THIRD SERIES.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

FOUNDED BY

H. N. RIDLEY, C.M.G., M.A., F.R.S., &c., in 1891, and edited by him up to 1911.

SINGAPORE:
THE STRAITS TIMES PRESS, LIMITED.

INTRODUCTION

AS the Bulletins contain much material of great interest to Planters and Horticulturalists in general, I have endeavoured to form as complete an index as possible by including each article under its special heading. This has been a matter of extreme difficulty as many articles had no title so that in many cases one article may be found under one of two or three headings.

Many of our readers may be interested in some special subject and may not want to purchase a complete volume to obtain the necessary literature, so that I have given the Volume, the Month and the page in nearly every case. Should they desire some particular article, it will now only be necessary to write to the Botanic Gardens giving Volume and Month *(by the way, enclosing the cost of same).*

As the Bulletin has been edited largely for the help of Planters in general, I have also endeavoured to keep all the articles on Para Rubber by themselves. This method should greatly facilitate the reference to articles required by Planters which have appeared in the Bulletins.

I trust this has not been a labour in vain and that it will supply a long felt want.

JAS. W. ANDERSON.
Assistant Curator.

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All Subscriptions are payable strictly in advance 14/3a

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No. 1.] JANUARY, 1911. Vol. X.

Agricultural Bulletin

OF THE

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EDITED BY

H. N. RIDLEY, M.A., F.R.S., F.L.S., F.R.H.S.
Director of Botanic Gardens, S.S.

PAGE.

The Price of the Bulletin will be as follows:

Annual Subscription for Straits Settlements and Federated Malay States ..	$5.00
Annual Subscription for other places in Malaya	$5.50
Annual Subscription for India and Ceylon	Rs. 9-8-0
Annual Subscription for Europe (Thirteen Shillings)	£0-13-0
Single Copy	50 cts. or s. 1/2 d.
Whole Volume	$5.00

All Subscriptions are payable strictly in advance.

To be purchased at the Botanic Gardens, Singapore, from Messrs. Kelly and Walsh, Ltd., No. 32 Raffles Place, and 194 Orchard Road, and The Straits Times Office, Cecil Street, Singapore.

Printed at the Straits Times Press, Ltd., Singapore.

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AGRICULTURAL BULLETIN

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No. 1.] JANUARY, 1911. [Vol. X

LEGISLATION AGAINST THE DISSEMINATION OF PESTS.

At the first International Congress of Tropical Agriculture Mr. Willis read an interesting paper on the steps taken to introduce the legislation against the introduction of pests into countries in which such pests did not occur. Unfortunately, his historical part of the subject is wofully incomplete and inaccurate. He commences by saying that "Such legislation to the best of my knowledge began in the United States and it has only in recent years appeared to any marked extent in the tropics." He gives no dates here and does not state when or what form of, legislation was first started in the United States, but how about the early regulations against *Phylloxera* in France? We think this was the first recorded legislation of the kind. The following paragraph is even more astonishing: "Ceylon is perhaps ahead of most tropical regions, though it was in actual time preceded by the Federated Malay States. In the latter country the beetles that attack the coconut palm had proved a most troublesome pest, and one which bid fair to render coconut cultivation entirely unrenumerative. Under these circumstances an ordinance was passed in 1898 for proper treatment of the disease, but as it was left for the owners to do so, and they were not inspected, nothing was done till 1902, when a white inspector with assistants was appointed."

His audience would probably have been surprised to hear after that statement, that the first steps to introduce legislation against the coconut beetles were taken in Singapore in 1887, and that in 1889 the Editor of this Bulletin, after studying the damage caused by these beetles, published a paper on the subject in the Journal of the Straits

Branch of the Royal Asiatic Society (Vol. 20 p. i) in which suggestions for legislation on the subject were made, and drafted an ordinance the same year which was carried into effect early in 1890 and has been kept in force with great success ever since. This ordinance was later adopted by some other tropical countries, and by the F. M. S. at the suggestion of the Director of Gardens of Singapore as soon as it was necessary to do so owing to the development of the industry in the F. M. S. The ordinance was in force and has been carried out by suitable staffs in Singapore, Malacca, Penang and Province Wellesley from 1890 to the present day.

The real history of legislation against insect and fungus pests with a good account of the ordinance passed by different Governments, their working, and efficacy or failure would be a subject well worth study and very helpful. It often happens that such legislative ordinances are not recorded in Botanical or Agricultural literature but, in inaccessible legal or official publications. The introduction of legislation, external as Dr. Willis calls it, against Phylloxera in France, Australia and the Cape certainly dates from the early eighties. Loder (Spraying of plants 374) gives the following dates: California, March, 1881, an internal law requiring cultivators to destroy insect and fungus pests, amended 1889; Canada 1892, a law forbidding spraying fruit trees with poisons injurious to trees; Massachussetts, March, 1890, legislation against the Gypsy moth; Michigan, 1895, legislation against pests; Utah, 1894, legislation to inspect fruit trees and destroy insect pests. Tasmania had legislation against the codlin moth pretty early, but I have no dates. Over twenty years ago Jamaica refused to admit plants coming from any country where *Hemileia vastatrix* occurred.

Australia has a Diseases of Plants act in 1896, but Tryon says no legal restrictions were put into force till 1897 (Queensland Agricultural Journal, June, 1898, 494).

In the East Indies Singapore seems to have taken the lead with the coconut trees ordinance in 1890. There was really no need for legislation against plants introduced from outside as practically all useful plants introduced to the Colony or F. M. S. came in via the Botanic Gardens at Singapore and were there cultivated before being sent out and any disease would have been noticed and checked. Since that date the only legislation passed has been the ordinance of 1908 to impower the Governor to pass legislation against importing diseased plants, etc., and this is being followed up by an ordinance against *Diplodia*. Ceylon, according to Dr. Willis, commenced legislating in 1901 with an ordinance for disinfecting fruit liable to carry dangerous pests and then as he says went further than the F. M. S. in legislation. He does not allude to the legislation of other countries. The Ceylon legislation was levelled at the introduction of diseases of tea, cocoa, pepper, citrus, fruits and plants, Indian potatoes and cotton.

It is quite natural for Ceylon to extend legislation of this type to a further series of plants than is required by the Malay Peninsula, for practically there have been only three or four cultivations of any importance to European planters in this country, coffee, coconuts and rubber, to which we may add nutmegs and cloves, while Ceylon linger under cultivation has had plantations of almost every tropical economic plant for many years and though many of these have nearly died out there are still estates of all kinds of economic plants which require protection. As a matter of fact Jamaica and some other countries went further even than Ceylon and either would not allow any plants at all to be introduced from other countries where diseases occurred or had all introduced plants disinfected thoroughly on their arrival.

Dr. Willis uses the word *external* for legislation dealing with plants, etc., introduced from other countries and *internal* for legislation only affecting the cultivations already in the country.

External legislation is apt to cause annoyance and hardship unless reasonably carried out, but it seems in some countries the officials whose business it is to administer the law are quite incapable of doing so at all rationally. We hear of a consignment of living plants kept uncared for till they are dead, or disinfected so carelessly as to completely kill them, plants (even old dried herbarium specimens) refused admission to the country for fear of introducing *Phylloxera*, though there is not a vine in the country of export nor owing to the climate would it be possible for Phylloxera to live there. All such legislation should be not only framed by scientific men but carried out if possible by them or if not, by thoroughly-trained and intelligent officers. It is essential that new plants of economic use should be introduced into different countries and equally imported to avoid in-breeding, at the same time as much care as possible should be taken not to bring in diseased plants. The question of the introduction of plants which, by reason of their taking thoroughly to the country, may become a nuisance is one of the most difficult subjects to decide. A plant which in one country grows to such an extent as to be injurious to the agriculturist may in apparently similar conditions in another country hardly grow at all or at least prove quite harmless. The Mexican poppy *Argemone Mexicana* has proved in many countries a pestilential weed, and it was with some care I watched its growth when we introduced it as an ornamental plant. It grew, fruited well, and occasionally reappeared again in a feeble way after the death of the original plant, but showed no signs of becoming a nuisance at all. The water hyacinth *Eichornia crassipes* which has been so injurious in blocking waterways in Florida and Australia grows well here, and has been cultivated by the Chinese first for its flowers and later for pig food. It does not appear to be at all aggressive and exposure to full sun causes it to be weak and die. It does not seem to be at all establishing itself as a river pest. Like *Limnocharis Plumierii* introduced many years ago from America and now spread over the whole Peninsula as far north at least as Perlis, *Eichornia* might choke up ditches or abandoned ricefields, but if it did

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not so do more troublesome plants would and the damage done is practically negligible. Eichornia is rigorously excluded from Ceylon, probably for some good local reason.

The common yellow flowered weed known as *Synedrella nodiflora* is not particularly troublesome in the Straits, but it somehow got introduced into Christmas island, perhaps in forage for horses or cattle, or perhaps in packing. It established itself in great abundance in various parts of the Settlement and proved a nuisance as in the dry season it died and dried up, and was extremely liable to fire, being very inflammable. I have never seen it behave like this in the Straits. There being no dry season it does not all die at once and form an inflammable mass. *Oxalisrosea*, a pretty pink flowered herb, has proved a great pest in Ceylon, propagating itself by its abundant underground tubers. It is not only harmless here but is rather a difficult plant to grow and will not establish itself in our low-country. On the top of the hill in Penang it established itself for a time on the banks, but was not in any way a nuisance.

These examples show how extremely difficult it is to judge whether any given plant would be likely to prove a nuisance if introduced into a country. However usually if any plant shows signs of becoming aggressive, it can be attacked in the early days of its spreading and exterminated.

With *internal* legislation the main difficulty is to carry it into effect satisfactorily and at the same time without annoyance or friction. Our natives in the Peninsula seem to realise the importance of this work in agriculture, and assist to carry it out. It is the law and laws are adamant. The highly civilised native of other parts and frequently the white man thinks he knows a great deal better what should be done than the scientific man, and makes trouble. Hence in some countries friction has occurred which has interfered with the success of the work. In Utah a judge decided that though spraying fruit trees for pests was absolutely necessary it was "unconstitutional" to enforce the law "as it hardly looked reasonable that the law can tell a person just how and when to spray or otherwise treat his orchard and to inflict a penalty if the law is not complied with." (Loder Spraying of Plants 381). This absurd decision seems to have interfered considerably with the effects of a good and wholesome law.

There was also some friction in carrying out the laws against the Codlin-moth in Tasmania at one time at least, for a Tasmanian official in 1894 told me that he believed that our coconut trees ordinance was the only legislation of the kind that had ever been carried out without friction.

Firmness with reasonableness is really the key to the difficulty, a want of firmness in administering the law is the chief cause of friction, assuming that the law had been drawn up by a competent person of scientific knowledge and common sense.—ED.

RUBBER CULTIVATION IN GERMAN COLONIES.

M. Cayla publishes in the Journal d'Agriculture Tropicale an account taken from different numbers of the Gumnie-Zeitung of the progress of rubber cultivation in German Colonies. The Germans have developed enormous activity in extending the cultivation of rubber in their Colonies in Africa and the Pacific. In 1908 there was a fall off in production of wild rubber from Africa due to the low price which did not pay the native collectors, and a spell of excessive dryness reduced the flow of latex. The total export for 1908 was in round numbers 1,577.70 kilos worth 6,400,000 marks against 1,900,000 kilos worth 10,800,000 marks in 1907. This came all from Africa except 6,000 kilos from New Guinea. Most of it was exported from the Cameroons, and the diminution in amount of rubber brought in in certain localities suggests that the Funtumias are dying out.

In the matter of cultivation *Hevea* is tried everywhere but the greatest area is in Samoa, where it is cultivated with cocoa, in equal proportions. There are about 400,000 Heveas, of from one to five years old in Samoa. It is also planted in New Guinea, but apparently *Ficus elastica* is preferred there.

Castilloa cultivation is not being extended in New Guinea, 240 hectares being lost by tapping. In Africa it is being continued but it appears that the strain at Amani is a bad kind.

The cultivation of Funtumia is largely developed in the Cameroons with varying success according to local circumstances. *Ficus elastica* grows well but slowly at Amani. *F. Schlechteri* grows better but does badly in the Cameroons. Experiments in *F. Vogelii* at Togo confirm the inferiority of the latex. *F. Rigo* of New Guinea gives hopes of success in Samoa.

Manihot Glaziovii is the only rubber cultivated in East Africa. A new method of tapping of two year old plants was tried and what is hardly astonishing gave very poor rubber. It is freely condensed for the Cameroons, as giving no prospectus of returns.

Manihot of Bahia and M. piauhyensis tried everywhere in Africa have shown no advantages over *M. Glaziovii, M. dichotoma* seems to be a little better at Togo. There are some cultivations (95 hectares) of Landolphias in East Africa, and *Eupharbia fulva* " Palo Amarillo " at Amani grows very slowly.

The Guayule is being cultivated in the South West. The plants are a year old and doing well. Gutta percha *Palaquium oblongifolium* has been tried everywhere but no results are given. Payexa Leerii failed in the Cameroons.

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EUTYPA AS A PARASITE.

An account of *Eutypa caulivora* on Pàra rubber trees was published in the Bulletin some time back, and Mr. Massee's suggestion that it was a true parasite though it did not appear on the tree till after its death was also mentioned. The trees on which the fungus appeared had, however, either been blown over or had died from some other cause and till after death had not shown any signs of fungus, of any kind. Hence I held that this species of Eutypa was probably not parasitic but saprophytic only. A few months ago, however, I found a young Para rubber tree dying from the top downwards which had produced a black fungus on its top, resembling *Eutypa*, and obviously not the well-known dieback fungs *Diplodia*. The tree was at no great distance from a big tree which had previously died and on which Eutypa had later developed and a portion of it sent to the Royal Gardens, Kew, was examined there and the report given that "the black growth on the Para rubber stem was the Stroma or young stage of some Eutypa-like funges which has not yet produced fruit, hence cannot be determined." It is probably then that this fungus was *Eutypa caulivora,* the only species seen near the spot and that it is truly parasitic, attacking the topshoot of the tree and growing downwards like *Diplodia*. The other trees however on which Eutypa caulivora appeared showed no signs of being killed by this fungus, as previously described. I have seen no other cases of death from this fungus, and it does not seem common. As too it seems to be very slow in fruiting, and to show its presence conspicuously in young plants before it is ready to fruit it should be very easily dealt with.

The only other tree I have seen it on is *Macaranga Griffithiana,* a tree of swampy open country which is abundant in the neighbourhood of the trees affected, and it is probable that this plant somewhat allied to *Hevea* is the original host of the Eutypa. Further investigations of this group of Fungi is however required.—ED.

