted is carefully recorded, but none are as yet sufficiently advanced to admit of a decided opinion being formed as to their probable future behaviour. I refer more particularly to introduced trees; as to the success of native trees I am in a degree certain, but it will be most useful to preserve statistics of the rate of their growth in order that it may be clearly ascertained which will grow most satisfactorily on exposed lands. All nursery operations and planting will be guided by the experience so gained.

18.—The collecting of Herbarium specimens, in order to afford material for Herbarium scientific investigation from other points of view, has not been forgotten. Herbarium specimens.

MALACCA.

19.—In Malacca, quarters for the forest watchmen have been erected in the following reserves:—Bukit Bruang, Ayer Panas, Jûs, and Sungei Udang. The houses erected are of a more permanent character than those in Singapore, being substantial wooden buildings raised on pillars. Erection of quarters.

20.—A nursery of about 3 acres in extent has been made at Bukit Bruang, and one at Ayer Panas of about one acre. Through these nurseries about 270,000 plants have passed during the year. In the vicinity coolies have collected about 340 lb of seed of various trees which, together with the greater number of the plants, were sent to Singapore. A good many plants have been planted out in and near the nurseries with a view to observing their rate of growth. Formation of nurseries.

21.—Forest reserves in Malacca require but little planting. They are, for the most part, well stocked with natural growth, and plants and seeds of the better kinds being comparatively abundant, the opportunity was taken of supplying the other Settlements which are less fortunate in this respect. A much larger supply of seed than that obtained can, however, be utilized with great advantage, as seeds are always preferable to plants when it is necessary to transport nursery stock from a distance. Forest reserves.

22.—In order to make Bukit Bruang reserve as efficient as possible, it was thought desirable to add to it the forest lands adjoining its eastern boundary. These lands contain a very large proportion of young trees of Těmpinis and other good timbers and are held by an Arab, without, it is believed, any real title to them. Bukit Bruang reserve.

I would earnestly urge on the Government the necessity for action in this matter, with a view to extending the reserve so as to take in these lands. Further delay may see them entirely destroyed.

23.—With a view to obtaining a more practicable western boundary for the reserve, it was decided to purchase some abandoned lands which had become overgrown with secondary growth and brushwood. A line was consequently run by survey outside those portions which were believed to be purchaseable at fair prices, but as soon as the Government were seen to be in earnest about securing the lands, the native owners raised the prices and it was found impossible to agree to the purchase of more than one holding of about 7 acres within the year. Some of the proprietors will no doubt come to terms later on, but the delay caused was vexatious, as nearly \$2,000 lapsed to the Treasury. I may here be permitted to observe that it would be advantageous in the future to set aside annually a certain lump sum of money to be expended in the purchase of lands required by the Forest Department and for compensation to cultivators.

Herbarium
specimens.

24.—The collecting of Herbarium specimens of the plants of Malacca and of the adjoining Protected Native States was taken in hand, and about a thousand were sent to Singapore before the close of the year. The Overseer has taken advantage of his visits to the reserves to collect as much botanical information as his various other duties permitted.

PENANG.

25.—Next to Singapore, the work accomplished in Penang has been the most extensive of the year, notwithstanding the drawback that one-half of the year elapsed before the arrival of a qualified assistant from England. Mr. CURTIS reported himself towards the end of July, and has pushed on the work with great energy.

The work accomplished consisted of the demarcation of the hill forest reserves; the formation of a Forest tree nursery, an experimental nursery, and the clearing and laying out of grounds at the Waterfall for planting colonial products.

Demarcation
of the hill
reserves.

26.—The largest reserve made covers the highest hill range in the island with an altitude varying from 2,550 to 2,713 feet, respectively. This was considered the most important and consequently it was the first taken in hand.

From one-third to one-half of the elevation of this range has been included, due regard being paid to the nature of the soil, angle of the slope and amount of cultivation. The outline of the reserves as demarcated is very irregular, owing to cultivation having attained a higher altitude than was consistent with the general welfare. That no restriction should have been placed on the ascent of cultivation is to be deplored. To avoid including these encroachments it was necessary to raise the outline of the reserve higher at certain points than would have been necessary had there been no such obstacles, and by way of compensating to some extent for this loss the line was proportionately lowered in places where no cultivation existed and where the angle of the hill side was such as to render cultivation impracticable. This has been done at the expense of much cutting and hard climbing, and the few clearings unavoidably included within the reserve are of no great value. A list of these and their approximate areas has been drawn up, and they have been valued with a view to arrangements being made for taking them over.

27.—The demarcation line has been cut nine feet wide, of which five feet have been cleared of tree stumps, etc., and the upper side of the slope dug away to make a passable inspection path. The total length of the line thus opened, from the commencement of operations to the close of the year, is about 30 miles. The line embraces the whole of the main hill range of the island from western Ayer Hitam to Batu Feringgi, and this circle is now completed with the exception of a small portion between Half-way house on Government hill and Bukit Timah, the opening of which has been deferred pending the settlement, by purchase or otherwise, of the lands over the watershed of the Penang river upon which George-town is principally dependent for its water supply.

Quarters.

28.—As the work of demarcation proceeded, it was found more economical to rent houses from Chinese for the accommodation of the coolies than to erect new quarters for them.

Substantial quarters for the forest watchmen have, however, been erected at Telok Bahang, Bukit Timah, and Government hill reserves at approved points, and it is hoped that when the watchmen get properly to work, destruction of forest above the reserve line will be entirely prevented.

29.—The preparation of a piece of land to serve as a forest tree and experimental nursery was begun early in September on Government hill. In selecting the site, care was taken to secure the greatest elevation combined with a constant supply of water. An area of about six acres has been selected and cleared of jungle close to the road leading to the Government Bungalow at an elevation of 2,000 feet. A stream runs through the nursery which affords a supply of water that is believed never to fail even in the driest season. It has been found necessary to terrace the greater portion of this nursery, owing to the slope of the hill side being too steep for cultivation in its natural form. Formation of nursery.

30.—Temporary sheds have been erected for coolies employed in the nursery and, although there is generally more or less fever on new clearings, the coolies have been exceptionally free from it in this place. A span roof plant house with a movable chick roof has been put up for plant protection and propagation purposes.

31.—The collecting of native plants was commenced in December, and a good many, useful for exchange, ornamentation, etc., have been got together. Collecting of native plants and seeds.

Such seeds as could be obtained in Penang have been collected, and among them a small supply of home grown Teak seed from trees growing near Telok Bahang where they appear to be doing remarkably well.

32.—But little could be done during the year to forestry in Province Wellesley, owing to the pressure of work on the Penang side of the Straits. Province Wellesley.

33.—The formation of a nursery for the planting of colonial products at the Waterfall in Penang was also a work of the Forest Department during the year. Penang Waterfall nursery.

Part of the Municipal land at the Waterfall was taken over by Government for the purpose of forming a nursery, but the work was not actively commenced till late in the year, when a large band of men were put on to clear an area of about ten acres: rather more than half of this space has been dug over twice to a depth of about two feet and the lalang roots and stones removed. The remaining portion, not being of a nature suitable for cultivation, has been sloped or levelled as the case required and a great part of it turfed. Holes have been prepared for the reception of plants, and a few flower beds have been made along the main walk with a view to combining the ornamental with the useful. The old path which passed through the land and which followed the course of the river has been altered, re-modelled, and metalled. It will prove a good, durable carriage road.

A new road striking off from the reservoir and skirting the outer boundary of the nursery was commenced and had considerably advanced towards completion before the close of the year.

The necessary paths for the convenience of working parties and visitors have been laid out and the edges turfed. Actual planting was only prevented by the setting in of dry weather before the nursery was sufficiently advanced to admit of planting being done.

34.—Summarizing the work of the Forest Department in the three Settlements during the past year, I would point out that the forest reserves dealt with to a more or less extent are fifteen in number; that forty-six miles of boundary line have been opened at an average cost of \$83 per mile including the planting up of twelve miles with fast-growing trees; that the area of land laid out in nurseries is over twenty acres; and that some 390,000 plants have been propagated in these nurseries at an average cost of \$1 per 100. Summary.

35.—Seventy-three acres of waste land were planted with about 148,000 plants at an average cost of \$12 per acre or per 2,000 plants. The stock in the nurseries at the close of the year numbered about 200,000 plants. It will be noticed that the area of waste land planted with trees is comparatively small, but what was of most importance, viz., the demarcation of reserves, to prevent further encroachment had to be first undertaken. This done, attention could with more security be turned to planting operations and other work within the reserve boundaries.

X/110

36.—Over 1,160 lbs of seeds have been got together from various quarters and utilized for the benefit of the reserves. About 1,600 Herbarium specimens of plants affording material for scientific investigation, have been procured at an average cost of \$10 per 100; which, when the difficult nature of the country and places requiring to be visited is taken into account, must be considered reasonable.

37.—The buildings erected include quarters for the overseers, stations for the forest watchmen, coolies' houses and plant sheds: in all 27 in number.

39.—A small Library of books on forestry has been formed for the benefit of the Forest Staff. A list of books received during the year is appended.

40.—In conclusion, I would add that, irrespective of periodical tours through the Settlements generally, a good deal of my time has been taken up in travelling over the island of Singapore on special forest duty, such as reporting on forest lands applied for by Chinese cultivators, it being now the rule that all forest lands applied for should be reported on by the Forest Department in the first instance.

These inspections entailed much heavy travelling and exposure, as in every case miles had to be walked on foot to reach the spot requiring inspection.

41.—I may also mention that the amount of correspondence which the addition of the Forest Department has thrown upon the Garden's office has about quadrupled the business of previous years.

N. CANTLEY.

Singapore, 13th April, 1885.

Revenue and Expenditure of the Forest Department, Straits Settlements, 1884.

REVENUE.

Government Grant, Singapore,	\$ 7,000
Do., Penang,	7,000
Do., Malacca,	6,000
	<hr/>
	\$ 20,000

EXPENDITURE.

	Singapore.	Penang.	Malacca.
Salaries,	\$654.52	\$731.72	\$837.90
Demarcation of reserves,	1,712.86	1,676.70	...
Formation of nurseries,	1,508.12	1,799.90	869.24
Planting waste lands,	600.00	...	...
Hill Bungalow grounds, Bukit Timah,	300.00	...	...
Herbarium specimens,	51.00	...	52.73
Erection of quarters,	993.23	608.31	631.00
Uniform, tools, and implements,	233.10	589.07	163.00
Manure and cartage,	214.82	...	80.00
Transport,	343.10	417.83	623.53
Miscellaneous,	366.24	95.57	99.30
Rent, ... ..	...	113.50	130.00
Boundary stones, ... ..	...	500.00	...
Survey fees, ... ..	...	264.00	494.28
Foreign seeds and plants purchased, ... ..	...	200.00	...
Purchase of land, ... ..	...	...	100.00
	<hr/>	<hr/>	<hr/>
Balance in hand,	6,976.99	6,996.60	4,080.98
	23.10	3.40	1,919.02
	<hr/>	<hr/>	<hr/>
	7,000.00	7,000.00	6,000.00

Nursery garden for planting Colonial Products, Penang.

Government Grant,— \$ 2,500.

Expenditure, 1884,	{	Salaries, Cooly hire, &c.	\$ 1,993.63
		Tools and materials,	250.75
		Manure and cartage,	190.00
		Rent of Cooly houses,	40.00
		Petty expenses,	20.50
			<hr/>
			2,494.88
		Balance in hand,	5.12
			<hr/>
			\$ 2,500.00

Statement of Seeds procured for the Department during the year.

Date.	Name.	Quantity	From whom received.
	<i>From Foreign Sources.</i>	lbs. oz.	
2.2	Casuarina equisetœfolia, ...	1	Forest Dept., India.
22.5	Lagerstrœmia reginæ, } ...	25	Do., Rangoon.
	Do., do. ...	25	Do., do.
30.5	Do., do. ...	50	Do., do.
10.6	Tectona grandis, ...	365	Do., do.
7.7.	Swietenia mahogani, ...	10	Botanic Garden, Jamaica.
24.7.	Do. do., ...	50	Do., Trinidad.
28.7.	Terminalia Sps., ...	100	Forest Dept. India N.W.P.
7.8.	Dipterocarpustuberculatus, ...	60	Do., N. C. Poona.
10.9.	Bassia longifolia, ...	26	Do., Coimbatore.
19.9.	Do. do., ...	26	Do., do.
14.10.	Aguillaria agallocha, ...	20	Do., Assam.
17.10.	Bignonia chelonoides, ...	5	Do., Rangoon.
24.12.	Chickrassia tabularis, ...	60	Do., Chanda.
	<i>From Home Sources.</i>		
	Calophyllum inophyllum, ...	340	Collected in Malacca.
	Hopea cernua, ...		
	Dipterocarpus Sps., ...		
	Azelia palembanica, ...		
	Strombosia javanica, ...		
	Scorodocarpus bornensis, ...		
	Hopea meranti, ...		
	Kumpassia malaccana, ...		
	Eugenia zeylanica, ...		
	Eugenia Sps., ...		
	Sloetia sideroxylon, ...		
	Diospyros discolor, ...		
	Elœodendron Sps., ...		
	Mixed species, ...		
		1,163	

List of Books at present forming the Library of the Forest Department.

- American Journal of Forestry (F. B. HOUGH.)
Notes on Forestry (C. F. AMERY.)
Timber Merchant and Builder's Vade Mecum (BOUSFIELD.)
Origin, Progress, Prevention, and Cure of Dry Rot in Timber (BRITTON.)
Forest and Moisture (J. CROMBIE BROWN.)
Pine Plantations on the Sand-wastes of France (J. C. BROWN.)
Introduction to the Study of Modern Forest Economy (BROWN.)
French Forest Ordinance of 1669 (J. C. BROWN.)
Reboisement in France (J. C. BROWN.)
Trees of America (BROWN.)
Science for Forests (A. J. BURROWS.)
The Planting and Profitable Cultivation of Underwood.
Tree-pruning, (A. DES CARS.)
Tree Lifter (G. GREENWOOD.)
Timber and Timber Trees (G. LASLETT.)
Strength of Timber (WILLIAM LEA.)
The Organization and Valuation of Forests on the Continental System. (L. MACGREGOR.)
Report on the Forest Resources of Western Australia (MULLER.)
Manual of Injurious Insects (E. A. ORMERO.)
Guide to Methods of Insect Life.
Saw Mills their Arrangement and Management (BALE.)
Indian Forest Reports.
Forest Department Code.

ANNUAL REPORT ON THE BOTANIC GARDENS, SINGAPORE,
FOR THE YEAR 1885.

Visitors.—The number of visitors to the gardens during the year may be roughly stated at about 7,000, an average month having drawn six hundred and twenty.

2. **Buildings.**—The permanent buildings connected with the Department are in good order. The following new structures have been erected, viz. :—

3. **Exhibition House.**—The exhibition house has been covered during the year with a permanent roof 170 feet long by 88 broad, and consists of a framework of one inch broad wooden rods with one inch interspaces to admit light, supported on strong ballow posts. On the south and west sides, the roof is closed in with shingles to provide shelter for visitors during rain. The paths throughout the house have been laid with concrete, five large tanks made to hold rain water, and the staging at both ends considerably extended. The house as it now stands is a creditable building, and suits its purpose well. The work of roofing was carried out by the Public Works Department, the plant staging by the garden authorities.

4. The first plants put into this new structure were the exhibits of the flower-show held during the year, which is acknowledged to have been the most successful exhibition of the kind ever held in Singapore. The exhibits being removed, the house was at once filled with a general collection of pot plants, which have grown well, but it will take time to obtain specimens sufficiently large to furnish the house properly.

5. **Aviary.**—A new aviary in two compartments consisting of 9 cages, each 10' × 6,' has been constructed. One compartment has been erected on each side of the old monkey house, which is an ornamental octagonal building with dome top, and makes a good centre, and has also been fitted up with cages for the larger carnivorous birds. The floors have been strongly laid with Malacca tiles set in cement mixed with broken glass to prevent rats (which were the great pest of the old building) burrowing. The cages being larger than those of the old aviary the birds have more room to disport themselves and seem more lively since their transfer.

6. **Tool Store.**—A wooden shed for the storage of tools and implements, materials, &c., has been constructed in the work-yard, as a temporary measure. A stone building will ultimately have to be erected for storage, in order to provide effectually against thieves.

7. **Water Supply.**—An apparatus furnishing a supply of water to the plant houses and nurseries was laid down during the year by Messrs. LYON & Co. of Singapore. It consists of a force pump which plays into a 10-ton cistern, placed underground on one of the Band-stand terraces, from which piping is laid to the plant houses and nurseries. The supply received in this manner has effected a great saving in labour, but during the late protracted drought, the supply well, which is situated on the land of Messrs. GILFILLAN WOOD & Co., who very liberally gave permission for the purpose, failed, owing to its defective size; but this drawback was easily remedied.

8. **Fernery.**—The larger portion of the rock work composing the fernery was planted during the year with an assortment of the stronger growing ferns. The absence of water on the site prevents the more delicate ferns being planted, but these can be accommodated elsewhere. The ferns have grown well, but it is feared the tree roots will ultimately interfere with their growth.

9. **Roads and Walks.**—The proper maintenance of roads and walks is always a difficult matter in this climate, especially when they lie at a considerable gradient, as is the case with most of those in the Singapore Garden. The 24-foot drive, lying between the entrance near the office and the band-stand, has been grubbed up, remodelled and heavily coated with laterite. A considerable portion of the front entrance drive has been treated in the same way, exclusive of that portion connected with the front entrance improvements, which is detailed separately. The walk leading from near the office to the site of the new aviary, the surface of which had worn to a concave shape, has been made up to the proper convexity. This required material to nearly a foot in depth over the greater portion of its extent.

The superficial area of the roads thus renovated is about 2,687 square yards. The various other roads and walks have been repaired where necessary.

10. **Flower Beds.**—The flower beds and beds of coloured leaves have been replanted from time to time as required. The rosery has produced flowers freely; the roses are not of the best kinds, but of such as have been found most suitable for out-door cultivation. Efforts are being made, however, to improve them, and a number of sorts have been introduced during the year for experiment in the open as well as in pots.

11. **Lawns.**—The grass lawns have been kept neatly cut and in good order. The *Amherstia* trees have been manured, as they shewed signs of decay, and other trees and plants throughout the grounds have received similar treatment where required. Several of the small walks have been planted on each side with ornamental palms, which have grown well and have already removed the bare and unstocked appearance of some parts of the lawns.

12. Two large shrubbery beds have been made behind the new aviaries, one behind each compartment, in order to shelter the cages and screen the buildings from sight from the main grounds. In these shrubberies large plants were planted, a good many of them coming from parts of the garden where improvements in course of completion made it necessary to remove them. The transplanting has proved successful.

13. Towards the middle of the year, I submitted for the approval of the Committee a plan for the completion of the planting of the grounds, which, though approved, was afterwards postponed in favour of other improvements.

14 **Front Entrance.**—New pillars have been erected at the front entrance, and the drive levelled to an easy gradient over a length of about 100 yards. It is intended to level and slope the lawns immediately inside the gate to a better shape, and to put down beds of brightly-coloured flowers, &c., but nothing further than the levelling of the drive and erection of the pillars was completed within the year.

15. **Lakes.**—The lakes have had the usual attention given them. The Victoria tank has been manured, and the lily has kept in flower nearly the whole year. The small lily lake has been taken possession of by the lotus lily, and some of the nymphæas have been removed in consequence to the large lake and Victoria tank.

16. **Herbaceous Garden.**—The Herbaceous Garden has been extended over the lawn lying between the Band-stand and Garden Road. The extension consists of a series of oval beds in which the monocotyledons (or second great division of plants) have been planted. The beds have been labelled with the names of the natural orders to which the plants they contain belong. A visitor on entering the garden by the entrance opposite the main lake, is now immediately introduced to the first orders of the natural system, and by keeping to the left hand follows through the whole arrangement, in proper sequence, and meets the Economic Garden at the further end, wherein the plants present a totally different arrangement; here they abandon all connection with botanical formality, and present themselves arranged according to their commercial products. In connection with this garden and forming a back ground to it, lies the site of the Arboretum which is arranged after the order of the Herbaceous Garden, but contains only trees instead of herbaceous plants.

17. **Economic Garden.**—Some alterations have been made in the ground plan of the Economic Garden, in order to admit of proper and convenient arrangement of the plant groups, the planting of which has been pushed on, but as the garden is constantly receiving additions, as plants are introduced into the Colony, the planting can hardly be said ever to be completed.

18. **Labelling.**—Nearly all the plant labels have been reprinted during the year, twelve months being about the time the printing remains legible on the labels, and one printer is now barely equal to the work of upkeep and extension.

19. **Interchange of Plants and Seeds.**—The usual Foreign correspondence with a view to interchange of plants and seeds has been maintained during the year.

The number of plants received was 1,123, and 297 packets of seeds weighing approximately 127 lbs. The following have been the chief contributors, viz. :—

Sir J. D. HOOKER, K.C.S.I., Royal Garden, Kew, 36 plants and 1 packet of seeds; Mr. PRESTOE, Botanical Garden, Trinidad, 50 plants; Mr. GUILFOYLE, Botanical Garden, Melbourne, 104 packets of seeds; Mr. JENMAN, Botanical Gardens, British Guiana, 10 packets of seeds; Mr. MORRIS, Botanical Gardens, Jamaica, 1 packet of seeds; Dr. DUTHIE, Botanical Garden, Saharanpur, 1 packet of seeds; Mr. FORD, Botanical Garden, Hongkong, 24 packets of seeds; Dr. TRIMEN, Botanical Garden, Ceylon, 100 plants; the Agri-Horticultural Garden, Calcutta, 84 plants; the Conservator of Forests, N. W. P., 20 lbs. of seeds; Indian Forest Department, 14 lbs of seeds; Conservator of Forests, Dehra Dun, 35 lbs. of seeds; the Conservator of Forests, Bengal, 6 lbs. of seeds; Mr. B. GROVE, Rangoon, 67 plants; Mr. H. W. WRIGHT, Colombo, 83 plants and 1 packet of

seeds; Mr. G. PEACH, Moulmein, 24 plants; Mr. PRYOR, North Borneo, 25 plants; Mr. E. E. ABRAHAMSON, North Borneo, 50 plants; Mr. GILBERT, Rangoon, 14 bulbs and 1 plant; H. B. M.'s Resident, Pêrak, 50 lbs. of seeds; the Venerable Archdeacon MEREDITH, 63 plants and 139 packets of seeds; Mr. H. L. NORONHA, 30 packets of seeds; other sources, 500 plants.

20. The number of plants and seeds sent abroad was 1,380, and 135 packets of seeds. The principal recipients were the following:—

Botanical Gardens, Melbourne, Sydney, Bowen, Adelaide, Mauritius, Brisbane, Trinidad, British Guiana, Reunion, Natal, Cape of Good Hope, Jamaica, Hongkong, Madras, Ceylon, and Kew; Mr. BESOT, Yokohama; Mr. E. J. ROBERTS, Nurseryman, Australia; Mr. PEACH, Moulmein; the British Consuls, Bangkok and Amoy; Mr. LINDEN, Belgium; Mr. BAYLEY, Colombo; Mr. WRAY, Pêrak, and others.

21. **Propagation of Plants.**—The number of plants propagated in the garden nurseries is approximately twenty-five thousand, of which number about two thousand were sold in small lots to the public, and ten thousand six hundred and five supplied to various works in Singapore. One thousand were given to Penang, three hundred and fifty to Malacca, four hundred and seventy-five to Sêlângor, thirty to Pêrak, and ten thousand five hundred and forty were used in the Botanic Garden, Singapore.

22. **Contributions to the Aviaries.**—The following contributions have been made for the Aviaries:—

Mrs. NEAVE, two black Swans and one Pigeon.

Mrs. VAUGHAN, one Kite.

Mr. DE VILLEROI, one Tawny Fish Owl.

23. **Government House Grounds.**—The grounds, flower beds and lawns of Government House have had the necessary attention. No improvements properly so called were undertaken during the year, the more needful changes having been carried out in the year previous and recorded in my last report. The plants have grown well in the new plant-houses and a larger and better stock is now on hand.

24. **Esplanade and Public Offices.**—The Esplanade has been kept mown and otherwise in order, the land lying between the new extension of the Colonial Secretary's Office and the river has been levelled and turfed over.

25. **Receipts and Expenditure.**—The receipts from sales of plants amount to \$569.61, which is an increase on the sales of last year of \$66.46. The total Receipts amount to \$12,075.60, and Expenditure to \$11,435.64, which leaves a balance of \$639.96 on the side of receipts. The balance is the result of a misunderstanding, provision for certain works having been made both by the Public Works Department and Botanic Gardens and finally charged against the P. W. D. vote.

A Statement of expenditure is annexed, as also is a list of economic plants.

N. CANTLEY,
Superintendent.

Singapore, 4th June, 1886.

*Revenue and Expenditure of the Botanic Gardens,
during the year 1885.*

REVENUE.	\$	c.	EXPENDITURE.	\$	c.	\$	c.
By Balance in Bank, ...	200.95		SALARIES.				
„ Government Grant, ...	11,000.00		Superintendent, ...	2,160.00			
„ Sale of Plants and Flowers, ...	569.61		Head Gardener, ...	1,350.00			
„ Interest on Current Ac- count, ...	220.90 348.61 70.59		Clerk, ...	600.00			
„ Special Receipts, ...	234.45		Herbarium Keeper, ...	51.00			
			Propagator, ...	180.00			
			Mason, ...	176.74			
			Carpenter, ...	150.74			
			Extra Carpenter, ...	12.35			
			Chief Mandore, ...	72.85			
			Printer, ...	120.12			
			Aviary Keeper, ...	83.95			
			Garden Police, ...	270.00			
			Plant Collector, ...	84.00			
			Garden Coolies, ...	2,365.87			
			<hr/>			7,677.62	
			BILLS.				
			New Aviary, ...	653.23			
			Flower Pots, ...	141.38			
			Herbarium Fittings, ...	145.00			
			Botanical Books, ...	46.44			
			Purchase of Tools, ...	115.22			
			Manure and Cartage, ...	405.28			
			Purchase of Plants, &c.,	41.25			
			Wood for Construction purposes, ...	208.80			
			Freight on Cases of Plants, ...	105.95			
			Head Gardener's Trans- port, ...	180.00			
			Petty Expenses, ...	162.87			
			Laterite, ...	378.31			
			Food for Birds, ...	208.90			
			Water Supply, ...	499.00			
			Miscellaneous, ...	466.39			
			<hr/>			3,758.02	
						<hr/>	
						11,435.64	
			Balance in Bank, ...			639.96	
						<hr/>	
						\$12,075.60	
						<hr/>	
						\$12,075.60	
						<hr/>	

N. CANTLEY,
Superintendent.

APPENDIX TO REPORT ON THE BOTANIC GARDENS, FOR 1885.

Notes on Economic Plants.

1. Enquiry was continued during the year into the source and extent of the vegetable supply of the Colony, and experiments have been made with various seeds from Europe with a view to increasing and improving the general supply, with results as follows:—

I.—VEGETABLES FOUND IN CULTIVATION.

ORD. CRUCIFERÆ.

- Lobák* (Long Raddish), *Raphanus sativus* var.:—Native of China, largely cultivated throughout the colony. Supply plentiful.
Water Cress, *Nasturtium officinale*:—Established in Singapore, but supply as yet very limited in the bazaars.

ORD. CAPPARIDÆ.

- Mamum*, *Gynandropsis pentaphylla*:—Pods chiefly used. Common in a wild state, not much cultivated.
Mamum Kěchil, *Cleome viscosa*:—A common weed, used in the same manner as the preceding, chiefly by Klings.

ORD. MORINGÆ.

- Kélor* (Horse Raddish tree), *Moringa pterygosperma*:—Native of Madagascar. Pods, root and leaves used. Supply plentiful.

ORD. PORTULACÆ.

- Daun Gúlung* (Purslane), *Portulacca oleracea*:—A common weed throughout the colony. Cultivated in England as a vegetable. Used in the Straits chiefly by the Malays and Klings, and seldom if ever taken into the bazaars.

ORD. MALVACÆ.

- Kacháng Bendie*, *Hibiscus esculentus*:—Cultivated all over the Tropics. Supply plentiful.

ORD. LEGUMINOSÆ.

- Kacháng Kara Puteh*, *Lablab cultriformis*:—A good bean, but not plentiful.
Kacháng Boty, *Dolichos tetragonolobus*:—Moderately plentiful.
Kacháng Prot Ayam, *Dolichos sesquipedalis*:—Largely cultivated throughout the colony. Supply plentiful.
Kacháng Prot Ayam Panjang, *Dolichos sesquipedalis* var.:—Plentiful.
Canavalia virosa:—A good bean said to be in cultivation, but I have only seen one plant.
Kacháng Párang, *Canavalia gladiata*:—A very large bean. Pods occasionally as large as a carving knife, hence the Malay name. Moderately plentiful.
Kacháng Kara (Lima Bean), *Phaseolus lunatus*:—One of the best beans in cultivation. Supply moderately plentiful. Also sold in tins imported direct from Brazil, its native country.
French Bean, *Phaseolus vulgaris*:—Cultivated largely throughout the Colony, but brought to the bazaars at an advanced age in order to measure better, but only really good when very young and small.
Kacháng Hijau, *Phaseolus* sp.:—Seed largely used in a germinating state. Supply plentiful. Pods also used after the manner of French beans.
Trong Mérah, *Agati grandiflora*:—Leaves and flowers used.
Trong Páteh, *Agati grandiflora alba*:—Leaves and flowers used. Supply limited. Seldom reaches the bazaars.
Měng Kawang, *Pachyrrhizus angulatus*:—The root very much resembles a turnip, both in size and taste, hence called turnips by Europeans in the Straits, but it is in every way inferior to turnip. The supply is apparently plentiful.
Kacháng Dahl, *Cajanus indicus*:—Pods used. Not much grown except by Klings.