PINK DISEASE PREVENTION EXPERIMENTS.

The most interesting matter in this district is the progress of the experiments which are being conducted at Palapilly and Vellanikana estates in the prevention of Pink Disease (*Corticium Javanicum*) on Para Rubber, a disease which has done a considerable amount of damage. It will be remembered that these experiments aim at prevention rather than cure, and the trees were painted in the dry season with Bordeaux mixture so that the spores of the fungus, which are wind-carried at that time and find a lodgement on the trees, especially in the forks, should germinate with the beginning of the monsoon rains in a medium of Bordeaux mixture which will kill them before the fungal hyphae can gain an entry into the bark. The experiments have yet a couple of months to run before completion, so that it is perhaps too soon to say very much about the results, but up to date the treatment has resulted in complete success, and the cases of attack have been reduced to a few individual instances, and these are due probably to the careless application of Bordeaux. Thus in one instance out of 60,000 treated trees there have so far been only three cases of Pink Disease where formerly there would have been hundreds. On estates where Bordeaux mixture has not been used, and which therefore act as a check, the disease has been as bad as usual, and attacked trees may be put down roughly at something like 1 per cent. Unless the unexpected happens during the next two months we have every reason to congratulate ourselves that we have discovered how to completely control Pink Disease. As soon as the experiments are quite finished the whole subject will be written up in detail in the Planter's Chronicle. I may, however, say here that the cost of the method will work out at about half a pie per tree. Where Pink Disease is still prevalent, measures are being generally taken to deal with it as soon as it is noticed, and most estates have a pest gang going round and cutting it out. Attempts at curing it by cutting out the area affected, washing the wound with Bordeaux mixture and tarring it, have generally failed, and, as far as I am able to ascertain, some 70 per cent of such treated areas developed the disease again in the following year. I still believe that, if carefully done and supervised, this method is a correct one, but under estate conditions it has not proved successful. Consequently the affected branch should be cut off at least 18 inches below the point of attack. This is best done with a mallet and a chisel, a neater and smoother cut being made with this than with a saw. In the case of an attack on the main stem unless 3 feet of tapable trunk can be left, it is better to cut the tree down close to the ground and get a sucker from low down to replace it.

(U. P. A. S. I. Scientific Officer's Second Tour in Cochin) Extracted from Tropical Agriculturist, Ceylon, Nov. 1910, p. 462.

BAILEY MEMORIAL FUND.

THE PLANTERS' ASSOCIATION OF MALAYA.

Kuala Lumpur, 25th November, 1910.

DEAR SIR,

The recent lamented death of Mr. W. W. Bailey, to whose energy and foresight the present state of the rubber industry in the Malay Peninsula is in a great measure due, has suggested to the Members of this Association the creation of a memorial, to perpetuate his name in the country, to which he gave the best of his life.

At the last meeting of this Association the urgent needs of a Scholarship Fund for the Straits and Federated Malay States Medical School (as per the Dean's Appeal, which I attach) were discussed, and the meeting was unanimous regarding the importance of this school for the whole future of the Rubber Industry in the Peninsula, in providing the necessary Medical Practitioners and Assistant Surgeons, without whom no labour force can be maintained.

It therefore seemed appropriate to suggest the formation of a W. W. Bailey Memorial Fund for the Endowment of Scholarships at the Straits and Federated Malay States Medical School, and I now have great pleasure in inviting you to contribute generously to this Fund.

Believe me, Dear Sir,
Yours faithfully,
H. C. E. ZACHARIAS,
Secretary

Straits and F. M. S. Medical School.

APPEAL FOR A SCHOLARSHIP FUND.

The Council of the Straits and F. M. S. Medical School begs to bring to your notice the needs of that Institution.

The School was started in 1905 at the instigation of the Chinese Community, the object being to secure a number of locally qualified practitioners.

It is obvious that it is to the advantage of planters and other large employers of labour to have in this part of the world such a class of practitioners. They are acclimatised; they are usually, if not invariably, conversant with a number of languages; they require a scale of pay lower than men possessed of European qualifications. Once a sufficient number of students have qualified locally, it will be less difficult than it is at present for employers of labour to secure qualified medical men trained from the first specially with a view to their future work amongst tropical conditions and diseases.

The difficulty was foreseen from the first of inducing sufficiently intelligent and adequately educated youths to take up the study of medicine for 5 years. The inducements offered to intelligent boys to adopt a mercantile career were such that it was found necessary to found a number of scholarships.

Twenty-five such scholarships of a value from $15 to $18 a month were furnished by the Chinese Community, while the Straits and F. M. S. Govts. provided suitable buildings and also 50 scholarships of a like value to those founded by the Chinese.

Students were divided into two classes, namely Full Course Students and Hospital Assistants. The former undergo a five years' course, and. at the end of their curriculum, on passing their examinations, acquire a Diploma which entitles them to the full right of

practising their profession in the Straits and F. M. S. The Hospital Assistants receive a two years' course and are intended to serve as dressers. Straits Govt. Student Hospital Assistants receive a subsistance allowance of $15 a month, F. M. S. students $30 a month.

At the end of 1905 there were 17 Full Course and 4 Hospital Assistant students; at present we have 84 Full Course and 24 Hospital Assistant Students. Seven Full Course students qualified in May 1910 and since 1905, 18 Hospital Assistants have passed.

In 1905 there were two regular teachers, namely the Principal and the Physiologist; in 1910 there are still two only. Had it not been for the voluntary help of private practitioners and Government Medical Officials in Singapore it would have been impossible to carry on the work.

But private practitioners and Government Officials can devote only a small part of their time to such duties, and now the numbers have increased to such an extent that an extra teacher on the regular staff must be obtained if we are to carry on the School with success.

The urgency is felt chiefly in connection with the work of the last year in the Hospitals. This is the most vital part of the whole course and ought to be undertaken by members of the regular staff. This is a time in which skilled and earnest tuition is specially called for, and to expect the regular staff to carry it on along with their other work is to expect two men to do what would be the work of six in European Medical Schools.

The need for medical practitioners is urgent and will daily become more so. It is not advisable to withdraw any Government scholarships for the purpose of securing an additional member of the regular staff unless some fund can be raised to take their place, and, therefore, the Council appeal to you to help to provide the funds for furnishing a capital sum yielding enough yearly to provide 25 scholarships of $15 to $18 a month (say $5000 annually) to take the place of twenty-five Government scholarships which could then be diverted to provide a much needed increase in the teaching staff.

In view of the growing urgency for properly qualified men and of the good work the School not only aims at doing but has already accomplished, the Council confidently issues this appeal for subscriptions to establish a fund for endowing 25 scholarships.

This appeal is especially made to planters, mine-owners, and other large employers of labour, as it is felt that there will be an urgent need in the not distant future for trained medical men, and it is thought that a certain supply of locally trained medical men will be cheaper and more valuable than an uncertain supply from Europe.

Each scholarship could be called by the name of the estate or mine founding it, or, instead of founding a scholarship, an estate, or mine, could nominate a student for a course of training at the School, guaranteeing the payment of his expenses during his course of study.

The capital sum required for the establishment of a scholarship is estimated at $3,600 while the total cost of the education of one student for five years including fees, expenses of living, etc., would amount to about $1,500.

On behalf of the School Council,
W. GILMORE ELLIS, *Dean.*

THE PLANTERS' ASSOCIATION OF MALAYA.

Kuala Lumpur,
25th November, 1910.

DEAR SIR,

As you are no doubt aware, an International Exhibition of Rubber and Allied Trades will be held next year in London.

It goes without saying that it is essential for the Rubber Industry of the Malay Peninsula to make an imposing show on this occasion; in fact all preparations for doing so have already been actively taken in hand by this Association in conjunction with the Governments of the Federated Malay States and Straits Settlements.

The expense entailed has been estimated at $15,000, out of which sum $10,000 remain to be raised by the parties most concerned, viz., the proprietors of the rubber estates in this Peninsula. It is now proposed to create a special fund for this purpose, and to ask each estate to contribute towards it a sum not exceeding $200; the surplus, if any, to be refunded pro rata, when the accounts are closed.

I enclose a duplicate of this letter, in case you wish to refer this question to your principals, and trusting to be favoured by you with the substantial support that this matter so amply deserves.

Believe me, Dear Sir,
Yours faithfully,
H. C. E. ZACHARIAS,
Secretary.

A meeting of the sub-committee appointed by the Planters' Association of Malaya in connection with the International Rubber Exhibition, London, in 1911, was held on December 11 and was attended by Mr. H. N. Ridley, Director of Gardens, Straits Settlements, and the Director of Agriculture, Federated Malay States.

The following points were agreed upon, subject to the approval of His Excellency the High Commissioner,:—

1. That, to avoid unnecessary duplication of letters, all correspondence, regarding the Exhibition, between England and Malaya, should be carried on between Sir William Taylor and the Director of Agriculture, Federated Malay States.

2. That there should be only one exhibit to be made by the Committee as representing the Governments of the Straits Settlements and the Federated Malay States, and the Planters' Association. All firms here wishing to exhibit should do so through the Committee.

3. The Secretary, Planters' Association of Malaya, is to try to collect $10,000 from the planters. A copy of his circular letter to planters is attached. With regard to this it was agreed, later at a meeting of the Planters' Association of Malaya, that those firms wishing to do so could forward their subscriptions to Sir W. Taylor in England, other subscriptions to be paid here to the Secretary, Planters Association of Malaya, on the understanding that the Committee here can if necessary draw on the money collected in England.

4. That the Secretary, Planters' Association of Malaya, is to arrange a preliminary exhibition at Kuala Lumpur in April, 1911.

5. That a model of a rubber estate be made here, showing factory, manager's house, coolie lines, etc., for the exhibition.

6. That the model Malay house be again used and that Sir W. Taylor be asked to supply the measurements for a new attap roof.

7. That if possible a number of Tamils and Malays be sent over to act as attendants, give demonstrations in tapping, etc., at the exhibition.

8. That each member of the Committee obtain as many photographs of typical Malay and rubber estate views as possible and that these should be collected here by the Director of Agriculture, who would select and send such negatives as he thinks fit on to Sir W Taylor for enlargement in England. In this way large and artistic photographs would be obtained and the whole series would be uniform in style, mounting, etc., and could be better fitted to the stands at the exhibition.

9. Mr. Ridley promised to be responsible for the supply of stumps to show the methods of tapping.

10. It was agreed to ask the Inspector of Coconut Plantations to get together an exhibit of coconuts, and articles of native manufacture as suggested by Mr. Manders. Mr. Brown has since consented to do this.

11. It was thought best to leave the decoration of the stall entirely in the hands of Sir W. Taylor. The Committee hope that it will be possible to achieve something distinctively Malayan.

12. An exhibit of rubber seed oil and oil-cake in large quantities was suggested. Mr. Cummings was spoken to on the subiect and Mr Ridley will try to obtain some also at Singapore.

13. The Director of Agriculture is to be responsible for a number of diagrams, showing increase in acreage under rubber, increase in export, labour force, population, and as many others as possible.

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14. Mr. Ridley promised to write a pamphlet dealing with the history of rubber in Malaya. It was also suggested that Mr. Brown's bulletin on Coconut Cultivation might be made use of. The Committee felt that a small charge of perhaps 1d. should be made for these, in order to prevent their being treated as waste paper, as so many circulars are at exhibitions if given gratis.

15. It was agreed to ask Mr. Burn-Murdoch to get together a forest section, specimens of wild rubber, gutta, would be included as also specimens of the native woods used for construction work on rubber plantations.

16. The Committee considered the machinery was outside the scope of their exhibit and that local firms wishing to exhibit machinery should do independently.

THE RUBBER EXHIBITION OF LONDON, 1911.

The International Rubber and Allied Trades Exhibition will be held in the Agricultural Hall, London, from the 12th to the 20th of June, under the management of Mr. A. Staines Manders. The immense success of the last Exhibition and the still increasing interest taken in the industry, augur well for the exhibition to be held this year. It is of the greatest importance that the Malay Peninsula, the head quarters of the industry, should be even better represented than that all interested and able to show samples of merit will assist in making the Exhibition worthy of the country.

Rubbers of all kinds, wild and cultivated, in all forms, Balata, Gutta percha, Jelutong and all such gums, Botanical specimens, methods of tapping, tools, machinery, fertilizers, motor boats, etc., as used on estates. Manufactured rubber of all kinds and articles used in the manufacture, photographs, pictures, diagrams, maps and literature bearing on the subject are all in request for the instruction of the home public. Other products connected with the industry, rubber seed, oil and oil-cake, coconuts, copra, etc., will all be shown.

It is proposed to have the exhibits of plantation rubber sent to Kuala Lumpur to the care of the Director of Agriculture by April 2, so that the finest and most interesting exhibits can be selected by the committee, and we hope that the whole series of exhibits will beat anything ever shown before, let alone anything else in the Hall.

GUM BENJAMIN.

Gum Benjamin or Benzoin is the aromatic resin of the tree (*Styrax benzoin*) of the order Styraceae, a common tree of the Malay Peninsula, and Sumatra. The Malay name of the product is Keminiyan.

In trade, there are two forms of Benzoin used, the Palembang benzoin, which is undoubtedly the produce of *Styrax Benzoin*, and Siam Benzoin. This latter is believed to be derived from a different tree and is reported to come from Laos. Up to the present time, however, no one has obtained any botanical material enabling us to decide from what tree it is derived, although many attempts have been made to induce people living in Siam to procure specimens. The Sumatra, or Palembang tree, inhabits dense forests at low elevations and attains a height of 60 to 80 feet or more with smooth grey bark. The leaves are lanceolate acuminate light green above, white or whitish beneath. The flowers in panicles or racemes are white and very fragrant, calyx cup shaped pale green corolla half an inch long of five narrow reflexed lanceolate lobes.

The stamens are adnate to the tube, 10 in number, with long narrow conspicuous orange anthers. Style straight and slender, a little longer. The fruit is globose, flattened at each end, pale greyish green ½–1 inch across, with rather thick, hard pulp, green and two hemispheric brown seeds, rounded on the back and flat on the inner face.

The tree flowers in quite a small state when it is about 12 feet tall, and is worth cultivating for its fragrant and pretty flowers.

It is very abundant in many parts of our forests, where the ground may be often found strewed with its fruit.

The Benzoin produced by the Malay Peninsula tree seems to be quite as good as that from Palembang, but for some reason the natives here seldom trouble to collect it.

The resin does not flow readily when the tree is cut, and the bark has no scent or signs of it at first, but about a fortnight or so after the infliction of a wound it exudes and often trickles down the bark.

The form that the resin appears in usually in the market is in cubic blocks of a brown colour, containing opaque yellowish white tears or almonds, with a good deal of debris of bark and wood. The more of the tears in the mass the more valuable is the Benzoin. The Sumatran Benzoin is not valued as highly as the Siamese kind, having a less strong and pleasant odour, and also being less pure. Fluckiger and Hanbury mention a Penang Benjamin or Storax-smelling Benjamin which differed in scent and appearance, being of a finer quality. It probably came from Sumatra. Benzoin is chiefly used in the manufacture of incense both in the East and in the churches of the West. The crude produce is readily sublimed, forming a strongly scented white mass of crystals. A Malay, I formerly knew, used to heat the crude drug in a small earthen chatty which was covered with a long cone of paper and cardboard about two feet in length, the sublimed Benzoin was deposited on the walls of the cone inside in the form of a white crystalline powder, which he sold to the natives as a drug at an enhanced price.

A note on some Gum Benjamin from the Federated Malay States sent to the Imperial Institute in 1905 was published in the Bulletin v. p., 261. Examination showed that it resembled Palembang Benzoin, and at prices at the time (1906) would be valued at £2.8 to £2.10 per cwt. a better quality at £3.8 per cwt.

Benzoin is not mentioned by Marco Polo, but we have an early account of it by Garcia da Orta in 1593 (Historia aromatum). He describes two forms known in his time (1) the almonds (*amygdaloides*) which came from Siam and the borders of Martaban, and which took its name from its containing portions like nails (*ungues*) or white spots. This was the most valued form then as it is now; (2) the form from Java and Sumatra which was cheaper. He mentions a black form from Sumatra called Benjin de Boninas, on account of its pleasing scent which was of ten times the price the other forms. He gives the name Cominham (Keminiyan) as Chinese and gives also the Arab name Louanjaoi (Luban Jawi). He describes also the tree of which he had specimens, with some accuracy, and states that it occurs in Malacca in wet woods, and says that the natives obtain the resin by wounding the tree. The young trees give, he says, the most fragrant resin, the Benjin de Boninas, which is obtained from the province of Bayros. He obtained this information and the specimens at some expense of money, as besides the great difficulty of penetrating the forests of Malacca, there was the greatest danger to be feared from the tigers which dwelt in the forest and which the natives called Reimones, a quaint latinizing of Rimau.

Marsden's History of Sumatra, p 123, gives an account of the product as treated in his day (1783). The tree, he says, grows in great abundance in the northern parts of the island, principally in the Battak country, and is met with though rarely to the south of the line where, from natural inferiority, or want of skill in collecting it, the small quantity produced is black and of little value. In some places near the coast the natives cultivate large plantations of it as the quickness of its growth affords them a probability of reaping the advantage of their industry. The seeds or nuts are sown in the paddy fields and afterwards require no other cultivation than to clear away the shrubs from about them. When the trees are grown so big as to have trunks of six or eight inches in diameter incisions are made in the bark from whence afterwards the gum exudes which is carefully pored off with a knife. The purest of the gum coming first from the tree is white, soft and fragrant, and is called Head Benjamin. The inferior sorts, which in the operation are more or less mixed with the porings and perhaps other juices of the tree, are darker coloured and harder, particularly the foot which is very foul. The trees will seldom bear a repetition of these incisions more than 10 or 12 years. The head is subdivided into Europe and India head of which the first is superior and the only sort adapted to that market, the other with most of the belly goes to Arabia, the Gulf of Persia and some places in India. "It is brought down from the country in "Tambangs" or large cakes covered with matting. In order to pack it in chests it is necessary to soften with boiling water the coarser sorts, the head benjamin is broken into pieces and exposed to the heat of the sun which proves sufficient to run it down."

Marsden does not give a clear enough description of the tree to show whether it is truly *Styrax Benzoin* he talks of. He says the tree does not grow to any considerable size and is never used for timber. The seeds are round, of a brown colour, and about the size of a moderate bolus. The leaves are rough, crisp, inclining to curl at the point (perhaps he only saw dry ones) and yield a very strong scent resembling that of turpentine.

Teysmann saw the cultivation in the neighbourhood of Batang Leko in Sumatra, the tree being planted 15 feet apart.

It does not seem to have ever been cultivated in the Malay Peninsula.

Siam Benzoin.

The Benzoin of Siam as found in commerce has long been suspected to have a different origin from the *Sumatran Benzoin*, but till lately it has apparently been impossible to get any reliable information about it, or specimens of the tree. Mr. E. M. Holmes, the well-known curator of the Museum of the Pharmaceutical Society, has for many years been endeavouring to trace up this plant, and has recently been able to procure fresh information on the subject, but still much remains unknown. Mr. Jamie, a former resident of Singapore, possessed a garden containing many rare plants, among which was a Siam Benzoin tree, and from this tree sent to the Pharmaceutical Society a twig with leaves, in 1883. At Mr. Holmes' request I visited this once famous garden in 1889, and found it had passed into Chinese hands and been neglected and I was unable to find any trace of the tree. Further attempts were made by Mr. Holmes and myself to obtain specimens from Siam without success. Residents in Siam told me that the tree did not occur near Bangkok but very far up-country in Laos. Recently, however, Herr Rordorf of Basle obtained from his brother-in-law, Dr. Nuwenhuis, Dutch Minister in Siam, some specimens of the tree and resin from the north-west provinces of Kiang Mai near the source of the river Meping, and describes them in the Schweizirische Wochenschrift and Mr. Holmes gives an account of this paper, with further notes on the resin, in the Pharmaceutical Society's Journal, Oct. 29, 1910, p. 515. The leaves are described as 11 to 12 inches long and 4 to 5 inches wide, leathery, longish, ovate and acuminate, the margins slightly undulate and entire. The upper surface dark olive green and glabrous with prominent veins, the under surface paler, olive green with abundant appressed stellate hairs. This description clearly shows that the plant is quite distinct from the Malayan *S. Benzoin*. The leaves are nearly twice as big of a different shape, and not white beneath as they are in *S. Benzoin.* Herr Rordorf lays stress on the fact that the leaves are not serrate-toothed as in *S. Benzoin.* This is an error, the leaves of S. Benzoin are never serrate toothed but always entire-edged.

He gives a curious account of the collection and preparation of the resin. The Benzoin district is very difficult of access, and nine expeditions in search of specimens failed to procure any. The tenth, however, was more successful. The only means of access are by the rivers which are not navigable at high-water, and at low water are impenetrable marshes. They are only navigable for a short period in the year, and it takes three days to get up the rivers. The benzoin collectors are a race of small long-haired Chinese who speak an old long forgotten language. The resin is collected in the following way, on trunks of 20-25 cm diameter pieces of bark of rectangular shape from half to four hand-breadths in size are loosened and the resin runs out on the inner side of the bark solidifying by the heat of the sun. This forms the finest quality. The smaller fragments are formed into a lump by hand. The resin is spread out in a heap on the strong mat, and ginger roots hollowed and filled with the marrow from pigs' bones are mixed with it and the mats are tied up in a bundle. The contents are examined from time to time to see if the fat has been taken up, if not fresh fat is used. Rancid pork fat, it is said, will not pass through the ginger roots. This process takes about a year, and is supposed to give a fine aroma. When the fat has disappeared from the ginger the resin is ready for export to Bangkok. The commercial product differs from ordinary Sumatran in its vanilla odour and the fact that the tears are separate from each other.—Ed.

THE OCCURRENCE OF RED PATCHES ON CREPE RUBBER.

During the month of June 1910 my attention was called to the occurrence of crimson patches on para crepe which developed during drying.

The patches varied in size from just visible red spots to blotches, a quarter of an inch or more in diameter, and as many as 288 occurring to the square foot in some samples.

The spots become visible when the rubber had been drying for 12 or 14 days, then increased rapidly in size until drying was all but complete, after this no apparent growth took place. They were not observed on the crepe from bark scrap as it was too dark at this stage of drying for them to be visible.

A close examination showed that the spots in the majority of cases had developed from a nucleus in the substance of the rubber.

Inoculations from freshly visible spots were made on sterilized bread and agar-agar, in a few days a strong crimson culture was obtained, this appeared to be Bacillus prodigiosus.

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It is a curious point that the colonies were so long in developing the colour. This is probably explained by the absence of necessary oxygen, which could only enter the tissues as the moisture evaporated.

The infection lasted for a month to six weeks and disappeared almost as suddenly as it had appeared, without the certain source of contamination being discovered. The natural conclusion is that it was introduced by pool water which a tapping coolie was using to dilute the latex, it is hardly possible (as was suggested) that the bark was the primary host, as great care in sieving the finest particles of this from the latex would not prevent the bacteria from being washed into it.

The colour in the crepe is almost completely removed by prolonged soaking in methylated spirit.

(Sd.) C. J. BROOKS, F. I. C.,
Sarawak.

SMOKED RUBBER.

A letter from Mr. H. A. Morss published in the India-rubber journal, Nov. 4, 1910, is of some interest to planters. Mr. Morss is a manufacturer of rubber covered wires and cables, and has been experimenting with plantation rubber mostly from Ceylon. His experience is that while plantation rubber is clean and on the whole has good mechanical qualities only smoked rubber is suitable for his purpose. He has been unable to make a compound with acid-cured rubber which will stand the searching chemical tests necessarily applied. On the other hand, he has been able to do fairly well with smoked Ceylon although owing to varying quality he cannot depend upon it for the highest class of work.

Here are two points to be observed the advantage of smoke-cured over acid-cured in electrical work, and the importance of regularity in quality of the rubber.—ED.

4/48

A HAND POWER CREPING AND SHEETING MACHINE.

We have received from Messrs. Howarth Erskine's a photograph and description of a little hand power creping and sheeting machine for the use of estates not yet equipped with power factories. In small or commencing estates, where the output is small, and not enough to warrant the use of an engine for creping or sheeting, the worker generally has to use a mangle for turning out his sheet and the ordinary scrap is simply made into balls and bark scrap wasted. The new design invented by Messrs. Howarth Erskine's is destined to save all this waste and to turn out first class crepe or sheet according to the rolls used. Many estates have already commenced using this handy little machine which is a great advance on the mangle which was hitherto our only machine for dealing with small lots of rubber.—ED.

EXPORTS TELEGRAM TO EUROPE AND AMERICA.

15th to 30th September.

	Steamers.		Tons.	Tons.
Tin	Str Singapore & Penang to	U. Kingdom &/or	1560	825
Do.	do.	U.S.A.	730	623
Do.	do.	Continent	230	250
Gambier	Singapore	Glasgow	—	—
Do.	do.	London	—	10
Do.	do.	Liverpool	75	—
Do.	do.	U.K. &/or Continent	25	25
Cube Gambier	do.	United Kingdom	10	20
Black Pepper	do.	do.	30	55
Do.	Penang	do.	5	—
White Pepper	Singapore	do.	150	45
Do.	Penang	do.	—	5
Pearl Sago	Singapore	do.	160	100
Sago Flour	do.	London	100	25
Do.	do.	Liverpool	975	400
Do.	do.	Glasgow	50	—
Tapioca Flake	Singapore	United Kingdom	55	140
T. Pearl & Bullet	do.	do.	340	180
Tapioca Flour	Penang	do.	190	15
Gutta Percha	Singapore	do.	110	150
Buffalo hides	do.	do.	80	35
Pineapples	do.	do.	13,750	9,750
Gambier	do.	U.S.A.	25	230
Cube Gambier	do.	do.	—	—
Black Pepper	do.	do.	5	25
Do.	Penang	do.	210	225
White Pepper	Singapore	do.	15	20
Do.	Penang	do.	45	60
Tapioca Pearl	Singapore	do.	110	180
Nutmegs	Singapore & Penang	do.	20	24
Sago Flour	Singapore	do.	175	110
Pineapples	do.	do.	2,000	3,750
Do.	do.	Continent	2,500	3,250
Gambier	do.	S. Continent	150	100
Do.	do.	N. Continent	700	250
Cube Gambier	do.	Continent	45	35
Black Pepper	do.	S. Continent	280	110
Do.	do.	N. Continent	140	15
Do.	Penang	S. Continent	45	35
Do.	do.	N. Continent	25	—
White Pepper	Singapore	S. Continent	60	10
Do.	do.	N. Continent	130	80
Do.	Penang	S. Continent	5	10
Do.	do.	N. Continent	55	25
Copra	Singapore & Penang	Marseilles	400	300
Do.	do.	Odessa	2,450	1,575
Do.	do.	Other S. Continent	500	520
Do.	do.	N. Continent	4,650	3,000
Sago Flour	Singapore	Continent	1,400	1,075
Tapioca Flake	do.	do.	80	10
Do. Pearl	do.	do.	5	—
Do. Flake	do.	U.S.A.	—	—
Do. do.	Penang	U.K.	—	25
Do. Pearl & Bullet	do.	do.	80	210
Do. Flake	do.	U.S.A.	—	—

	Steamer.		Tons.	Tons.
Tapioca Pearl	do.	do.	175	420
Do. Flake	do.	Continent	90	30
Do. Pearl	do.	do.	175	85
Copra	Singapore & Penang	England	200	260
Gutta Percha	Singapore	Continent	35	5
Cube Gambier	do.	do.	—	—
T. Flake & Pearl	do.	do.	—	—
Sago Flour	do.	do.	—	—
Gambier	do.	S. Continent	—	—
Copra	do.	Marseilles	—	—
Black Pepper	do.	S. Continent	—	—
White Pepper	do.	do.	—	—
Do.	do.	U.S.A.	—	—
Pineapples	do.	do.	—	—
Nutmegs	dc.	do.	—	—
Black Pepper	do.	do.	—	—
Do.	Penang	do.	—	—
White Pepper	do.	do.	—	—
T. Flake & Pearl	do.	do.	—	—
Nutmegs	do.	do.	—	—
Tons Gambier			800	500
Do. Black Pepper			350	340

SINGAPORE MARKET REPORT.

August, 1910.

Articles.	Quantity sold.	Highest price.		Lowest price.	
	Tons.	$	c.	$	c.
Coffee—Liberian	31	11	00	10	10
Copra	9,820	11	70	11	35
Gambier Bale	740	15	25	14	50
„ Cube No. 1 and 2 ...	50	350	00	300	00
Gutta Percha, 1st quality	...	240	00	120	00
	...	100	00	26	00
Gutta Jelotong	...	13	00	9	00
Nutmegs, 110 s.	...	17	00	17	25
„ 80 s.	...	20	50	23	00
Mace, Banda	...	115	00	110	00
„ Amboina	...	85	00	78	00
Black Pepper	628	15	25	14	25
White Pepper	662	27	75	26	50
Sago Flour, small	145	4	80	4	70
„ Medium	10	...		...	
„ Large	20	...		...	
„ No. 1	5,305	3	85	3	40
Flake Tapioca, small	715	7	00	6	20
Pearl Tapioca, small	386	7	75	6	00
„ Medium	716	6	80	6	70
Tin	3,938	80	75	74	90

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PENANG.