ORD. MYRTACEÆ.

Nási Nási:—The young leaves of a species of *Eugenia*, used by the Malays in Malacca as a vegetable in curries.

ORD. PASSIFLORACEÆ.

Grenadilla, *Passiflora quadrangularis*:—Used chiefly by Europeans; the natives look upon it as unwholesome and dangerous.

ORD. CUCURBITACEÆ.

Timon, *Luffa petola*:—Used as a cucumber, but good only when green. If used in a ripe state is said to cause violent purging. Plentiful in the bazaars everywhere.

Kětála Manis, *Luffa acutangulus*:—Largely used as a vegetable and for other purposes. Supply plentiful.

Kaundon, *Cucurbita pepo* and vars.:—Plentiful in the bazaars all over the colony. Not much used by the Malays, who say that it creates cramp in the stomach when eaten raw.

Water Melon, *Citrullus vulgaris*:—Not very plentiful.

Lobu Ayer, *Cucumis sativus flavus*:—Very plentiful, and extensively used.

Pria Paddy (Bitter Gourd), *Momordica charántiæ* and vars.:— } Both extensively cultivated.

Pria, *Momordica balsamina*:—

Cucurbita sulcata:—Not very plentiful.

Kětála Ular (Gourd), *Lagenaria vulgaris*, var. *striata*:—Very extensively grown. Bazaars constantly supplied.

Kětála (Pumpkin), *Cucurbita moschata*:—Several kinds. Very plentiful.

Chocho, *Schium edule*:—Established on Penang Hill; in general excellence this cucumber far surpasses all others grown in the Straits.

ORD. UMBELLIFERÆ.

Sadriea (Celery), *Apium graveolens*:

Do. do., sp.? } Leaves only seen. Grown only for flavouring purposes. Supply plentiful.

Do. do., sp.?

Do. do., sp.?

Pungga, *Hydrocotyle asiatica*:—A common weed, used by the Malay and Kling inhabitants only.

(Dill), *Anethum graveolens*:—Used in soups, sauces, &c. Supply very limited.

ORD. VERBENACEÆ.

Búas-búas, *Premna cordifolia*:—Young leaves used in curries. Supply plentiful.

ORD. COMPOSITEÆ.

Tang Ho, *Senecio chinensis*:—Leaves used as spinaeh. Supply plentiful.

Sáwi, (Lettuce) *Lactuca sativa* var., } Boiled and used as cabbage. Extensively grown and supplied.

Sáwi Hitam, Do. do.,

Salad, Do. do., Used only as salad, and apparently a very good lettuce, but cut and brought to bazaar at a too great age in order to obtain as much leaf as possible. I have examined this plant very closely, and am of opinion that, if cut when young, it would be little inferior to lettuce grown in Europe. There is also a leaf commonly sold in the bazaar which I think belongs to this order, but no clue to its name has presented itself so far. It is said to be a good vegetable.

ORD. SOLANÆÆ.

Trong (Egg Plant), *Solanum melangena*:—Very extensively grown. Abundant supply in all the bazaars.

Trong Manis, *Solanum coagulans*:—Plentiful. Used in curries.

Love Apple or *Tomato*, *Lycopersicum esculentum*:—Grown by Europeans in very limited quantity, and seldom if ever finds its way into the bazaars. The plant, especially the small variety, grows freely, and might be largely cultivated. *Solanum nigrum*, one of this order, is largely used in Mauritius as a vegetable with currie, but is not used in the Straits, although the plant is by no means uncommon throughout the colony. Its use requires some care, however, being poisonous if eaten raw, and regarded in England as highly dangerous. I have myself used it frequently as a vegetable and can testify to its excellence as such. It has a bitter appetitious taste and is a vegetable one gets much attached to after a time, and the Mauritians seem as fond of it as the Malays are of Durians.

ORD. PHYTOLACCEÆ.

Phytolacca decandra:—Is so very scarce in the Colony that it can hardly be said to be in use. It is nevertheless an excellent vegetable, when the young leaves only are used; the seed is noxious. Largely used in the Mauritius as a vegetable.

ORD. BASELLEÆ.

Tress, *Basella alba*:—Somewhat extensively grown, but not nearly enough so. It is an excellent substitute for spinach and grown in England as such. It is better known among the Klings than the Malays. A small supply reaches the Singapore bazaars.

ORD. EUPHORBIACEÆ.

Chěkop Manis, *Phyllanthus reticulatus*:—Largely used as a vegetable with currie by Chinese, Klings and Malays; not so much among Europeans. Supply plentiful.
Ubi Kayu, *Jatropha manihot*:—Root largely used as a vegetable by all classes, but the leaves only by the Malays and Klings, especially the former.

ORD. ZINGIBERACEÆ.

Kūnit (Turmeric), *Curcuma longa*:—Root used in currie, and leaves as a vegetable, by the Malays.

ORD. MUSIACEÆ.

Pisang (Banana) *Musa*, many vars.:—Pith and young shoot used as a vegetable.

ORD. AROIDEÆ.

Kladi Klamomo, *Calocasia esculenta*:—
Kladi China, *Calocasia esculenta* var.:—
Kladi Hitam, *Calocasia esculenta* var.:— } A small portion of the root used as a vegetable. Grown extensively for leaves, which are boiled and pigs fed with them.
Calocasias sp.:—Grown only in Padang. Largely used as a vegetable in Singapore. The Malays affirm that the plant will only grow in Padang. Not cultivated elsewhere.

ORD. LILIACEÆ.

Bawang, *Allium ascolonicum*:—
Bawang Kechil, *Allium ascolonicum* var.:—
Bawang Merah, *Allium ascolonicum* var.:— } Very extensively grown, and largely in demand. Plentiful supply.
Allium cepa:—Not grown in the colony, but largely imported from China in a green state.

ORD. COMMELYNEÆ.

Tapak Itek, *Ancilema nudiflorum*:—Used by the Malays as a vegetable with currie.

ORD. BOROGINACEÆ.

Cordia olitoria, Blanco:—The leaf of this plant is used as a vegetable by the Malays, who eat it with boiled rice.

ORD. SCROPHULARINEÆ.

Brēm̄is, *Limnophila punctata*:—Used as spinach. Supply very limited.

ORD. AMARANTHACEÆ.

Bayam Durie, *Amaranthus spinosus*:—
Bayam, *Amaranthus gangeticus*:—
Bayam Pasir, *Amaranthus tristis*:—
Kruma, *Alternanthera sessilis*:— } Extensively used as a substitute for spinach. Largely grown and largely in demand. Used only by the Malays and Klings.

ORD. DIOSCOREÆ.

Klédék (Sweet Potato), *Dioscorea batatas*:—Extensively grown. Bazaars largely supplied.
Dioscorea bulbifera (?):—Grown more sparingly.

ORD. CONVULVULACEÆ.

Kangkong, *Convolvulus repens*:—Extensively grown for the leaves, which are used as a vegetable with rice and for feeding rabbits. Supply plentiful.

ORD. ARTOCARPEÆ.

Sákún (Bread-fruit), *Artocarpus incisa*:—Fruit used by the Malays as a vegetable. The tree, however, seldom produces fruit in perfection in the Straits, the greater number falling prematurely.

Nángká *Artocarpus integrifolius*:— }
Champedak, *Artocarpus polyphema*:— } Young fruit used as a vegetable by the Malays.

ORD. PAPAYACEÆ.

Bětěk or *Buah Papaya*, *Carica papaya*:—Extensively cultivated and used as a vegetable. Plentiful in the bazaars.

ORD. FILICES.

Paku Rúan, *Ceratopteris thalictroides*:—Common in ditches. Used chiefly by Klings and Malays.

Anisogonium esculentum:—A fern not uncommon in ditches. Is a very good vegetable, used by the Malays, who also use the young shoots of the following ferns:—

Paku Akar, *Stenochlaena palustris*:— }
Paku Uban, *Blechnum orientale*:— } All fairly plentiful in a wild state.
Samber, *Thamnopteris nidus*:— }

ORD. GRAMINEÆ.

Rěbonq, *Gynotochloa aspera* (?):—A bamboo the young shoots of which are extensively used among the Chinese as a vegetable and for preserves.

Jaggong, (Maize):—Is grown to some extent and used green as a vegetable.

ORD. PALMEÆ.

Pinang, *Klapa*, *Areca* and *Cocos*:—Heart or growing point used as salad. Supply very limited.

2. From the foregoing it will be seen that there are about eighty kinds of vegetables at present more or less in cultivation in the Colony. Of that number, but few are exclusively Chinese, but a good deal of the seed from which they are grown comes from China. The cultivation is, however, much at fault, there being a tendency to produce quantity instead of quality, and some control over present system of cultivation seems necessary.

3. The following 45 kinds of vegetables of species cultivated in England have been tried, in Penang, at 1,000 feet elevation, and in Singapore at about 150 feet, with results as follows:—

II.—VEGETABLES GROWN FOR TRIAL.

Giant Asparagus, in Penang grew freely, but not to a large size.

Broad Windsor Beans, ... } Flowered in Singapore and Penang, but failed to set fruit.

Scarlet Runners, ... } Failed quite everywhere.

Egyptian Turnip, rooted Beet, ... } Did well in Penang.

Delt's Flower Garden Beet, ... } Grew fairly well in Singapore, not tried in Penang.

Broccoli, ... }
Brussels Sprouts, ... } Grew leaves only in the open ground, makes better
Cabbage, Large White Erfurt, ... } centre when grown in pots. Penang and Sin-
Cabbage, Early Blood Red, ... } gapore experiments gave same results.
Cabbage, Savoy, ... }

Carrots—Early short Horn, ... }
Carrot, Earliest French forcing, ... } Grew well both in Penang and Singapore, but of inferior flavour in Singapore.

Cress, Curled, ... }
Cress, American, ... } All grew well in Penang and Singapore. Succeeded
Cress, Indian, ... } better in Penang.

Telegraph Cucumber, ... } Grew fairly well in Penang. Failed in Singapore.

Sundringham Celery, ... } Grew fairly in Penang.

Cos defiant Celery, ... }
Williams' Matchless Celery, ... } Grew to leaves only in Singapore.
Major Clark's Red Celery, ... }

Dandelion, ... } Grew well in Penang and Singapore.

Musselburgh Leek, ... } Grew well in Penang.

Kole Rubi, ... } Do. do. and Singapore.

<i>Lettuce, Cabbage, ...</i>	...	} Succeeded perfectly in Penang and fairly well in Singapore.
<i>Lettuce, Tom Thumb,</i>	...	
<i>Carter's Giant White Cos,</i>	...	
<i>Carter's Giant Brown,</i>	...	
<i>Melon,</i>	...	Failed everywhere.
<i>Mustard,</i>	...	Grew freely everywhere.
<i>Onion, The Queen,</i>	...	Grew well in Penang.
<i>The Student Parsnip,</i>	...	Grew well in Penang.
<i>Parsley,</i>	...	Everywhere a success.
<i>Peas, Ring-leader, ...</i>	...	Grew fairly well in Penang.
<i>Peas, Best of all, ...</i>	...	Failed in Singapore.
<i>Potatoes, Early Ash-leaf,</i>	...	Grew to a fair size, but rather watery in quality.
<i>Raddish,</i>	...	All kinds grew well.
<i>Horse Raddish,</i>	...	Grew well.
<i>Rhubarb,</i>	...	Grew well for a time in Penang. Failed in Singapore.
<i>Sea Kale,</i>	...	Failed everywhere.
<i>Turnip, Early French,</i>	...	Grew well in Penang; not tried in Singapore.
<i>Turnip, American Strap-leaf,</i>	...	Grew well in Singapore; not tried in Penang.
<i>Tomatoes,</i>	...	All kinds grew well, especially the small variety.
<i>Jerusalem Artichoke,</i>	...	Failed in Singapore.
<i>Globe Do., ...</i>	...	Failed in Singapore, but produced a few flowers in Penang.

POT HERBS.

<i>Sage,</i>	...	} All grew well in Penang and Singapore. Sage and Thyme best in Penang.
<i>Thyme,</i>	...	
<i>Sweet Marjorum,</i>	...	
<i>Spear Mint,</i>	...	
<i>Pepper Mint,</i>	...	
<i>Sweet Basil,</i>	...	

4. It will be admitted that these results carry with them a large amount of success, and all that seems required to keep up a supply is the issuing of a standing order to a seedsman to send a regular supply of seeds of such as have succeeded and the appointment, for a year or two, of an intelligent person well acquainted with vegetable cultivation to superintend the distribution of seeds and regulate bazaar supply.

He should keep a register of all growers for sale, and submit, for the information of Government, periodical reports on the progress of new vegetables, and encourage cultivators by liberal assistance.

5. By this means private enterprise would be stimulated and the object desired obtained without causing the injury to cultivators which the establishment of a Government vegetable garden for bazaar supply would entail upon them.

III.—OTHER ECONOMIC PLANTS.

6. *Coca-leaf*.—The seed of coca was much in demand during the early part of the year, but the value of the leaf has now fallen so low that it would hardly pay to cultivate it in the Straits.

7. *Cubeb*s.—There is at present but little cubeb pepper in cultivation in the Straits. Some plants lately received from Dr. TREUB have been placed in the Experimental Nursery for trial. Samples of a large consignment from India of prepared cubeb pepper were received at the Garden from a Singapore merchant for botanical determination. The samples turned out to be only one-third cubeb, the remainder *Piper nigrum*, or some allied specimens. Cubeb can always be distinguished from *Piper nigrum* by the berries having little stalks.

9. *Black Pepper*.—The rise in the price of black and white pepper has stimulated the cultivation of the plant both in the colony and elsewhere. Several demands from other colonies have been made for the Singapore variety, which is acknowledged to be of superior quality.

10. I made a special visit to the Achinese plantations in Province Wellesley, where the plant is cultivated differently from the mode practised by the Chinese, but the difference only proved to be what may be summed up in the word neglect, and bore no comparison to the better and higher cultivation as practised by the Chinese.

The adoption of living supports by the Achinese (*Dadup*) is a point I would recommend, however, as in every way more natural and economical than dead wood as used by the Chinese.

11. *Tea*.—The cultivation of tea is likely to prove a success in the Straits if handled with forethought and care. The chief drawback is the tendency the soil has to rent and fissure, even during a short period of drought, but this could be remedied by making special compost and planting in large holes.

12. *Cardamums*.—Further experiments with Cardamums show that the atmosphere in Singapore and Penang is apparently too dry for the proper cultivation of the plant, but it would no doubt succeed admirably in some parts of the Native States.

13. *Gambier*.—Observations have shewn that the gambier plant may be cultivated for forty or fifty years on the same land without the land becoming exhausted, if properly cultivated. This is the opposite to the general opinion. I measured the stems of some plants of the age mentioned and found them about 18 inches in circumference close to the ground and still bearing large quantities of leaves.

14. *Croton Oil*.—The Croton Oil plant produces seed freely in Singapore, and could no doubt be grown with advantage. I would strongly recommend it to planters for trial.

15. *Cassia Auriculata*.—This is an East Indian bark which grows very freely in the Straits. The bark contains a valuable tanning principle, which would no doubt pay in cultivation.

16. *Cocoa*.—The new varieties of Chocolate grow well, and the plant is now established in the Straits, but white ants, leaf insects, mildew, &c., play such havoc as almost to prohibit its cultivation in some districts.

17. *Nutmegs and Cloves*.—The protracted drought in Penang tried the Nutmegs and Cloves plantation very much, many young plants died, but the drought was of exceptional severity and has not discouraged planting.

18. *Hemp*.—Some plants of Mauritius Hemp, planted for experiment among rough lalang, have coped successfully with that troublesome grass, and although they have grown less rapidly, they have by means of their wide-spreading leaves, prevented the grass from covering them over and cutting off their supply of light.

19. *Rubber and Gutta Percha*.—The Foreign Rubber trees mentioned in previous reports continue to grow well, but in a country where the best rubbers grow wild, it is somewhat superfluous to refer to foreign species, the ultimate success of which may be doubtful. What is more required is the careful conservation and cultivation of native kinds, the growth and produce of which in our soil is not a matter of question. I believe a purely Gutta Taban forest, worked as they do timber forests in Germany, on say, a 30 years rotation would yield a good return in profit, that is to say, a certain area, however large, to be reaped (cut down if necessary) annually, and a corresponding area planted with young trees.

20. *Vanilla*.—The cultivation of Vanilla is being tried in the colony. There are some native varieties which fruit freely, especially in Penang, but I doubt the suitability of our climate for the cultivation of *V. planifolia*, the kind most prized.

21. *Mangosteen and other Fruits*.—The Mangosteen, which has hitherto been considered to fruit nowhere out of Malaya, is now reported almost simultaneously as bearing fruit in Jamaica, Ceylon, and India, and must be near bearing in the Mauritius and Seychelle Islands.

The cultivation of fruit pays well in the Straits, and orchards might be greatly extended with advantage.

22. *New Economics*.—Introductions during the year include *Mimusops globosa*, a famous West Indian Rubber tree; Chinese ginger; Chinese rice-paper plant; Yoroba Indigo, Canouboll tree of West Indies, and West Indian fruits and medicinal plants the growth and properties of which will be detailed in next year's report.

N. CANTLEY,
Superintendent

FIRST
ANNUAL REPORT
ON THE
FOREST DEPARTMENT,
STRAITS SETTLEMENTS.

ITS ORGANIZATION AND WORKING

BY

N. CANTLEY, F.L.S., F.R.G.S., M.R.A.S.,

MEMBER OF THE SCOTTISH ARBORICULTURAL SOCIETY, EDINR. ; CORR. MEMBER OF THE
ROYAL SOCIETY OF ARTS AND SCIENCES ; CORR. MEMBER OF THE METEOROLOGICAL
SOCIETY ; HON. MEMBER ACCLIMATIZATION SOCIETY, MAURITIUS ;
SUPERINTENDENT OF THE BOTANICAL GARDENS,
SINGAPORE.

1885.

SINGAPORE:

PRINTED AT THE "SINGAPORE AND STRAITS PRINTING OFFICE."

*Annual Report on the Forest Department, Straits Settlements,
for the year 1884.*

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IN the organization and working of the Forest Department during the year, the recommendations contained in my preliminary report (see paragraph 112) on the Introduction of Forests of the Straits Settlements have been closely adhered to.

2.—Following the plan of that report, details are here given of the work accomplished and the expenditure incurred in each Settlement. The work has been entirely separate from that carried out in connection with the Botanic Gardens during the year.

3.—It having pleased His Excellency Governor Sir F. A. WELD, to accord me the honour of organizing the Forest Department throughout the Colony, the following executive officers have been appointed and, although some of these are still new to their work, the Department may now be said to be established and will yearly become more efficient and useful.

(1st.)—Superintendent, N. CANTLEY, Singapore.

(2nd.)—Assistant Superintendent, C. CURTIS, Penang.

Staff.

This officer assumed his duties towards the end of July, and has been placed in charge of the Penang and Province Wellesley forests.

(3rd.)—Overseer 1st grade, V. JACKSON, Malacca. Assumed his duties on the 1st January.

(4th.)—Overseer 2nd grade, D. C. YOUNG. Was appointed in July to be Overseer in Singapore

(5th.)—Overseer 3rd grade, PETER NENKEY. In charge of the Penang experimental nurseries.

4.—The Assistant Superintendent in Penang and Overseers in Malacca and Singapore have each a separate staff of subordinate officers for the supervision of forest watchmen and coolies engaged in forest work.

5.—The number of labourers employed during the year has varied greatly, ranging between two and six hundred, according to the nature of the work in hand.

6.—The forest watchmen are a body separate from the ordinary employes. They wear uniform, and their chief duties are to protect the forest reserves and keep open the boundary paths. They work under special regulations which have been drawn up for their guidance.

SINGAPORE.

7.—In Singapore there are eight reserves, the two largest being the Jurong and Bukit Mandi reserves; the total area to be reserved is about 8,000 acres (or about one-twentieth of the total area of the island). About sixteen miles of boundary line have been demarcated, and about 12 miles planted with fast-growing trees. Selection of forest reserves.

8.—In selecting these reserves, every effort has been made to obtain as much forest and forest growth within their boundaries as possible, but, as trees generally occur in small patches widely scattered over the island, it has been impossible to avoid the inclusion of a large extent of waste land.

9.—Among the Singapore reserves I have classed the Bakau or Mangrove jungle, which extends along most of the coast line of the island. The preservation of this jungle, which includes wood useful for many purposes, is a very important matter. Its great length renders it difficult of protection and, so far, I have had to content myself with merely pointing out to the Land Department what extent of it might be leased for cultivation.

A paper on the sanitary disadvantages arising from the destruction of mangrove jungle has been already laid before Government, and the subject is worthy of further careful enquiry.

Erection of
quarters.

10.—Quarters for the accommodation of the Overseer have been erected at Bukit Timah, within the reserve, and near the same position the central station of the forest watchmen has been constructed.

Two houses have been put up at each of the Jurong and Bukit Mandi reserves, one for the forest watchmen and one for the coolies employed in the work of demarcation. Two houses have also been erected for the coolies at each of the nurseries at Bukit Timah and the Military reserve.

Demarcation
of reserves.

11.—The demarcation of the Bukit Timah reserve was one of the first works that occupied my attention. The line cleared around this reserve is 6 miles in length and 16 feet in width and has been planted along its outer edge with fast-growing trees, 14 feet apart, over its whole length. The width of this line will prevent a jungle fire, under ordinary circumstances, from crossing into the reserve and injuring the young plantations and natural growth.

12.—The Jurong reserve has been demarcated with an eight-foot path over a distance of three miles and has also been planted with trees.

13.—The boundary of the Bukit Mandi reserve has been opened over a distance of about seven miles, three miles of which have been planted with trees.

The cutting of the boundary line of this reserve presented much difficulty, owing to the irregularity of the surface and the heavy covering of jungle.

Formation of
nurseries.

14.—A nursery for the propagation of trees has been opened at Bukit Timah, and comprises an area of about 3 acres. There is also one at the Military reserve for propagation and experimental purposes, about 4 acres in extent. The number of young trees propagated in these two nurseries may be roughly set down at about 300,000; this number was supplemented by about 60,000 from the forest nursery opened in the Botanic Gardens in 1883, but since closed, owing to its being inconveniently distant from the seat of operations.

About 148,000 plants, of the number given above, were planted out within the year. It was not advisable to plant out the rest, as they had not gained sufficient strength to enable them to cope with obstructive vegetation in the open.

Planting of
waste lands.

15.—It being desirable to perfect the Bukit Timah reserve as early as possible, about 50 acres of the waste land within its boundary have been planted with young trees at about 2,000 to the acre. Twenty acres of the Military reserve have also been planted in the same way, and about eight acres of the latter have been gone over and the plants cleared of weeds and grass.

Introduced
trees.

16.—The kinds of trees planted on these waste lands are chiefly as under:—

Teak.—*Tectona grandis*, has grown well only on the low lands in the better kinds of soil.

African Gum Copal.—*Hymenia verrucosa*, has thriven well.

American Rain Tree.—*Inga saman*, makes very rapid growth.

Mahogany.—*Swietenia mahogani*,
Brazilian Iron Wood, *Cæsalpinia ferrea*, } thrive exceedingly well.

Illipi.—*Bassia longifolia*, looks promising.

Australian Dammar.—*Dammara robusta*, grows moderately well.
 Albizzia.—*Albizzia stipulosa* and *A. moluccana*, grows very rapidly.
 Indian long-leaved Pine.—*Pinus longifolia*, plants small as yet.
 Toon.—*Cedrela Toona*,
 Pride of India.—*Lagerstræmia regina*, } grow fairly well.
 Cassia florida, grows with remarkable vigour.
 Sissoo.—*Dalbergia Sissoo*, grows slowly and appears unsuited to the climate.
 Inga dulcis, grows slowly.

Bintangor.—*Calophyllum inophyllum*, grows well. Native Trees.
 Serayah.—*Hopea cernua*,
 Wood oil tree.—*Dipterocarpus Sps.*,
 Mirabu.—*Azelia palembanica*,
 Petaling.—*Strombosia javanica*,
 Kulim.—*Scorodocarpus bornensis*,
 Meranti.—*Hopea meranti*,
 Malacca Iron Wood.—*Kumpassia malaccana*,
 Këlat.—*Eugenia zeylanica*,
 Eugenia Sps.,
 Tëmpinis.—*Sloetia sideroxylon*,
 Kayu Arang.—*Diospyros discolor* } grow slowly.
 Incense Tree.—*Elæodendron Sps.*,
 Kayu Ru.—*Casuarina equisetifolia*, } very rapid growth.

17.—The rate of growth of the various trees planted is carefully recorded, but none are as yet sufficiently advanced to admit of a decided opinion being formed as to their probable future behaviour. I refer more particularly to introduced trees; as to the success of native trees I am in a degree certain, but it will be most useful to preserve statistics of the rate of their growth in order that it may be clearly ascertained which will grow most satisfactorily on exposed lands. All nursery operations and planting will be guided by the experience so gained.

18.—The collecting of Herbarium specimens, in order to afford material for scientific investigation from other points of view, has not been forgotten. Herbarium specimens.

MALACCA.

19.—In Malacca, quarters for the forest watchmen have been erected in the following reserves:—Bukit Bruang, Ayer Panas, Jûs, and Sungei Udang. The houses erected are of a more permanent character than those in Singapore, being substantial wooden buildings raised on pillars. Erection of quarters.

20.—A nursery of about 3 acres in extent has been made at Bukit Bruang, and one at Ayer Panas of about one acre. Through these nurseries about 270,000 plants have passed during the year. In the vicinity coolies have collected about 340 lb of seed of various trees which, together with the greater number of the plants, were sent to Singapore. A good many plants have been planted out in and near the nurseries with a view to observing their rate of growth. Formation of nurseries.

21.—Forest reserves in Malacca require but little planting. They are, for the most part, well stocked with natural growth, and plants and seeds of the better kinds being comparatively abundant, the opportunity was taken of supplying the other Settlements which are less fortunate in this respect. A much larger supply of seed than that obtained can, however, be utilized with great advantage, as seeds are always preferable to plants when it is necessary to transport nursery stock from a distance. Forest reserves.

22.—In order to make Bukit Bruang reserve as efficient as possible, it was thought desirable to add to it the forest lands adjoining its eastern boundary. These lands contain a very large proportion of young trees of Tëmpinis and other good timbers and are held by an Arab, without, it is believed, any real title to them. Bukit Bruang reserve.

I would earnestly urge on the Government the necessity for action in this matter, with a view to extending the reserve so as to take in these lands. Further delay may see them entirely destroyed.

23.—With a view to obtaining a more practicable western boundary for the reserve, it was decided to purchase some abandoned lands which had become overgrown with secondary growth and brushwood. A line was consequently run by survey outside those portions which were believed to be purchaseable at fair prices, but as soon as the Government were seen to be in earnest about securing the lands, the native owners raised the prices and it was found impossible to agree to the purchase of more than one holding of about 7 acres within the year. Some of the proprietors will no doubt come to terms later on, but the delay caused was vexatious, as nearly \$2,000 lapsed to the Treasury. I may here be permitted to observe that it would be advantageous in the future to set aside annually a certain lump sum of money to be expended in the purchase of lands required by the Forest Department and for compensation to cultivators.

Herbarium
specimens.

24.—The collecting of Herbarium specimens of the plants of Malacca and of the adjoining Protected Native States was taken in hand, and about a thousand were sent to Singapore before the close of the year. The Overseer has taken advantage of his visits to the reserves to collect as much botanical information as his various other duties permitted.

PENANG.

25.—Next to Singapore, the work accomplished in Penang has been the most extensive of the year, notwithstanding the drawback that one-half of the year elapsed before the arrival of a qualified assistant from England. Mr. CURTIS reported himself towards the end of July, and has pushed on the work with great energy.

The work accomplished consisted of the demarcation of the hill forest reserves; the formation of a Forest tree nursery, an experimental nursery, and the clearing and laying out of grounds at the Waterfall for planting colonial products.

Demarcation
of the hill
reserves.

26.—The largest reserve made covers the highest hill range in the island with an altitude varying from 2,550 to 2,713 feet, respectively. This was considered the most important and consequently it was the first taken in hand.

From one-third to one-half of the elevation of this range has been included, due regard being paid to the nature of the soil, angle of the slope and amount of cultivation. The outline of the reserves as demarcated is very irregular, owing to cultivation having attained a higher altitude than was consistent with the general welfare. That no restriction should have been placed on the ascent of cultivation is to be deplored. To avoid including these encroachments it was necessary to raise the outline of the reserve higher at certain points than would have been necessary had there been no such obstacles, and by way of compensating to some extent for this loss the line was proportionately lowered in places where no cultivation existed and where the angle of the hill side was such as to render cultivation impracticable. This has been done at the expense of much cutting and hard climbing, and the few clearings unavoidably included within the reserve are of no great value. A list of these and their approximate areas has been drawn up, and they have been valued with a view to arrangements being made for taking them over.

27.—The demarcation line has been cut nine feet wide, of which five feet have been cleared of tree stumps, etc., and the upper side of the slope dug away to make a passable inspection path. The total length of the line thus opened, from the commencement of operations to the close of the year, is about 30 miles. The line embraces the whole of the main hill range of the island from western Ayer Hitam to Batu Feringgi, and this circle is now completed with the exception of a small portion between Half-way house on Government hill and Bukit Timah, the opening of which has been deferred pending the settlement, by purchase or otherwise, of the lands over the watershed of the Penang river upon which George-town is principally dependent for its water supply.

Quarters.

28.—As the work of demarcation proceeded, it was found more economical to rent houses from Chinese for the accommodation of the coolies than to erect new quarters for them.