Abstract of Meteorological Readings in the Prison Hospital Penang for the month of November, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew Point.	Mean Humidity.			
Prison Hospital Penang	29.919	135.8	80.2	85.4	74.0	11.4	76.9	.876	74.6	86.0	N.W.	20.22	4.35

Prison Hospital, Penang,
Penang 15 *December, 1910.*

B. DANE.
Senior Medical Officer, Penang.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the month of November, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° F.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%		Ins.	Ins.
Kota Bharu ...	...	147.3	79.8	83.90	74.45	9.45	77.3	.885	75.6	89.3	...	12.19	3.57
* Kuala Lebir ...	...	...	76.9	86.8	71.9	14.8	74.6	.812	73.03	88.1	...	7.58	1.54
* Kuala Pahi ...	...	...	...	84.10	72.0	12.10	...	...	...	...	...	8.72	3.03
* Pasir Gajah Estate ...	...	...	...	88.0	72 0	16.0	...	...	...	...	...	7.06	2.00
* Taku Plantation ...	...	...	...	...	...	...	...	...	...	...	...	9.97	2.11
* Pasir Besar ...	...	...	...	...	...	...	...	...	...	...	...	8.26	2.70
* Nenggiri ...	...	...	...	...	...	...	...	...	...	...	...	10.33	1.75
Chaning Estate ...	...	...	...	...	...	...	...	...	...	...	...	9.50	3.40
Pasir Tinggi ...	...	...	...	...	...	...	...	...	...	...	...	7.29	1.56

* Supplied by the courtesy of the Kelantan Planters' Association.

John D. Gimlette,
Residency Surgeon,
Kelantan.

Residency Surgeon's Office.
Kota Bharu, *12th December, 1910.*

NEGRI SEMBILAN.

Abstract of Meteorological Readings in Negri Sembilan Hospitals for the month of November, 1910.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Seremban		143.8	81.	86	72.1	13.7	76.	802.9	72.9	76.4	N.NW	3.47	1.24
Mantin												5.69	.97
Tampin												4.82	1.40
Kuala Pilah												5.13	1.13
Jelebu												4.84	.74
Port Dickson Town												4.92	1.12
Do. Beri Beri												3.53	1.21

Office of the Medical Officer in Charge.
Seremban 16th December, 1910.

A. J. M. CLOVELY.
Medical Officer in Charge.

PERAK.

Abstract of Meteorological Readings in Perak for the month of November, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	106	81.30	92	71	21	76 73	859	...	80	...	7.84	3.00
Kuala Kangsar	...	...	78.89	91	67	24	74.15	781	...	80	...	6.97	.82
Batu Gajah	...	107	79.80	91	71	20	76.22	857	...	85	...	5.11	.96
Gopeng	...	...	79.75	91	69	22	74.99	808	...	80	...	6.64	1.46
Ipoh	...	...	79.65	91	70	21	75.69	839	...	84	...	7.62	1.66
Kampar	...	...	79.87	93	68	25	75.57	828	...	82	...	8.25	1.40
Teluk Anson	...	...	80.68	92	68	24	74.97	792	...	76	...	5.28	1.25
Tapah	...	...	80.02	92	67	25	75.90	842	...	82	...	8.31	1.37
Parit Buntar	...	...	79.15	89	72	17	76.56	880	...	89	...	11.78	2 05
Bagan Serai	...	...	79.04	89	71	18	75.36	829	...	84	...	10.13	1.34
Selama	...	...	79.56	90	71	19	74.89	803	...	80	...	13.05	2 24

S. Lucy,

Senior Medical Officer, Perak.

Office of Senior Medical Officer,

Ipoh, 15th, December 1910

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of November, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.870	150.6	91.2	87.2	72.4	14.8	75.7	0.754	72.0	74	Calm.	3.53	0.62
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	3.42	0.88
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	2.51	0.52
,, Klang	...	...	...	88.3	69.0	18.3	...	...	...	...	...	7.64	2.30
,, Kuala Langat ...	...	...	...	86.4	73.3	13.1	...	...	...	...	...	6.34	1.98
,, Kajang	...	...	...	84.7	75.2	9.5	...	...	...	...	...	3.08	0.79
,, Kuala Selangor ...	...	...	...	87.1	74.7	12.4	...	...	...	...	...	2.02	0.42
,, Kuala Kubu	...	...	...	89.4	70.8	18.6	...	...	...	...	...	9.42	1.55
,, Serendah	...	...	...	92.1	70.5	21.6	...	...	...	...	...	4.79	1.24
,, Rawang	...	...	...	88.5	71.1	17.4	...	...	...	...	...	3.31	0.67
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	4.39	0.71

OFFICE OF SENIOR MEDICAL OFFICER,
Kuala Lumpur, 19th December, 1910.

G. D. FREER,
Senior Medical Officer, Selangor.

SEREMBAN.

Table showing the Daily Results of the Reading of Meteorological Observation taken at the General Hospital, Seremban, for the month of November, 1910.

Date.	Temperature of Radiation.						Temp. of Radiation.		Wind Direction.		Temp. of Evaporation.			Computed Vapour Tension			Relative Humidity.			Clouds 0 to 10			Cloud and Weather Initials.			Rain.
	9 H.	15 H.	Mean.	Maximum.	Minimum.	Range.	Sun.	Difference Sun & Shade.	9 H.	15 H.	9 H.	15 H.	Mean.	9 H.	15 H.	Mean.	9 H.	15 H.	Mean.	9 H.	15 H.	21 H	9 H.	15 H.	21 H.	Inches.
1	81	87	84.	89	73	16	154	65	N	N W	72.6	70.6	71.6	.802	.749	.775	76	58	67	0	0	0	S	S	S	
2	81	80	80.5	86	74	12	135	49	N	W	72.6	71.6	72.1	.802	.775	.788	76	75	75.5	0	0	0	S	S	S	.29
3	79	82	80.5	86	73	13	151	65	N W	N	72.3	72.	72.1	.793	.785	.789	80	72	76	0	6	5	S	C	C	
4	79	84	81.5	85	74	11	144	59	W	W	72.3	74.	73.1	.793	.840	.816	80	72	76	0	0	0	S	S	S	
5	80	86	83.	88	73	15	143	55	W	W	73.3	72.8	73.	.820	.808	.814	80	64	72	0	0	0	S	S	S	
6	78	85	81.5	87	73	14	140	53	W	N W	72.9	71.8	72 3	.810	.781	.795	84	64	74	0	0	0	S	S	S	
7	82	77	79.5	87	72	15	158	71	N W	S W	72.	75.3	73.6	.785	.877	.831	72	94	83	0	10	6	S	N	C	1.24
8	80	80	80.	85	71	14	151	66	W	W	73.3	75.	74 1	.820	.867	.843	80	85	82.5	0	6	0	S	C	S	.20
9	78	83	80.5	85	72	13	141	56	W	S W	74.6	74.7	74.6	.857	.856	.856	89	76	82.5	0	6	0	S	C	S	
10	82	86	84.	88	71	17	151	63	N	S W	70.3	72.8	71.5	.742	.808	.775	68	64	66	0	0	0	S	S	S	
11	83	88	85.5	90	70	20	145	55	N	W	71.3	70.	70.6	.766	.733	.749	68	55	61.5	0	0	0	S	S	S	
12	82	87	84.5	89	70	19	150	61	N W	W	73.6	72.2	72.9	.830	.792	.811	76	61	68.5	0	0	0	S	S	S	
13	78	80	79.	84	73	11	148	64	N	N W	74.6	71.6	73.1	.857	.775	.816	89	75	82	0	9	5	S	N	C	.04
14	77	82	79.5	85	71	14	144	59	N W	N W	71.9	70.3	71.1	.783	.742	.762	84	68	76	0	0	0	S	S	S	
15	77	79	78.	86	73	13	140	54	N W	N W	71.9	68.9	70.4	.783	.707	.745	84	71	77.5	4	0	0	C	S	S	
16	80	83	81.5	87	68	19	146	59	N	N W	71.6	73.	72.3	.775	.810	.792	75	72	73.5	0	10	0	S	N	S	.20
17	79	82	80.5	89	70	19	145	56	N	N W	72.3	70.3	71.3	.793	.742	.767	80	68	74	0	0	0	S	S	S	
18	82	84	83.	87	71	16	147	60	N	W	72.	74.	73.	.785	.840	.812	72	72	72	0	0	0	S	S	S	
19	75	82	78.5	85	72	13	138	53	W	N W	73.3	73.6	73.4	.820	.830	.825	94	76	85	6	0	0	C	S	S	.37
20	80	86	83.	88	72	17	143	55	N W	N W	71.6	74.5	73.	.775	.855	.815	75	68	71.5	0	0	9	S	S	N	.20
21	81	82	81.5	86	73	13	146	60	N W	N	72.6	75.3	73.9	.802	.877	.839	76	80	78	0	0	6	S	S	C	.16
22	79	83	81.	85	72	13	146	61	N	W	72.3	73.	72.6	.793	.810	.801	80	72	76	0	5	0	S	C	S	
23	81	84	82.5	86	73	13	141	55	N W	N W	72.6	71.2	71.9	.802	.763	.782	76	61	68.5	0	0	0	S	S	S	.03
24	77	79	78.	82	74	8	124	42	N W	N W	73.6	70.6	72.1	.829	.749	.789	89	75	82	5	0	0	C	S	S	
25	76	77	76.5	82	73	9	132	50	N W	N W	74.3	73.6	73.9	.848	.829	.838	94	89	91.5	6	8	4	C	N	C	.09
26	75	84	79.5	85	72	13	148	63	N	N W	71.6	74.	72.8	.774	.840	.807	89	72	80.5	9	0	0	N	S	S	.15
27	76	83	79.5	86	73	13	144	58	N W	N W	72.6	71.3	71.9	.801	.766	.783	89	68	78.5	0	2	5	S	S	C	.01
28	78	82	80.	86	74	12	148	62	W	N W	74.6	73.6	74.1	.857	.830	.843	89	76	82.5	3	0	0	S	S	S	.14
29	82	84	83.	86	72	14	144	58	N	N W	70.3	74.	72.1	.742	.840	.791	68	72	70	0	6	0	S	C	S	.35
30	80	83	81.5	84	72	12	119	35	W	N W	75.	73.	74.	.867	.810	.838	85	72	78.5	5	0	0	C	S	S	
Mean.	79.2	82.8	81.	86	72.1	13.7	143.8	57.6	N	N W	72.9	72.9	72.9	.803	.802	.802	80.9	71.6	76.4							3.47

Seremban,
16th December, 1910.

Highest Temperature 90
Lowest Temperature 68

Greatest Rainfall in 24 hours 1.24

A. J. M. CLOVELY,
Senior Medical Officer in Charge.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 2.] FEBRUARY, 1911. [VOL. X

THE ACREAGE OF RUBBER IN THE COLONY.

Through the courtesy of the land officials I have been able to obtain, approximately, the area of land under cultivation in the various parts of the Colony. The figures are only approximate, sent by the registration under the Rubber Dealer's Ordinance, when completed, we shall be able to get a more definite and accurate idea of the area cultivated.

The estimates are as follows:—

Singapore	...	14,000 acres
Malacca	between	55,000 and 60,000 acres
Penang	...	3,000 acres
Province Wellesley		22,920 acres

The total approximates to 100,000 acres which is a pretty large area considering the class of country in which it is planted.—Ed.

RUBBER NOTES.

Bolivia.

"Next to tin the most important product of this Republic is rubber, of which in 1908 about £600,000 worth were exported. The exploitation of the rubber lands is regulated by law by payment of a tax of 1 Bol (one shilling and seven pence farthing) yearly. It is found principally in the north-east near the Peruvian boundry, in the East in the provinces of Santa Cruz and Azero, and in the Acre and Beni territory which is the richest in this product."

Two varieties of rubber plant are found in the Acre territory, the caoutchou which has to be cut down in order to extract the sap, and the Hevea which is merely tapped. In some cases the trees are tapped during a period of two years and are them rested for a similar period. Other rubber trees are tapped for six years at a time and then left untouched for a like time. The trees selected for tapping in the Acre are usually from 30 to 40 years of age and are expected to yield for 20 years after which they become useless. (C. Gosling, Consular report, Bolivia, 1910).

Surninam.

Here, as elsewhere, the cultivation of rubber continues to excite a good deal of attention. There are, it is estimated, some 17,000 trees growing, besides a large number of young plants yet to be put out. Some 800,000 seeds are expected from Ceylon at the end of the present year (1910) in addition there are a certain number of trees in the Colony which are now yielding seed. A species of the Hevea (Hevea Guianensis) is indigenous to the Colony. The percentage of rubber yielded by the variety is less and the quality very inferior to that obtained from Hevea Braziliensis. (Consular Report, for 1909.)

Fiji.

The cultivation of rubber in the Fiji Islands appears from the Agricultural report of 1909, to be effected under some difficulties not shared in by other parts of the world, namely from hurricanes and scale insects. Para rubber suffered much from the hurricane during which at one place nearly half were broken down, but none were uprooted; in other parts of the Colony, however, the damage was confined to the loss of the leaves. The broken trees were trimmed and tarred and they recommenced sprouting.

The growth of the tree does not seem to be quite up to our mark for good growth here. The average for 60 plants is given as at one year old 4.0 inches girth at 3 feet; 5.75 inches at 2 years old, 9.2 at 3 years old. Plants planted at Lantoka in 1907 are only (1909) five feet tall. The Superintendent of Agriculture considers the plant unsuitable for the dry parts of the island.

In cultivation cowpease are planted in the spaces between the trees and weeds chiefly *Mikania scandens* allowed to grow which covers the ground with a thick mat of vegetation and has to be prevented from climbing over the trees.

Castilloa and Ceara rubber have suffered from scale.

The rainfall in the islands seems to be about the average for Para rubber cultivation; 98.27 in some parts to 130.43, which is high, and in Lantoka only 60.86, which probably accounts for the low rate of growth there referred to above.

Gold Coast.

The quantity of rubber exported during 1909, was 2,764,190 lbs. as compared with 1,773,248 lbs. in the previous year. The systematic cultivation of this product is now rapidly extending but the whole of the output is still obtained from trees and vines (Funtumia and Landolphia) in the vast undeveloped forests of the Interior (Consular report, 1909).

Southern Nigeria.

Here 100 Para rubber trees at 8 years were tapped. The average yield from each tree at 23 tappings was 6½ ounces. "Assuming that the trees can be tapped 100 times a year this would give a yield of 1½ lbs a year. Trees at Ebute Mitta, 15 years old, tapped last year, yielded 1 lb. 4 oz. from 26 tappings, amounting to a yield of 5 lbs. per tree and year per 100 tappings". Even if the yield per tree turn out to be less than in the Straits our tapping experiments will still in West Africa, be far superior to Funtumia, and that it should take the place of the latter where planting is to be done in the moist zones (H. N. Thompson, Conservator of Forests, Annual Report for 1909).

The return is undoubtedly poor, and it by no means follows that the results of 23 tappings will give a corresponding output at 100 tappings, practically nearly a whole year's continuous tapping. There are about 30,000 plants of Para rubber in this part of Nigeria.

GOW, WILSON AND STANTON, LIMITED.

India Rubber Market Report for the Year 1910.

Market Conditions.—It can be no exaggeration to say that the past year has been the most remarkable in the history of the Rubber industry since the discovery of vulcanisation.

Though the Brazilian crop last season was larger than ever before, the current demand for raw Rubber was such that prices were raised to an unparalleled level which was maintained for several months.

Consumption, however, gradually became hampered by the strain of high prices, and this, coupled with the inevitable speculation induced by the condition of business brought about a reaction in May, since when the tone of the market has been largely dominated by the stocks and the general trade outlook in America.

The highest prices ever recorded for Crude Rubber were made in April, when the quotation for Hard Fine Para reached 12s. 6d. per lb., while at the auction on the 19th of that month Plantation Smoked Sheet realised up to 12s. 10d. per lb., and the average price for all kinds of Plantation Rubber sold that day was no less than 11s. 11⅜d. per lb. (or say one-third of the value of Silver.)

14/11/56

After the prolonged period of high quotations and generally exceptional trade conditions, the reaction has reduced prices to a basis on which manufacturers are better able to safeguard and cater for the requirements of the Industry, and it is satisfactory to record that the condition of the trade generally is now far more healthy than has been the case for some considerable time past.

High prices have seriously interfered with the enormously increased powers of consumption which have been manifest during the past two years, and have had the effect of bringing into use a much larger quantity of waste Rubber and other compounds. This is strikingly shown by the Imports into the United States, the quantity of old scrap for re-manufacture imported during the first nine months of 1910 amounted to 13,327 tons, as compared with 2,714 tons for the same period two years before. This example gives some idea of the extent to which increasing supplies of raw Rubber could be handled at moderate prices by displacing these very large quantities of inferior substances to the ultimate advantage of the Industry from the consumers' (as well as producers') point of view.

PLANTATION RUBBER—LONDON AUCTIONS.—The amount of Plantation Rubber offered at the London auctions during the year aggregated 95,394 packages (or 5,193½ tons), which figures compared with 50,602 packages (or 2,684 tons) for 1909.

For the period under review the average price realised at auction was the highest on record, viz. 7s. 7¾d. per lb., being no less than 1s. per lb. over the previous record established in 1909.

The following table shows at a glance the expansion of the Industry during the past five years :—

TABLE SHOWING TOTAL QUANTITY AND AVERAGE PRICE OF PLANTATION RUBBER OFFERED AT AUCTION IN LONDON DURING THE LAST FIVE YEARS.

1st January to 31st December.	No. of pkgs. offered.	Quantity in tons.			No. of Pkgs. Sold.	Average Price Paid.
		Ceylon.	Malaya.	Total.		
1906	6,462	98¼	250¼	348½	4,130	5/6¼
1907	15,380	192½	621½	814	7,388	4/9⅝
1908	24,647	290	1,005½	1,295½	16,018	4/1¾
1909	50,602	432	2,252	2,684	40,877	6/7⅜
1910	95,394	761¼	4,432¼	5,193½	85,438	7/7¾

During the past year nearly double the quantity of these grades of rubber has been received as compared with that brought to the London market during 1909. This, coupled with the fact that the average realised was higher than during the previous year causes the result, so far as Importers are concerned, to be highly satisfactory.

Though there are differences of opinion as to the quality of Plantation rubber, the increasing quantities continue to be freely taken in all markets, and we are again able to refer to a satisfactory feature which has been much in evidence, viz., the disposition amongst manufacturers to contract for the crops of Plantations in advance, strong enquiry having been observable even when "spot" markets were quite.

PREPARATION.—For the past 18 months the result of experience with the rubber has induced many manufacturers to give a decided preference to that cured with smoke, it being noticeable that a premium is generally given for this preparation when properly carried out.

Thorough smoking has a preserving effect, with the result that the rubber is better able to stand the handling necessitated in manufacture and subsequent use.

The process is, therefore, strongly to be recommended, but if the premium at present offered is to be maintained, it is of course essential that the quality must be kept up.

A very important fact which cannot be too strongly brought before the notice of Planters is that, on the estate the less handling Rubber undergoes the better, all that is required is to wash out the impurities and reduce the coagulated Rubber into the most suitable form for economical drying. There has lately been a marked tendency to roll out Crepe very thin to hasten drying, but it is desirable that crepe in the finished form should be thick and even in texture, say ⅛-inch thick. Smoking carefully applied during drying is beneficial either to sheet or any other kinds prepared.

Generally speaking, the preparation of Plantation Rubber now arriving shows improvement in various directions, more attention being given to factories and machinery than formerly, and the sending out of Chemists to Ceylon and the Malay States to study the question on the spot has been a valuable move in the right direction which should have beneficial results.

STANDARD QUALITY.—In view of the proportions which the Plantation industry is now assuming, the need of establishing and maintaining an efficient standard of quality cannot be exaggerated.

Especially in the case of what is known as "First Latex Crepe," there have been complaints on account of the streaky and discoloured nature of many arrivals. These, if continued, might affect the prospects of Plantation rubber successfully competing with other grades, and Estates Managers must take every possible precaution to insure that their first quality rubber is in fact first quality and free from any such defects as those refered to.

PARA.—As with Plantation so with Para, the last complete crop has been the largest, exceeding that of 1909 by nearly 1,000 tons, the sole cause being no doubt the satisfactory prices ruling. The receipts at Para during the last eleven complete seasons and the first six months of the last six years are given below.

4/57

Exports of Plantation Rubber from Malaya and Ceylon Since 1905.

	Port Swettenham Tons.	Singapore Tons.	Penang Tons.	Ceylon Tons.	Total. Tons
1905	—	83	47	75	205
1906	—	321	58	146	531
1907	—	649	236	248	1,133
1908	—	919¾	719¼	371¼	2,010¼
1909	1,321½	1,077	932¼	666¼	3,997
1910	3,482	1596½	977½	1,465	7,521

* The December figures (and part of those for November) are estimated.

Receipts at Para During the Last Eleven Seasons.

	Tons.		Tons.		Tons.
1899-00	26,693	1903-04	30,580	1907-08	36,680
1900-01	27,640	1904-05	23,100	1908-09	38,150
1901-02	29,997	1905-06	34,710	1909-10	39,130
1902-03	29,890	1906-07	37,810		

Receipts from July to December for the Last Six Years.

1905, 14,690 tons. 1906, 14,680 tons. 1907, 14,240 tons, 1908, 15,765 tons. 1909, 16,600 tons. *1910, 1,568 tons.

* Up to 30th December.

GOW, WILSON & STANTON, Ltd.,
13 & 23, Rood Lane, E. C.

31st December, 1910.

THE COCONUT INDUSTRY IN 1910.

(From the Times of Ceylon, Wednesday, January 11th, 1911.)

The past year was, on the whole, a very satisfactory one for our coconut products, for it not only witnessed copra sold at the unprecedentedly high figure of R93·50 per candy, but also a marked a considerably increased export trade in coconut oil and desiccated coconut. We have to blame the long drought, and the heavy rains which fell in the latter part of the year, and for the fact that the production was somewhat less than during the previous twelve months. Coconuts rose to a very good figure, but the general shortage, and probably the increased consumption of the nut as a food by the natives, resulted in fewer coconuts being exported. The countries of the United Kingdom, which yearly take something like 10,000,000 nuts, imported nearly 800,000 less than in 1909, but the demand made by the European countries, taken together, was larger than in the previous year, Belgium alone increasing her coconut imports by one-fifth. Many planters believe that the present year will see a further shortage in coconuts, which may cause prices to reach new records. We have to bear in mind, however, that the Straits, Java and Philippines, and several of the German colonies are also producing coconuts, and that with the opening up of new estates, the extension of existing properties, and the coming into bearing of other young ones, the output is yearly growing larger, and it is a question whether the very considerable increase in prices anticipated by many planters will be realised.

The year has seen considerable activity in the planting up of coconuts in the F.M.S., and there are still big Companies, we understand, on the eve of being brought forward. A number of new Companies were formed during the year in Ceylon to develop coconuts in the Straits, and the shares were received with considerable favour. The suitability of parts of the F.M.S. for coconut planting is now beyond dispute, as coconuts reach the production stage there in the sixth year. In future, the F.M.S. will undoubtedly be a factor in regulating the prices of coconut products. Ceylon brains and money pioneered the rubber industry in the Straits, and are doing the same for the coconut industry, and, we trust, with the same success and material advantage.

The advantages of manuring are becoming more apparent every year, and last year it was taken up to a greater extent on coconut properties in Ceylon than ever before. There is no plant which responds more readily to manuring than the coconut, and we are told that planters frequently obtain double or even treble the number of nuts as a result of careful treatment of the soil in this way. In reviewing the business in coconut, there must also be considered the fact that the population is growing, and that, with the increased cost of living, the consumption of coconuts by the natives has increased considerably. Copra, as the most important item of produce in the coconuts industry, must be regarded as having had a very profitable year, considering the record prices which were realised. Coconut oil also found a very ready market the world over, and prices showed a steady upward tendency. An important point to be considered while on the subject of coconut oil is the predicted scarcity of cotton, which would necessarily bring with it a shortage of cotton-seed and cotton-seed oil. Cocconut oil is in some respects a competitor of cotton-seed oil in the various uses to which it is put, and it is quite within reason, in the event of an increase in the cost of the latter, to anticipate a largely increased demand for the former. The previous year's export of desiccated nuts was largely exceeded last year, from 27,000,000 to 28,000,000 lbs. being sent out of the Island, as against an average export for the last ten years of 18,500,000 lbs. The quality of the products was well maintained during the year.

FUNTUMIA ELASTICA.

There are two ways of tapping this tree for latex i.e., the excision and the incision systems.

By the excision method deep cuts as far as the cambium are made, while by the incision system only shallow channels are opened, just deep enough to allow the latex to run down the tree; incisions are then made into these channels by means of a pricker.

Of the incision tapping, the most satisfactory results, so far as the quantity of latex is concerned, were obtained from the spiral system: this gave in comparison with the total length of cuts the highest yield of latex.

Taking it all round however the experiments carried out with the excision method have been very disappointing. Trees tapped last year for the first time, and tapped on the same area this year gave only one ton of the amount of latex yielded last year. This shows that a tree has to be given many years rest after one tapping before it can be profitably tapped again.

There seems to me little doubt left that the incision tappping by means of a pricker is the right method for Funtumia trees, as there is comparatively little damage done to the plant and, as Dr. Christy of Uganda assured us, a tree can be tapped three times a year without showing a decrease in yield.

Experiments were also made in connection with the preparation of Funtumia rubbber.

Of cold methods, i.e., coagulation without boiling the latex, purub and acetic had no effect on the Funtumia latex. Good biscuits can be prepared by adding formalin or absolute alcohol to the latter. But there is no reason why the native should use expensive chemicals for the preparation of this rubber, as good thin biscuits can just as well be made by simply boiling the latex and then washing and pressing it, the principle thing being to boil as small a quantity of latex as possible at a time, so as to ensure the preparation of very thin biscuits. The latter are then easily dried. (Report on Forest and Agriculture in Southern Nigeria).

Improvement in Quality of Rubber.

Foreseeing that if the quality of rubber exports from Southern Nigeria were not improved, the rubber buyers at home would not only lower the price of our rubber but would also in time possibly refuse to purchase it at all, the Forestry Department with a very limited staff commenced instructing the natives in the manufacture of biscuit rubber. Forest Officers instructed the natives throughout the whole of the Central Province, and biscuit rubber commenced to come in before the merchants were really prepared to buy it. But as the latter continued to give full prices for the lump rubber the natives became discouraged and gave up making the biscuits, the difference in price not compensating them for the extra labour.

The Chamber of Commerce of Lagos was approached and it was suggested that an inspection fee of 2d. per pound should be placed on all rubber exported and the proceeds be spent in increasing the teaching staff of the Forest Department so that all the rubber tappers in the Protector might be instructed, and persuaded to give up making lump rubber.

The Chamber of Commerce finally agreed to the quite inadequate sum of ½d per pound, but the matter was referred to the African Trade Section of the Liverpool Chamber of Commerce, who in spite of the high price of rubber, and the decision of the merchants on the spot, protested against this tax, and suggested that this extraordinary expense be paid out of the general revenues. Here the matter rests. Our only remedy is (1) to refuse to grant rubber licenses to the tappers until they have learnt to make biscuit rubber and promise to make no other kind, and—(2) after a certain date to prohibit the export of lump rubber. More especially should this be done as we know that lump rubber is adulterated with the latices drawn from the Iroko, Alstonia Congensis, and other latex giving trees.

The Provincial Forest Officer of the Eastern Province reports as follows on the methods of collecting and preparing Landolphia rubber by the Munchis inhabiting the newly opened out Obudu Districts.

"The systems are invariably cut down to within two or three feet of the ground and the Caoutchouc in the laticiferous vessels allowed to coagulate before the stems are cut into foot long pieces and stripped of bark, which is pounded and washed alternately till the shredded bark is almost estimated. The result is irregularly shaped pieces of rubber containing about 20 per cent of shredded bark. The pieces of rubber are then heated in boiling water, softened and pressed into an irregularly shaped ball bound together by thin strips of pure rubber, viz., latex coagulated by salt as it exudes from the wounds in the bark of a contiguous Landolphia.

The district will not for some time be sufficiently under control to enforce the rules relating to rubber. The producers were impossible to get at but the Hausa middlesmen rubber traders were instructed in the proper way of tapping and preparing pure rubber."—(Report on Forestry and Agriculture in Southern Nigeria, para. 43 & 4.)

VARIABILITY OF PLANTATION PARA.