Substantial quarters for the forest watchmen have, however, been erected at Telok Bahang, Bukit Timah, and Government hill reserves at approved points, and it is hoped that when the watchmen get properly to work, destruction of forest above the reserve line will be entirely prevented.

29.—The preparation of a piece of land to serve as a forest tree and experimental nursery was begun early in September on Government hill. In selecting the site, care was taken to secure the greatest elevation combined with a constant supply of water. An area of about six acres has been selected and cleared of jungle close to the road leading to the Government Bungalow at an elevation of 2,000 feet. A stream runs through the nursery which affords a supply of water that is believed never to fail even in the driest season. It has been found necessary to terrace the greater portion of this nursery, owing to the slope of the hill side being too steep for cultivation in its natural form. Formation of nursery.

30.—Temporary sheds have been erected for coolies employed in the nursery and, although there is generally more or less fever on new clearings, the coolies have been exceptionally free from it in this place. A span roof plant house with a movable chick roof has been put up for plant protection and propagation purposes.

31.—The collecting of native plants was commenced in December, and a good many, useful for exchange, ornamentation, etc., have been got together. Collecting of native plants and seeds.

Such seeds as could be obtained in Penang have been collected, and among them a small supply of home grown Teak seed from trees growing near Telok Bahang where they appear to be doing remarkably well.

32.—But little could be done during the year to forestry in Province Wellesley, owing to the pressure of work on the Penang side of the Straits. Province Wellesley.

33.—The formation of a nursery for the planting of colonial products at the Waterfall in Penang was also a work of the Forest Department during the year. Penang Waterfall nursery.

Part of the Municipal land at the Waterfall was taken over by Government for the purpose of forming a nursery, but the work was not actively commenced till late in the year, when a large band of men were put on to clear an area of about ten acres: rather more than half of this space has been dug over twice to a depth of about two feet and the lalang roots and stones removed. The remaining portion, not being of a nature suitable for cultivation, has been sloped or levelled as the case required and a great part of it turfed. Holes have been prepared for the reception of plants, and a few flower beds have been made along the main walk with a view to combining the ornamental with the useful. The old path which passed through the land and which followed the course of the river has been altered, re-modelled, and metalled. It will prove a good, durable carriage road.

A new road striking off from the reservoir and skirting the outer boundary of the nursery was commenced and had considerably advanced towards completion before the close of the year.

The necessary paths for the convenience of working parties and visitors have been laid out and the edges turfed. Actual planting was only prevented by the setting in of dry weather before the nursery was sufficiently advanced to admit of planting being done.

34.—Summarizing the work of the Forest Department in the three Settlements during the past year, I would point out that the forest reserves dealt with to a more or less extent are fifteen in number; that forty-six miles of boundary line have been opened at an average cost of \$83 per mile including the planting up of twelve miles with fast-growing trees; that the area of land laid out in nurseries is over twenty acres; and that some 390,000 plants have been propagated in these nurseries at an average cost of \$1 per 100. Summary.

35.—Seventy-three acres of waste land were planted with about 148,000 plants at an average cost of \$12 per acre or per 2,000 plants. The stock in the nurseries at the close of the year numbered about 200,000 plants. It will be noticed that the area of waste land planted with trees is comparatively small, but what was of most importance, viz., the demarcation of reserves, to prevent further encroachment had to be first undertaken. This done, attention could with more security be turned to planting operations and other work within the reserve boundaries.

36.—Over 1,160 lbs of seeds have been got together from various quarters and utilized for the benefit of the reserves. About 1,600 Herbarium specimens of plants affording material for scientific investigation, have been procured at an average cost of \$10 per 100; which, when the difficult nature of the country and places requiring to be visited is taken into account, must be considered reasonable.

37.—The buildings erected include quarters for the overseers, stations for the forest watchmen, coolies' houses and plant sheds: in all 27 in number.

39.—A small Library of books on forestry has been formed for the benefit of the Forest Staff. A list of books received during the year is appended.

40.—In conclusion, I would add that, irrespective of periodical tours through the Settlements generally, a good deal of my time has been taken up in travelling over the island of Singapore on special forest duty, such as reporting on forest lands applied for by Chinese cultivators, it being now the rule that all forest lands applied for should be reported on by the Forest Department in the first instance.

These inspections entailed much heavy travelling and exposure, as in every case miles had to be walked on foot to reach the spot requiring inspection.

41.—I may also mention that the amount of correspondence which the addition of the Forest Department has thrown upon the Garden's office has about quadrupled the business of previous years.

N. CANTLEY.

Singapore, 13th April, 1885.

Revenue and Expenditure of the Forest Department, Straits Settlements, 1884.

REVENUE.

Government Grant, Singapore,	\$ 7,000
Do., Penang,	7,000
Do., Malacca,	6,000
	<u>\$ 20,000</u>

EXPENDITURE.

	Singapore.	Penang.	Malacca.
Salaries, ...	\$654.52	\$731.72	\$837.90
Demarcation of reserves, ...	1,712.86	1,676.70	...
Formation of nurseries, ...	1,508.12	1,799.90	869.24
Planting waste lands, ...	600.00	...	...
Hill Bungalow grounds, Bukit Timah, ...	300.00	...	...
Herbarium specimens, ...	51.00	...	52.73
Erection of quarters, ...	993.23	608.31	631.00
Uniform, tools, and implements, ...	233.10	589.07	163.00
Manure and cartage, ...	214.82	...	80.00
Transport, ...	343.10	417.83	623.53
Miscellaneous, ...	366.24	95.57	99.30
Rent, ...	...	113.50	130.00
Boundary stones, ...	...	500.00	...
Survey fees, ...	...	264.00	494.28
Foreign seeds and plants purchased, ...	...	200.00	...
Purchase of land, ...	...	...	100.00
	<u>6,976.99</u>	<u>6,996.60</u>	<u>4,080.98</u>
Balance in hand, ...	23.10	3.40	1,919.02
	<u>7,000.00</u>	<u>7,000.00</u>	<u>6,000.00</u>

Nursery garden for planting Colonial Products, Penang.

Government Grant,— \$ 2,500.

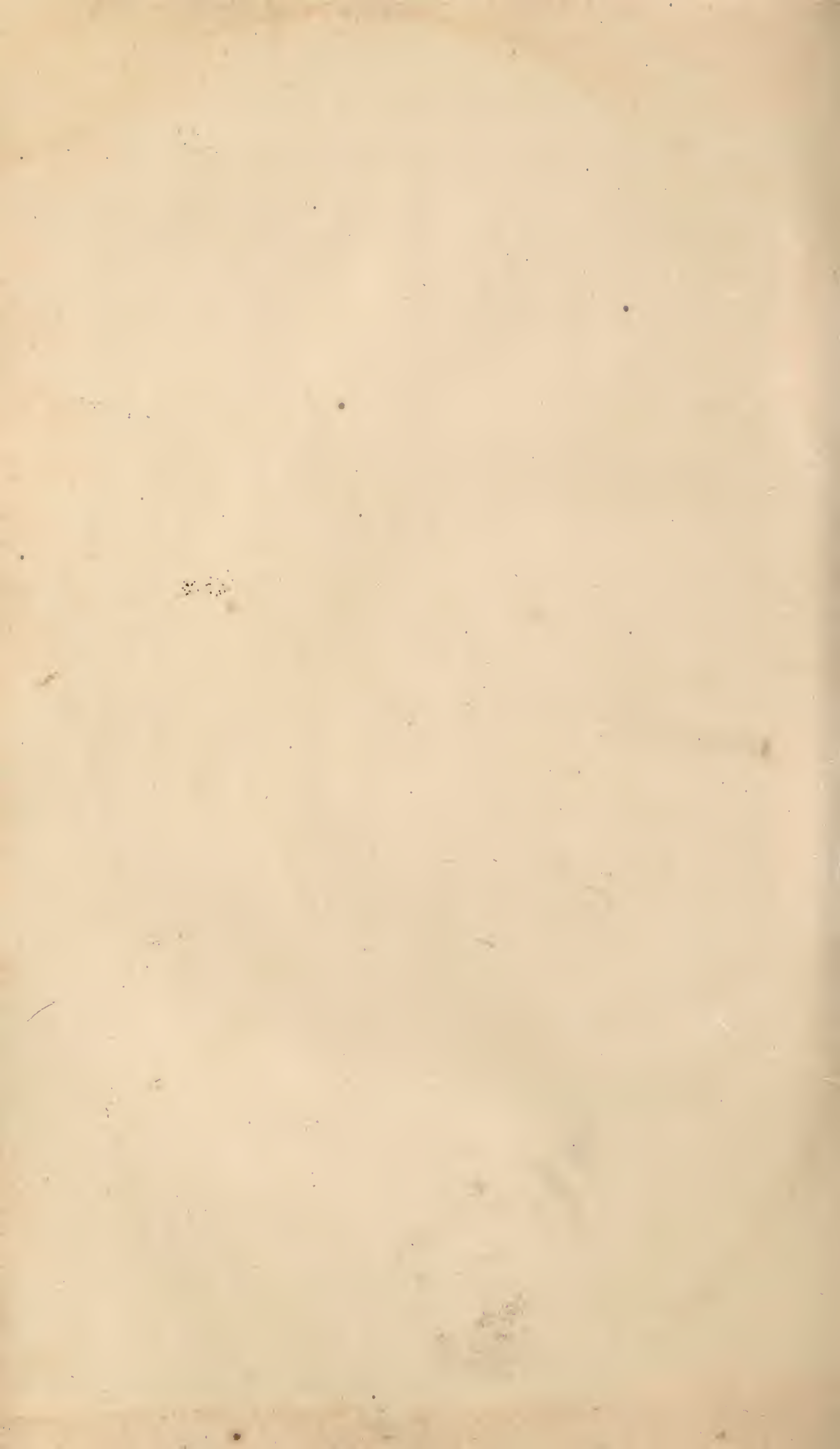
Expenditure, 1884,	{	Salaries, Cooly hire, &c:	\$ 1,993.63
		Tools and materials,	250.75
		Manure and cartage,	190.00
		Rent of Cooly houses,	40.00
		Petty expenses,	20.50
			<u>2,494.88</u>
		Balance in hand,	5.12
			<u>\$ 2,500.00</u>

Statement of Seeds procured for the Department during the year.

Date.	Name.	Quantity	From whom received.
<i>From Foreign Sources.</i>		lbs. oz.	
2.2	Casuarina equisetœfolia, ...	1	Forest Dept., India.
22.5	Lagerstrœmia reginæ, } ...	25	Do., Rangoon.
30.5	Do., do. ...	25	Do., do.
10.6	Tectona grandis, ...	50	Do., do.
7.7	Swietenia mahogani, ...	365	Do., do.
24.7	Do. do., ...	10	Botanic Garden, Jamaica.
28.7	Terminalia Sps., ...	50	Do., Trinidad.
7.8	Dipterocarpus tuberculatus, ...	100	Forest Dept. India N.W.P.
10.9	Bassia longifolia, ...	60	Do., N. C. Poona.
19.9	Do. do., ...	26	Do., Coimbatore.
14.10	Aguillaria gallocha, ...	26	Do., do.
17.10	Bignonia chelonoides, ...	20	Do., Assam.
24.12	Chickrassia tabularis, ...	5	Do., Rangoon.
		60	Do., Chanda.
<i>From Home Sources.</i>			
	Calophyllum inophyllum, ...		
	Hopea cernua, ...		
	Dipterocarpus Sps., ...		
	Azelia palembanica, ...		
	Strombosia javanica, ...		
	Scorodocarpus bornensis, ...		
	Hopea meranti, ...		
	Kumpassia malaccana, ...	340	Collected in Malacca.
	Eugenia zeylanica, ...		
	Eugenia Sps., ...		
	Sloetia sideroxylon, ...		
	Diospyros discolor, ...		
	Elœodendron Sps., ...		
	Mixed species, ...		
		1,163	

List of Books at present forming the Library of the Forest Department.

- American Journal of Forestry (F. B. HOUGH.)
Notes on Forestry (C. F. AMERY.)
Timber Merchant and Builder's Vade Mecum (BOUSFIELD.)
Origin, Progress, Prevention, and Cure of Dry Rot in Timber (BRITTON.)
Forest and Moisture (J. CROMBIE BROWN.)
Pine Plantations on the Sand-wastes of France (J. C. BROWN.)
Introduction to the Study of Modern Forest Economy (BROWN.)
French Forest Ordinance of 1669 (J. C. BROWN.)
Reboisement in France (J. C. BROWN.)
Trees of America (BROWN.)
Science for Forests (A. J. BURROWS.)
The Planting and Profitable Cultivation of Underwood.
Tree-pruning, (A. DES CARS.)
Tree Lifter (G. GREENWOOD.)
Timber and Timber Trees (G. LASLETT.)
Strength of Timber (WILLIAM LEA.)
The Organisation and Valuation of Forests on the Continental System. (L. MACGREGOR.)
Report on the Forest Resources of Western Australia (MULLER.)
Manual of Injurious Insects (E. A. ORMERO.)
Guide to Methods of Insect Life.
Saw Mills their Arrangement and Management (BALE.)
Indian Forest Reports.
Forest Department Code.



STRAITS SETTLEMENTS.

R E P O R T

ON THE

FOREST DEPARTMENT,

FOR THE YEAR

1885.

L A I D B E F O R E T H E L E G I S L A T I V E C O U N C I L B Y C O M M A N D O F H I S E X C E L L E N C Y
T H E O F F I C E R A D M I N I S T E R I N G T H E G O V E R N M E N T.



SINGAPORE:

PRINTED AT THE GOVERNMENT PRINTING OFFICE, STRAITS SETTLEMENTS.

1885.

ANNUAL REPORT ON THE FOREST DEPARTMENT, STRAITS
SETTLEMENTS, FOR THE YEAR 1885.

SINGAPORE.

Demarcation of Reserves.

THE demarcation of reserves has been one of the chief works of the year. The following have been marked off where necessary by an eight-foot boundary path, viz. :—Chan Chu Kang, Sembawang, Pandan, and Mandai reserves. These contain together an area of about 4,383 acres.

2. The length of boundary lines opened amounts to about thirteen miles, five miles of which have been planted with fast-growing trees; rivers and public roads have been adopted for ten miles of boundary, which has kept down cost of demarcation and maintenance. Reserves in various districts other than the above have been marked off on the maps and noted by the Land Office; these contain an area of about 4,914 acres.

Leases within Reserves.

3. Within the boundaries of the reserves are several small holdings as yet unpurchased, these may amount together to an area of 1,500 acres, and will be demarcated under the new Land Ordinance without cost to Government.

Protection.

4. For protective purposes, a staff of ten watchmen has been employed throughout the year, and has protected an area of 5,553 acres, being an average charge of 555 acres per man. They have also kept in order 16 miles of 8-foot boundary line opened last year, which has been the means of preventing fire entering the reserves as well as forming a boundary to them. The watchmen made four arrests and obtained three convictions, chiefly for illicit wood-cutting.

Maps shewing the reserve boundaries have been supplied by the Survey Department, on a scale of 16 chains to the inch, which materially assisted the work of the year.

Fires and Damage.

5. The only case of fire which occurred during the year took place on the military reserve, where about two acres of young plantation were partly destroyed. The fire originated through carelessness on the part of workmen who had quarters within the reserve.

The heavy rains which took place in the middle of December flooded some 20 acres of the flat land of this reserve and killed about 3,000 plants. There have been no other casualties to record.

Erection of Quarters.

6. Sheds for the accommodation of coolies employed in demarcation work have been erected at Pandan and at Chan Chu Kang, and a substantial wood house for the overseer of the experimental nursery at Tanglin.

Nurseries.

7. About seven acres have been added to the area of the nurseries, viz.:— a new nursery of about 2 acres at Jurong, one of 1 acre at Bukit Mandai, and 4 acres added to the experimental nursery at Tanglin. The number of plants propagated during the year amounted to about 150,000, of which about 110,000 were sent to the reserves, and 40,000 distributed to various Government institutions, the Public Works Department taking the greater number. Seed to the amount of 386 ₪ has been used in the nurseries, being 300 ₪ of various native tree-seeds and 86 ₪ of kinds received from India.

8. In the Tanglin nursery, the following, not specially mentioned previously, form part of a large assortment planted during the year, viz.:—Dindie (said to be the best timber tree of British Columbia); Araucarias; Eucalyptus of sorts (E. Sideroxylon, E. Piperata, and E. Calophyllus have done remarkably well); Teak; Indian long-leaved pine; Cassia bark tree; Sissoo; Nutmegs and Cloves; long-leaved Acacia from Australia; Casuarina stricta; American, African and Native Rubbers; new varieties of Chocolate; Brazilian, African and Queensland edible nuts; native and foreign fruit trees; native Sago palms; Mauritius Hemp plant; Cardamums, &c.

Planting Waste Lands.

9. The area planted during the year in the reserves is about 55 acres, with about 2,000 plants to the acre—forty-seven acres of the waste lands in Bukit Timah reserve and eight acres of the military reserve. The trees planted in the former consisted chiefly of the best native kinds; and principally foreign trees in the latter. The progress made by the plants planted is very satisfactory in most cases.

10. From observation of the growth of the plantations made last year, the following among native trees have grown with most vigour, viz.:—Serayah, Meranti, Kemunyan, Bintangor, Kēlat, Klēdang, Tembusu, Kayu arang, Merabu, Chempadak, Petaling, Kayu minyak, and Eugenias of sorts. Among foreign kinds, the following grow with great vigour on suitable soils, viz.:—Teak, Dipterocarpus tuberculosa, Inga saman, Schleicheria trijuga, Cedrela, Toona, Eucalyptus of sorts, Stereospermum chelonoides, Albizzia Moluccana and Albizzia stipulata, Cassia florida, Hymenoclea verrucosa, and Mahogany.

Weeding.

11. All the plantations made during the year, and also those made last year, have been gone over twice, and the plants cleared of weeds and grass, except on a portion of the military reserve, which was left untouched for observation as to how the plants would cope with the lalang and other obstructive vegetation. On examination, the following were found to have grown up through the grass, and seem beyond danger of suffocation, viz.:—Bintangor, Kēlat, Klēdang, Chempadak, Tembusu, Kumpas, several Eugenias, Albizzia Moluccana, Cassia florida and Cedrela odorata. The last three mentioned are exotics.

12. The undermentioned were left behind in the race for light and completely covered over by the grass in most cases, viz.:—Lagerstrœmia reginæ, Mahogany, Dindie, Albizzia lebbeck, Bassia longifolia, Teak (when planted in elevated situations), Adenantha pavonina, and Inga dulcis. These observations shew that native trees are best adapted for the re-wooding of the waste lands of the Settlement, and that, if closely planted, or sown *in situ*, require but little assistance in the way of weeding under ordinary circumstances.

Assistance to other Departments.

13. A quantity of small timber has been supplied from the reserves for the renewal and repairing of bridges on country roads. In September orders were received to assist the Colonial Engineer with certain works at the new fortifications. The work then put in hand has continued up to date and has occupied much time.

Herbarium.

14. Some hundreds of herbarium specimens have been collected during the year, and are being reduced gradually to their various genera and species as time admits.

Changes in Staff.

15. The salary attached to the post of Overseer of Forest has been placed on an increasing scale of from \$600 to \$840 per annum, at which rate an intelligent officer was

obtained towards the close of the year. The previous Overseer resigned on account of insufficient salary. The duties attached to the post are arduous and trying to a European constitution in this climate.

MALACCA.

Demarcation of Reserves.

16. In Malacca, as in the other Settlements, demarcation constituted the chief work of the year. The total area demarcated was about 10,000 acres and includes the following reserves:—Sungei Udang, Merlimau, part of Bukit Bruang, and part of Bukit Panchor. The length of 8-foot boundary opened was 22 miles. The area surveyed, 8,865 acres, of which 3,300 acres were surveyed specially by the department.

The total area taken up amounted to about 42,000 acres, of which 32,000 remain undemarcated.

17. The additions made to the old reserves have been as follows:—Merlimau, 4,000 acres; Sungei Udang, 1,300 acres; Ayer Panas, 1,675 acres; Bukit Bruang, 23 acres (the latter purchased at a cost of about \$11 per acre); Bukit Panchor, 2,880 acres. Total additional area, 8,203 acres. The Bukit Panchor reserve is, however, more of a new reserve than an addition to the old one, of which 420 acres only were retained. In the modification of this reserve, the Bukit Panchor hill-chain has been included within the boundary. Nearly all the additions made to the reserves are fairly well wooded and none require to be stocked artificially by planting.

Erection of Quarters.

18. Quarters for watchmen have been erected during the year at Briso, Merlimau, and Bukit Panchor reserves, and consist of three substantial wooden buildings raised on piles.

Protection.

19. Seven watchmen have been employed during the latter half of the year, and have occupied quarters at Sungei Udang, Merlimau, and Bukit Bruang. They have had charge of about 1,870 acres each on an average, and have kept the boundary paths in order. They made fifteen arrests for illicit wood-cutting within the reserves, and obtained ten convictions.

Nurseries.

20. The nursery made last year at Bukit Bruang has been maintained for experimental purposes, in which the following plants have been tried, viz.:—*Bassia longifolia* (which yields good timber and an excellent oil); *Cedrela odorata*; *Pinus longifolia*; Rubber trees of sorts; Mahogany; Teak; Logwood; Mauritius Hemp; China Grass; Coffee, and several others. The *Cedrela*, *Bassia* and Mahogany have grown best. Mauritius Hemp has grown well, and some Chinese are about to take up its cultivation.

21. About 20,000 young trees have been raised in the nursery during the year, chiefly *Tampinis*, but as these are little wanted in Malacca, they are being transported to the other Settlements where a supply is needed. The Ayer Panas nursery, opened last year, was closed during the year, owing to the cost of transport and difficulty attending its proper supervision, it being at too great a distance from the site of all other operations of a kindred nature.

22. Mr. JACKSON, the Overseer, resigned at the close of the year, and as no one possessing the necessary qualifications could be found in the Colony, application has been made to the Home Government for an officer to fill the post.

Specimens for Exhibition.

23. Specimens of the indigenous timbers, to the number of 86, and 100 kinds of fibres, prepared mostly from Malacca plants, have been forwarded to the Colonial and Indian Exhibition, London.

Herbarium specimens, to the number of 1,840, and 300 lb of seeds of the most valuable timber-trees have been collected and forwarded to Singapore.

PENANG.

Demarcation of Reserves.

24. In Penang, the demarcation of the hill reserves has been urgently pushed on and nearly completed within the year. The reserves demarcated are four in number, viz.:—Bukit Batu, Bukit Lasmana, Highlands, and Muka Head. The area of these reserves has not yet been fully determined, but the Revenue Survey now at work will

be able to supply the information at an early date. I think, however, that 6,000 acres may be taken as representing approximately the total demarcated area up to date.

25. The reserves cover and protect the crests of the principal hill-chains and have been established, wherever practicable, throughout the island. The reserves contain, for the most part, trees or shrub, and require but little, if any, planting.

26. Twenty-three miles of boundary line have been opened during the year, the rugged nature of the hill-sides offering many obstacles to progress as the work proceeded. The breadth and nature of the line cut is the same as detailed in my report of last year. Little further demarcation can be done in Penang, the chief work which now remains is the placing in position of boundary-marks, for which purpose stones have been already procured and properly lettered.

Watershed of Town Rivers.

27. The proposal to re-wood the watershed of the river which supplies the town with drinking water was abandoned after much survey and labour, it is said, through want of funds. A paper came under my notice during the year in which Dr. HAMPSHIRE called attention some eight years ago to the pollution of the river by Chinese squatters on the watershed, and it is to be regretted that, after so much labour, a remedy could not be found for the evil, which now extends over nearly the whole catchment area of the river, whereas when Dr. HAMPSHIRE wrote the clearings made were very few. It is earnestly to be hoped, however, that so important a subject will not be left in abeyance any longer than the financial position of the Settlement may render absolutely necessary.

Protection.

28. Notices in Chinese, Tamil, and Malay have been posted on the boundary lines informing people of the nature of the reserves and forbidding trespass. Three watchmen have been at work throughout the year, located in quarters erected for them on the hills last year. They have succeeded in preventing any serious encroachment on the reserves, as well as having kept the boundaries opened last year in proper order. They made four arrests, and obtained two convictions.

Nurseries.

29. The Bungalow-Garden on Government Hill was placed under the control of the Forest Department in March, and has been utilised for the accommodation of plants which require a low temperature. The addition of this garden gives the Department as complete a range for experiment as can be obtained within the Colony, and the course proposed is to place plants on their first arrival from temperate countries into the hill top nursery, and, by taking them down through the other nurseries, gradually acclimatize them for cultivation on the lower plains.

30. Four hundred and fifty kinds of seeds, and a great variety of plants, have been introduced during the year; included among the latter were peaches, figs, olives, oranges, apples, pears, apricot, cherries, &c. The growth of nearly all has exceeded expectation. A large assortment of vegetables, both native and foreign, have been tried and grown to great perfection in the intermediate hill nursery; some of which were sent to Singapore and arrived in perfect condition. *Vide* Botanic Gardens Report for 1886.

Waterfall Nursery.

31. The economic plants introduced into the Waterfall Nursery have mostly grown well. The following are measurements of a few planted only twelve months ago, viz.:—Ceara rubber (*Manihot glaziovii*) 15 to 20 feet; Para rubber (*Hevea Braziliensis*) 7 to 9 feet; Teak (*Tectona grandis*) 5 to 10 feet. Teak grows better in Penang than in any of the other Settlements, which the comparative absence of laterite in the soil accounts for.

32. The principal work of the year in this nursery consisted in planting, construction of bridges, roads, lawns, and the planting of shrubberies, &c. It has been much visited by the public for recreation. The site contains many natural beauties hardly equalled elsewhere, and with a little further expenditure could be made very picturesque and attractive. Requisitions for trees for roadside and other planting have been met by this nursery, and some 11,500 plants have been supplied.

Specimens for Colonial and Indian Exhibition.

33. Forty-three samples of timber and forty-seven of fruits have been prepared for the Colonial and Indian Exhibition after considerable labour, and forwarded to London.

Mr. CURTIS, the Assistant Superintendent, who has worked with great energy and enthusiasm, collected on his various rounds one thousand eight hundred herbarium specimens of the flora of the Island. So far as these have been determined, the order Dipterocarpeæ appears much more largely represented in Penang than has hitherto been known. The order yields excellent timber, oils, resins, &c. The specimens of timber prepared for the Exhibition have also shewn that a larger percentage of valuable timber exists in the Island reserves than has hitherto been credited, and although these exist at present mostly as small trees, they constitute an element of growing value which will benefit the Island at no distant future.

PROVINCE WELLESLEY.

Selection of Reserves.

34. The active forest operations in Penang has hitherto prevented much being done in Province Wellesley. A beginning was, however, made during the year, and 72 acres of land reserved in the interior of the country, four acres of which reserve have been planted with about 8,000 trees from Penang nurseries. Two have been dressed into nursery order for the reception of seeds, &c. A large collection of sugar-cane and dadup cuttings have been planted in this nursery for local supply.

I would here point out that, although forestry proper is kept in view, and worked up to as the primary object of the Forest Department, it nevertheless assists, by means of its nurseries, the agriculture of the Colony generally, of which forestry is but a branch.

Special Forest Tours.

35. Three special tours in search of plants and information were undertaken during the year. In January, I visited Pêrak, accompanied by Mr. CURTIS, and after inspecting the various Government gardens, we ascended Gunong Bubu, and made a large collection of plants, both as dried and living specimens. In November, I visited, with Mr. CURTIS, the Achinese pepper plantations at Arakudah near the boundary of Kêdah; and in December, Mr. CURTIS made a short trip to Lower Pêrak, and brought back a large collection of plants required for various purposes.

Summary.

36. In conclusion, I would briefly summarize the more important works of the year in the three Settlements, viz. :—Area demarcated, 17,455 acres. Surveyed, 8,865 acres. Length of boundary opened, 61 miles, at a cost of about \$62 per mile, and five miles planted with fast-growing trees. Length of boundary kept up of previous year's demarcation, 46 miles. Area protected, 22,753 acres, being about an average of 1,202 per watchman employed. Buildings erected, 7, being 4 permanent and 3 temporary. Area planted, 59 acres; weeded, 64 acres. Weeding and planting taken together cost about \$13 per acre. Number of plants propagated, 180,000, at an average cost of \$9 per 1,000. Number of specimens for Colonial and Indian Exhibition, 271. Number of Herbarium specimens collected, 4,389. Seeds collected, 300 lb. Received from India, 86 lbs. Number of prosecutions for illicit tree-cutting, 23. Number of convictions obtained, 15. Area added to nurseries, 9 acres.

37. The annexed Comparative Statement shews the progress of the principal works since the commencement of the Department in 1884, exclusive of erection of quarters and purchase of lands.

38. A Statement shewing the Revenue and Expenditure of the year is also annexed.

N. CANTLEY,
Superintendent.

Settlements Generally, for both Years.

Total Contemplated, ...	...	...	82,000 Acres
Do., Demarcated, ...	...	...	21,918 ,,
Do., Planted, ...	...	...	109 ,,
Do., Under Protection, ...	...	...	26,371 ,,
Do., Eight-foot Boundary-line opened, ...	...	...	107 Miles.

REVENUE AND EXPENDITURE OF THE FOREST DEPARTMENT,
STRAITS SETTLEMENTS, 1885.

REVENUE.

Government Grant, Singapore, ...	...	...	\$ 7,000
Do. Penang, ...	...	...	7,200
Do. Malacca, ...	...	...	5,800
			<u>\$20,000</u>

EXPENDITURE.