The publication of letters in recent issues of *India-Rubber Journal* from important manufacturing and chemical firms relating to the variability of plantation rubber from the East has brought forward numerous suggestions and enquiries. It is quite clear that the growers of plantation rubber view with some misapprehension the objections repeatedly raised against their product; hitherto they have prided themselves upon the proved constancy in chemical composition of their rubber, and have, from the commencement, maintained a reputation for purity which will always stand them in good stead. In fact the standard of constancy in composition has stimulated collectors of wild rubber in Africa and America to work with the same object in view, and already inferior rubbers, known for all time on account of the loss on washing, are being placed on the market as washed crêpe, comparable, in many respects, to low grades of plantation crêpe from the East. Despite the advance made and good reputation earned while in its infancy, plantation rubber is now finding much more difficulty in competing with wild Para on problems of utility. That plantation supplies are comparatively weak very few will deny; increased age alone will lead to improvements in that respect. It is the far more serious problem of variablity before and after vulcanization that is troubling growers and manufacturers alike. Mr. D. Thornton, of the Canadian Consolidated Rubber Company, Limited, Montreal, has appealed again to our growers on this difficulty, and we, recognising his position from the manufacturing point of view, gladly give publicity to the statements he now makes. Mr. Thornton has sent us two samples of "biscuits" from an estates well-known in Ceylon; the name of the estates is on each biscuit, and is, in itself, a guarantee of high quality. These were taken from the same case, and yet they vary in colour, elasticity and time of vulcanization. They have the appearance of first class rubber, one being the dark colour of smoked rubber, and the other pale amber. Any broker would class them as being almost equal in value; nevertheless their variability renders their extensive use impossible. Mr. Thornton states that while he does not object to the shade as a shade, he does object to differences in colour, because parallel differences prevail all through the process of manufacture; he even goes so far as to state that it represents differences in actual composition which lead to confusion in the factory. The objections raised are so important to growers that we think it will be necessary to effect grading, according to colour, on a much finer scale than has been customary in the past. This is not very expensive work, and is warranted by the necessity to maintain the support of manufacturers, who find that though fine hard Para is not uniform, it is reasonable and so can advantageously be used instead of plantation lots.

We are not quite sure whether the same variability has been experienced when dealing with crêpe, sheet or block rubber. Perhaps Mr. Thornton will give us some information on this point.

Attention should also be called to the communication from Mr. Henry A. Morss, published in our issue of November 14th. Mr. Morss made definite comparisons between plantation crêpe purchased in Singapore and fine hard Para, and concluded that for use in covering wires and cables plantation rubber was not satisfactory. He states that acid-cured rubber will not stand the searching electrical tests applied, and advises us that only smoked rubber can be used for these special purposes. Mr. Parkin followed this up with some sound advice on the abuse of acetic acid on plantations. We are hopeful that the publicity given to the variability of plantation rubber will awaken the minds of all who have planting interests at stake. It is a serious problem, and the sooner it is approached by planters and chemists the better.

We refer our readers to Dr. Stevens, rejoinder to Mr. Thornton, Dr. Stevens, while qualifying his remarks on the relative insignificance of colour, maintains that the irregularity complained of can be expected, except from large estates producing considerable quantities of rubber. He maintains that both in colour and time of vulcanizing certain grades of rubber from estates which we know have a wide reputation, exhibit great uniformity.

We have shown the samples of rubber to the head of one of the principal brokers' houses in London, and he expressed surprise that two samples differing so widely in colour should have been sold in the same case. We can only repeat that it will amply repay planters to grade their rubber better than they have done in the past. This point is one which brokers, too, might bear in mind, as we have reason to believe that more care might be bestowed by them in the offering of rubber of variable colour in the same lot. In the past brokers have sometimes been able to obtain small premiums for a difference in colour, and in such cases every care has been taken to keep the colour-grades separate; now, and in the future, when premiums for novelties in colour and thickness cannot be obtained, there may be a tendency to offer lots of a mixed character—a course which is obviously likely to do considerable harm to the industry.

(India rubber Journal January 7th, 1911.)

GERMINATION OF RUBBER SEED IN BRITISH GUIANA.

By Prof. J. B. Harrison, C.M.G., M.A., and F. A. Stockdale B.A., F.L.S.

(Reprinted from the Journal of the Board of Agriculture, British Guiana.) Vol. IV., No. 2.

"Hevea braziliensis is not known to occur in the forests of the colony, and as there are but very few trees of sufficient age under cultivation to produce seeds our supply of plants must, for some years, be obtained from abroad. It is impossible to obtain seeds, the germination of which can be relied upon from Brazil, and therefore we have to obtain for the present our supplies from the East. During the last four years 172,957 seeds have been obtained by the Department of Science and Agriculture from the Botanic Gardens, Singapore, from which 134,419 plants have been raised and sold to different purchasers in the colony. Various private attempts have been made with shipments of seeds and stumps from Ceylon, the Straits Settlements and the Federated Malay States, with, so far, but slight success.

The following table gives the details of germinations of seeds of Para rubber at the Botanic Gardens during the two years 1905-7:—

	Number of Seeds	Where obtained from	Number of Plants raised	Percentage of Germination
1905-6	50	Para, Brazil	None	—
1906-7	20,000	Received from Messrs. Booker Bros., McConnell and Co., from (Ceylon)	6,000	30
	12,000	Presented by Hon. B. Howell Jones	None	
	25,000	Ceylon	1,000	4
	1,200	Botanic Gardens, Singapore	900	75
	500	Royal Botanic Gardens, Ceylon	100	20

The following table gives particulars of the shipments of Para rubber seeds imported from the Botanic Gardens, Singapore, by the Department of Science and Agriculture and germinated at the Botanic Gardens, Georgetown, since 1907:—

BOTANIC GARDENS, SINGAPORE.

1907-8	10,800	(Spring crop)	6,955	64. 4
	*52,000	(Autumn crop)	42,100	80.00
1908-9	50,000	(Autumn crop)	43,150	86. 3
1909-10	30,131	(Autumn crop)	21,609	70. 0
1910-11	29,676	(Spring crop)	20,465	68. 9
	303	(Intermediate crop)	139	46. 0
Total 1907-10	172,957		134,419	77.7

It has been demonstrated that the most satisfactory method is to obtain seeds packed in weathered, charred rice dust in biscuit tins direct by parcel post, with about 500 seeds per tin. The autumn crop of seeds has given much better germination than has the spring crop as much as 86% having been obtained from the former as against

*Since the seeds obtained from the Botanic gardens have been obtained packed in charred rice dust in biscuit tins and sent by parcel post, the average germination of seeds of the autumn crop has been nearly 81% while the average germination of the spring and intermediate crop seeds has been 67.6%. In 1907-8 at the same time as 52,000 seeds were obtained from the Botanic Gardens through the parcel post with 80% germination a shipment of 10,500 seeds obtained by freight was sent to the Botanic Gardens for germination and 18 plants were raised. Several other shipments have been obtained by private firms, by freight, and all have resulted disastrously.

70% for the latter. Germination depends to a very great extent upon the length of time that elapses between the falling from the trees and the packing for transport, as well as upon the skill in packing, while it has been shown that unless the seeds are sown within one week of their receipt in this colony their germinating capacity falls rapidly. Some shipments of stumps from the East have done fairly satisfactorily while others have failed."

This story of the germination of Para rubber seeds after long-travelling possesses some points of interest. The journey is about 60 days from Singapore to Guiana and considering the short-lined durability of the seed the percentage of germination, when carefully packed, is satisfactory.

The most interesting point, however, in the article, is the difference between the germinative power of the spring and autumn crops. There is a marked difference as will be seen by referring to the table, the seed of the autumn crop germinates much better. It is possible that this is due to the dryer weather about the time of ripening of the autumn crop. The spring crop comes on early in the year, just after or during the rains. The seeds are only thrown from the capsule during sunshine, and it frequently happens that when they are actually ripe the days are dull and wet and the seeds are retained in the capsule till the first fine day. In this case they have, it appears, a tendency to commence germination in the capsule, and even if the radicle is not protruded the earlier preliminary stages may take place without any external symptoms. Such seeds, when travelling doubtless receive a check in growth which causes their death. Seeds received from various estates in the peninsula have in many cases given extremely unsatisfactory results, few or more in a large lot germinating at all. The cause of this is not clear. It is possibly due to the trees being young and the travelling power of such seeds may be inferior to those of older trees, or it may be due to some effect caused by the heavy tapping of the trees. It is, again, possibly due to imperfect fertilization from the absence or insufficient supply of flies which fertilize the flowers. Anyway the fact has been very marked.—ED.

THE FIBRE OF THE NIPA PALM.

Imperial Institute, (South Kensington, London, S.W.)

Report on "Nipa" fibre from the Federated Malay States, by Professor Wyndham R. Dunstan, M.A., L.L.D., F.R.S., Director.

Regd. No. 35799.

The sample of Nipa palm fibre which is the subject of this report was forwarded to the Imperial Institute by Mr. Edward Valpy of Klang, Selangor, with letter dated 8th September, 1910. It was stated that the palm grows in large quantities in Selangor and it was desired to ascertain whether the fibre would find a market in Europe.

Description of Sample.

The sample consisted of a portion of petiole weighing 3oz. and a quantity of fibre weighing 13 oz.

The petiole was about 3 inches in diameter and was composed of a compact mass of dark, reddish-brown fibre and cellular tissue, surrounded by a very thin, smooth epidermis. The fibre which had evidently been obtained from the inside of the stem or petiole of the palm, was dark reddish-brown and very coarse and brittle. This product would be of little or on value for rope mat or brushmaking, or as a stuffing material, on account of its coarseness, weakness, brittleness, and lack of flexibility and resiliency.

Results of Examination.

Experiments were made at the Imperial Institute in order to ascertain whether the petiole or the fibre could be used for papermaking. Both materials, on suitable treatment with hot alkali, yielded a brownish pulp which was easily bleached to a very pale cream colour.

The results of the examination of the petiole and fibre are given in the following table, which also includes the corresponding figures for Algerian esparto grass:—

	Nipa palm petiole per cent.	Nipa palm fibre per cent.	Esparto grass from Oran per cent.
Moisture (calculated by drying at 100° to 110° C)	21.5	17.3	8.8
Ash (calculated on dried material)	14.2	7.0	3.0
Yield of unbleached pulp (dried at 100° to 110° C):—			
Calculated on material as received	10.8	24.2	29.5
Calculated on dried material	13.8	29.2	32.3
Loss of pulp on bleaching	8.4	8.4	1.3
Yield of bleached pulp (dried at 100° to 110° C) calculated on dried material	12.6	26.8	32.0
Length of ultimate fibre.	Generally from 0.028 to 0.1 inch; average, 0.056 inch		From 0.012 to inch; 0.12 average 0.045 inch

The above figures show that the yield of pulp from the fibre calculated on the dried material, is slightly below that for esparto grass similarly treated, whilst the yield from the whole petiole is very low.

Samples of the paper prepared at the Imperial Institute from the Nipa pulp are enclosed with this report. The paper would no doubt be stronger if prepared under manufacturing conditions.

Remarks.

It is evident that the fibre of the Nipa palm could be utilised for paper-making, but its value for this purpose could only be decided by trials on a manufacturing scale. It is, however, doubtful whether the fibre could be remuneratively extracted from the petiole and exported to Europe, as the value in the United Kingdom of esparto grass is only about £3. 2s. 6d. per ton (November, 1910.)

The yield of pulp from the whole petioles is very low, and they would probably not be worth more than 30s. per ton in the United Kingdom.

If a large and regular supply of this material can be assured it might possibly remunerative to convert the fibre into pulp in the Federated Malay States to be either exported or made into paper for local use.

(Sd.) WYNDHAM R. DUNSTAN.

30th November, 1910.

PLANTERS' ASSOCIATION OF MALAYA.

Minutes of a Meeting held on 11th December, 1910, at the Masonic Hall, Kuala Lumpur.

PRESENT:

Mr. C. M. Cumming,—Chairman.

For Kuala Lumpur District Planters' Association:—Messrs. F. G. Harvey, E. B. Skinner, H. F. Dupuis, and H. C. E. Zacharias.

For Batu Tiga District Planters' Association:—Mr. H. L. Jarvis.

For Negri Sembilan Planters' Association:—Mr. A. D. Davidson (by his proxy Mr. J. G. Hubback.)

For Kuala Langat District Planters' Association:—Mr. F. J. Dupuis.

For Lower Perak District Planters' Association:—Mr. M. Maude.

Mr. G. H. Day, Legal Adviser.

Mr. H. C. E. Zacharias, Secretary.

Visitors:—Mr. H. N. Ridley and Mr. L. Lewton-Brain.

1. The Minutes of the previous Meeting are taken as read and confirmed.

2. The Secretary reports that the Taiping Planters' Association have paid the balance of their subscription under protest.

3. AGRI-HORTICULTURAL SHOWS.

The Secretary reads the following letters:

Botanic Gardens, Singapore, 2nd December, 1910.

SIR,—I have the honour to inform you that I have received the following reply from the Government in connection with the Agri-Horticultural Show.

"With reference to your letter of the 15th September forwarding copy from the minutes of a meeting of the Standing Committee of the Agri-Horticultural Shows, I am directed to inform you that after consultation with the Planters' Association of Malaya, His Excellency the Governor has been pleased to direct that in future Agri-Horticultural Shows are to be held biennially instead of annually.

I have, etc.,
(Sd.) W. EVANS,
Secretary.

4. LONDON EXHIBITION.

The following letters are read:

The Secretary, Planters' Association of Malaya,
Kuala Lumpur.

London, 26th October, 1910.

DEAR SIR,—I have the pleasure in enclosing you herewith copy of a Resolution which was passed at a Meeting of the Honorary Advisory Committee of the above-named Exhibition held at the London Chamber of Commerce, on the 17th instant.

Yours truly,
(Sd.) A. STAINES MANDERS,
Manager.

International Rubber and Allied Trades Exhibition, 1911.

At a Meeting of the Advisory Committee of the International Rubber and Allied Trades Exhibition (1911) held at the London Chamber of Commerce, on the 17th October, 1910, the following Resolution was duly passed :—

"That this Meeting of the Advisory Committee of The International Rubber and Allied Trades Exhibition (1911) in recording its appreciation of the cordial co-operation and support given to the Exhibition, desires to tender its best thanks to the Planters' Association of Malaya.

At the same time, this Meeting expresses the hope that the Exhibition will be attended by the Representatives of your Association, who are assured of a hearty welcome."

No. 37/1910 Kuala Lumpur, 10th November, 1910.

SIR,—I am directed to inform you that Sir W. T. Taylor, Agent, Malay States Development Agency, has been invited and has consented to take charge on behalf of the Straits Settlements and Federated Malay States of the arrangements for the International Rubber Exhibition.

2. I am to say Sir William Taylor would be glad to learn at as early a date as possible what action it is desired that he should take.

I have, etc.,
(Sd.) E. C. H. WOLFF,
for Federal Secretary.

To The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

No. 37/1910. Kuala Lumpur, 17th November, 1910.

SIR,—I am directed to forward the enclosed copy of a letter received from the Agent, Malay States Development Agency, on the subject of the International Rubber and Allied Trades Exhibition.

I have etc.,
(Sd.) E. C. H. WOLFF,
for Federal Secretary.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

London, 20th November, 1910.

SIR,— With reference to the subject of the representation of the Federated Malay States and the Straits Settlements at the forthcoming International Rubber and Allied Trades Exhibition to be held in the Agricultural Hall in June, 1911, I have had an interview with the Manager of the Exhibition, Mr. A. Staines Manders, in the course of which that gentleman expressed a hope that the Malay Hut which was used in connection with the last Rubber Exhibition, should be again set up, as it was in his opinion a source of attraction and interest to a large number of those who visited the Malay Section.

2. If Mr. Manders' views in his respect are to be met, and they appear to me to be worthy of consideration unless your Government should decide on having something more ornate and attractive than the Hut, it will be necessary that you should send here at an early date some fresh attaps for the roof. The materials of the building have been carefully stored since they were last used, by the Manager's directions.

3. Mr. Manders also suggested that large photographs of scenery and places of interest in the Peninsula should be available. The photographs sent and utilized at the Exhibition of 1908 were much too small in his opinion.

4. Another suggestion is that stumps of Rubber Trees showing the methods of tapping adopted should be sent here and be on show in the Malay Section. At the last Exhibition this course was taken in connection with the Ceylon Section with very satisfactory results.

5. A further suggestion of Mr. Manders is that other products of the Colony, such as coconuts, coffee, etc., should be on view in the Section. These products would be used by way of ornamenting the stands and making them attractive to the General public, not in any way in the sense of being exhibited.

6. If you have any pamphlets or other literature that could be distributed gratis to visitors a supply might be sent.

7. So far I have heard of only two Rubber Companies having estates in Malay Peninsula having applied for space. I should be glad of an expression of your views as to whether the space assigned to the F. M. S. and Straits Settlements Governments may be to any extent allowed to be made use of by Exhibitors connected with the Peninsula. I understand the Management to be opposed to this, and to hold that the Government space should be utilized for Government Exhibits only, and that other Exhibitors should apply for space for their several purposes.

8. However this may be I venture to hope that the Governments of the Straits Settlements and Federated Malay States will get together a large and representative collection of Rubber of the various descriptions and qualities put on the market and have it sent here in good time for the opening of the Exhibition. At the Exhibition of 1908 the display of Malay grown rubber would have been even more indifferent than was the case but for the fact of samples of Rubber having been obtained from representatives in London of Rubber Companies connected with the Malay Peninsula.

9. It would add to the interest of the Malay Section if some of the firms who manufacture machinery for the treatment of rubber, such firms as the Federated Engineering Company, Riley Hargreaves and Co., and others known to you would send over samples of the Machinery and appliances made by them.

I am, Dear Sir,
Your obedient servant,
(Sd.) W. T. Taylor.

London, 3rd November, 1910.

Dear Sir,—At a Meeting of the Agency Board held to-day was decided to address the Committee of your Association on the subject of the representation of the Federated Malay States at the Rubber Exhibition to be held in the Agricultural Hall in June 1911, and to invite through them the cordial co-operation and assistance of the F. M. S. Rubber Estates with a view to rendering the Government Exhibit worthy of the occasion and of the F. M. S.

It is desired to have exhibits of all classes of Rubber, and Rubber stumps showing the methods of tapping in vogue, also rubber seeds, fresh if possible.

I am, Dear Sir.
Yours faithfully,
(Sd.) W. T. Taylor.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

London, 4th November, 1910.

Dear Sir,—I am in receipt of your letter of 6th ultimo for wihch I thank you.

International Rubber Exhibition.—I note with interest the preliminary arrangements which you are making with a view to organizing a thoroughly representative exhibit of the F. M. S. rubber industry.

I am instructed by the Executive Committee of the Association to state that the organisation of this Association is entirely at your service in connection with the F. M. S. Exhibit. We are in close touch with the promoters of the Exhibition, and should be pleased to act on your behalf should you so desire, in arranging your exhibit, or if you are appointing special commissioners or representatives, for this purpose, to co-operate with or assist them.

I note that you are holding a preliminary local show with a view to selecting ihe most suitable exhibits to be sent to the Exhibition, and I understand from your letter, that you desire that the Companies who are members of the Malaya Section of the Association should instruct their representatives to forward samples to this local exhibition with a view to their being sent to the London Exhibition if chosen by your Selection Committee. I am, accordingly, requesting all our members to send out instructions to this effect.

You do not mention photographs as forming part of your exhibit, but if I may make the suggestion, as selection of photographs of trees, young and old, estate factories, tapping curing operations, the Members of the P. A. M. assembled in Meeting, scenes of interest in the F. M. S. would greatly add to the interest of the exhibit. Even if these photographs could not all be accommodated on the F. M. S. Exhibit they could be displayed on the walls of the " Rubber Club " which the promotors or organising within the precincts of the Exhibition.) Would not sections of tree trunks showing the various systems of tapping add to the completeness of the exhibit?

FINANCE.—Will you kindly favour me with such particulars on this point as will enable the Malaya Committee to consider how best to co-operate. Can you let me know what was the total cost of the Malayan Exhibit at the 1908 Exhibition, and who contributed thereto, and in what proportions and what is the estimated cost of the exhibit at the 1911 Exhibition, and whether the Government are contributing, and to what extent, and whether you suggest a contribution should be raised by the R. G. A. in London, or whether to recommend members to send contributions direct to the F. M. S., and if so, to whom they should be sent.

This Association is offering Diplomas with Gold, Silver, and Bronze Medals in connection with the Exhibition, but the conditions of competition are not yet determined.

BRUSSELS EXHIBITION. RUBBER SECTION.—You are doubtless aware that the exhibits of the Planters' Association of Malaya and of the Rubber Exhibition at Tervueren, (were photographed)? and I have a photograph including both exhibits which I have had copied in two sections showing each exhibit. These are being sent per Messrs. Pitt & Scott and will not perhaps arrive until after this reaches you. Copies of these are forwarded herewith for your acceptance.

GENERAL.—The Rubber Growers' Association has been much indebted in the past to Mr. R. W. Harrison, your late Chairman, for information regarding local matters which are of interest to the Malaya Companies in this Association. Mr. Harrison is now at Home, and has joined the Executive Committee of the Association, and has suggested that, in place of seeking an individual correspondent in the F.M.S., that I should approach you on the matter, and to ask whether you will from time to time keep me advised of matters of interest to our Malaya Companies. We should be glad to be favoured with any printed reports of the P.A.M. Meetings and of the *Federal Government Gazette*. (The latter must, no doubt, be subscribed for, and if this is so, would you kindly lodge an order in the proper quarter on behalf of this Association.)

On the 15th July last communications were addressed to the Chairman of the P.A.M. relating to the F.M.S. Government Drains and the Water Scheme, and the co-operation of your Association in these matters will be esteemed.

I await with interest further information of the progress of your arrangements for the exhibition, and on hearing from you on the points relating to finance, will bring these before my Committee.

With compliments.
I am, Dear Sir,
Yours faithfully,
(Sd.) C. TAYLOR,
Secretary, Rubber Growers' Association.

The Secretary reports on the progress made by the Sub-Committee.

The subject having been discussed by the Meeting in Committee, the Secretary is directed to receive all subscriptions made locally towards the Exhibition Fund, and to arrange for Sir William Taylor to receive all home payments.

5. BRUSSELS EXHIBITION.

The Secretary lays on the table a photograph, forwarded by Messrs. Lewis and Peat, show the P.A.M. Exhibit at Tervueren.

The Secretary also reads the following letter:

Anvers, le 25 Octobre, 1910.

MESSIEURS,—Nous avons le plaisir de vous informer, que le jury de l'Exposition Universelle & Internationale de Bruxelles vous adcerne Un Diplome de Grand Prix pour votre participation a l'Exposition de Tervueren. Veuillez agreer Messieurs, avec nos felicitations, l'assurance de nos meilleurs sentiments.

Association des Planteurs de Caoutchouc,
ANVERS.

6. COMPULSORY GRADING OF EXPORTS.

Mr. Skinner, as Chairman of the Sub-Committee appointed, reports that the Government has been approached and consented that the Directors of Agriculture and Commissioner of Trade and Customs be appointed to confer with the P.A.M. Sub-Committee; and that their first joint meeting would shortly take place.

7. STRAITS MEDICAL SCHOOL.

The Secretary lays on the table the appeal for fund issued by him in this connection.

The Chairman emphasizes the great benefits to the Rubber Industry that this Endowment Fund would ensure and bespeaks the whole-hearted support of all planters.

8. CENSUS.

The Secretary lay on the table further correspondence received.

9. BENEVOLENT FUND.

The Secretary informs the Meeting that is was suggested to place the money raised at Home under the control of three Trustees, viz. Sir William Treacher, Mr. C. Meikle, and Mr. J. M. Allinson, with survivorship. The Committee of the Benevolent Fund had full authority to deal with this matter, but it was of such importance, that it was thought better to obtain the approval of the Association.

The sense is then taken of the Meeting which is unanimously in favour of the Ben. Fund Committee taking the step as suggested.

10. ACREAGE UNDER RUBBER.

The following letters are read:

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

SIR,—I beg to draw your attention to the statement recently made by H. E. Sir John Anderson that the F.M.S. would probably export 70,000 tons of Rubber six years hence, and to my remarks on this estimate in a letter to the *India Rubber Journal* of 3rd instant, page 456.

The simultaneous publication of H. E. speech in the issue containing my letter was the first time I had an opportunity of reading his statement in full, and it appears to me that the great discrepancy in our figures arises from the fact that H. E. assumes 400,000 acres of rubber to be already planted.

The Annual Report of the Resident General of the F.M.S. for 1909 gives the total acreage of rubber in that year as 195,953. It is incredible that 203,047 acres have been planted up since then.

The total acreage under Coconuts, Rubber, Coffee and "other cultivation" in 1909 is given by the Resident General as 353,389 acres. It would almost appear that H. E. has added 47,000 acres for 1910 planting to his total and assumed it was all under rubber!

I would therefore suggest it would be an admirable thing if your Association would immediately set about framing an estimate to check the accuracy or otherwise of Sir John's figures. This statement has alarmed those interested in the growing of rubber here and it being a matter of vital importance to know the approximate truth, (it is impossible to have extreme accuracy), I consider your Association is the channel from which an official estimate should emanate. Having all data at your disposal with regard to average yields per acre, the acreages planted annually in preceding years and also being in a position to value the question of labor supply, and also that of tree resting as affecting output, I am satisfied the planting community and others interested would accept your figures before that of any other body or individual.

Trusting your Association may see its way to carry out this proposal,

I am, Sir,
Your obedient servant,
(Sd.) H. K. RUTHERFORD.

2088/1910. Kuala Lumpur, 25th November, 1910.

Sir,—I have a letter from the Editor of the *India Rubber Journal* asking for the estimates of acreages under rubber in the F.M.S. and Straits Settlements, at the end of December this year.

2. We have, of course, the figures for 1909 but I have no means of making an estimate for 1910, until our returns are in. I should be greatly obliged if you can give me any information or can suggest any means of getting it.

I have the honor to be,
Sir,
Your obedient servant,
(Sgd.) L. LEWTON-BRAIN.

The Secretary explains the difficulty experienced in the past in obtaining the said statistics and that all attempt was given up a few years ago, as it was realized that only Government had the necessary machinery to obtain sufficiently accurate returns.

Resolved to instruct the Secretary to reply accordingly.

11. LOCALLY RECRUITED LABOUR.

The Secretary reads the following communication from the Negri Sembilan Planters' Association:

Seremban, 7th December, 1910.

Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,—I beg to inform you that at the last Meeting of the Negri Sembilan Planters' Association held on the 5th instant, the following Resolution was unanimously carried:

Proposed by Mr. Mansergh and seconded by Mr. Burgess.

"That this Association approve that every locally recruited Tamil coolie shall be assessed at the rate of $20—and that the sum be irrecoverable from the cooly, and that the amount so obtained be used firstly, to pay for the proper administration of the scheme, and secondly to pay a bonus for every cooly imported from India, and that this Resolution be put before the Planters' Association of Malaya at their next Meeting, and that a copy be sent to the other District Associations."

I enclose a copy of Mr. Mansergh's speech with reference to same, and be much obliged if this could be read at the next Meeting of the Planters' Association of Malaya.

Yours faithfully,
(Sd.) J. G. HUBBACK,
Honorary Secretary.

Seremban, 4th December, 1910.

Gentlemen,

You yourselves, no doubt, have fully recognized that the present position of the planter who recruit his own labour from India is fast becoming untenable. The recruiting planter who organizes his recruiters at the cost of a good deal of money and trouble, import his labour only to find that other planters, contractors and Government Departments, perhaps by raising pay or promises of shorter hours of work, are continually inducing coolies to give him notice. A planter who has a recruiting staff in India does not, I think, land his coolies in this country under $15 a head, and for this he may get one months work out of a coolie, anyhow very often only two or three. How is this to be stopped? There is of course a cumbersome way of lending coolies money and making them sign a kind of indenture paper but anything to do with interfering with the personal freedom of a cooly is I think wrong and undiplomatic. Besides the fault is not with the coolie but with the employer—left alone and not dazzled by tales of better pay etc: I feel certain that most coolies would stay on the estates that imported them. I therefore suggest to you the following scheme as a remedy:—that every locally recruited tamil coolie be assessed at the sum of $20 and that this money be irrecoverable from the coolie, that the money so obtained be used (1st) to pay for the proper administration of the scheme, (2nd) to pay a bonus on every coolie imported from India. I will point out how this will affect both both planters and coolies. It will be seen that this scheme puts the recruiting employers and the local recruiting man on the same footing both now stand the chance of a coolie giving them notice and leaving very soon after he has come to the estate, saddling the estate with his assessment in one case and with the recruiting expenses in the other. At present the local recruiter can afford to raise rates having no advance account and nothing to lose if the coolie bolts, so when the recruiting employer pays 35 cents the local recruiter can well afford to pay 40 cents, and so on but if he has to pay $20 he will be in a worse position than the man who imports his labour by $5 for every coolie and therefore in no position to raise rates over the man who imports his own labour. It may be asked why make the assessment $5 a head more than the cost of importing labour; there are three reasons—

1. The man who imports from India goes to great trouble and in benefiting himself is no doubt benefiting the country and the rubber industry in general and should be protected.