	SINGAPORE		PENANG.		MALACCA.	
	\$	c.	\$	c.	\$	c.
Salaries, ...	1,534.64		2,601.26		1,391.00	
Demarcation of Reserves, ...	1,610.83		1,261.61		758.80	
Planting Waste Lands and Weeding, Formation and Up-keep of Nurse- ries, ...	1,057.79		522.60		...	
Erection of Quarters, ...	974.00		746.34		405.81	
Purchase of Land, ...	225.00		...		637.00	
Survey Fees, ...	...		...		260.00	
Road-making, ...	...		...		511.31	
Manure and Cartage, ...	...		...		299.10	
Foreign Seeds and Plants purchased, Herbarium Specimens and collecting Seeds, ...	143.25		53.20		...	
Transport, ...	...		131.76		36.10	
Rent, ...	200.00		...		...
Personal Field Allowance, ...	477.03		432.00		424.71	
Uniforms, Tools and Implements, ...	...		420.00		120.00	
Miscellaneous and Petty Expenses, ...	...		530.14		591.51	
	313.03		255.66		11.30	
	464.41		245.00		353.36	
Balance, ...	0.02		0.43		...	
Total, ...	\$7,000.00		\$7,200.00		\$5,800.00	\$20,000

Nursery Garden for Colonial Products, Penang.

Government Grant, ...	...	...	\$2,000.00
EXPENDITURE, ...	{	Overseer, ...	215.00
		Coolies ...	1,467.69
		Tools and Materials, ...	98.52
		Manure and Cartage, ...	80.80
		Miscellaneous, ...	137.99
Total, ...			\$ 2,000.00

ANNUAL REPORT ON THE BOTANIC GARDENS, SINGAPORE,
FOR THE YEAR 1886.

During the past year, much progress has been made. The improvements unfinished at the close of the preceding year have been completed, and other new works carried out, as far as the funds available would admit of. Every effort has been made to further improve the appearance of the grounds by the removal of dying, decayed and unsightly trees, the careful pruning of those that remain, and the planting of new ones and flowering plants in suitable positions.

2. *Front Entrance.*—The completion of the front entrance improvements is one of the most striking works of the year. At the close of the year 1885, the new pillars which replaced the heavy masses of masonry which previously did duty as pillars, and the levelling and reduction of the drive to a proper curve, were the only work completed by the Public Works Department.

3. During the year, the greater portion of the grass-bank on the right on entering the gate was shaped into proper form. In this operation, much soil had to be removed, and found a ready receptacle on the opposite side of the drive, which previously sloped southward, but has now been brought up to nearly level; which admits of the flower beds and plants on that side being better presented to the view on entering.

4. The carriage drive, which existed on the right of the entrance, has been reduced to a 6-foot path, as far as the junction with the main interior drive. The area of the lawn on that side has consequently been considerably increased, which gave more scope for arranging and grouping plants, and advantage was taken of this to re-arrange the plants accordingly, and to put down a number of flower beds on each side of the drive for a distance of about 90 yards within the gate; in these beds, Gaillardias and other flowering annuals, mixed with coloured-leaved plants, have done well. To form a back-ground to these, beds of a larger nature have been made and filled with Hibiscus and other plants, which have flowered and greatly contributed to the general effect. The open drain which carried the surface water from the high-ground surrounding the aviaries to near the entrance has been laid down in tile piping, and the surface brought up to the general level. In this operation, about 350 8-inch pipes were used (cost \$28). The new pillars have been painted and topped with handsome globe lamps, which give a finish to the improvements generally as well as the pillars themselves.

5. *Roads and Paths.*—Three hundred and ninety (390) square yards of the main-drive, from nearly on a line with the junction of the small walk leading to the aviaries, to the band-stand, have been re-metalled. The drive surrounding the stand has also been remodelled and heavily coated with laterite. Total area renovated, 2,790 square yards, requiring about 150 cart-loads of laterite. The other drives and walks have been repaired where required, and have been kept in good order.

6. A series of new walks, 6 feet in width and about 400 yards in length in all, have been made, leading from the band-stand to Garden-road, and towards the lake, to admit of easy access to the new fernery, which is being made in that quarter; and about an equal area of old walks had to be closed up to effect the necessary curves and alterations. The road to the Superintendent's quarters and the main drive through the Garden jungle will soon need extensive repairs.

7. *Lawns*.—These have been well looked after during the year under review, but their up-keep is a somewhat expensive item, the state in which they are maintained being quite equal to that of those of any nobleman's garden in Europe, and it is doubtful whether so much attention is paid to lawns in any other Public Garden in the East. The peculiar topography of the Garden admits of no classification, as first and second class lawn, to be kept in order accordingly, hence the expenditure. Where, however, the soil is very poor, bare patches are making an appearance, and top-dressing will soon have to be resorted to.

8. *Flower Beds, Shrubberies, &c.*—A large number of unsightly trees and bushes have been removed from the grounds; other trees have had dead branches cut off, and parasitical plants removed.

9. The removal of those trees has not only relieved the Gardens of untidy objects, but has brought many of the ornamental trees more into prominence.

10. A new shrubbery has been made in front of the bamboo hedge between the office and the front entrance, and may be looked upon as forming part of the improvements carried out in that quarter.

Front Entrance Improvement.—This border has an area of about 6,728 square yards, and in it many of the large specimens removed from the site of the new Fernery Reserve, have been successfully transplanted. Many flowering shrubs have also been added, and its outer edge kept gay with annuals, &c. Another border, with an area of about 80 square yards, has been made between the sago palm clump and the turnstyle entrance. A third, having an area of about 1,000 square yards, has been formed to screen from view the reserve for the new Fernery at the upper end of the main lake, as well as for landscape effect. The two former are continuations of the improvements begun in the previous year, when the shrubbery lying between the office and chief plant-house was made.

11. In all these shrubberies, the trees planted have grown well, while the shrubs, consisting of Allamanda, Hibiscus, Honeysuckle, Clerodendron, Tabernæmontana, Eranthemum, Justicia, Strobilanthes, Eucharis, Lilies, Roses, &c. have flowered well. The shrubberies which surround the aviaries have been thinned out to some extent, owing to the rapid growth of the trees. The plants removed have been used for various purposes.

12. The shrubbery borders on each side of the road leading from the old Fernery to the new Herbaceous Grounds, have been trenched about two feet deep and replanted, the plants being re-arranged, according to their sizes, in re-planting; and a liberal manuring given, a work very much required. The other borders have been dug over and kept in good order. The planted out specimens throughout the grounds have mostly received an application of manure.

13. The flower beds on the terrace below the band-stand, have not been much altered during the year, the employés being fully occupied with other works, but they have otherwise been well kept and have looked well throughout the year.

14. The Herbaceous Garden plants have been removed to ground maintained by the Forest Department, and the beds they occupied have been closed up where they could not be advantageously filled with flowering shrubs, &c.

15. A small Flower Garden, in which annuals only have been tried during the year, has been made on an area of 390 square yards on the site of the old aviary. As anticipated, the plants did not all come into bloom together, and the effect was consequently lost, but it may succeed on further trials with a better selection of plants and better timing as regards the flowering periods. The following annuals flowered well in the Gardens during the year, viz.:—Browallia, Calliopsis, Coreopsis, Rockscombs, Dahlia, Datura, Convolvulus, Gaillardias, Helianthus, Helichrysum, Heliotropium, Indian Pink, Ipomæa, Lobelia, Marigold, Marvel of Peru, Mignonette, Passiflora, Petunia, Phlox, Salvia, Solanum, Antirrhinum, Verbena, Tithonia, Zinnia and Torenia, as also the following bulbs:—Achimenes, Begonias, Gladiolus, Gesneria, Tydeas, Pancratium, Amaryllis, Crinum, and Gloxinias.

16. It is hoped that, by successive sowings of the above, as an auxiliary to the

flowering perennials, the flower beds, borders and plant-houses may be kept gay all the year round.

17. The following roses, introduced during the year and grown in tubs, have flowered, viz. :—Etoile de Lyon, La Boule d'Or, Pink China, Aline Sisley, Jean Ducher, Hon'ble Edith Griffard, Francesia Kruger, White Baroness, Crimson China, Clothilda, and Reine Maria Henrietta. Others are coming into bloom.

18. *Lakes.*—Little has been done to the lakes, except what work was required for their proper maintenance. Plants of Nymphæas were tried in the narrow end of the large lake, but they disappeared after a time. The Victoria Regia lily has been continually in flower and grown well all the year. The Lotus lily has taken complete possession of the second largest lake, in the front of which some further excavation is required to deepen the water and thus prevent the growth of grass and other weeds which form in it with great rapidity and give it an unsightly appearance. Some re-adjustment of the plants is also necessary.

19. *Plant-houses.*—The plants in the chief plant-houses have nearly all been potted during the year, and have grown well, but large specimens are still required to fully stock the house; numerous additions have, however, been made, notably a number of large tree ferns received through the assistance of the Forest Department, and by a special trip to Johor by the Head Gardener. These with the largest of the old collection, which have been potted in tubs, give the house now a more furnished appearance than has hitherto been possible. In this work, together with that of the other plant-houses, about 2,190 new pots and 170 tubs have been used up.

20. The outer line of posts on which the roof rests have been covered with a wire spiral for the accommodation of creepers, a selection of which have been judiciously put down and are already covering many of the posts, greatly to the enhanced appearance of the house. The cost of wiring amounted to \$49.30.

Between the posts in the centre of the house, plants in baskets have been hung, and over the path leading through the fern collection, plants of Elk's-horn fern and other ferns have been placed. A rock-work has been put down to form a back ground to the pot collection on the south side of the house and runs between the Hibiscus hedge and the staging the whole length of the house.

This rock-work has been planted with ferns, Begonias, and other small ornamental plants, which have grown well and contributed much to the picturesqueness of the surroundings.

21. Four circular plant stages have been constructed on a line with the diagonal paths within the house, which was part of the original plan of the house, and which had been postponed; viewed from the interior, these stages give the house a more finished appearance.

A new structure has been erected, at a cost of about \$91.00 for materials, for the propagation of ferns and other delicate plants requiring protection; the house is about 60 feet long by 30 wide, consists of a broad centre staging with two side-stagings, and has been found very useful.

22. Another small shed, for the accommodation of the finer orchids, has been made and filled with those and others. The orchid collection has been mostly re-potted.

23. *Propagation House.*—The propagation house has not been so well maintained during the year as could be desired, especially the collection for foreign exchanges, which is owing to the Head Gardener's time being too much occupied with other works, but a fairly good collection has been kept up. The greater part of the wooden staging in this house will soon require renewal.

24. *Buildings.*—A covered passage has been erected between the Superintendent's house and out-houses, and the stables have been repaired. The Overseer's house has been re-attaped, and the roof of the Carpenter's shop repaired. These repairs cost \$103. The Office has been renovated by painting and white-washing by the Public Works Department. The other buildings are in good order.

25. *Fernery*.—The fernery has been very attractive during the year; the ferns have grown well, especially the stronger growing kinds, which now form objects of great beauty and are much admired by visitors.

26. *New Fernery*.—A site for a new fernery is being prepared at the upper end of the main lake, where, it is believed, filmy ferns and other delicate plants can be grown under shade of the stronger growing kinds and trees, with the assistance of irrigation. To meet requirements, a reservoir for the retention and storage of rain water has been made close by the site; its dimensions are 160' x 60' x 6', and into it the drainage of nearly all the upper portion of the Gardens has been turned; from this reservoir pipes are run for the irrigation of the rock-work. The reservoir was brought almost to completion within the year by the Public Works Department, but the rock-work is still unmade, and will take time and careful thought.

27. *Labelling*.—Five hundred ballau labels, at a cost of \$30, were procured during the year, and nearly all used up. The amount of printing required has been greater during the year than formerly, and one man being unequal to the work, he was assisted for a short time by another printer.

28. *Nurseries and Propagation*.—The low ground near the Head Gardener's quarters was partly cleared during the year, dressed into nursery beds, and planted with cuttings and seeds of various plants. About an acre of the west slope of the hill in the same quarter has been cleared and levelled to a serviceable gradient, at a cost of \$100, for transplanting purposes. The fancy plant nursery near the plant-house has also been well kept up during the year. In these nurseries, about 20,000 plants have been propagated, and disposed of (approximately) as follows:—Sold in small lots to the public, 700; Government Institutions, 6,790; Colonial exchanges, 792; sent abroad, 1,210; used in improvements within the Gardens, 6,000; retained, 4,608.

29. During the past year, the lawns, flower-beds and plant-houses have been more directly than heretofore under the control of the Head Gardener (Mr. FOX), owing to the frequent absences of the Superintendent on Forest duty, and much credit is due to him for the numerous improvements which have been effected.

30. *Aviaries*.—The new aviaries, re-erected last year, answer the purpose well, and little trouble from rats, which were the pest in the old structure, has been experienced. Nearly all the cages on one side have been kept in reserve for a collection of birds expected from Australia in exchange for a collection sent, but the season there prevented their being sent within the year.

31. The following contributions to the Aviaries have been received, viz.:—M. BEAN, Esq., one eagle; Hon'ble E. E. ISEMONGER, one adjutant and one bittern; Hon'ble W. E. MAXWELL, one stork.

In addition to the above, a few cockatoos and paraquets were purchased.

32. *Economic Plants*.—The collections of economic plants are now under the care of the Forest Department, and will be found detailed in the Report on Forests.

33. *Police Protection*.—The system of protecting the Gardens by special Police, works well upon the whole, but occasionally plants are stolen, and the past year has seen three plants of a new fern (*Adiantum Fergusonii*) removed in one night, and although every effort was made by the Police Force generally to recover them, nothing so far has been heard of them.

34. *Flower Show*.—The annual Flower Show was held on the 15th and 16th of June, the weather was exceedingly fine, which brought a very large attendance during the day as well as at the night illumination.

It is satisfactory to find that the chief plant-house still affords admirable accommodation for these exhibitions, there being no crowding anywhere.

35. *Interchange of Plants and Seeds*.—The number of plants received from abroad during the year was 1,319, and 729 packets of seeds. The number of plants sent out was 1,210, and 454 packets of seeds.

The following have been the chief contributors:—

The Botanical Gardens, Trinidad, 9 packets seeds, among which were the Mamme Apple, Davi Davi, Mohagany, and West Indian Palms; Royal Gardens, Kew, 35 plants and about 16 lb seeds, including the Mountain Papaya, the Lace Bark

tree of *Jainacia*, the Palmyra palm, Timber-tree seed and ornamental shrubs; Botanical Gardens, Java, 6 plants of the Cubeb Vine; Botanical Gardens, Sydney, 8 packets seeds of *Araucaria* and Australian Palms; Botanical Gardens, Mauritius, 1 case containing about 20lb Logwood seeds; Botanical Gardens, Jamaica, 19 packets West Indian Palms and other seeds; Botanical Gardens, Ceylon, a collection of 55 plants and 1 packet seeds, including the new vegetables—*Arracacha esculenta*, *Ipomæa chrysorrhiza* or Kumra, the Tree Tomato, and Ceylon ferns, &c.; Botanical Gardens, British Guiana, seeds of Indian Rubber plants, West Indian Palms, Rain-tree, &c.; Botanical Gardens, Hongkong, 100 kinds of various seeds chiefly that of vegetables grown in China; Botanical Gardens, Saharampur, 123 packets seeds, of which number 97 were vegetable and 26 various shrubs; Botanical Gardens, Calcutta, 238 seedling bamboos of sorts; L. BOEHMER, Esq., Japan, a collection of 153 Japanese plants, specially selected by the Hon'ble J. F. DICKSON, C. M. G., when on a tour in Japan; R. DERRY, Esq., Malacca, seeds of water lilies, vegetables, &c., in all 8 packets; the Consul-General for the Netherlands, a packet of seeds of a tree yielding vegetable fat; A. F. AYRE, Esq., Singapore, a plant of the beautiful *Pteris serrulata variegata*; G. PECHE, Esq., Moulmein, 18 Burmese orchids and 30 ferns; A. LAURIE, Esq., Ceylon, 31 plants *Hibiscus* of sorts; Mr. ANGUS, Singapore, 50 bulbs; the Pharmaceutical Society of Great Britain, 2 packets of seeds of Cape Aloes, &c.; Hon'ble J. F. DICKSON, C. M. G., Singapore, 1 fern.

The following were purchased during the year:—From Messrs. CARTER & Co., London, 120 kinds of annuals and 108 kinds of vegetables; Messrs. BARR & SONS, London, 551 kinds of bulbs, chiefly of flowering plants; Messrs PAUL & SONS, London, 64 rose plants assorted; Mr. B. S. WILLIAMS, London, 188 kinds of annuals; Messrs. CANNEL & SONS, London, 86 rose plants assorted.

36. The following have been the principal recipients:—

Royal Gardens, Kew, 38 plants and 13 packets seeds; Botanical Gardens, Brisbane, 43 packets seeds; Botanical Gardens, Melbourne, 108 plants and 39 packets seeds; Botanical Gardens, Hongkong, 25 packets seeds; Botanical Gardens, Mauritius, 54 plants and 30 packets seeds; Botanical Gardens, Adelaide, 37 plants and 26 packets seeds; Botanical Gardens, Cape of Good Hope, 26 packets seeds; Botanical Gardens, Natal, 43 packets seeds; Botanical Gardens, Saharampur, 39 packets seeds; Botanical Gardens, Cambridge, 8 packets seeds; Botanical Gardens, British Guiana, 4 packets seeds; Botanical Gardens, Java, 12 packets seeds; Botanical Gardens, Ceylon, 164 plants and 39 packets seeds; Botanical Gardens, Calcutta, 18 packets seeds; Botanical Gardens, Bangalore, 26 packets seeds; Botanical Gardens, Trinidad, 13 packets seeds; Botanical Gardens, Jamaica, 13 packets seeds; Botanical Gardens, Saigon and Reunion, 209 plants; Botanical Garden, Agri-Horticultural Society, Calcutta, 13 packets seeds; Acclimatization Society, Mauritius, 4 packets seeds; Mr. YANKIERSBILEK, Mauritius, 4 packets seeds; Agri-Horticultural Society, Moulmein, 4 packets seeds; A LAURIE, Esq., Ceylon, 36 plants; Captain GREEN, 20 plants; G. PECHE, Esq., Moulmein, 34 plants; W. BULL, Esq., London, 200 plants; HENRY WALKER, Esq., Sandakan, 65 plants and 7 packets seeds; L. BOEHMER, Esq., Japan, 25 plants.

EX-ESTABLISHMENT.

Government House Grounds.

The grounds surrounding Government House have been extensively overhauled during the year, as will be seen from the following details:—

37. *Old Orchards.*—In the old orchards, the greater number of the fruit trees had, owing to non-pruning, grown together in such a way as to act highly injurious to each other and diminish the fruit crop.

38. To remedy this, a liberal pruning and thinning became necessary, and the termination of the fruit-farms admitted of this being carried out. The orchard was found to contain, moreover, many common jungle trees, dead trees, and numerous others with stag-horn tops, *i. e.*, with the extremities of the branches dead. The orchard, therefore, required much labour to put it to right, and advantage was consequently taken of the absence of His Excellency and family in the Native States, to command all the available labour, which I daily supervised and directed, and by this means the orchard as well as the grounds generally have had attention.

39. On the removal of the timber and prunings, the orchard was drained over the low ground on each side of the front entrance, and the whole of the underwood and accumulation of débris brought down and deposited under the trees by the overflowing of the adjoining canal, were removed.

Much grass had also to be planted to cover places where the dense shade of the trees had killed it, and where it had been destroyed by the overflowing of the canal.

40. *Young Orchards.*—The young orchards between the Colonial Secretary's house and Cavenagh-road, and between the main house and Bukit Timah-road, have been cleared of scrub, and the young trees manured.

41. *Lawns.*—A good many trees and shrubs, which intercepted the view from Government House, have been removed from the lawns, and others which had lost their beauty; much sensitive plant and rank weed which disfigured the lawns have also been removed. The Lawn Tennis ground received several top dressings of a special compost for encouraging the growth of the grass, which has improved it.

42. *Planting.*—A number of ornamental plants have been planted near the house, among which were the red-stemmed Palm, and two nice plants of *Livistona sinensis* to replace two trees of the same kind killed by beetles during the year. Bamboos have been planted at points on the boundary and elsewhere where required to screen the neighbouring buildings and unsightly objects. A root of the large Bamboo—*Dendrocalmus giganteus*—has been planted in a suitable position near the front entrance, and is making strong growth. This fine bamboo was obtained from the Botanical Gardens, Ceylon, with the assistance of the Hon'ble J. F. DICKSON, C. M. G., who took great interest in the work generally.

43. *Hedges.*—The bamboo hedges which surround the grounds have been cleared of creepers and weeds, clipped and strengthened by horizontal strapping with strips of areca-palm, bamboo, &c., and a portion, 200 yards in length on right of main entrance where the dense shade cast by trees, now removed, had killed it, has been replanted.

44. *Plant-houses.*—The pot plants throughout the plant-houses have been repotted, and new tubs obtained for the repotting of the large plants in the verandahs and corridors of the main building.

An attap covered shed has been erected at the end of the bower near the house, under which a rockery has been made and planted with a variety of ferns, &c.

45. *Flower Beds and Borders.*—The flower beds adjoining the Tennis grounds have been mostly replanted and kept gay throughout the year with annuals and coloured-leaved plants. The ridge of laterite rock lying between the main entrances, and the Cadets' bungalow, has been planted around with a collection of flowering creepers, with a view to covering it from sight, and ferns have been planted on protected portions.

Notices prohibiting the making of foot-paths across the lawns have been put up, and a few cases of trespass punished, which has stopped encroachment and prevented the grass being rendered unsightly.

Esplanade and Grounds surrounding Government Offices.

46. The Esplanade has been kept mown and in order, together with the lawn lying between the main road and the sea, also the small grass plots which surround the Government Offices. In the latter, a few ornamental plants have been planted where required.

47. The trees along the outer edge of the Esplanade require attention, many of them will never grow so as to afford shade to the roads, which seems to have been the object the planter of them had in view. These trees are not considered to be under my care.

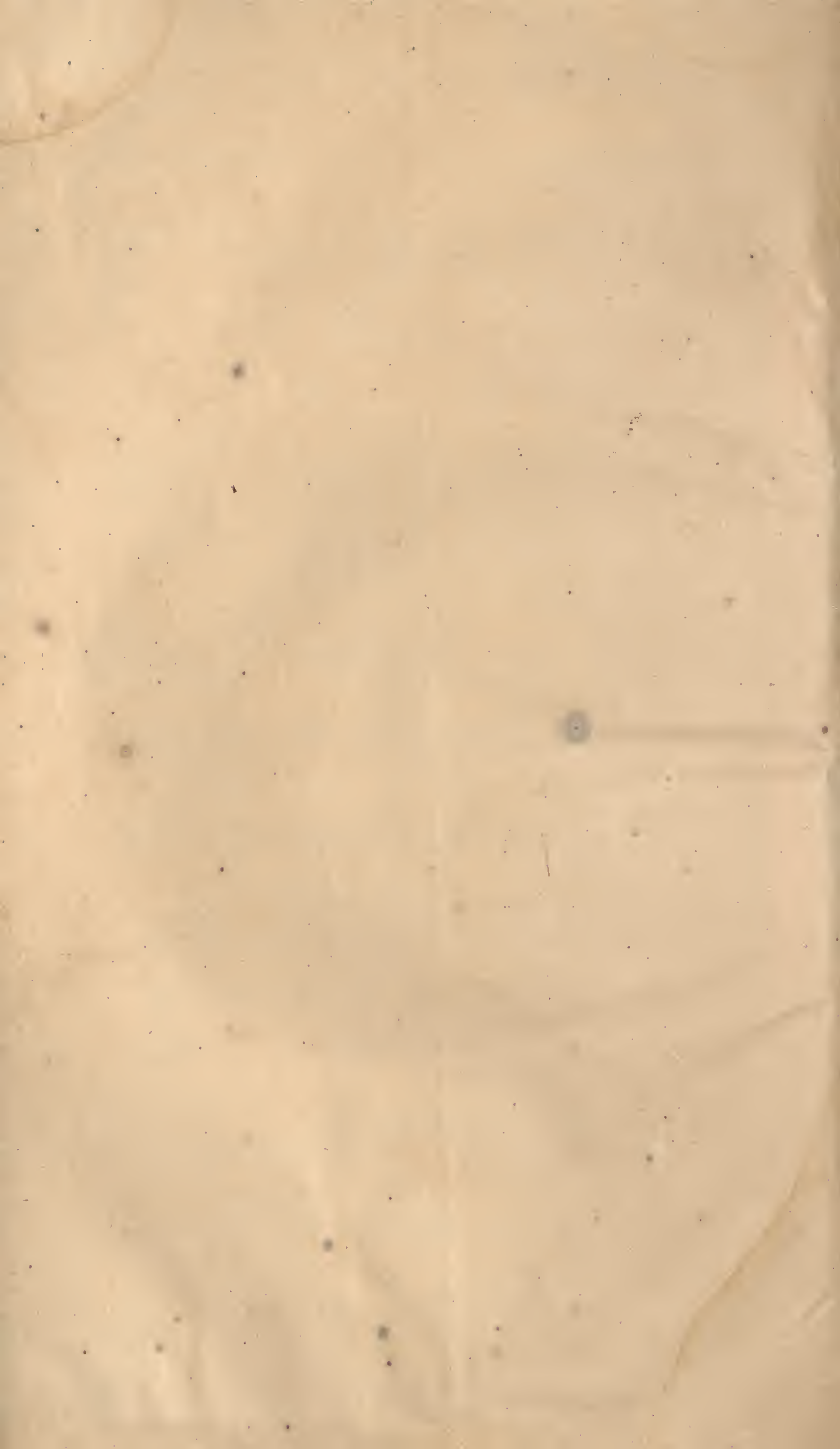
Revenue and Expenditure.

48. A statement of the Revenue and Expenditure for the year is annexed, from which it will be seen that the sum realised by sales of plant has considerably fallen off, being \$348.63 less than last year, owing principally to ornamental plants being less in demand than in the previous year.

The balance of \$318.77 shewn in annexed statement is only apparent, the amount having been expended, but not paid during the year.

N. CANTLEY,
Superintendent.

Singapore, 19th March, 1887.



ANNUAL REPORT ON THE FOREST DEPARTMENT, STRAITS SETTLEMENTS, FOR THE YEAR 1886.

Introductory Remarks.

Before detailing what has been accomplished during the past year, I would most respectfully beg to point out that all the recommendations contained in my preliminary Forest Report and approved of by His Excellency Governor Sir FREDERICK A. WELD, G.C.M.G., in the beginning in 1883, have now been carried out to a greater or less extent.

2. The recommendations then made comprised such items as were considered most urgent at the time, and which, as will be seen, have proved capable of practical application, and have met the end in view. The Government forests were, at that time, being recklessly cut down and fast disappearing; measures to check such fellings and encroachments were consequently the first to be considered and acted upon, and have occupied the attention of the Department almost up to date.

3. What has been accomplished will appear from the maps appended, which detail the restrictions placed on felling and the distribution of the Reserves established throughout the colony.

For the sake of clearness the original recommendations are briefly sketched in the margin, and the following will show what has been done to carry them out, viz. :—

4. Details shewing the internal organization of the Department and the duties apportioned to each Officer will be found in paragraph 3 of my Forest Report for 1884. Since then, however, another Officer has been appointed to the position of Assistant Superintendent, and the Overseership in Malacca has been abolished.

Mr. DERRY reported his arrival from British Guiana on the 8th August of the year under review, and after a brief initiatory stay in Penang, assumed charge of the Forest Department in Malacca in the following September.

5. A body of Forest Police who work under special rules, and who are assisted in their duties by an open boundary line, have worked well and have entirely prevented any serious encroachment on the Reserves.

6. The whole of the Reserves throughout the colony have now been demarcated by an 8-foot path, mostly by survey, except the Jus Reserve in Malacca, and some undetermined Reserves in Province Wellesley. Separate maps of all the Reserves have been procured, but are as yet of a temporary nature.

Original Recommendations.

R. 1st

The establishment of a Forest Department to take charge of all Crown Forests whether proclaimed Reserves or otherwise.

R. 2nd and 3rd

Preventing the felling of forests and clearing of forest lands.

The appointment of a body of Forest Police for protective purposes, to be quartered in the country districts throughout the Settlements.

R. 4th

The survey and demarcation of such Crown Forest lands as are still undetermined and the preparation of good and reliable maps shewing the forests and the topographical features of the country.

R. 5th

The marking out (or formation) of certain blocks of forest near the chief town in each Settlement of a sufficient size to serve as Reserves for the supply of fuel and small building wood.

R. 6th

The formation of local Forest Reserves for the supply of wood for general purposes and Mountain River Reserves for protection where necessary.

R. 7th

The redemption by exchange or otherwise of such private lands as are selected for planting.

R. 8th

The introduction of an Ordinance for the better conservation of the Crown Forests.

R. 9th

The immediate collection of seeds of the best indigenous timber trees and the formation of nurseries for the propagation of such seeds.

7. The Forest Reserves which may be looked upon as Town Reserves, are, in Singapore, the Bukit Timah, Jurong, and Military Reserves. For fuel, the Coast Reserves generally.

In Malacca, the Bukit Bruang and Sungei Udang Reserves. In Penang, the Balik Pulau Reserve, and Pulau Jerėjak; the latter has not yet been officially handed over.

8. All the other Reserves are either timber or village Reserves, or for the protection of streams, mountain crests, the equalization of showers, and storage of rainfall. The natural reproduction of trees has had every protection and encouragement.

9. It has fortunately been found unnecessary to purchase much land for forest purposes, what has been secured amounts only to a few acres, which interfered with a proper system of supervision being maintained over the Bukit Bruang Reserve in Malacca.

10. A detail of the more essential items for inclusion in a Forest Ordinance was drawn out during the year, but no case of direct friction with the ordinary law having occurred, further action was postponed for the present.

11. Much tree seed has been collected and many thousands of trees planted, as will be seen from details given in the body of this Report and in the Appendices.

12. The Nurseries established are of two kinds, viz.:—Temporary Nurseries, which precede planting generally, and those for special experimental planting or operations of *first instance*.

In the former, timber trees are propagated to the exclusion of all others, but in the latter economic plants of every kind likely to prove useful are admitted for trial and experiment.

13. The Waterfall Nursery in Penang has been extended, so as to provide means for recreation and instruction for the Penang public generally, and has thereby supplied a long-felt want.

14. Within the year, the scientific portion of the Botanic Gardens, Singapore, was, at the instance of the Botanic Gardens Committee, placed in charge of the Forest Department, and consisted of the herbarium, the economic garden and economic collection generally, the herbaceous arrangement, the medicinal garden, and the palmetum.

15. These additions, although not anticipated, place the Department on a botanical footing, and afford a wider field for investigation and usefulness. Considerable advantage has been already taken of these additions.

16. A Nursery for the cultivation of vegetables for sale, with cost chargeable to Forest vote, was begun within the year, and experiments have already proved conclusively that much can be done to augment and improve the bazaar supply.

17. Little has been done so far to collect revenue under the Department, but its organization is now sufficiently advanced to admit of attention being turned to the conservation of minor forest produce, and to the preparation of a rational working plan for the utilization of the resources of the forests generally, and for their requirements with reference to sustained yield and improvement.

18. In the preparation of a working plan of this kind, the forest in the adjacent States will necessarily require to be considered, and it is satisfactory to know that the nature of the Department is now such that, while fully occupied within itself, is nevertheless sufficiently elastic to stretch beyond the boundary and render assistance to dependent States whenever called upon to do so.

In the Appendices will be found a list of Economic Plants introduced almost entirely through the agency of the Forest Department, which has no connection with the Botanic Gardens. Plants are, however, freely exchanged between the two institutions.

19. The Department has now passed its infancy and assumed a fixed position among the public institutions of the colony. Its organisation has been a matter of no small difficulty, but the absence of failures has suppressed a large amount of that adverse criticism which, at the beginning, has fallen to the share of so many similar operations in other parts of the world.

SINGAPORE.

Demarcation of Reserves.

20. The following tabular statement shews the names, number, and areas of the Reserves demarcated, and the extent of boundary line opened during the year, from which it will be seen that the work in hand was of an extensive nature:—

Names of Forest Reserves.	Area added or demarcated during the year.	Length of 8-foot boundary line opened during the year.	Total Areas.	Total length of boundary line now opened and maintained.	Approximate length of water frontage protected.
	<i>a. r. p.</i>	<i>Miles.</i>	<i>a. r. p.</i>	<i>Miles.</i>	<i>Miles.</i>
Blukang, ...	1,514 0 32	8	1,514 0 32	8	11
Murai, ...	314 1 05	2½	314 1 05	2½	2
Kranji, ...	746 0 32	7	746 0 32	7	10
Selitar, ...	1,492 1 08	7	1,492 1 08	7	6
Ang Mo Kio, ...	290 1 04	3	290 1 04	3	...
Changi, ...	1,393 1 08	13	1,393 1 08	13½	4
Bukit Panjang, ...	117 2 16	3	117 2 16	3	...
Military, ...	...	0½	109 0 0	0½	...
Chan Chu Kang, ...	...	...	813 3 08	5	...
Mandai, ...	...	...	407 0 32	3	...
Sambawang, ...	...	...	936 0 32	7	...
Bukit Timah, ...	...	...	846 0 0	6	...
Pandan, ...	...	3	2,162 0 16	5	14
Jurong, ...	...	...	412 0 16	6	...
Total,...	5,868 0 25	47	11,554 2 09	76½	47

Surveys.

21. The Reserves surveyed within the year were the Blukang, Murai, Kranji, Selitar, Ang Mo Kio, Bukit Panjang, and Changi Reserves; the cost being charged to the Forest vote.

Private Rights within Reserves.

22. The Reserves are very free from right of private entry, Changi and Sambawang being the only two where private holdings to any great extent have had to be demarcated within the boundaries. It is intended to purchase these holdings as favourable opportunity occurs, or include them when the leases expire. A detail of the boundaries was published during the year in the *Government Gazette*.

Classification of Reserves.

23. The Reserves established may be classified thus:—As town Reserves—Bukit Timah, Pandan and Military; as coast Reserves—Blukang, Murai, Kranji, Selitar, and Changi; as interior Reserves—Sambawang, Mandai, Chan Chu Kang, Bukit Panjang and Ang Mo Kio. The Reservoir Reserve is under the care of the Municipality.

Description of Reserves.

24. The Reserves cover the best forests that remain in the Settlement. The following table will show the nature of their contents, viz. :—

Names of Forest Reserves.	Approximate area under timber.	Approximate area under brushwood.	Approximate area under grass and fern.	Area artificially stocked during the year.	Total area artificially stocked.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Blukang, ...	1,400	114	...	...	...
Murai, ...	300	14	...	...	...
Kranji, ...	560	6	180	...	...
Selitar, ...	1,000	..	492	...	...
Ang Mo Kio, ...	200	...	90	...	...
Changi, ...	900	...	493	...	...
Bukit Panjang, ...	17	...	100	...	...
Military, ...	...	59	16	6	34
Mandai, ...	100	200	107	...	...
Sambawang, ...	378	100	458	...	...
Bukit Timah, ...	300	218	328	13	118
Pandan, ...	720	42	1,400	...	...
Jurong, ...	127	106	169	6	6
Chan Chu Kang, ...	200	200	413	...	...
Total, ...	6,212	1,059	4,246	25	158

25. The wooded portions of the Reserves comprise, in many cases, good timber of all kinds common to the country, and, as will be seen from the map appended, is rendered easy of removal by good roads and by water.

Planting Waste Lands.

26. In addition to the above, a belt of about 10 acres was planted behind Tanglin Barracks to protect the soldiers' quarters from the malarial miasma arising from adjoining swamps, and six miles of boundary line were planted with bamboo.

The number of young trees planted out during the year was 50,000, and comprised chiefly, Bintangor, Tembusu, Eucalyptus, Serayah, Kayu-minyak, Meranti, Kumpus, Casuarina, Eugenia, &c. ; and all have grown well.

27. The following are measurements of present size of seedlings planted in Bukit Timah Reserve in 1884-85, and which were about a foot in height at the time of planting :—

Mahogany,	8 feet.	Hymenaea,	5 feet.	Cassia florida,	10 feet.
Serayah,	6 "	Eugenia,	6 "	Teak,	2 to 15 "
Bintangor,	5 "	India Cedar,	4 "	Meranti,	3 "
Casuarina,	10 "	Dipterocarpus,	3 "	Ketapong,	3 "
Kelat,	8 "	Ebony,	6 "	Mirabau,	6 "
Dipterocarpus } tuberculatus, }	3 "	Jack,	10 "	Lagerstraemia,	3 "
		Kumpas,	3 "	Albizzia,	15 "

The cost of planting was found to be about \$20 per acre, including cost of raising the seedlings in the Nursery. The state of natural reproduction in some of the Reserves is very satisfactory ; young seedlings are now making their appearance in places which shewed no traces of them before protective measures were adopted ; the same can be said of the Reserves in the other Settlements.

Weeding.

28. About 80 acres of the plantations made at Bukit Timah in 1884-85 and about 20 acres of the Military Reserve have been gone over, and the young trees cleared of obstructive vegetation. It would be an advantage to the trees as well as recoup possibly the cost of weeding, if some crops such as indigo or sweet potatoes were cultivated between the lines of trees.

Protection and Up-keep of Boundaries.

29. It will have been seen that the total reserved area in Singapore amounts to 11,554 acres, or about one-twelfth of the Island, and that about 71 miles of boundary are kept in order. The watchmen being 20 in all, this gives an average charge per man of 577 acres to protect, and 3 miles of boundary to keep in order; exclusive of 2 miles of water frontage requiring patrol by boat. A boat for the purpose was purchased during the year, at a cost of \$140. The average cost of protection at present is about 8 cents per acre protected, but as this amount will be reduced when the boundaries are better established, the probable permanent cost will be about 5 cents an acre.

30. There were five arrests made during the year for illicit timber cutting, and conviction was obtained in every case. The Magistrates inflicted fines on the depredators to the amount of \$104.

Fires and Damage.

31. No fires of any importance have taken place during the year within the Reserves boundaries, but they have raged in the open country. On coming into contact with the cleared boundary line the fire was promptly stopped. In a few cases, the fire followed the boundary for over a mile without being able to cross into the Reserve.

Forest Nurseries.

32. About 80,000 plants have been propagated from seeds in the Forest Nurseries at Bukit Timah and Jurong. The seedlings raised consisted of the following:—
Mahogany, 20,000; Mirabau, 20,000; Eugenia, 10,000; Casuarina, 10,000; Cassia florida, 8,000; Serayah, 7,000; Tembusu, 5,000.

The Jurong Nursery has been enlarged by about one acre.

Experimental Nursery.

33. For detailed information regarding the progress of plants planted in the Experimental Nursery, see Appendix C. Much success has attended the experimental planting, and the Nursery as a whole is considered by visitors the most interesting institution connected with the Forest Department in the Settlement. The area of the Nursery has been increased during the year by about 3 acres.

Herbarium.

34. The whole of the herbarium collection has been mounted on white paper during the year, and arranged into their natural families. About 3,000 have been determined or compared, and a portion of the monocotyledons is now about ready for printing.

Systematic Arrangements.

35. A new garden of herbaceous plants, arranged after the natural system, has been made in the grounds temporarily handed over by the Botanic Gardens; also a palmetum with the palms arranged and named according to Sir J. D. HOOKER'S last Kew Report. Ground has been put in order for the planting of a medicinal garden and an Arboretum, but, owing to the pressure of other work, it was found impossible to complete the planting of them within the year.

Vegetable Nursery.

36. A small Vegetable Nursery has been opened on the top of Bukit Timah, and a larger one on a portion of the Military Reserve, Cluny Road. In these Nurseries, very good lettuces, radishes, tomatoes, turnips, peas, cucumbers, parsley, beetroot, &c. have been grown. The cultivation will be continued during the ensuing year on a scale sufficiently large to afford a bazaar supply, and discontinued as soon as it is seen that Chinese market-gardeners can produce a sufficiency to meet requirements, and with this in view seeds of various vegetables have been distributed among them.

Buildings.

37. The buildings connected with the Department are in good order. Wooden quarters for the herbarium keeper were erected during the year at a cost of about \$126, and the herbarium has been painted. Rent has been paid in country districts for coolie quarters, it having been found more advantageous to rent than build temporary quarters for temporary work.

Interchange of Plants and Seeds.

38. Interchanges of plants and seeds of an economic nature are now made with every part of the world; ornamental plants being in request for the Waterfall Garden in Penang only.

Inspection and Valuation of Land.

30. Forty requisitions for information as to the advisability of leasing forest lands have been received from Government, and dealt with during the year—a work which required much hard travelling and occupied much of my time.

Meteorological Observations.

40. An account of the rainfall has been carefully recorded during the year at Bukit Timah and at Tanglin, the results shew a greater distribution of showers in the vicinity of the hills and Forest Reserves.

Supply of Forest Produce.

41. The Municipal Department has been kept supplied with timber and small wood for the renewal and repair of culverts on country roads. About 500 trees have been supplied within the year.

MALACCA.

42. The work in the early part of the year in Malacca was carried on under the supervision of Mr. JOHN WALKER, Acting Overseer of Forests. On Mr. DERRY'S arrival in September, Mr. WALKER was transferred to Penang.

Demarcation of Reserves.

43. The following statement will show the extent to which demarcation has been pushed during the year:—

Name of Reserve.	Area added or demarcated during the year.	Length of 8-foot boundary path opened during the year.	Total area.	Total length of boundaries now opened and maintained.
	<i>Acres.</i>	<i>Miles.</i>	<i>Acres.</i>	<i>Miles.</i>
Sungei Udang, ...	2,000	8	4,800	15
Ayer Panas, ...	1,900	4½	3,900	4½
Bukit Panchor, ...	2,600	7	3,640	10½
Merlîmau, ...	2,000	6½	6,000	12
Brisu, ...	...	10½	2,247	10½
Bukit Bruang, ...	1,000	6	1,734	8½
Total, ...	9,500	42½	22,321	61

The undemarcated area at Jus amounts to about 29,000 acres, which, when demarcated, will bring up the total area to about one-tenth of the Settlement.

Surveys.

44. The Reserves surveyed during the year were Merlîmau, part of Sungei Udang, and Brisu; the latter by the Government Survey Department, the two former by a special survey under the Forest Department.

Private Rights within Reserves.

45. Several Malay families possessing rights over restricted areas for the removal of fruits and small timbers for domestic purposes reside within the reserved boundary at Ayer Panas, Brisu, and Panchor.

Classification of Reserves.

46. The Forest Reserves in Malacca may be thus classified:—town Reserves—Bukit Bruang and Sungei Udang; timber, village and climatic Reserves—Merlimau, Ayer Panas, Panchor, Brisu, and Jus.

Description of Reserves.

47. The following table shows the nature of the growing stock within the Reserves. It will be observed that the proportion of timber-covered area in Malacca is much larger than in Singapore.

Name of Reserves.	Area under timber.	Area under brushwood and small trees.	Area under grass and fern.	Area planted during the year.	Total area artificially re-stocked.	Remarks.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	
Bukit Bruang, ...	700	1,000	34	1	3	
Sungei Udang, ...	3,000	1,000	800	...	...
Ayer Panas, ...	3,000	900	...	...	...
Bukit Panchor, ...	2,000	1,640	...	...	...
Merlimau, ...	6,000	...	...	...	...
Brisu, ...	1,000	1,247	...	...	...
Total, ...	15,700	5,787	834	1	3	

Planting.

48. But little planting has been done in Malacca, and little is required, except, perhaps, the introduction of Gutta Percha and other trees producing commercial produce other than timber into Reserves occupying positions from which timber transport might be attended with difficulty, and with a view of restoring to the colony its lost commerce in these articles.

Protection and Up-keep of Reserves.

49. A staff of ten watchmen have been at work during the year, the average charge per man being about 2,232 acres. Cost about three cents per acre per annum. Ten arrests for illicit wood-cutting were made, and eight convictions obtained. Fines to the amount of \$147 were imposed and paid.

Nurseries.

50. In the Bukit Bruang Nursery, the following plants have thriven well, notwithstanding the uncongenial soil, viz.:—Mahogany, Cedrela, Furcraea, Bassia, Hevea, Oranges, &c., but native timber trees do best, Tampinis especially, a large number of which was sent to Singapore during the year for plantation in the Reserves there. The Nursery is on the point of being closed, and the stock transferred to a new Nursery at Bukit Sa'Bokor, where the formation of an Experimental Nursery on the same principle as that at Singapore was begun before the year closed. The object of the Nursery is to test the adaptability to the soil of an immense number of foreign economic plants at present little known in Malacca. Compensation for growing crops on land taken up for this Nursery cost \$834.

51. A small Nursery for the propagation of forest trees was opened towards the close of the year within the Sungei Udang Reserve, and in it a number of the seedling Mahogany raised from Kew seed, have been planted, for trial in the waste lands surrounding the Nursery, and to which they will be transferred when sufficiently grown.

PENANG.

Demarcation of Reserves.

52. All the Forest Reserves in Penang may now be looked upon as demarcated. The following statement shows the work of the year and the approximate areas of the Reserves generally, viz. :—

Name of Reserve.	Area added or demarcated during the year.	Length of boundary line opened during the year.	Total areas.	Length of boundary now opened and maintained.	Length of water frontage protected.
	<i>Acres.</i>	<i>Miles.</i>	<i>Acres.</i>	<i>Miles.</i>	<i>Miles.</i>
Boetong, ...	475	6	475	6	...
Ghinting, ...	40	1	40	1	...
Penara, ...	234	4	234	4	...
The Highlands, ...	...	...	227	4	...
Main Range, ...	...	...	3,664	30	...
Laksamana, ...	...	...	1,160	8	...
Feringgy, ...	...	...	225	3	...
North West Reserve, ...	...	...	2,808	3	8
Total, ...	749	11	8,833	59	8

Surveys.

53. No systematic survey of the Reserves has so far been completed, but is being proceeded with under the general survey of the Island now in progress. The boundaries have been opened by a rough survey conducted by the Assistant Superintendent of Forests (Mr. CURTIS), to whom much credit is due for the way in which he has carried the boundaries through exceptionally difficult country.

Private Rights within Reserves.

54. The number of small lots of alienated land lying within the boundaries of the Reserves are wonderfully few, considering the late date at which conservancy measures have been adopted. The paucity of such holdings appears to have arisen from the disinclination of land-purchasers to ascend the mountains; the cultivation at high elevations was consequently found to be chiefly that of squatters without permit or claim.

Classification of Reserves.

55. The Reserves in Penang may be classified thus:—as town Reserves, Boetong, Pulau Jerčjak, and in some measure "The Highlands"; fuel Reserves—N. W. Reserve and Pulau Jerčjak; as protection Reserves, the Hill Reserves generally. These distinctions are not, however, arbitrary in any Settlement. In a working plan all available produce of whatever nature and from whatever locality, would be utilised for the public good.

Description of Reserves.

56. The internal condition of the Reserves with reference to growing stock may, in the absence of a forest survey, be roughly classified according to the following table :—

Name of Reserve.	Area under timber.	Area under brush-wood.	Area under grass and fern.	Area artificially re-stocked.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Boetong, ...	400	55	20	...
Ghinting, ...	40	...	...	...
Penara, ...	100	100	34	...
The Highlands, ...	150	77	...	...
Main Range, ...	2,000	1,600	62	2
Laksamana, ...	600	560	...	...
Feringgy, ...	125	100	...	...
N. W. Reserve, ...	2,000	808	...	...
Total, ...	5,415	3,300	116	2

57. The wooded portion of the Reserves contain timber suitable for most purposes, and, as pointed out in my last year's report, contains a much larger proportion of the better kinds than has generally been known. Investigation into the nature of the trees was continued during the past year, and several new species and one new genus were discovered. The re-wooding of the watershed of the Penang River was ruled to be a Municipal undertaking, and my duty has, therefore, been confined to advising that body.

Protection and Up-keep of Boundaries.

58. The amount disbursed last year on protection of Reserves and up-keep of boundaries was \$561.34, which gives an average of about 8 cents per acre protected.

The Forest guards made three arrests, each case being convicted and fined \$10, which was paid.

Fires and Damage.

59. The Reserves have been free from fires throughout the year.

Nurseries.

60. The Experimental Nurseries in Penang rival those of Singapore in some respect, owing chiefly to the scope which a command of temperature and climate gives them.

It is known that, to obtain the best results from botanic experiments, provision for planting at various elevations must be made, and in Penang these conditions exist, where there are three Nurseries—one on the plain, one at about 1,900 feet, and one at 2,550 feet elevation, respectively. Of the work carried out during the year in the 1,900 feet elevation Nursery, I quote the following from the report of Mr. CURTIS:—

61. "Peaches and other plants have been propagated freely, and experiments are in course of progress in grafting and inarching the cultivated fig on an indigenous species, and which promise to be successful."

"The fruit trees introduced last year from Australia, India and China are for the most part growing vigorously, especially the olives and oranges.

"Two of the apple trees planted in September, 1885, have already borne fruit of excellent quality, as also have the peach trees, which have grown very freely.

"Cardamums planted in a semi-shaded position have grown well. (*Vide Appendix C.*)

62. "His Excellency the Governor having expressed a desire, when last here, that every encouragement should be given to vegetable cultivators, 150 packets of European vegetable seeds easy of cultivation, as proved by a series of sowings in this Nursery, have been distributed to Chinese growers, whose gardens are at an altitude where they cannot fail to command success. Also a number of that admirable West India vegetable (*Sechium edule*) have been propagated and distributed to Chinese market-gardeners. This plant, though some years in the Settlement, has been confined almost exclusively to Penang Hill top, and believed to refuse to grow elsewhere, but its botanical origin having been determined by the Superintendent, this was found to be erroneous. It is hoped that its distribution among the Chinese will be the means of bringing into the bazaars a plentiful supply for the whole community."

63. The Hill Top Nursery includes the grounds which belong to the Government bungalow and convalescent bungalow. Economic plants tried in the Nursery have given less promise of satisfactory growth than elsewhere, which I attribute to exposure and to the scarcity of manure. The sum apportioned for the up-keep of the Nursery is no more than used to be expended on the bungalow grounds before they came under the control of the Department, and is found no more than sufficient for their proper maintenance now, which necessarily gives little scope for alteration or improvement.

Waterfall Nursery Garden.

64. The Waterfall Nursery Garden has become very popular, and now supplies means of recreation and instruction. The garden has an advantage of natural ornament, which few public gardens can boast of. Regarding this garden, Mr. CURTIS writes as follows:—

65. "So far as means would permit, the extension of the Waterfall Garden has been steadily pushed on during the year, and judging by the increased number of visitors, the work is thoroughly appreciated by the general public. A small plant-house has been erected near the entrance. The main road has been reduced to

“proper gradients, and one of the old bridges has been entirely re-constructed. A foot bridge to connect the grounds already laid out with the proposed extension has also been put up.”

66. “Additional flower-beds have been formed and clumps of trees and shrubs planted. The making and turfing of the steep banks which remained unfinished at the close of last year has been completed. A new site for seed sowing has been cleared and stocked. One thousand and seven hundred trees have been supplied during the year for road-side planting in Penang, Province Wellesley and Pêrak. One hundred Eucalyptus were supplied for planting in the vicinity of the Leper Hospital, Pulau Jerëjak, and the rate of growth of the young trees is very satisfactory.”

67. In addition to its general usefulness, the Waterfall Garden acts as the emporium of all plants arriving for Penang and Province Wellesley, and in a great measure for the Native States. In the latter capacity, its utility is only becoming known, and I think it has a future to which the Singapore Gardens cannot aspire.

PROVINCE WELLESLEY.

68. In Province Wellesley, one Reserve only has been established so far, namely at Kubang Ulu, about 8 miles from the coast. The Reserve has an area of 72 acres, and within the boundary is an Experimental Nursery into which a considerable collection of economic plants have been planted during the year for trial, among which were hemp, coffee, patchouly, jalap, oil-plants, sugar-cane, &c.; also numerous forest trees for planting in the Reserve, which included a good stock of Mahogany (raised on the spot from seed received from Kew), Merabau, Cedar, Adenanthrea, Kranji, &c. Several of the sugar-canes have proved new to the Province, and orders have been received from planters for supply. (*Vide Appendix C*)

69. The boundary line of the Reserve has been extended to 10 feet in breadth and thoroughly cleared, in order to prevent the entry of fire from the outer wind-swept country.

The 8,000 trees planted in the Reserve last year have been weeded, and about 12,000 more added to the number. The Dadup cuttings planted in the Reserve for the benefit of pepper planters have been much attacked by white ants, and many eaten off close to the surface of the ground.

GENERAL.

Working Plan.

70. It will be seen from details already supplied, that the Forest Department has now passed its preliminary stages, and that attention to the preparation of a working plan, the conservancy of minor forest produce, and to the development of revenue is now desirable.

In this connection, I would call attention to remarks in Mr. SWETTENHAM'S Report on the collections of Straits timbers sent to the Indian and Colonial Exhibition, and would observe that the specimens sent from the Forest Department were sufficiently large for testing under the common process, but for some unexplained reason the experimenters seem to have confined their attention to *logs* which was, of course, not anticipated, nor was it known that any test experiments were to be made. The specimens were consequently prepared with a view to exhibition only, and shaped so as to shew the grain of the wood in every section.

Steps should now be taken, however, to have as many as possible of the good native timbers properly tested, and when a collection is sent to the Colonial Institute a ticket shewing the test results should be attached to each log or specimen.

Grazing and Fencing.

71. The extent to which grazing can be advantageously practised within the reserve boundaries is not now clear, probably but to a very limited extent. At present grazing leases are issued for the Military Reserve only; which Reserve, from its position near Town and main thoroughfare, requires to be strongly hedged with bamboo or logwood.

Introduction of Plants and Seeds.

72. Two hundred and forty-six kinds of plants and seeds have been introduced during the year, among them being plants of economic value from every part of the

world having a climate similar to the Straits, and have been lodged in the Experimental Nurseries. (*Vide* para. 12.)

Forest Legislation.

73. The preparation of a Forest Ordinance has been for the present postponed, in the belief that, so far, no case has occurred which cannot be dealt with by laws already in force in the colony. I would beg to point out, however, that what gives most trouble is the inveterate habit which most men have of looking upon forest as "every man's" or "no man's" property, hence the temptation to the acts of mischief and trespass complained of. To check such offences it is desirable the public should be quite clear what may not be done in a forest.

73. What is wanted is a simple mode of dealing with petty forest offences. All modern nations recognise the difference between small forest offences and crimes of a graver sort implying criminality of character in the perpetrator, and I hold that it is but fairness to the public and to those who have to administer the Department that clear and simple rules for guidance should be catalogued by law.

Summary.

74. In conclusion, I would briefly summarise the more important works carried out, during the year, as follows:—area demarcated, 16,117 acres; length of boundary line opened, 100 miles; maintained of previous years' demarcation, 95 miles; total length of boundary and coast line now under protection, 254 miles; area protected, 42,708 acres; average per watchman employed, 1,256 acres; cost of protection per acre, 6 cents; area planted, 38 acres; area weeded, 104 acres; cost of planting per acre, \$20; number of plants propagated about 100,000; planted, 65,000; herbarium specimens collected, 3,000; quantity of seed collected, 200 lbs.; number of kinds of seeds received, 250; number of prosecutions, 18; convictions, 16; amount of fines imposed, \$281.

75. The annexed comparative statement shows the progress of the principal works since the commencement of the Department in 1884, exclusive of erection of quarters and purchase of lands.

76. Appendices detailing the progress of economic plants, the distributions of Reserves, the contents of the Experimental Nurseries, and the Revenue and Expenditure of the year, are also annexed.

N. CANTLEY,
Superintendent.

Singapore, 4th July, 1887.

APPENDIX A.

Comparative Statement shewing the Principal Works carried out since the Commencement of the Forest Department in 1884.

YEAR.	SINGAPORE.						MALACCA.						PENANG.						PROVINCE WEL-LESLEY.								
	Contemplated.	Demarcated.	Miles.	Miles.	Surveyed.	Waste Lands planted.	Nurseries made.	Protected.	Acres.	Contemplated.	Demarcated.	Miles.	Miles.	Surveyed.	Waste Lands planted.	Nurseries made.	Protected.	Acres.	Contemplated.	Demarcated.	Miles.	Miles.	Surveyed.	Waste Lands planted.	Nurseries made.	Protected.	Acres.
1884, ...	14,000	1,463	16	...	50	7	1,453	42,000	...	...	...	...	2,000	...	4	...	...	9,000	4,000	30	30	...	...	...	...	3,000	6,000
1885, ...	...	4,223	13	...	55	7	7,299	...	10,000	19	8,865	...	8,865	...	...	13,000	...	...	4,084	18	18	...	...	...	6,000	72	72
1886, ...	...	5,868	47	47	25	4	11,554	...	9,500	42½	11,747	3	22,321	...	6	22,321	...	...	749	11	11	...	...	...	8,833	72	72
Total, ...	14,000	11,554	76	47	130	18	11,554	42,000	19,500	61½	22,612	310	22,321	9,000	8,833	59	222	8,833	8,833	59	59	...	...	...	8,833	6,000	72

APPENDIX B.

REVENUE AND EXPENDITURE OF THE FOREST DEPARTMENT,
STRAITS SETTLEMENTS, 1886.

REVENUE.

				\$
Government Grant, Singapore,	...	...	...	7,000
Do., Penang,	...	...	...	7,000
Do., Malacca,	...	...	...	6,000
				\$20,000

EXPENDITURE.

	SINGAPORE.		PENANG.		MALACCA.	
	\$	c.	\$	c.	\$	c.
Salaries, ...	1,287	87	2,276	72	858	10
Demarcation of Reserves, ...	1,766	21	966	05	734	39
Planting Waste Lands and Weeding, ...	132	79	520	40	20	00
Formation and Up-keep of Nurseries, ...	1,331	20	784	22	306	02
Erection of Quarters, ...	152	50	45	43	...	...
Compensation for Crops, ...	...	...	...	...	834	00
Surveys, ...	230	00	...	...	345	67
Rent of Quarters, ...	10	00	420	00	110	00
Manure and Cartage, ...	139	20	31	56	...	...
Foreign Seeds and Plants purchased, ...	104	55	39	56	...	...
Herbarium Specimens and collecting Seeds, ...	...	...	...	...	400	42
Transport, ...	465	85	447	75	555	84
Botanical Books, ...	...	...	52	63	...	...
Personal and Field Allowances, ...	37	12	400	45	103	00
Uniforms, Tools and Implements, ...	180	00	355	16	220	31
Protection and Up-keep of Boundaries, ...	979	19	561	54	796	00
Miscellaneous and Petty Expenses, ...	183	52	91	99	270	25
Balance, ...	...	...	6	54	446	00
Total, ...	7,000	00	7,000	00	6,000	00

APPENDIX C.

NOTES ON ECONOMIC PLANTS.

The following Notes on Economic Plants are made with a view to the encouragement of minor industries. Sufficient time has not yet elapsed since the establishment of the Experimental Nurseries to obtain complete information, but that given below may be useful in shewing the tendency towards results, in the absence of more complete details.

FIBRES.

MAURITIUS HEMP (*Furcræa gigantea*) continues to grow with great vigour in the Nurseries, and several thousand plants have been disposed of to planters for trial. The price realized for good fibre is about £28 per ton in London, and if the fibre can be prepared here at say 5 cents per pound, its profitable cultivation is no doubt possible.

MANILA HEMP (*Musa textilis*) grows well. When first planted it takes longer to send up suckers than the common Banana does, but once established it grows freely.

In Manila, on good soil, the plantations are renewed only after a period of about 20 years. The present market value of the fibre is from £30 to £40 per ton in London, and as labour is about equally as cheap in the Straits as in Manila, the plant is no doubt capable of profitable cultivation in favourable localities.

*seen a plant
W.M.* SUNN HEMP (*Crotalaria juncea*).—Common in a wild state all over the Settlements, and grows well in ordinary soil. Some attempt to utilize the plant should be made, as the fibre commands a good price in the market.

PENGUIN HEMP (*Bromelia sylvestris*) grows with remarkable vigour. It is one of the pine-apple tribe, but the leaves are much longer than those of the pine-apple plant. It succeeds best under the treatment pine-apples require.

RHEA or CHINA GRASS (*Boehmeria nivea*) grows well in rich moist soils, and now that a simple process for the extraction of the fibre from the wood by steaming has been hit upon, its manufacture, considering the high price obtained for the fibre, is worthy of careful trial, especially on land where sugar cultivation has ceased to be remunerative owing to low prices, and where the ground is not marshy.

PLANTAIN and BANANA FIBRE (*Musa sapientum*).—The common plantain or banana yields a good fibre worth about £15 a ton. I observed when in Sélângor a wild banana which grew there with great luxuriance, in appearance the plant looked very like *Musa textilis* and it is probable it will be found to yield a very good marketable fibre.

From the *Kew Gardens Bulletin* of April last I learn that in Jamaica a red banana produces fibre worth £25 per ton; the plant is probably the same as the red banana of the Straits.

LALANG (*Imperatia Kœnigii*).—Lalang has been found to produce good paper-making material, but as the grass had to be transported to England in bales, only the longest grass containing stout fibrous stems was found to pay. The land that will support grass of such a robust nature, will also grow more valuable crops. The quantity of material available for paper-making in the Straits, including bamboos, pine-apple leaves, wood, &c., would seem to warrant the establishment here of a permanent paper factory.

PINE APPLE FIBRE (*Ananassa sativa*).—In reference to pine-apple fibre, Mr. MORRIS writing in the *Kew Bulletin*, already referred to, observes as follows:—
“Although not much at present in commercial use, the fibre has a future of considerable importance before it. It is finer and stronger than that yielded by any other plant.
“A beautiful fabric known as Piña cloth is made from it. A rope of pine-apple fibre
“ $\frac{3}{4}$ inches in circumference bore a strain of 57 cwt.”

MUDAR FIBRE (*Calotropis gigantea*).—Plants of Mudar have been in demand during the past year. The plant on hand is apparently the white variety, and grows very freely in almost any soil. The downy substance contained in the follicles or seed pods is the part most valued, but the stem also yields a fibre, which is said to be superior to the common *Calotropis* which by branching more is less valuable. The plant also yields a Gutta. The juice of ten average plants is said to yield about a pound of Gutta.

COTTON (*Gossypium arboreum*).—Cotton is found to do well on alluvial deposits on the plains and also on hills up to an elevation of about 2,000 feet as a first crop after the removal of virgin forest, but the soil of the Straits generally is unsuited for the cultivation of Cotton, being too clayey and retentive.

KAPOK (*Eriodendron anfractuosum*).—The cultivation of Kapok is attracting much attention. The plant is of rapid growth and succeeds well on ordinary soils. Its cultivation in the Straits can hardly fail to be profitable under good management.

INDIAN HEMP (*Cannabis sativa*) grows, but shews no hope of profitable production, the fibre being five times shorter than it naturally is when grown in a congenial climate.

OTHER FIBRES.—The following fibre-producing plants are also found to grow well in the Straits:—American aloe, Hibiscus of sorts, Bowstring hemp of sorts, Cus-cus, Palm and Pandan fibres, and numerous plants belonging to the Urticaceæ, Verbenaceæ and Malvaceæ families. Jute has not been tried, the seed requisitioned not having arrived in time, but I have hope of the plant succeeding.

OILS.

CITRONELLA GRASS (*Andropogon nardus*) and LEMON GRASS (*Andropogon citratus*).—The cultivation of these grasses would appear not to receive sufficient attention. Their growth in the Straits is all that can be desired, and the cultivation pays well when properly attended to.

RUSA OIL GRASS (*Andropogon schænanthes*) does not seem to be known in the Straits, and so far I have not been able to procure plants, but that it will succeed here there is but little doubt.

CROTON OIL (*Croton tiglium*).—Among recent introductions, this is by far the most promising. It seems to have found a climate and soil entirely to its liking in the Straits. The plant bears heavy crops of fruit, its cultivation will no doubt prove a profitable investment.

ILLUPI OIL (*Bassia latifolia*).—Plants of this valuable oil tree do not appear to succeed well in Singapore. They are much preyed upon by insects, and although the tree is found in a wild state at no great distance, it has refused so far to grow satisfactorily in this island.

CASTOR OIL (*Ricinus communis*).—Castor oil is now largely used in the manufacture of soap, for machinery and other purposes. In the Straits the plant grows with great vigour, and under proper treatment its cultivation should pay. Some Chinese made an attempt to cultivate the plant in Malacca some years ago. The attempt was a failure in point of profitable return, and no one else seems to have tried it since then. I have strong reason to think, however, that the plant used was an inferior variety, *i. e.*, the variety common in the Straits, the cultivation of which could hardly have been expected to be profitable. The failure has had the effect of discouraging others, but there would seem no good reason to be discouraged so long as the plant has not had a proper trial.

COCOA-NUT OIL (*Cocos nucifera*).—Little need be said of this well-known oil, but it is found that the plant does not yield sufficient crops to pay, when grown more than about half-a-mile from the sea; when grown in the interior of Singapore the crops obtained are said to be only sufficient to cover cost of labour.

OLIVE OIL (*Olea europea*).—The olive plants introduced in 1885 and planted on

Penang Hill are making very satisfactory growth, and I am in hope of its proving well adapted for cultivation on mountains and high lands generally.

BEN OIL TREE (*Moringa pterogysperma*) is everywhere cultivated in the Straits for its leaves and roots, which are used as vegetables, but apparently no attempt has been made to manufacture oil from the tree.

KAYU PUTEH OIL (*Melaleuca leucodendron*).—Whole forests of this tree exist in Malacca, but little attention seems to be given to the manufacture of oil from the plant as is done elsewhere. The tree yields many useful produce, but oil may be looked upon as the most valuable, and it could, no doubt, be extracted from it at a rate which would give a good margin of profit.

GINGELLY OIL (*Sesamum indicum*) grows wild all over the country, and bears abundance of seed from which oil might be profitably extracted. The seed contains 50% of oil, and some three crops a year may be had. The oil is used for soap-making, in perfumery, and to adulterate almond oil, which it much resembles. In India one million acres is said to be under cultivation of Sesamum.

WOOD OIL (*Dipterocarpus spp.*).—At present wood oil in paying quantity is obtained only from primeval forest. I would however suggest that indigenous trees yielding wood oil and gutta percha be planted for pepper supports. The time they will require to make supports will be about seven years, at which date the temporary supports (Dadup or deadwood) could be removed. Acting on this principle, a time would arrive when the supports would become a source of considerable revenue, probably greater than the pepper crop, whereas at present they are generally a source of trouble and expense.

FRUITS.

PEACH (*Amygdalus persica*).—The successful acclimatization of the peach tree in the Straits is a work of the Forest Department which has already borne fruit, and very excellent fruit too; the trees have now borne three crops in succession, which shews that they are in earnest, and it is not too much to hope that, when the tree gets widely distributed among Chinese cultivators, peaches will become a common fruit in the bazaars of the colony.

APPLE (*Pyrus malus*).—Very good apples have been produced by the plants introduced from Sydney. I did not attach much importance to the first crop, as plants with fruiting branches (buds) ripened before their arrival will generally produce a first crop, but that the plants are now producing good fruits from Colonial ripened wood shews that they have adapted themselves to the altered circumstances of climate.

COCOA PLUM (*Chrysobalanus icaco*).—The cocoa plum of the West Indies came into bearing during the year for the first time in the Straits. The plants were received originally from Kew. On being removed from their pots and planted in the open ground they grew with great rapidity, and when about six feet in height came into fruit which they have ripened in fair quantity.

PINE-APPLE (*Ananassa sativa*).—The following pine-apple plants have been collected from various sources and are now growing in the Experimental Nursery, viz.:—Black Jamaica, Cayenne, Queen, Mauritius and New Providence. It is unfortunate that of all those just named the Mauritius, a very inferior kind, is the only one extensively cultivated here; time only will work a change. I would here mention that the profitable introduction of a new product (fruit or vegetable) into a Chinese bazaar is a more difficult thing than most people imagine, the Oriental taste once educated to a certain thing, even though an inferior article, is clung to with a persistence truly remarkable. I would observe further that the pine-apple everywhere known here under the name "Mauritius" is not known in that colony, and that the sugar-cane known in Mauritius under the name of "Penang" is not found here.

LIME BERRIES (*Triphasia trifoliata*).—The fruit of this plant is preserved in Manila and sent to the London market. The plant produces fruit here in great plenty, and will no doubt be found to pay here as well as in Manila.

BREAD NUT (*Brosimum alicastrum*), and BRAZIL-NUT (*Bertholetia excelsa*).—These plants continue to grow with unabated vigour, the first planted are now about twelve feet in height, and I have hopes of their producing useful fruit in the Colony.

ALLIGATOR PEAR (*Persea gratissima*).—This highly esteemed fruit tree is now in bearing in the Nursery. About two years ago when only a small plant it was removed from the Botanic Gardens where its growth had stood stationary for some years, but since being planted in more congenial soil it has grown with great freedom.

DATE PALM (*Phœnix dactylifera*).—Being often asked as to the possibility of dates being grown in the Straits, I may observe that our climate is altogether unsuitable for the cultivation of the plant or any of its varieties, of which there are over a hundred. The date grows well only in hot, dry climates, in localities where its roots can find a sufficiency of moisture. The plant exists in this Colony.

COMMON FIG (*Ficus carica*).—The common fig ripens fruit in the Straits very freely, but is much subject to attack from insects. A few drops of kerosine oil applied to the parts attacked will keep the ants away for about a week when another application becomes necessary. The underground portion of the stem is generally the part attacked first. Fruits which have attained full size but are backward in ripening may be brought to maturity in a few days by the application of a little olive oil to the extremity of the fruit.

NATIVE FRUITS.—It is notorious that the supply of native fruits, such as Durian and Mangosteen, is not sufficient to meet the local demand, and still orchards are not being extended with any great rapidity. So far as I have been able to discover, there seems two causes for this. The first is, that nearly all the land accessible to small cultivators on which fruit trees can be grown *easily* in Singapore and Penang is already under cultivation; and the second appears to be, that the growers in Malacca, where land is available and who are chiefly Malays, are indifferent to money-making further than sufficient for their daily requirements.

The foreign demand for Mangosteen plants has become somewhat excessive since the tree has been found to fruit in East Africa and East and West Indies.

ORANGES.—Every effort has been made to get together as large a collection of orange plants as possible in the hope that at least a few may be found to fruit freely. So far, orange cultivation in the Straits has not been very successful, the plants grow freely enough, but produce but little fruit. Some China oranges planted on the Woodneuk Estate in Singapore produced during the first year a perfect crop of yellow oranges, next year a crop of a greener nature, and the third crop was entirely green. For some years past they have ceased producing edible fruit. How far cultivation may be to blame for these results is not known, but the stock now on hand will shew what can be done to acclimatize and cultivate this favourite fruit.

BEVERAGES.

LIBERIAN COFFEE (*Coffea liberica*) is becoming an established product of the Straits, but its proper cultivation is far from being properly understood. Drainage is too little attended to by some; others by starting the plant in very rich compost change the character of the roots to an extent that unsuits them for penetration of the natural soil. When these errors and some others get corrected, the adaptability of the plant for cultivation here will then shew itself in its true character. Plants of this Coffee are under various treatment in the Experimental Nursery, but it would be premature at present to detail these, I may state however that the plant will not bear manuring in the ordinary way when in fruit, manure should therefore be applied in liquid form, or as top dressing, when given to encourage the welling of the berries. When the soil is disturbed around the plant when in fruit, a large number of the berries wither and die owing to the destruction of rootlets in the manuring process, and which renders the act a loss instead of a gain.

MAROGOGEPIC COFFEE (*Coffea sp.*).—Three plants of the Coffee known as "Marogogepic" and very favourably reported on some little time ago by the Brazilian Minister of Agriculture, were received from Kew during the year and have grown with less vigour than the Liberian kind, but with almost double that of Arabian Coffee (*Coffea arabica*). The leaves are somewhat larger than the Arabian kind, so that the plant seems from its growth to approach an intermediate form between *Coffea liberica* and *Coffea arabica*, and is not as yet affected by the disease. Should it prove as well adapted to our soil as *Coffea liberica* does, keep free from disease, and have a distinct cropping season, it will no doubt supersede all other kinds in the Straits.

ARABIAN COFFEE (*Coffea arabica*).—The Arabian coffee planted in the Nursery Hooks healthy, but grows slowly. Hybridization may probably re-establish it in cultivation.

BENGAL COFFEE (*Coffea bengalense*).—The growth made by Bengal coffee does not look promising, the plants are still small however and may not shew their true character.

CHOCOLATE (*Theobroma cacao*).—Some plants of Chocolate which stood for some years leaf-eaten, extremities of the branches dead, and looking in a dying state had, on the land coming under the control of the Forest Department, a number of Dadup trees planted among them for experiment. The Dadup trees have now grown to about twenty-five feet in height and their branches having nearly met, the solar rays are prevented from striking the Chocolate plants directly.

The result has been that the latter have thrown off their lethargy and started into determined competition for light with the Dadups and have grown remarkably, the insects have given up attacking the leaves, and robust health has returned to them, but on other plantations where the plants have had shade from their infancy they have mostly died.

The Chocolate plant has proved very capricious in the Straits, whole plantation going off without any apparent cause except the attacks of leaf insects, while here and there a solitary plant will for many years survive its fellows and go on bearing heavy crops of fruits. It has been said that animals or plants located in large numbers together are liable to epidemic disease, which looses its grasp only after the individuals are thinned down to health permitting numbers. There is doubtless such a law in nature. What seems required is a knowledge of how far one can safely go without danger of calling its working into activity.

TEA (*Assam hybrid*) grows with a freedom which would seem to insure profitable cultivation, the question is more one of cheap manipulation than of plant growth.

I have lately inspected tea cultivation on some estates in Ceylon, and I see no good reason why its cultivation should not be taken up freely in the Straits on selected soils and made remunerative.

SPICES.

CLOVE (*Caryophyllum aromaticum*).—The Clove trees raised from Singapore grown seed and planted in the Tanglin Nursery look remarkably healthy, both in swampy ground and on the hill sides. They could hardly succeed better anywhere than they are doing.

NUTMEG (*Myristica fragrans*).—Nutmegs planted in the same Nursery look very promising and seem as if prepared to begin another cycle of satisfactory growth in the Settlement. Their successful cultivation seems to depend on what nearly all other crops depend on in the Straits, *i. e.*, liberal manuring.

ALLSPICE (*Pimenta vulgaris*).—A plant of allspice raised from seed some nine years ago is now about twelve feet in height and is for the moment covered with blossom and small fruit.

GINGER (*Zingiber officinale*).—Ginger grows satisfactorily, low prices only prevent its cultivation being freely developed. It is, however, an exhausting crop, soon wearing out the land in which it is planted in the absence of liberal manuring.

CHINESE GINGER (*Zingiber sp.*).—Some plants of this species, which produces the well-known preserved ginger of the shops, were received during the year from the Royal Gardens Kew. It has grown well, but shews no sign of flowering. It is believed to be an entirely new species, but this cannot be determined in the absence of flowers.

PEPPER (*Piper nigrum*).—The cultivation of pepper is being gradually taken up by Europeans. If present prices (\$41 per picul for white) keep up, large areas will soon be placed under pepper cultivation.

CAYENNE PEPPER (*Capsicum annuum*).—No pepper from this plant seems to be made in the Straits, but chillies of all kinds grow freely. The value of chillies is about 45 shillings per hhd. in London.

CHINESE CASSIA (*Cinnamomum cassia*).—The plants of this, introduced from Hongkong in 1884, have grown with remarkable rapidity and are now large pyramidal bushes of 25 feet in height, but the substitution of Ceylon Cinnamon leaves for those of this Cassia will probably put an end to its cultivation, which has never been very profitable.

ROOTS AND CULINARY VEGETABLES.

TAPIOCA (*Fatropa manihot*).—The rise in the price of Tapioca flour has stimulated planting afresh. The estates lately closed are getting into working order again.

Of Tapioca, there are many varieties; so far I have been able to secure the following:—Red and white Brazilian, Singapore, and Mauritius. These are all in cultivation here, and the time they take to mature is about as follows:—Brazilian, nine months; Singapore, fifteen months; and Mauritius, eighteen months.

ARROW-ROOT (*Maranta arundinacea*) grows perfectly in the Experimental Nursery. It is not much cultivated here except by Cottagers for home consumption, but the produce is said to be very superior in quality.

KUMARA (*Ipomœa chrysorrhiza*).—This is a new vegetable received from the Royal Gardens Kew, and has grown with remarkable vigour. The tubers have grown to a fair size at date, but the crop is not yet ripe. I have no doubt that it will realize its high reputation as a vegetable and prove a most beneficial acquisition.

ARRACACHA ESCULENTA.—Native of New Grenada and said to be an excellent vegetable. The plants received from Ceylon have all failed.

Among the more common European vegetables which have been found on trial to grow well are the following, which may be ordered from Europe with every hope of success by those desirous of cultivating them:—

- Radish, early varieties (*Raphanus sativus*).
- Carrot, early varieties (*Daucus carota*).
- Lima Bean (*Phaseolus lunatus*).
- Watercress, of sorts (*Nasturtium officinale*).
- Parsley, of sorts (*Pteroselinum sativum*).
- Tomato, all the varieties (*Lycopersicum esculentum*).
- Beet, Turnip rooted (*Beta vulgaris*).
- Horse Radish (*Cochlearia armoracia*).
- Jerusalem Artichokes (*Helianthus tuberosus*).
- Basella alba (*Basella alba*).
- Lettuce, mixed (*Lactuca sativa*).
- Cho-cho, or Jamaica Cucumber (*Sechium edule*).
- Turnips, American Strop leave (*Brassica rapa*).
- Kohl-Rabi (*Brassica oleracea Caulo-rapa*).

DYES.

INDIGO (*Indigofera tinctoria*).—Not yet under cultivation by Europeans here, but largely cultivated by Chinese. The plant succeeds equally well on hill and swamp.

DIVI-DIVI (*Cæsalpinia coriaria*) is a new product for the Straits. The plant has shewn satisfactory growth. At the late flower show, Mr. ALLEN exhibited some pods from plants grown on his estate and which seemed quite equal to Indian produce. Its cultivation will no doubt be found profitable.

ARNOTTO (*Bixa orallina*) has found apparently a congenial home in the Straits, and grows with all the vigour of its native habitat. It yields abundance of dye which might surely be profitably utilised.

DYERS CASSIA (*Cassia auriculata*).—This plant is quite at home in Singapore soil, and its profitable cultivation is believed to be possible.

OTHER DYES.—Among other unutilised dyes, the growth of which leave nothing to be desired, may be mentioned, *Cæsalpinia sappan*, *Fibraurea tinctoria*, *Henna*, *Phytotacca*, &c.

INDIA-RUBBER, CAUTCHOUC, AND GUMS.

GUTTA PERCHA (*Dichopsis gutta*).—From statistics afforded by plants growing in the Nursery, this plant, the best variety of Gutta Percha tree, seems a moderately fast grower. A plant planted in 1879 is now twenty-five feet in height and twelve inches in circumference at six feet above the ground. This gives an average yearly growth in height of about three and a half feet, and an annual increase in circumference of about one and one-fourth inch.

NATIVE CREEPING GUTTA.—The various Willoughbeias and others from which a very large proportion of East Indian Gutta is drawn, grow with great vigour when planted on cleared land, and where, in the absence of anything to climb upon, they form large bushes in twelve months. Results of growth seem to show that it would be more profitable to plant these than the larger trees requiring some fifteen years to produce a first return.

FOREIGN CREEPING GUTTA.—The Foreign creeping Guttas on hand are the African and Madagascar creepers; these are planted side by side with the native kind, and although they grow freely are far behind the native kinds in rate of growth and general vigour.

Other foreign rubber, such as Para, Ceara and Panama rubbers grow well, but so far as experiments have gone, the produce of latex is very watery and it is doubtful whether they will hold their own against the better native kinds. The other Gums under cultivation are, Gum Tolu, Gum Benzoin, and Gum Arabic, all growing satisfactorily.

DRUGS.

KOLA (*Cola acuminata*) a native of western Africa and acclimatised in our West Indian Colonies, produces a pod which contains several seeds about the size of horse chestnuts, which are used for many purposes by the Negroes, but one of its newest uses is that of an antidote for the effects of alcohol, or cure for inebriety, a nut powdered and taken in a little water is said to at once restore the most intoxicated mind to a state of sobriety. It is also used to heal wounds, as a remedy for indigestion, and a substitute for coffee, &c. The plant grows well in the Straits.

IPECACUANHA (*Cephælis ipecacuanha*), a native of Brazil, and a plant which has been found generally very difficult to cultivate, seems to grow in the Straits with all the luxuriance of its native country when a proper situation is hit upon. It enjoys a very moist still atmosphere and somewhat dense shade. In the Straits it forms a compact little bush of about eighteen inches in height and is very ornamental when well in flower. I lately visited a plantation of the plant in Johor and saw thousands of plants in excellent health. They were protected from the sun by palm leaves laid side by side on artificial supports about 6 feet in height; hedges of the same material were put down a few yards apart. Soil chocolate colour, rich in vegetable matter, wood ashes, &c.

TOBACCO (*Nicotiana tabacum*)—The soil of the Straits is generally not sufficiently rich for the successful cultivation of tobacco, except perhaps as a first crop after the removal of virgin forest, or in specially prepared compost. The plant requires heavy manuring to keep it growing satisfactorily on ordinary ground, as it exhausts the soil so quickly and thoroughly. Where the soil is not congenial, to start with its cultivation can hardly prove remunerative. Seed of the best kinds have however been distributed amongst the planting community.

CAMPHOR (*Camphora officinarum*), or Formosa Camphor, is not of much interest to Straits people so far as its cultivation is concerned, the climate being unsuitable for its proper growth. It nevertheless grows fairly well in Singapore.

SUMATRA CAMPHOR (*Dryobalanops aromatica*), also known as Borneo Camphor, is sparingly found on the Peninsula; and its importance in the afforestation of the Settlements is not overlooked. Private enterprise will hardly ever successfully cultivate the plant, owing to the time which is required to elapse between first outlay and first income.

JALAP (*Ipomæa purga*) } The climate of the Straits is not found suitable
 GENSENG (*Panax genseng*) } for the cultivation of either of these valuable drugs.
 The former sell at 1s. 2d. a pound, the latter at (occasionally) \$400 the ounce.

SIAMESE BENZOIN (*Styrax sp.*).—The cultivation of Siamese Benzoin might pay, as it seems greatly in demand. I frequently receive letters offering long prices for plants or produce. The plant is supposed to be a variety of the common Benzoin (*Styrax benzoin*) but until proper specimens are obtained, this cannot be settled.

CUBEBS (*Piper cubeba*).—Experiments with Cubebs on a small scale seem to shew that the plant prefers a shady moist situation. Plants exposed to the full sun grew much more slowly. The cultivation of Cubeb plants does not receive the amount of attention in the Straits it deserves. The crop pays well, but for the present the monopoly of its cultivation remains in the hands of the Dutch, through apparently no other reason than a want of enterprise on the part of planters on this side of the water. In Johor the plant grows remarkably well, bearing heavy crops of fruit, but details of its cultivation as practised in Java is still a desideratum.

MISCELLANEOUS.

SAGO (*Sagus Rumphiana* and *S. lævis*).—The cultivation of native Sago is deservedly receiving increased attention in the Straits. The trees prefer rich swampy ground and become productive in about six years after planting from seed. When grown on other than swampy land the seed seldom matures. The tree can be increased from seed or from suckers or off-shoots, but when the latter process is adopted a large percentage generally fail to grow.

PATCHOULI (*Pogostemon patchouli*).—Plants of Patchouli have been in demand for experimental planting, and a good number have been supplied. Picked leaves are now selling at \$17 per picul. The plants grow freely with but little care, and should figure among Colonial products. Plants raised from seed are reported to grow well, but to have no scent, but retain it when produced from cuttings. I have not been able to verify these statements, but it is well known that plants do sometimes play tricks of this kind—Sandal-wood frequently.

TONQUIN BEAN (*Dipterix odorata*).—A plant of this, received from Kew some three years ago, has made very fair growth, being now about ten feet in height.

GUINEA CORN (*Sorghum vulgare*).—A quantity of seeds of Guinea Corn was received during the year from His Excellency the Governor. The plant grew well and produced an abundance of fruit, but the seeds were so much attacked by insects when near maturity that it was with difficulty a sufficiency was saved to retain the plant in stock. It is said to succeed well wherever Indian Corn will grow. The plant is of rapid growth and makes excellent fodder.

INDIAN CORN (*Zea mays*).—Indian Corn tried in the Nursery grew with great ease and ripened fine heads of fruit. Why the plant is not more largely cultivated here is difficult to understand. The plant comes to maturity in about sixty days, which admits of numerous crops in a year being reaped under energetic treatment.

TREE TOMATO (*Cyphomandra betacea*) } These two excellent fruits have
MOUNTAIN PAPAYA (*Carica candamarcensis*) } been introduced, but a proper place to plant them has not yet been procured. They would no doubt grow admirably on the Thaeping Range in Pérak at about four thousand feet elevation, or on the Sélângor hills, and be within range of practical use. I hope to obtain permission to plant them there under my personal directions. I had the advantage of seeing both of these fruits growing when lately at Hakgala in Ceylon, and of tasting them, and can testify to their excellence. The fruit of the mountain Papaya had some of the flavour of a peach and a very agreeable odour. Some of the Papaya plants I observed had partly left mother earth and were establishing themselves as sub-epiphytes, growing with but scanty support and fruiting freely in the crevices of stone walls, &c.

DAHL (*Cajanus indicus*) grew and produced fruit freely. Considering the large Indian population in the Straits, the plant might be profitably cultivated.

RICE (*Oxyra sativa*).—The mode of cultivating rice is as varied as the nations who cultivate it. The Malays are good cultivators in their particular way; they take only one crop a year, and which has been ascribed to indolence, but enquiry has led me to the conclusion that this is not the case. What the Malay does is simply this,

he grows a crop of rice during one half of the year, and a crop of manure during the other half. One he harvests, the other he digs into the ground to enrich it for his principal crop, and thus obviates the necessity of purchasing manure.

BAMBOOS (*Bambusa dendrocalmus, gigantochlia, &c.*).—The absence of serviceable Bamboos in Singapore must be a sore point with Indian immigrants. Clumps of Bamboos are common enough near villages, but are protected on account of their being used as a vegetable in a young state, and do not belong to the species used in house building, &c. Attention has been turned to the introduction of more serviceable kinds, and among those procured are the male Bamboo possessing an almost solid stem, the giant Bamboo, Sikkim Bamboo, green and yellow Java Bamboo and several unnamed kinds from Calcutta.

SUGAR CANE.—The new varieties of Sugar Cane which have been planted in the Province Wellesley Experimental Nursery have attracted much attention. Planters have expressed a belief that some promising kinds have never been tried in the Colony. The following descriptive summary of some of them will, therefore, be of interest. The summary is taken from results obtained by Mr. MORRIS in Jamaica:—

Hillu.—Of slender habit; 16 canes in a clump; height 9 feet; length of joint 5 to 6 inches, circumference $3\frac{1}{2}$ inches; leaves heavy; round stem, 4 feet long, 3 inches wide; stands drought well; stools freely; a prolific small black cane suitable for poor soils. Percentage of trash 35; juice 65 (6.0 gals.); density of juice 1.067: Arnaboldi 22.

Seeti.—Of stout habit; 12 to 16 canes in a clump; height 8 feet; colour a greenish yellow when young, white when matured; length of joint 4 inches, circumference 3 inches; foliage very heavy, length 4 feet, breadth 3 inches; stands drought moderately well; a good cane for experimental trial in soft soils. Percentage of trash 30; juice 70 (6.5 gals.); density of juice 1.082: Arnaboldi 28.

Nagapoury.—Of strong vigorous habit; 16 canes to a clump; colour cream white; length of joint 4 inches; circumference 5 inches; foliage heavy; does not stand drought but grows well in fairly moist situations; an excellent cane under irrigation. Percentage of trash 31; juice 69 (6.4 gals.); density of juice 1.065: Arnaboldi 21.

Vulu-Vulu.—Of stout habit; 10 to 12 canes in a clump; height 8 to 10 feet; length of joints 4 inches; colour fine yellow; foliage light; stands drought well; not liable to lodge; free from rust. Percentage of trash 35.75; juice 64.25 (5.9 gals.); density of juice 1.078: Arnaboldi 26.

Liguanea.—Of short stunted habit; number of canes in each clump 10 to 12; height 6 to 8 feet; colour dark purple and black; length of joint $3\frac{1}{2}$ inches, circumference 5 inches; foliage light; length $4\frac{1}{2}$ feet; breadth 3 inches; stands drought very well. Percentage of trash $33\frac{1}{3}$; juice $66\frac{2}{3}$ (6.2 gals.); density of juice 1.076: Arnaboldi 25.

Nain.—Habit strong, with large stools ratooning freely; canes in each clump 35; height 10 feet; colour light brown; length of joint 5 inches, circumference 5 inches; foliage of a fine texture and dark green, leaves short and broad. This cane stands drought well; a clean healthy cane of very vigorous habit. Percentage of trash 34; juice 66 (6.1 gals.); density of juice 1.066: Arnaboldi 23.

Lahina.—Of rather delicate habit at first, but afterwards a strong fine cane; canes in each stool 18; height 9-11 feet; colour yellow; length of joint 5 inches, circumference $5\frac{1}{2}$ inches; foliage pale green and moderately light. This cane does not stand drought well and is liable to get lodged. A bright free growing cane under irrigation, very much like the best type of Bourbon canes. Percentage of trash $37\frac{1}{2}$; juice $62\frac{1}{2}$ (5.8 gals.); density of juice 1.076: Arnaboldi 25 (Beaumé 10.).

Keni-Keni.—Of slender habit; 12-15 canes in a clump; 8-10 feet high; length of joints 5 inches, circumference 4 inches; colour white; leaves green, 4 feet 6 inches long, $2\frac{1}{2}$ inches broad; fine healthy cane suitable for seasonable districts; does not stand drought well. Percentage of trash 33; juice 67 (6.2 gals.); density of juice 1.080: Arnaboldi 26.

China.—Very similar in habit, size and characteristics to last. Percentage of trash 35; juice 65 (6.0 gals.); density of juice 1.066: Arnaboldi 22.

Po-a-ole.—This would appear to be identical with the Mauritius cane No. 96 already distilled and tested in 1880. "A stout black cane of fine habit and growth; leaves rather heavy; stands drought well; rind rather hard; not subject to lodge; makes a good grain of sugar and yields at the rate of $2\frac{1}{3}$ hhds. per acre."

Ko-poapa.—Of strong rapid growth; 18 canes in a clump; about 11 feet high; length of joints 4 inches, circumference 5 inches; colour white; leaves moderately heavy, 5 feet long, $2\frac{1}{2}$ inches broad; stands drought well; not liable to get lodged; a fine white cane, one of the best in the collection for dry districts; always healthy and throwing good large stools. Percentage of trash 28; juice 72 (6.4 gals.); density of juice 1.063: Arnaboldi 21 (Beaumé 8.2-5.)

Lakona.—Of upright and somewhat slender habit; about 12 feet high; length of joint 6 inches, circumference 4 inches; colour white; leaves dark green; 5 feet long, 3 inches broad; healthy, vigorous cane and free from rust. Percentage of trash $30\frac{1}{2}$; juice $69\frac{1}{2}$ (6.4 gals.); density of juice 1.074: Arnaboldi 24 (Beaumé 9.4-5.)

Vituahaula.—Strong, vigorous habit; 30 canes in a clump; about 11 feet high; length of joints 3 inches, circumference 4 inches; colour pale when young, growing into a light purple; leaves dark green $4\frac{1}{2}$ feet long, 3 inches broad; somewhat liable to lodge; free from rust. Percentage of trash 25; juice 76 (7.0 gals.); density of juice 1.055: Arnaboldi 18 (Beaumé $7\frac{1}{3}$.)

Sacuri.—Of strong habit and very rapid growth; 20 canes in a clump; average height 11 feet; length of joints 6 inches, circumference 5 inches; leaves somewhat heavy, 5 feet long, 3 inches broad; likely to lodge; free from rust. Percentage of trash 25; juice 75 (7.9 gals.); density of juice 1.076: Arnaboldi 25 (Beaumé 10.)

Cubun.—Habit light; 12 canes in each clump; height 10 feet; joints long and straight; leaves light green, 5 feet long, $2\frac{1}{2}$ inches broad; suitable for moist districts only; a clean healthy cane resembling the Bourbon. Percentage of trash $33\frac{1}{3}$; juice $66\frac{2}{3}$ (6.2 gals.); density of juice 1.074: Arnaboldi 24 (Beaumé 9.4-5.)

Horne.—Habit strong; 20-25 canes in each clump; height 10 feet; colour pale with purple and violet stripes; length of joint $4\frac{1}{2}$ inches, circumference 5 inches; leaves heavy, 5 feet long, 3 inches broad; stands drought well and not liable to get lodged. Percentage of trash $24\frac{1}{4}$; juice $65\frac{3}{4}$ (6.1 gals.); density of juice 1.076: Arnaboldi 25 (Beaumé 10.)

Samuri.—Of slender habit; 16 canes in each clump; average height 8 feet; colour black with pale purplish stripes; length of joints $2\frac{1}{2}$ inches, circumference 4 inches; leaves light, 5 feet long, $2\frac{1}{2}$ inches broad, rather hard rind; stands drought well. Percentage of trash 40; juice 60 (5.5 gals.); density of juice 1.079: Arnaboldi 26 (Beaumé $10\frac{1}{2}$.)

Brèhèret.—Of strong habit; 14 canes in each clump; height 8 feet; colour black; length of joints $2\frac{1}{2}$ inches, circumference 5 inches; foliage light, 4 feet long, $2\frac{1}{2}$ inches broad. The joints of this cane are strikingly short and heavy; it stands drought well and would be very suitable for dry districts. Percentage of trash $33\frac{1}{2}$; juice $66\frac{2}{3}$ (6.2 gals.); density of juice 1.079: Arnaboldi 26 (Beaumé $10\frac{1}{2}$.)

Mamuri.—Of strong habit and rapid growth; 30 to 40 canes in each clump; height 10-12 feet; colour light brown with the outer epidermal layer dry and chaffy; length of joints 4 inches, circumference $3\frac{1}{2}$ inches; foliage light; leaves 4 feet long, 3 inches broad; a clean healthy but somewhat peculiar looking cane; stands drought well. Percentage of trash 34; juice 66 (6.1 gals.); density of juice 1.084: Arnaboldi 28 (Beaumé 11.1-5.)

In favourable localities the Elephant cane, where it has been tried, throws immense canes looking almost like clumps of bamboos: the yield per acre has not, however been quite equal to the show of the canes, but it has yielded at the rate of two, or two and-a-half tons of sugar per acre, which is far beyond the average of ordinary canes in Jamaica."

The following have not yet been tested:—

Vico,	Meligeli,	Kokeia,
Kamba Vati,	Lahria,	Mozambique,
Chyaca,	Vagabonde,	Samoa,
Canne Morte,	Dark red striped cane,	Claret coloured cane,
Diard,	Loma Loma,	Loa,
Dama,	Nova Java,	Green and yellow,
Tamarind,	Large green,	Karaka Rawa.
Dayanboota,	Meera,	
Samoan,	Ila,	

LIST OF THE PRINCIPAL ECONOMIC
PLANTS CONTAINED IN THE FOREST EXPERIMENTAL
NURSERIES.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
<i>Abrus precatorius</i> , ...	Crabs' eyes,	E. Indies.
<i>Abutilon indica</i> , ...	Chinese lantern,	Do.
<i>Acacia arabica</i> , ...	Gum Babool,	Arabia.
<i>Acacia Catechu</i> , ...	Cutch,	E. Indies.
<i>Acacia decurrens</i> , ...	Black Wattle,	Australia.
<i>Acacia Farnesiana</i> , ...	Cassia,	S. America.
<i>Achros sapota</i> , ...	Chicko or Bullet Wood,	Trop. America.
<i>Acrocomia sclerocarpa</i> , ...	Gru-gru Palm,	W. Indies.
<i>Adansonia digitata</i> , ...	Boabab,	Africa.
<i>Adenanthera pavonina</i> , ...	Circassian Bean,	E. Indies.
<i>Ægle marmelos</i> , ...	Bael Fruit,	Do.
<i>Æschynomene aspera</i> , ...	Shola,	India.
<i>Azelia plembanica</i> , ...	Merabou,	Malaya.
<i>Azelia</i> sp., ...		British Guiana.
<i>Agati grandiflora</i> , ...	Trong Merah,	India.
<i>Agati grandiflora alba</i> , ...	Trong Puteh,	Do.
<i>Agave mexicana</i> , ...	Mexican Aloe,	S. America.
<i>Agave americana</i> , ...	American Aloe,	Do.
<i>Alternanthera sessilis</i> , ...	Kruma,	Asia.
<i>Albizzia procera</i> , ...	Safed Siris,	E. Indies.
<i>Albizzia stipulata</i> , ...	Bummaizale,	Do.
<i>Albizzia Lebbek</i> , ...	Bois Noir,	Travancore.
<i>Aleurites triloba</i> , ...	Otaheite Walnut,	Polynesia.
<i>Aleurites vernicifera</i> , ...	Chinese Varnish Tree	China.
<i>Aleurites</i> sp., ...		Cochin China.
<i>Alpinia galanga</i> , ...	Galangal,	E. Indies.
<i>Allium cepa</i> , ...	Onion,	Africa.
<i>Allium porrum</i> , ...	Leek,	Switzerland.
<i>Allium ascalonicum</i> , ...	Bawang,	Palestine.
Do. do. var.	Bawang Kechil,	Do.
Do. do. var.	Bawang Merah,	Do.
Do. schænoprasum, ...	Chives,	Britain.
<i>Alocasia indica</i> , ...	Taro,	India.
<i>Amaranthus spinosus</i> , ...	Bayam Durie,	Do.
Do. gangeticus,	Bayam,	Do.
Do. tristis,	Bayam Pasir,	Do.
<i>Amygdalus persica</i> , ...	Peach,	Asia.
<i>Anacardium occidentale</i> ,	Cashew Nut,	W. Indies.
<i>Ananassa sativa</i> , ...	Pine-apple,	Do.
Do. var. ...	Mauritius Pine,	Tropics.
Do. do., ...	Black Jamaica Pine,	Do.
Do. do., ...	Hen and Chicken Pine,	Do.
Do. do., ...	Queen Pine,	Do.
Do. do., ...	New Providence Pine,	India.
Do. do., ...	Smothe Cayenne Pine,	Do.
<i>Ancilema nudiflorum</i> , ...	Tapak Etek,	Asia.
<i>Andropogon nardus</i> , ...	Citronella-oil Grass,	India.
<i>Andropogon citratus</i> , ...	Lemon Grass,	Central India.
<i>Andropogon muricatus</i> ,	Cus Cus,	India.
<i>Anamirta paniculata</i> , ...	Cocculus,	E. India.
<i>Anethum foeniculum</i> , ...	Fennel,	England.
<i>Anethum graveolens</i> , ...	Dill,	Spain.
<i>Anona reticulata</i> , ...	Custard-apple,	W. Indies.
<i>Anona cherimolia</i> , ...	Cherimoyer,	S. America.
<i>Anona muricata</i> , ...	Sour-sop,	Trop. America.
<i>Anona squamosa</i> , ...	Sweet-sop,	Do.
<i>Anona montana</i> , ...	Mountain Custard-apple,	
<i>Anisogonium esculentum</i> ,		Malaya.
<i>Anthriscus cerefolium</i> , ...	Chervil,	Europe.
<i>Antiaris toxicaria</i> , ...	Upas,	Malaya.
<i>Apium graveolens</i> ...	Celery,	Britain.
<i>Areca monostachya</i> , ...	Walking-stick Palm,	N. S. Wales.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
Areca Catechu, ...	Areca-nut, ...	Ceylon.
Areca nebong, ...	Nibong, ...	Malaya.
Areca oleracea, ...	Mountain Cabbage Palm, ...	Trop. America.
Arachis hypogaea, ...	Earth-nut, ...	E. W. Tropics.
Araucaria Bidwellii, ...	Bunya Bunya, ...	Australia.
Arenga saccharifera, ...	Sugar Palm, ...	Malaya.
Artocarpus incisa, ...	Bread Fruit, ...	Malacca.
Artocarpus integrifolia, ...	Jack Fruit, ...	E. Indies.
Artocarpus echinatus, ...	Monkey Jack, ...	Malaya.
Artocarpus Blumeii, ...	Gutta Tarrap, ...	Malaya.
Artocarpus polyphemia, ...	Tampang, ...	Malaya.
Artocarpus sp., ...	Kledang, ...	Malaya.
Asclepias curassavica, ...	Bastard Ipecacuanha, ...	W. Indies.
Asparagus officinalis, ...	Asparagus, ...	Europe.
Averrhoa bilimbi, ...	Blimbing, ...	India.
Averrhoa carmbola, ...	Carambolla, ...	India.
Azaderachta indica, ...	Nem, ...	E. Indies.
Aberia Caffra, ...	Kei Apple, ...	Cape of Good Hope.
Artanthe elongata, ...	Matico, ...	India.
Aloe Perryii, ...	Socotrine Aloe Tree, ...	Socotra.
Arduina grandiflora, ...	Natal Plum, ...	Natal.
Bambusa nana, ...	Hedge Bamboo, ...	China.
Bambusa arundinacea, ...	...	E. Indies.
Bambusa verticillata, ...	...	China.
Bambusa vulgaris, ...	Common Bamboo, ...	E. Indies.
Bambusa vulgaris var aurea, ...	Yellow Bamboo, ...	E. Indies.
Bambusa vulgaris var striata, ...	Striped Bamboo, ...	E. Indies.
Barbarea præcox, ...	American Cress, ...	England.
Barringtonii speciosa, ...	Bois de jolie cœur, ...	Seychelles, &c.
Bassia butryacea, ...	Butter Tree, ...	India.
Bassia latifolia, ...	Mahwa, ...	E. Indies.
Basella alba, ...	Indian Spinach, ...	Bengal.
Berrya amonilla, ...	Trincomalee-wood, ...	N. Australia.
Beesha travancorinsis, ...	...	Travancore.
Do. Rheedii, ...	Quill Reed, ...	Do.
Beta vulgaris, ...	Beetroot, ...	S. Europe.
Bixa orellana, ...	Arnatto, ...	Trop. America.
Boehmeria nivea, ...	Rhea or China Grass, ...	China.
Borago officinalis, ...	Borage, ...	England.
Boxus sempervirens, ...	Box Wood, ...	Europe.
Brassica actinophylla, ...	Umbrella Tree, ...	Australia.
Brassica oleracea acephala, ...	Borecole or Kale, ...	Europe.
Do. do. Caulo-rapa, ...	Kohl-Rabi, ...	Do.
Brassica napa, ...	Turnip, ...	Britain.
Bromelia Pinguin, ...	Pinguin Fibre, ...	W. Indies.
Brosimum alicastrum, ...	Bread-nut Tree, ...	Jamaica.
Butea frondosa, ...	Bengal Kino, ...	Bengal.
Bertholletia excelsa, ...	Brazil-nut, ...	Brazil.
Bombax malabaricum, ...	Malabar Silk Cotton Tree, ...	E. Indies.
Blighia sapida, ...	Akee Apple, ...	W. C. Africa.
Caesalpinia ferrea, ...	Brazilian Iron Wood, ...	Brazil.
Caesalpinia coriaria, ...	Divi-Divi, ...	E. Indies.
Caesalpinia Nuga, ...	...	China.
Caesalpinia sappan, ...	Sappan-wood, ...	E. Indies.
Caesalpinia sepiaria, ...	Mysore Thorn, ...	E. Indies.
Cajanus indicus, ...	Kachang Dahl, ...	E. Indies.
Calophyllum inophyllum, ...	Poon Spar, ...	E. Indies.
Calamus Rotang, ...	Rotang, ...	Malaya.
Calamus arborescens, ...	Rotang, ...	Malaya.
Calamus fasciculatus, ...	Rotang, ...	Malaya.
Calamus longipes, ...	Rotang, ...	Malaya.
Calodendron Capense, ...	Natal Wild Chestnut, ...	Natal.
Cosciniun fenestratum, ...	False Calubra, ...	Malacca.
Chloranthus inconspicuus, ...	...	China.
Calamsogus hernifolius, ...	Rotang, ...	Malaya.
Calamsogus Wallichifolius, ...	Rotang, ...	Malaya.
Caotropsis gigantea, ...	French Cotton, ...	E. Indies.
Calocasia esculenta, ...	Kjadi Klamomo, ...	Do.
Do. do., var., ...	Kladi China, ...	Do.
Cajanus indicus, ...	Pigeon Pea, ...	Do.
Canavalia villosa, ...	Do., ...	Do.
Do. gladiata, ...	Kachang Parang, ...	India.
Cannabis sativa, ...	Hemp, ...	Do.
Cannabis gigantea, ...	...	Do.
Canna Indica, ...	Indian Shot, ...	China.
Cananga odorata, ...	Kananga, ...	W. Indies.
Carica papaya, ...	Papaya, ...	Columbia.
Carica Candamarcensis, ...	Mountain Papaya, ...	E. Indies.
Carypha flabelliformis, ...	Lantor, ...	E. Indies.
Carissa Carandas, ...	Karaundas, ...	Moluccas.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
<i>Caryophyllum aromaticum</i> , ...	Clove, ...	Panama.
<i>Carludovica palmata</i> , ...	Panama Hat Palm, ...	India and Ceylon.
<i>Caryota urens</i> , ...	Jaggery Palm, ...	E. Indies.
<i>Cassia auriculata</i> , ...	Dyers Cassia, ...	E. Indies.
<i>Cassia fistula</i> , ...	Purging Cassia, ...	E. Indies.
<i>Cassia florida</i> , ...	Waa Tree, ...	E. & W. Indies.
<i>Cassia occidentalis</i> , ...	Payavera, ...	E. Indies.
<i>Cassia grandis</i>, ...	...	India.
<i>Cassia alata</i> , ...	Ringworm Shrub, ...	Malaya.
<i>Castenopsis</i> sp., ...	Brangan or Native Chestnut, ...	Malaya.
<i>Casuarina equisetifolia</i> , ...	Beef-wood, ...	E. Indies.
<i>Casuarina sumatrana</i> , ...	Sumatra Beef-wood, ...	Panama.
<i>Castelloa elastica</i> , ...	Panama Rubber, ...	Moreton Bay.
<i>Castanospermum australe</i> , ...	Moreton Bay Chestnut, ...	Sumatra.
<i>Ceratonia Siliqua</i> , ...	Carob Bean, ...	S. Europe.
<i>Ceratopteris thalictroides</i> , ...	Rawan Rawan, ...	Malaya.
<i>Cerus triangularis</i> , ...	God Ochro, ...	...
<i>Cedrela toona</i> , ...	Toon, ...	E. Indies.
<i>Cedrela odorata</i> , ...	West India Cedar, ...	W. Indies.
<i>Ceropegia bulbosa</i>, ...	...	...
<i>Cephaelis ipecacuanha</i> , ...	Ipecacuanha, ...	Brazil.
<i>Cerasus vulgaris</i> , ...	Cherry, ...	Barbadoes.
<i>Cinchona saccirubra</i> , ...	Chinchona, ...	S. America.
<i>Cinnamomum Cassia</i> , ...	Cassia Buds, ...	China.
<i>Cinnamomum Zeylanicum</i> , ...	Cinnamon, ...	Ceylon.
<i>Cinnamomum iners</i> , ...	Wild Cinnamon, ...	Malaya.
<i>Cinnamomum camphora</i> , ...	Camphor, ...	E. Asia.
<i>Cichorium Endivia</i> , ...	Endive, ...	E. Indies.
<i>Cicer arietinum</i> , ...	Gram, ...	India.
<i>Cicca disticha</i> , ...	Cambling, ...	India.
<i>Citrullus vulgaris</i> , ...	Water Melon, ...	...
<i>Citrus Aurantium</i> , ...	Sweet Orange, ...	India.
<i>Citrus aurantium</i> var <i>Bergamia</i> , ...	Bergamot Orange, ...	India.
Do. do. var <i>Bigaradia</i> , ...	Bitter or Seville Orange, ...	India.
Do. do. var <i>melitense</i> , ...	Blood Orange, ...	...
Do. <i>decumana</i> , ...	Shaddock, ...	India and China.
Do. <i>Limetta</i> , ...	Sweet Lime, ...	India and China.
Do. <i>Limonum</i> , ...	Lemon, ...	India and China.
Do. <i>medica</i> , ...	Citron, ...	Persia.
Do. <i>nobilis</i> var <i>Tangerina</i> , ...	Tangerine Orange, ...	N. Africa.
Do. do. var <i>major</i> , ...	Mandarin Orange, ...	China.
<i>Cissampelos Pareira</i> , ...	Brava, ...	Jamaica.
<i>Chavica betel</i> , ...	Betel Pepper, ...	Java.
<i>Chloroxylon swietenia</i> , ...	Satin Wood, ...	Ceylon.
<i>Chlorophora tinctoria</i> , ...	Dindie, ...	B. Columbia.
<i>Chilocarpus</i> sp., ...	Gutta sp. ...	Perak.
<i>Chrysophyllum Cainito</i> , ...	Star Apple, ...	W. Indies.
<i>Chrysobolanus Icaco</i> , ...	Cocoa Plum, ...	Trop. America.
<i>Cleome viscosa</i> , ...	Mamum Kéchil, ...	E. Indies.
<i>Cookia punctata</i> , ...	Wampee, ...	China.
<i>Cochlearia Armoracia</i> , ...	Horse Raddish, ...	England.
<i>Coffea Bengalense</i> , ...	Bengal Coffee, ...	Bengal.
<i>Coffea arabica</i> , ...	Arabia Coffee, ...	Arabia.
<i>Coffea</i> sp., ...	Marogogipe Coffee ...	Mexico.
<i>Coffea liberica</i> , ...	Liberian Coffee, ...	W. Africa.
<i>Cocos nucifera</i> , ...	Cocoa-nut, ...	Tropics.
<i>Cocos nucifera</i> var, ...	Kalapa Gading, ...	Do.
Do. do., ...	Do. Pooyoh, ...	Do.
Do. do., ...	Do. Dadeh, ...	Do.
Do. do., ...	Do. Sapang, ...	Do.
Do. do., ...	Do. Logee, ...	Do.
Do. do., ...	Do. Hijau, ...	Do.
Do. do., ...	Do. Tandok, ...	Do.
Do. do., ...	Do. Kapal, ...	Do.
Do. do., ...	Do. Manis, ...	Do.
Do. do., ...	Do. Chin Chin, ...	Do.
Do. do., ...	Do. Pooyoh Panjang, ...	Do.
Do. do., ...	Do. Wangi, ...	Do.
Do. do., ...	Do. Laut, ...	Do.
<i>Coleus parviflorus</i> , ...	Ubie, ...	Java.
<i>Coix Lachrynea</i> , ...	Job's Tears, ...	Tropics.
<i>Cola acuminata</i> , ...	Kola-nut, ...	Africa.
<i>Coccoloba uvifera</i> , ...	Sea-side Grape, ...	W. Indies.
<i>Convolvulus repens</i> , ...	Kangkong, ...	China.
<i>Crotolaria juncea</i> , ...	Sun Hemp, ...	Asia.
<i>Crescentia cujete</i> , ...	Calabash, ...	W. Indies.
<i>Croton eluteria</i> , ...	Cascarilla Bark, ...	Bahamas.
<i>Croton tiglium</i> , ...	Croton-oil Tree, ...	E. Indies.
<i>Cucumis sativus flavus</i> , ...	Loba Ayer, ...	Moluccas.
<i>Curcuma zedoaria</i> , ...	Zedoary, ...	Java.
<i>Curcuma longa</i> , ...	Turmeric, ...	India.
<i>Cucurbita pepo</i> and vars, ...	Kaundon, ...	Moluccas.
<i>Cucurbita moschata</i> , ...	Kitula (Pumpkin), ...	Moluccas.
<i>Cyphomandra betacca</i> , ...	Tree Tomato, ...	Peru.
<i>Cycas revoluta</i> , ...	Sago, ...	Japan.
<i>Cycas circinalis</i>, ...	...	Malaya.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
<i>Cycas rumphiana</i>, ...	...	Australia.
<i>Cycas media</i>, ...	...	E. Australia.
<i>Cynara scolymus</i> , ...	Artichoke, ...	S. Europe.
<i>Cynometra cauliflora</i> , ...	Nam Nam, ...	E. Indies.
<i>Dalbergia sissoo</i> , ...	Sissu, ...	E. Indies.
Do. <i>frondosa</i> , ...	Black Wood, ...	E. Indies.
<i>Dammara robusta</i> , ...	Kauri Pine of Queensland, ...	Queensland.
Do. <i>orientalis</i> , ...	Dammara, ...	Malaya.
<i>Datarium senegalense</i> , ...	Senegal Plum, ...	Senegal.
<i>Datura stramonium</i> , ...	Thorn Apple, ...	Trop. America.
<i>Daucus carota</i> , ...	Carrot, ...	Britain.
<i>Derris elliptica</i> , ...	Tuba, ...	Malaya.
<i>Dendrocalamus strictus</i> , ...	Male Bamboo, ...	E. Indies.
Do. <i>spinosus</i> , ...	Prickly Bamboo, ...	E. Indies.
Do. <i>tulda</i>, ...	...	Bengal.
Do. <i>sp. sikkim</i>, ...	...	E. Indies.
<i>Dialium indicum</i> , ...	Kranji, ...	Malaya.
<i>Dichopsis gutta</i> , ...	Gutta Percha, ...	Malaya.
<i>Diospyros discolor</i> , ...	Mabola, ...	Malaya.
Do. <i>ebenum</i> , ...	Ebony, ...	Ceylon.
<i>Dioscorea batatis</i> , ...	Sweet Potato, ...	E. Indies.
Do. <i>bulbosa</i>, ...	...	E. Indies.
Do. <i>bulbifera</i>, ...	...	India.
<i>Dipterocarpus laevis</i> , ...	Kayu Minyak, ...	Malaya.
<i>Dipterix odorata</i> , ...	Tonquin Bean, ...	Cayenne.
<i>Doona trapeziformis</i> , ...	Doon, ...	Ceylon.
<i>Dolichos tetragonolobus</i> , ...	Kashing Boty, ...	India.
<i>Doryanthes Palmeri</i> , ...	Palm Lily, ...	Queensland.
<i>Dolichos sesquipedalis</i> , ...	Kachang Prot Ayam, ...	India.
<i>Dryobalanopsis aromatica</i> , ...	Borneo Camphor, ...	Borneo.
<i>Dolichos sesquipedalis</i> var, ...	Kachang Prot Ayam Panjang, ...	India.
<i>Durio Zebethiuns</i> , ...	Durian, ...	Malaya.
<i>Dyera costulata</i> , ...	Gutta Jelutong, ...	Malaya.
<i>Dorstenia Contrayerva</i> ...	Contrayerva Root, ...	Trop. America.
<i>Dracæn Draco</i> , ...	Dragons Blood, ...	...
<i>Davidsonia pruriens</i> , ...	Queensland Plum, ...	Queensland.
<i>Elaeocarpus serratus</i>, ...	...	Australia.
<i>Elaeis giuneensis</i> , ...	African Oil Palm ...	Africa.
<i>Elettaria cardamomum minor</i> , ...	Cardamum, ...	Malabar.
<i>Erythrina corallodendron</i> ...	Coral Bean Tree, ...	W. Indies.
<i>Erythrina umbrosa</i> , ...	Bois Immortelle, ...	W. Indies.
<i>Erythroxyton Coca</i> , ...	Coca Leaf, ...	W. Indies.
<i>Eriobotrya Japonica</i> , ...	Loquat, ...	Japan.
Do. Do., improved, ...	...	Do.
<i>Eriodendron anfractuosum</i> , ...	Silk Cotton Tree or Kapok, ...	Trop America.
<i>Epipremnum mirabile</i> , ...	Tongá, ...	Fiji, Malaya.
<i>Eucalyptus Baileyana</i>, ...	...	Australia.
Do. <i>corymbosa</i> , ...	Blood Tree, ...	Queensland.
Do. <i>pilularis</i> , ...	Black Butt, ...	N. S. Wales.
Do. <i>Planehowiana</i>, ...	...	Australia.
Do. <i>fibrosa</i> , ...	Stringy Bark, ...	N. S. Wales.
Do. <i>rostrata</i> , ...	Red Gum of South Australia, ...	S. Australia.
Do. <i>resinifera</i> , ...	Red Mahogany, ...	N. S. Wales.
Do. <i>obliqua</i> , ...	Stringy Bark, ...	N. S. Wales.
Do. <i>piperata</i> , var <i>eugeneoides</i> , ...	Stringy Bark, ...	N. S. Wales.
Do. <i>coriacea</i> , ...	White Gum, ...	N. S. Wales.
Do. <i>tereticornis</i> , ...	Bastard Box, ...	N. S. Wales.
Do. <i>amygdalina</i> , ...	Peppermint Tree, ...	Tasmania.
Do. <i>homostoura</i> , ...	Spotted Gum, ...	Queensland.
Do. <i>siderophlora</i> , ...	Iron Bark of N. S. Wales, ...	N. S. Wales.
Do. <i>citradorea</i> , ...	Spotted Gum, ...	Queensland.
Do. <i>fasiculata</i> , ...	Iron Bark, ...	N. S. Wales.
<i>Eugeissonia triste</i> , ...	Bertam, ...	Malaya.
<i>Eugenia brasiliensis</i> , ...	Brazil Cherry, ...	Brazil.
<i>Eugenia magnifica</i> , ...	New Caledonian Apple, ...	N. Caledonia.
<i>Eupatorium Ayapana</i> , ...	Ayapanah, ...	E. Indies.
<i>Euterpe edulis</i> , ...	Maurcole, ...	Brazil.
<i>Exostemma caribacum</i> , ...	West Indian Bark ...	Jamaica.
<i>Fagraea peregrina</i> , ...	Tembusu, ...	Malaya.
<i>Fibraurea tinctoria</i> ...	Dye-root, ...	Malaya.
<i>Ficus religiosa</i> , ...	Peepul Tree, ...	E. India.
<i>Ficus Carica</i> , ...	Fig, ...	S. Europe.
<i>Flacourtia Sepiaria</i> , ...	Rukum, ...	Tropics.
Do. Rukum, ...	Do., ...	Do.
<i>Furcraea gigantea</i> , ...	Mauritius Hemp, ...	S. America.
<i>Fatsia papyrifera</i> , ...	Rice-paper Plant, ...	China.
<i>Garcinia Livingstonii</i> , ...	African Mangosteen, ...	Africa.
Do. <i>Xanthochymus</i> ...	...	Malaya.
Do. <i>Sp.</i> ...	Siam Gamboge, ...	Siam.
Do. <i>Gambogea</i> , ...	Gamboge, ...	India.
Do. <i>Morella</i> , ...	Ceylon Gamboge, ...	Ceylon.
Do. <i>Mangostana</i> , ...	Mangosteen, ...	Malaya.
<i>Gendarussa vulgaris</i> , ...	Gendarussa, ...	Malaya.
<i>Gigantochloa Aspera</i> , ...	Bitong, ...	China.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
Gmelina arborea, ...	...	E. Indies.
Do. asiatica, ...	...	Do.
Gluta velutina, ...	Rûngas, ...	Malaya.
Gnetum Gnemon, ...	...	Malaya.
Grevillea robusta, ...	Silky Oak, ...	Moreton Bay.
Grias cauliflora, ...	Anchovy Pear, ...	Jamaica.
Gossypium arboreum, ...	Tree Cotton, ...	S. America.
Do. flaviflorum, ...	...	...
Guaiacum officinale, ...	Lignum Vitæ, ...	W. Indies.
Guilandina Bonducella, ...	Bonduc, ...	E. Indies.
Gynandropsis pentaphylla, ...	Mamum, ...	Asia.
Gonolobus Cundurango, ...	Cundurango, ...	New Grenada.
Galactodendron utile, ...	Milk Tree, ...	S. America.
Haematoxylon campechianum, ...	Logwood, ...	Central America.
Hardwickia binata, ...	Acha, ...	E. Indies.
Helianthus tuberosus, ...	Jerusalem Artichoke, ...	Brazil.
Hevea Brasiliensis, ...	Para Rubber, ...	Brazil.
Hippamane mancinella, ...	Manchinel Tree, ...	W. Indies.
Hibiscus Sabderaffa, ...	Indian Sorrel, ...	E. Indies.
Do. esculentus, ...	Kachang Bendie, ...	India.
Hopea cernua, ...	Serayah, ...	Malaya.
Hopea meranti, ...	Meranti, ...	Malaya.
Heritiera littoralis, ...	Looking-glass Tree, ...	E. Indies.
Hura crepitans, ...	Sand Box, ...	Trop. America.
Hydrocotyle asiatica, ...	Pungga, ...	Asia.
Ilex paraguayensis, ...	Paraguay Tea, ...	Paraguay.
Illicium anisitum, ...	Star Aniseed, ...	Japan.
Indigofera tinctoria, ...	Indigo, ...	E. Indies.
Inga dulcis, ...	Manila Tamarind, ...	India.
Inga laurina, ...	...	W. Indies.
Inga Xylocarpa, ...	...	E. Indies.
Inocarpus edulis, ...	Otaheite Chestnut, ...	Malaya.
Ipomæa purga, ...	Jalap, ...	Mexico.
Ipomæa chrysorrhiza, ...	Kumara, ...	New Zealand.
Jateorrhiza palmata, ...	Calomba Root, ...	Mozambique.
Jatropha curcus, ...	Physic-nut, ...	E. Indies.
Do. manihot, ...	Tapioca, ...	W. Indies.
Do. do. var., ...	Mauritius Tapioca, ...	W. Indies.
Do. do. do., ...	Brazil do., ...	Brazil.
Jambosa vulgaris, ...	Rose Apple, ...	Malaya.
Kigelia pinnata, ...	...	Nubia.
Kumpussia Malaccensis, ...	Kumpas, ...	Malaya.
Lactuca sativa var., ...	Sawi (Lettuce), ...	Asia.
Lagenaria vulgaris var striata, ...	Ketula Ular (Gourd), ...	India.
Lagetta lintearia, ...	Lace Bark Tree, ...	Jamaica.
Lancium domesticum, ...	Dukoo, ...	Malaya.
Landolphia Watsonii, ...	African Rubbers, ...	Africa.
Do. Patersonii, ...	Do., ...	Do.
Do. Kirkii, ...	Do., ...	Do.
Lavendula vera, ...	Lavender, ...	S. Europe.
Lablab cultriformis, ...	Kachang Kara Puteh, ...	Moluccas.
Lawsonia inermis, ...	Henna, ...	Egypt.
Do. var rubra, ...	...	...
Licula acutifida, ...	Penang Lawyer, ...	Penang.
Limnophila punctata, ...	Brémis, ...	Malaya.
Linum usitatissimum, ...	Flax, ...	Europe.
Lepidium sativum, ...	Garden-cress, ...	Persia.
Leucaena glauca, ...	Soah-wood, ...	Tropics.
Lonchocarpus sp., ...	Yurabo Indigo, ...	W. Indies.
Lucuma Sapota, ...	Mamme Sapota, ...	New Grenada.
Luffa acutangula, ...	Strainers Vine, ...	India.
Luffa petola, ...	Timon, ...	Moluccas.
Lycopersicum esculentum, ...	Love Apple or Tomato, ...	S. America
Latania borbonica, ...	Latanier Palm, ...	Reunion.
Macadamia ternifolia, ...	Queensland Nut, ...	Queensland.
Malpighia urens, ...	Barbados Cherry, ...	Barbados.
Manihot glaziovii, ...	Ceara Rubber, ...	Trop. America.
Marrubium vulgare, ...	Hoarhound, ...	Britain.
Mammea americana, ...	Mamme Apple, ...	W. Indies.
Maranta arundinacea, ...	Arrow-root, ...	S. America.
Mangifera, indica, ...	Mango, ...	India.
Do. do. vars, ...	...	Do.
Do. caesa, ...	Benje, ...	Malaya.
Do. foetida, ...	Bachang, ...	Malaya.
Monstera deliciosa, ...	Monstera, ...	Mexico.
Meliantes Major, ...	Honey Shrub, ...	Cape of Good Hope.
Melia composita, ...	Limbarra, ...	E. Indies.
Melia sempervirens, ...	West Indian Lilac, ...	India.
Melaleuca leucodendron, ...	Kayu Puteh Oil, ...	Malaya.
Melissa officinalis, ...	Balm, ...	S. Europe.
Messua ferrea, ...	Ceylon Iron-wood, ...	Ceylon.
Mentha viridis, ...	Mint, ...	Britain.
Mimosa arborea, ...	...	W. Indies.
Michelia champaca, ...	Champac, ...	E. Indies.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
Mimusops elengi, ...	Elangi, ...	India.
Do. indica, ...	Smaram, ...	Malaya.
Do. sp. ...	Sou, ...	Malaya.
Mirabilis jalapa, ...	Marvel of Peru, ...	Peru.
Momordica charantia and vars, ...	Pria Paddy (Bitter Gourd), ...	India.
Momordica balsamina, ...	Pria, ...	Do.
Moringa pterygosperma, ...	Ben Oil Tree, ...	Trop. Asia.
Morus alba, ...	Mulberry, ...	Persia.
Murraya exotica, ...	China Box, ...	China.
Musa textilis, ...	Manila Hemp, ...	E. Indies.
Musa superba, ...		E. Indies.
Musa sapientum, ...	Pisang Mas, ...	} Malaya.
Do. var., ...	Do. Tandok, ...	
Do. " ...	Do. Pinang, ...	
Do. " ...	Do. Sooson, ...	
Do. " ...	Do. Nipah, ...	
Do. " ...	Do. Kling, ...	
Do. " ...	Do. Raja, ...	
Do. " ...	Do. Raja Udang, ...	
Do. " ...	Do. Bakar, ...	
Do. " ...	Do. Bata, ...	
Do. " ...	Do. Hijau, ...	} Brazil.
Do. " ...	Do. Lang, ...	
Maclura tinctoria ...	Fustisk-wood, ...	
Marsilea macropus, ...	Nardoo, ...	
Mucuna puriens, ...	Cow Etch, ...	E. Indies.
Machærium firmum, ...	Palissander-wood, ...	
Myrospermum Peruiferum, ...	Balsam of Peru, ...	Peru.
Nasturtium officinale, ...	Water Cress, ...	Britain.
Nectandra Rhodiæi, ...	Green Heart, ...	Guiana.
Nerium oleander, ...	Oleander, ...	S. Europe.
Nicotiana tabacum, ...	Tobacco, ...	Trop. America.
Nephelium Lappaceum, ...	Rambutan, ...	Malaya.
Do. Litchi, ...	Litchi, ...	China.
Do. Longan, ...	Longan, ...	Do.
Do. Mutabile, ...	Polesan, ...	Malaya.
Ocimum basilicum, ...	Basil, ...	E. Indies.
Olea Europea, ...	Olive, ...	Europe.
Opuntia Cochinillifera, ...	Cochineal Plant, ...	Trop. America.
Do. Ficus-indica, ...	Indian Fig, ...	Trop. America.
Origanum marjoram, ...	Marjoram, ...	Europe.
Oreodoxa oleracea, ...	Cabbage Palm, ...	Antilles.
Ouvirandra fenestralis, ...	Madagascar Yam, ...	Madagascar.
Pachyrrhizus anglutus, ...	Měng Kawang, ...	India.
Paederia foetida, ...	Bedolee Sutta, ...	Malaya.
Pandanus utilis, ...	Sugar Mat Plant, ...	Madagascar.
Panicum spectabile, ...	Guiana Grass, ...	Guiana.
Parmentiera cerifera, ...	Candle Tree, ...	Panama.
Parkia Roxburghii, ...	Saputi, ...	Malaya.
Payenia Learii, ...	Gutta Sundak, ...	Malaya.
Passiflora quadrangularis, ...	Grenadilla, ...	W. Indies.
Passiflora laurifolia, ...	Sweet Cup or Water Lemon, ...	W. Indies.
Passiflora macrocarpa, ...	Gigantic Granadilla, ...	
Persea gratissima, ...	Avocado Pear, ...	Trop. America.
Petroselinumsativum, ...	Parsley, ...	Sardinia.
Petiveriæ alliaciæ, ...	Tooth-ache Tree, ...	Trop. America.
Phaseolus lunatus, ...	Kachang Kara (Lima Bean), ...	Brazil.
Phaseolus vulgaris, ...	French Bean, ...	India.
Do. sp., ...	Kachang Hijau, ...	
Physalis alkekengi, ...	Water Cherry, ...	S. Europe.
Phyllanthus emblica, ...	Malacca, ...	Malaya.
Do. reticulatus, ...	Chékop manis, ...	
Phoenix sylvestris, ...	Wild Date, ...	India.
Phytelephas macrocarpa, ...	Ivory-nut, ...	S. America.
Phytolacca decandra, ...	Dye Wort, ...	India.
Phormium tenax, ...	New Zealand Flax, ...	New Zealand.
Pimenta vulgaris, ...	Allspice, ...	W. Indies.
Pimpinella Anisum, ...	Anise or Aniseed, ...	Egypt.
Pierarda dulcis, ...	Rambe, ...	Malaya.
Piper Betel, ...	Betel Leaf, ...	E. Indies.
Piper nigrum, ...	Pepper, ...	E. Indies.
Piper cubeba, ...	Cubebs, ...	Java.
Piper Futokadsura, ...	Japanese Pepper, ...	Japan.
Pinus longifolia, ...	Long-leaved Pine, ...	E. Indies.
Pisum sativum, ...	Pea, ...	Levant.
Piscidia erythrina, ...	Dog-wood, ...	W. Indies.
Plumiera lutea, ...	Frangipani, ...	Trop. America.
Pogostemon patchouli, ...	Patchouli, ...	E. Indies.
Pongamia glabra, ...	Pongam, ...	E. Indies.
Portulaca oleracea, ...	Daun Galang (Purslane), ...	Tropics.
Pterocarpus indica ...	Rose-wood, ...	E. Indies.
Do. marsupium, ...	Kino, ...	E. Indies.
Psophocarpus tetragonolobus, ...	Kachang, ...	Trop. Africa.
Poinciana regia, ...	Flamboyant, ...	Madagascar.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
<i>Psidium cattleianum</i> , ...	Guava, ...	W. Indies.
Do. <i>guava</i> , ...	Do., ...	S. America.
Do. <i>do. varigata</i> , ...	Do., ...	...
Do. <i>acre</i> , ...	Do., ...	...
<i>Punica granatum</i> , ...	Pomegranate, ...	E. Indies.
<i>Premna cordifolia</i> , ...	Buas-Buas, ...	Malaya.
<i>Pyrus malus</i> , ...	Apple, ...	Persia.
Do. <i>communis</i> , ...	Pear, ...	Persia.
<i>Paritium elatum</i> , ...	Cuba Bast, ...	Cuba
<i>Prosopis juliflora</i>, ...	...	...
<i>Paullina sorbilis</i> , ...	Guarana Tea Plant, ...	...
<i>Putranjiva Roxburghii</i> , ...	Putranjiva, ...	E. Indies.
<i>Pistacia terebinthus</i> , ...	Turpentine Tree, ...	...
<i>Pisonia sylvestris</i>, ...	...	Moluccas.
<i>Quassia amara</i> , ...	Quassia or Bitter-wood, ...	W. Indies.
<i>Quercus salicina</i> , ...	Chinese Oak, ...	China.
<i>Quisqualis indicus</i> , ...	Rangoon Creeper, ...	E. Indies.
<i>Raphanus sativus var.</i> , ...	Lobak (Long Raddish), ...	China.
<i>Ravensara aromatica</i> , ...	Ravensara, ...	Madagascar.
<i>Rheum officinale</i> , ...	Rubarb, ...	Asia.
<i>Ricinus communis</i> , ...	Castor-oil Plant, ...	E. Indies.
<i>Ruta graveolens</i> , ...	Rue, ...	S. Europe.
<i>Roupellia grata</i> , ...	Cream Fruit, ...	W. Indies.
<i>Rhmex patientia</i> , ...	Patience, ...	Italy.
<i>Rhus vernicifera</i> , ...	Japanese Lacquer Tree, ...	...
<i>Rhus succedaneum</i> , ...	Japanese Wax Tree, ...	Japan.
<i>Sabal palmetto</i> , ...	Palmetto, ...	S. America.
<i>Sagus rumphiana</i> , ...	Sago, ...	Malaya.
<i>Sagus laevis</i> , ...	Sago, ...	Malaya.
<i>Sandoricum indica</i> , ...	Sentol, ...	E. Indies.
<i>Sapindus saponaria</i> , ...	Soap Berry, ...	...
do. <i>inaequalis</i> , ...	Do., ...	W. Indies.
<i>Sansevieria Zeylanica</i> , ...	Bow String Hemp, ...	Ceylon.
<i>Santalum album</i> , ...	Sandal-wood, ...	E. Indies.
<i>Sarcocephalus cordata</i> , ...	Negro Peach, ...	Australia, &c.
<i>Sechium edule</i> , ...	Cho-Cho, ...	Jamaica.
<i>Scorodocarpus Borneensis</i> , ...	Bawang Hutan, ...	Malaya.
<i>Senecio chinensis</i> , ...	Tang Ho, ...	...
<i>Sesamum orientale</i> , ...	Gingelly-oil Plant, ...	E. Indies.
<i>Semecarpus anacardium</i> , ...	Marking-nut, ...	India.
<i>Shorea Dyeri</i>, ...	...	Ceylon.
<i>Sinapsis alba</i> , ...	Mustard, ...	Britain.
<i>Sideroxylon Malaccense</i> , ...	Daroo, ...	Malaya.
<i>Solanum melangena</i> , ...	Trong (Egg Plant), ...	...
do. <i>coagulans</i> , ...	Trong Manis, ...	...
do. <i>tuberosum</i> , ...	Potato, ...	S. America.
<i>Sorghum Saccharatum</i> , ...	Millet, ...	Tropics.
do. <i>vulgare</i> , ...	Guinea Corn, ...	E. Africa.
<i>Sloetia sideroxylon</i> , ...	Tampinis, ...	Malaya.
<i>Stenochlaena palustris</i> , ...	Paku Akar, ...	...
<i>Stillingia sebifera</i> , ...	Tallow Tree, ...	China.
<i>Strombosia Javanica</i> , ...	Petaling, ...	Malaya.
<i>Strychnos nux-vomica</i> , ...	Nux-vomica, ...	E. Indies.
do. <i>colubrina</i> , ...	Shakewood, ...	E. Indies.
<i>Styrax Benzoin</i> , ...	Benzoin, ...	Sumatra.
<i>Sterospermum chelonoides</i> , ...	Padrie Marum, ...	E. Indies.
<i>Saccharium officinarum</i> , ...	Sugar Cane, ...	Tropics.
<i>Salvadora persica</i> , ...	Mustard Tree of Scripture, ...	Central Africa.
<i>Smilax sarsaparilla</i> , ...	Sarsaparilla Vine, ...	India.
<i>Tabernaemontana Crassa</i>, ...	...	Senegal.
<i>Taraxacum officinale</i> , ...	Dandelion, ...	Europe.
<i>Tecoma pentaphylla</i> , ...	Fiddle-wood, ...	Jamaica.
Do. <i>leucoxylon</i> , ...	Tecoma, ...	Madagascar.
<i>Terminalia Catappa</i> , ...	Wild Almond, ...	E. Indies.
<i>Terminalia Bellerica</i> , ...	Myrabalans, ...	India.
<i>Tetragonia expansa</i> , ...	New Zealand Spinach, ...	New Zealand.
<i>Thamnopteris nidus</i> , ...	Samber, ...	...
<i>Thea chinensis var assamica</i> , ...	Assam Hybrid Tea, ...	China.
<i>Theobroma Cacao</i> , ...	Chocolate or Cacao, ...	W. Indies.
Do. <i>var condeamar</i>, ...	...	Do.
Do. <i>criollo</i>, ...	...	Do.
Do. <i>Forbsteri</i>, ...	...	Do.
Do. <i>Cavenne</i>, ...	...	Do.
Do. <i>Ferdilico</i>, ...	...	Do.
Do. <i>Sangle toro</i>, ...	...	Do.
<i>Thevetia neriifolia</i> , ...	Exile Tree, ...	India.
<i>Triphasia trifoliata</i> , ...	Lime Berries, ...	China.
<i>Tropæolum majus</i> , ...	Nosturtium, } or Indian Cress, ...	Peru.
Do. <i>minus</i> , ...	Small do., }	...
<i>Tacca pinnatifolia</i> , ...	Tacca, ...	Australia.

<i>Systematic Name.</i>	<i>Local Name.</i>	<i>Native Country.</i>
Uncaria gambir, ...	Gambier, ...	Malaya.
Urena lobata ...	Beng Fibre, ...	E. Indies.
Vanilla planiifolia, ...	Vanilla, ...	Trop. America.
Do. aromatica, ...		W. Indies.
Do. Sp., ...		Singapore.
Vahea gummifera, ...	Madagascar Rubber Vine, ...	Madagascar.
Vitex umbrosa, ...	Box-wood, ...	W. Indies.
Vitis Martenii, ...	Saigon Vine, ...	Saigon.
Vitis vinifera, ...	Grape Vine, ...	E. and W. Hemispheres.
Vitex trifoliata, ...	Chaste Tree, ...	E. Indies.
Vangueria edulis, ...	Edible Vangueria, ...	
Willoughbeia firma, ...	Gutta Gegrip, ...	Malaya.
Wrightia tinctoria, ...	Ivory-wood, ...	India.
Yucca aloifolia, ...	Dagger Fibre, ...	Jamaica.
Zalacca edulis, ...	Salak, ...	Malaya.
Zea mays, ...	Indian Corn, ...	
Zingiber officinale, ...	Ginger, ...	E. and W. Indies.
Zingiber sp, ...	Chinese Ginger, ...	China.
Zizyphus mucronatus ...	Wild Injob, ...	Australia.
Zizyphus Jujuba, ...	Jujube Tree, ...	China.

LIST OF THE FOREST DEPARTMENT PALMETUM,
SINGAPORE.

(*Vide Para. 35.*)

TRIBE I.—ARECEÆ.

SUB-TRIBE EUARECEÆ.

Genus ARECA, Linn.

- A. catechu, Linn. Betel-nut Palm. Tropical Asia.
A. concinna, Thwaites. Ceylon.
A. triandra, Roxb. Molouccas.

Genus PENANGA, Blume.

- P. maculata, Porte.
P. malaiana, Scheff.

Genus HYDRIASTELE, Wendl. & Dr.

- H. Wendlandiana, W. & D. Tropical Australia.

Genus HEDYSCEPE, Wendl. & Dr.

- H. Canterburyana, W. & D. "Umbrella Palm." Lord Howe's Island.

Genus LOXOCOCCUS, Wendl. & Dr.

- L. rupicola, W. & D. Ceylon.

Genus ARCHONTOPHÆNIX, Wendl. & Dr.

- A. Alexandræ, W. & D. Queensland.

Genus RHOPALOSTYLIS, Wendl. & Dr.

- R. Baueri, W. & D. Norfolk Island.

Genus DICTYOSPERMA, Wendl. & Dr.

- D. aureum, W. & D. Rodriguez Island.
D. album, W. & D. Mauritius.
D. rubrum, W. & D. Mauritius.

SUB-TRIBE II.—PTYCHOSPERMEÆ.

Genus PTYCHOSPERMA, Labill.

- P. filifera, Wendl. Fiji Islands.
P. Macarthurii, Wendl. Tropical Australia.

Genus CYRTOSTACHYS, Blume.

C. Renda, Blume. Malay Archipelago.

Genus DRYMOPHLOEUS, Zippel.

D. Singaporensis, Hook. Singapore.

SUB-TRIBE III.—ONCOSPERMEÆ.

Genus ONCOSPERMA, Blume.

O. filamentosum, Blume. "Nibung Palm." Java.

Genus EUTERPE, Gœrtn.

E. edulus, Mart. "Assai Palm." Tropical America.

E. oleracea, Mart. "Mountain Cabbage Palm," Tropical America.

Genus ACANTHOPHœNIX, Wendl.

A. crinita, Wendl. Mauritius and Bourbon.

A. rubra, Wendl. Mauritius and Bourbon.

Genus OREODOXA, Willd.

O. oleracea, Mart. West Indies.

O. regia, Kunth. "Royal Palm." West Indies.

Genus PHYTELEPHAS, Ruitz et Pav.

P. macrocarpa, R. et P. Ivory-nut Palm. New Grenada.

Genus NIPA, Wurmbr.

N. fructiens Thumb, Nipa Palm. Trop. Estuaries.

Genus PHOLIDOCARPUS, Blume.

P. Ihur, Bl. Moluccas.

Genus LIVISTONA, Br.

L. altissima, Zoll. Java.

L. australis, Mart. Eastern Australia, Temperate and Tropical.

L. Hoogendorhffii, Teysm. & Binn. Hab.?

L. humilis, Br. Tropical Australia.

L. olivœformis, Mart. Java.

L. rotundifolia, Mart. Malay Islands, Moluccas, Penang.

Genus RHAPIS, Linn. f.

R. flabelliformis, Ait. China.

Genus THRINAX, Linn.

T. argentea, Lodd. "Silver-Thatch Palm." West Indies.

T. parviflora, Swartz. West Indies.

TRIBE IV.—LEPIDOCARYEÆ.

SUB-TRIBE CALAMEÆ.

Genus CALAMUS, Linn.

C. callicarpus, Griff. Malacca.

C. fissus, Blume. Borneo.

C. marginatus, Blume. Borneo.

C. periacanthus, Miquel. Sumatra.

C. rotang, Linn. Bengal, Assam, and Coromandel.

Genus ZALACCA, Reinwtdt.

Z. edulis, R. Java, Moluccas.

Genus CERATOLOBUS, Blume.

C. glaucescens, Bl. Java.

Genus PLECTOCOMIA, Mart.

P. elongata, Blume. Java, Malacca, Penang.

Genus RAPHIA, Beauv.

R. Ruffia, Mart. Madagascar.

R. sp. West Africa.

TRIBE V.—BORASSEÆ.

Genus BORASSUS, Linn.

B. flabelliformis, Linn. "Palmyra Palm." Tropical Africa.

Genus LATANIA, Comm.

L. Commersonii, Linn. Mauritius and Bourbon.

L. Loddigesii, Mart. Round Island.

L. Verschaffeltii, Linn. Rodriguez Island.

Genus HYPHÆNE, Gartn.

H. thebaica, Mart. "Doum Palm." Upper Egypt, Nubia and Abyssinia.

TRIBE VI.—COCOINEÆ.

Genus ACROCOMIA, Mart.

A. sclerocarpa, Mart. "Macau Palm." Brazil and West Indies.

Genus MARTINEZA, Ring and Pav.

M. caryotæfolia, Humb and Kth. New Grenada.

SUB-TRIBE II.—ELÆIDEÆ.

Genus ELÆIS, Jacq.

E. guineensis, Jacq. "Oil Palm" West Tropical Africa.

SUB-TRIBE III.—EUCOCOINEÆ.

Genus COCOS, Linn.

C. flexuosa, Mart. Brazil.

C. nucifera, Linn. "Cocoa-nut Palm." Tropics.

C. plumosa, Lodd. Brazil.

C. Weddelliana, Wendl. Brazil.

Genus MAXIMILIANA, Mart.

M. Martiana, Karst. N. Brazil and Guiana.

SUB-TRIBE IV.—LINOSPADICEÆ.

Genus CALYPTROCALYX, Blume.

C. spicatus, Bl. Moluccas.

Genus BACULARIA, F. Muell.

B. monostachya, F. Muell. "Walking-stick Palm." North South Wales and Queensland.

Genus HOWEA, Beccari.

H. Forsteriana, Becc. "Flat or Thatch-leaf Palm." Lord Howe's Island.

H. Belmoreana, Becc. "Curley Palm." Lord Howe's Island.

SUB-TRIBE VII.—CEROXYLEÆ.

Genus CEROXYLON, Humb. and Bonpl.

C. andicola, H. & B. "Wax Palm." New Granada and Venezuela.

SUB-TRIBE VIII.—MALORTIEÆ.

Genus MALORTIEA, Wendl.

M. intermedia, Wendl. Costa-Rica.

SUB-TRIBE IX.—IGUANUREÆ.

Genus HETEROSPATHE, Scheff.

H. elata, Scheff. Amboyna.

Genus NEPHROSPERMA, Balf. fil.

N. Houtteanum, Balf. fil. Seychelle Islands.

Genus STEVENSONIA, Duncan.

S. grandifolia, Wendl. Seychelle Islands.

Genus VERSCHAFFELTIA, Wendl.

V. splendida, Wendl. Seychelle Island.

Genus DYPISIS, Norohn.

D. madagascariensis, Hort. Madagascar.*D. pinnatifrons*, Mart. Madagascar.*D. sp?* Madagascar.

SUB-TRIBE X —CHAMÆDOREÆ.

Genus CHAMÆDOREÆ, Willd.

C. elegans, Mart. Mexico.

Genus SYNECHANTHUS, Wendl.

S. fibrosus, Wendl. Guatemala.

Genus HYOPHORBE, Gœrtin.

H. amaricaulis, Mart. Round Island, Mauritius.*H. Verschaffeltii*, Wendl. Rodriguez Island, Mauritius.

Genus CHRYSALIDOCARPUS, Wendl.

C. lutescens, Wendl. Mauritius and Bourbon.

SUB-TRIBE XI.—GENOMICÆ.

Genus CALYPTOGYNE, Wendl.

C. Swartzii, H. F. Mountain Thatch Palm. West Indies.

SUB-TRIBE XII.—CARYOTIDEÆ.

Genus WALLICHIA, Roxb.

W. caryotoides, Roxb. Eastern Bengal, Chittagong, and Burma.

Genus ARENGA, Labill.

A. obtusifolia, Mart. Java and Sumatra.*A. saccharifera*, Labill. "Gomuti Palm." Malay Archipelago, Moluccas and Bourbon.

Genus CARYOTA, Linn.

C. Cumingii, Lodd. Philippine Islands.*C. furfuracea*, Bl. var. *Timbala*. Java.*C. obtusa*, Griff. Upper Assam.*C. sobolifera*, Wall. Arracan and Andaman Islands.*C. urens*, Linn. "Wine Palm." East Bengal and Malay Peninsula.

Genus ORANIA, Zipp.

O. macrocladus, Mart. Malacca.

TRIBE II.—PHŒNICEÆ.

Genus PHŒNIX, Linn.

P. acaulis, Roxb? Central India, Bengal and Burma.*P. dactylifera*, Linn. "Date Palm." North Africa.*P. Hanceana*, Naud. China.

- P. reclinata*, Jacq. South East Africa.
P. rupicola, T. Anders. "Sikkim." Himalaya.

TRIBE III.—CORYPHÆ.

Genus CORYPHA, Linn.

- C. Gebanga*, Blume. "Gebang Palm." Java.

Genus SABAL, Adans.

- S. Adansoni*, Guerns. "Dwarf Palmetto." Southern United States.
S. glaucesens, Lodd. Trinidad.
S. Palmetto, Lodd. "Cabbage Palmetto." Southern United States.
S. Princeps, Hort. Versch. Hab.?

Genus WASHINGTONIA, Wendl.

- W. filifera*, Wendl. South California.

Genus TEYSMANNIA, Reichb. f. & Zoll.

- S. altifrons*, R. & Z. Malaya.

Genus CHAMÆEROPS, Linn.

- C. humilis*, Linn. South Europe and North America.
C. Humboldtii.

Genus PRITCHARDIA, Seem & Wendl.

- P. pacifera*, Seem & Wendl. Fiji Islands.
P. Thurstonii,
P. sp. novo.

Genus LICUALA, Thunt.

- L. acutifida*, Mart. "Penang Lawyer." Singapore and Penang,
L. peltata, Roxb. Bengal, Assam, Burma, Tenasserim, &c.

N. CANTLEY,
Superintendent

Singapore, 4th July, 1887.

Conserved by