2. The object of this scheme is to make the employers do their own importing. If you fix the assessment at the same rate as the cost of importing, you will find employers saying, "I am no worse off taking local coolies and I save myself all the trouble and worry of recruiting."

3. The larger the assessment on locally recruited coolies the large the bonus it will be possible to pay on coolies imported from India, and consequently the bigger encouragement for all men to recruit.

I think what I have said will shew you that the scheme will benefit the recruiting employer. Let us see how it will affect the coolie. We all know that the coolie is an absolute child, easily persuaded into anything; a glass or two of gin, a dollar or two in the hand, pleasant tales of short hours work and high pay: and many of them will follow any of the touts and crimps that infest the Keddais in all the towns to wherever they like to take him. When the coolie comes to himself he is told all sorts of tales of debts incurred and more often than not a pronote is shown him as having been signed by himself for money he probably never had. If he is not induced to bolt he is persuaded by specious promises to give his employer notice which I think the Tamil coolie, if left to himself, very seldom does. In both cases he gets into the hands of a very dangerous class of native and one which should be suppressed. If the scheme I propose was enforced, the touts would find their occupation gone. It would not pay the employer to pay touts commission and a heavy assessment for coolies the majority whom would not stay long when he could import cheaply for without a doubt the coolies who are picked up this way are never really satisfactory. I think therefore it may be said that the coolie as a body will benefit by the scheme.

I would now like to point out what may be considered objections to the scheme.

1. There is the case of a coolie wanting to leave an estate to join relatives on another. The estate that took him on would have to pay $20 for him. This happens so rarely, and I consider that the benefits of the scheme are so large that any employer would rather pay $20 than have any exceptions made to the rule.

2. The great objection is really that if the scheme is successful it becomes objectionable in this way. Suppose the scheme is so successful that all employers recruit their own labour, a kangany and coolies are dissatisfied perhaps justly so, they cannot get work. They are tied to the estate they want to get away from because no one will put up a large sum of money for local coolies when they can recruit them cheaper from India. I know this is looking far ahead and assuming a wonderful success for the scheme. I bring it forward as I think the Government may object to the scheme for this sort of reason. You know how frightened Government is of anything that endangers the freedom of a coolie. My own idea is this—I said previously that a certain part of the funds of the assessment would be used to properly administer the scheme. I would go to Government and ask them to second sufficient officers say, one to each State, whose salary the assessment would pay, to take charge of the whole scheme. When these officers said "there is practically no local recruiting, no moving of coolies, we therefore think that the scheme may be a hardship to the coolie" it could be abolished. There is no doubt this is, to a certain extent, a coercive measure and when it has served its purpose, it should be allowed to die. As to the administration, at first anyhow there would be an enormous revenue from this assessment; to make the scheme a success no expense should be spared to have a sufficient and capable staff—every quarter a form such as this would be filled in by every employer of labour as under:—

No. of coolies on estate at end of last quarter.	Recruited from Coast.	Locally recruited.	Carried forward to next quarter.
1,000	20	30	1,050

I would have an office in the capital of each State to which these returns would be sent. Lists would be sent from Penang of the number of coolies imported from India by each employer; it would therefore be quite easy to check every tamil employer, Estate, Government, and Contractors would be kept at the office with particulars etc. as to numbers employed kept up to date. Furthermore I would have a copy of the name of coolies in every check roll sent in to this office at the end of every quarter. This officer would have the right to inspect the original check roll whenever he desired. I think it very necessary to the successful working of the schme that the officer inspect every check roll in the state of which he has charge at least once a quarter I must apologize for the length of these remarks. I may say they are the results of conversations with various planters and I have also been privileged to see a memorandum on the subject by an officer not unconnected with the Tamil Immigration Fund.

I put the scheme before you with no idea of finality, but with the hope that this Association by working on the fundamental basis that if a man who wishes to employ tamil labour went import his own tamil coolies, he must pay very heavily for other peoples, may evolve a scheme that will not only benefit us all individually but the country in general and the rubber growing industry in particular.

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Mr. Cumming remarks that one of the propositions before the Meeting was that made by him to the effect, that a labour clause be inserted in all new agricultural grants. As the measure now proposed by Mr. Mansergh, really aimed at the same object, he would withdraw his original proposal in favour of the one now before them. The latter was a matter of the gravest import and one that should not be lightly rushed through very careful deliberation, ensuing a perfect unanimity on their part. It seemed to him therefore essential that the whole matter be discussed very thoroughly by all their constituent Associations and he was in favour of their appointing a Sub-Committee, who would go thoroughly into the question and report to them. It was however desirable that they got the sense of the Meeting, so as to enable the planting members on the Immigration Committee to represent adequately the views of the P. A. M. at the forthcoming Meeting of the Immigration Committee.

Mr. Skinner remarks that he has listened to Mr. Mansergh's letter carefully, and is quite at one with him in thinking it very urgent that steps should be taken to recompense the *bona-fide* recruiter at the expense of those who obtained their Tamil labour locally. He did not however think that a differential scheme, that is to say, a tax of $20 per head on locally engaged coolies, and also the normal assessment, would be workable. However honest an employer may be, it is expecting too much, and it is almost impossible for him to keep trace in his check-roll of the locally engaged cooly, and the cooly recruited from India. If this is the case with the honest employer, just imagine what scope there would be for an unscrupulous man, employing locally engaged coolies, to make inaccurate returns. It would require enormous machinery to work Mr. Mansergh's plan, and even then, he doubted if satisfactory results would be achieved.

He would like to draw their attention to the following points:—

1. Firstly, the advisability of increasing the staff of inspectors of the Indian Immigration Fund, whose duties are to patrol the country and prevent evasions of the present enactment. These inspectors should be provided with motor-bicycles, to enable them to do their work with greater rapidity.

2. The existing maximum assessment of $5 per head had proved insufficient to cover the expenses of the large influx of labour during the present year, and the Indian Immigration Committee had been obliged to stop giving recruiting rebates to the importers of Tamil coolies, for the third and fourth quarters of 1910.

3. In view of the large area which had been and was to be opened, it was absolutely essential that every encouragement should be given to recruiting, especially to kangany recruiting. This could only be done by giving encouragement to the older estates, who during many years had built kangany recruiting system, and had spent large sums of money on recruiting coolies.

4. It was obviously unfair that anyone should be expected to undergo a great deal of trouble and expense in recruiting labour, and that after the arrival of this labour in the country, the non-recruiter should, by offering a slightly increased wage (which is quite unnecessary as far as the cooly is concerned) be able to entice the labourer to leave and yet be in a better financial position than if he had recruited the cooly himself at a lower though ample wage.

5. It would be a great loss and a serious matter for all parties concerned, if the present scarcity of labour be allowed to continue, and a large number of employers persisted in obtaining coolies locally, merely by offering higher wages. This would only increase the cost of labour all round, would not increase the labour supply of the country, and would lead the coolies into extravagant habits.

6. In his opinion, the man who can recruit coolies into the country by the kangany system, should be given every encouragement. He should not be expected to bring coolies over here for the benefit of other people, without being recompensed financially.

As he had already said, he did not think Mr. Mansergh's scheme would be a practical solution of this difficulty; he would therefore suggest the following:—

1. That the assessment rate should be raised from $5 to $10 per head.

2. That the money thus obtained should be used to pay all expenses of the coolies from their villages to the Port of disembarkation, and that has high a rebate as possible should be paid per cooly to each person who imports kangany recruited labour.

A committee should be appointed to ascertain the average cost of each cooly to the recruiter. It should be the aim on the Indian Immigration Committee to fix the rebate to the importer as high as possible, though perhaps the rebate might not be sufficient to cover the full cost of each imported cooly. As time went on however the fund will increase, and the rebate will be increased proportionately, until there were sufficient funds to compensate each importer fully. In this way, the employer of locally obtained Tamil coolies will be penalised, and greater encouragement would be given to recruiters, and employers of locally engaged coolies would soon realise that it would pay them better to import their own labour.

Mr. Jarvis reminds the Meeting that a similar Committee had been appointed a couple of years ago, which had advocated a similar remedy as that now brought forward by Mr. Mansergh, but that the only reply they had got from Government was that the scheme "would greatly hamper the movements of labor and would be likely to defeat its own ends by acting prejudicially on the supply of immigrants, to whom it would no doubt be obnoxious."

The Meeting then resolves itself into Committee, and an open Meeting being resumed, the following sub-Committee is appointed to report on the various proposals before the Association, viz. Messrs. Duncan, Maude, Skinner, Cumming, Darby Prior and Mansergh.

12. POST OFFICES HOURS.

Mr. A. Dupuis Brown proposes that the Postal Authorities arrange for all Money Order offices to be kept open on one weekday, say Wednesday, until 6 p. m., and on Sundays for two hours in the morning. At present all M. O. offices closed so early, that if a cooly wished to remit money, it entailed on his part loss of a day's wages.

Mr. F. J. Dupuis seconds the proposal.

Mr. Harvey does not see why each estate should not undertake to do all this M. O. business for their coolies. He had done this for years with the best results. There was no loss of time, remittances were made correctly and expeditiously and the coolie was saved from employing letter writer.

Mr. Cumming thinks that there should be no compulsion and that if the cooly preferred to transact his own business at the post office, he be given every facility for doing so.

Mr. A. Dupuis Brown's motion is then put to the Meeting and carried unanimously.

It having been decided to hold the next Meeting on February, 12 the Meeting terminates at 1 p. m.

(Sgd.) H. C. E. ZACHARIAS,
Secretary.

PENANG.

Abstract of Meteorological Readings in the Prison Observatory, Penang, for the month of December, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew Point.	Mean Humidity.			
	Ins.	°	°	°	°	°	°	°	°	%		Ins.	Ins.
Prison Observatory Penang ...	29·906	145.5	80·6	86·4	74·2	12·2	77·2	·890	74.9	84.9	N.W.	4·24	1.19

E. ARTHUR GIMLETTE,
Medical Officer.

PRISON HOSPITAL,
Penang, 25th January, 1911.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the month of December, 1910.

District.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Mean Maximum.	Temperature. Mean Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
	F.	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	%		Ins.	Ins.
Kota Bharu	...	146.5	78.0	80.70	73.4	7.3	76.4	.857	74.6	89.4	...	28.21	4.49
* Kuala Lebir	...	...	75.1	83.2	72.4	10.8	73.6	.799	72.5	91.4	...	24.68	5.35
Kuala Kelatan	...	..	...	81.42	71.58	9.84	...	...	...	...	...	25.58	4.75
Pasir Gajah Estate	...	...	...	88.0	72.0	6.0	...	...	...	...	...	29.97	6.50
Kuala Pahi Estate	...	...	...	80 .	71.71	8.64	...	...	...	...	...	21.83	4.40
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	24.23	3.91
Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	28.94	5.84
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	25.36	4.40
Channing Estate	...	...	...	...	...	...	...	...	...	...	...	20.03	4.70
Pasir Tinggi	...	...	...	...	...	...	...	...	...	...	...	23.94	4.90

* Supplied by the courtesy of the Kelantan Planters' Association.

Residency Surgeon's Office,
Kota Bharu, 9. 1. 1911.

John D. Gimlette,
Residency Surgeon, Kelantan.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1910.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity. %	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kuala Lipis	...	...	76.9	91	66	21.6	75.1	...	73.84	91	...	3.5	.90
Raub	...	...	81.6	92	67	20.9	76.4	...	72.92	75	...	6.7	1.45
Bukit Fraser	...	...	...	...	59	...	...	...	...	...	...	4.8	1.04
Bentong	...	...	80.9	92	68	19.2	73.2	...	67.97	66	...	3.3	.98
Temerloh	...	...	...	94	69	20.9	...	...	...	...	...	6.5	2.00
Pekan	. .	...	83	93	71	17.5	78.0	...	74.65	78	...	7.4	2.18
Kuantan	...	...	...	101	69	...	...	...	...	...	...	...	2-48
Sungei Lembing	...	...	...	88	67	...	...	...	...	...	...	5.5	1.46

Office of the Medical Officer in Charge, Pahang.

K. Lipis, 29th December, 1910.

S. C. G. FOX,

Medical Officer in Charge, Pahang.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State for the month of October, 1910.

DISTRICT.	Mean Barometrical Pressure at 32 Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
										%			
Kuala Lipis	...	...	75.8	91	65	20.3	74.5	...	73.58	93	...	12 9	2.80
Raub	...	...	80.2	92	68	19.3	74.7	...	70.96	75	...	11.8	1.47
Bukit Fraser	...	...	...	...	59	...	...	...	...	...	...	12.9	1.55
Bentong	...	...	80.9	92	69	18.7	75.9		72.50	77	...	10.4	1.53
Temerloh	...	...	...	92	69	20.8	...	...	...	...	...	8.2	2.30
Pekan	...	...	82 0	91	71	17.0	78.0	...	75.32	80	...	9.6	1.78
Kuantan	...	...	83.6	96	70	18.8	76.3	...	71.49	66	...	10 9	2.85
Sungei Lembing	...	...	...	88	67	...	...	...	...	...	...	14.2	2.72

OFFICE OF THE MEDICAL OFFICER IN CHARGE,
PAHANG.
K Lipis, 28th, December, 1910.

S. C. G. FOX,
Medical Officer in Charge,
Pahang.

PAHANG.

Abstract of Meteorological Readings in Pahang for the month of November, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° F.	Mean Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Mean Maximum.	Temperature. Mean Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
										%		Ins.	Ins.
Kuala Lipis	...	...	76.3	92	65	20.1	74.9	...	73.91	93	...	15.0	3.70
Raub	...	...	81.3	91	68	19.6	74.5	...	69.88	70	...	6.8	1.26
Bukit Fraser	...	...	...	...	59	...	...	...	...	...	...	8.7	1.40
Bentong	...	...	81.7	92	66	16.8	75.6	...	71.52	73	...	3.3	.70
Temerloh	...	...	...	92	63	18.7	...	...	...	...	...	6.7	2.20
Pekan	...	...	82.0	90	70	15.4	77.0	...	73.65	78	...	12.3	2.85
Kuantan	...	...	82.8	95	69	19.7	75.2	...	70.11	66	...	10.8	2.48

Senior Medical Officer,

Negri Sembilan and Pahang.

Kuala Lumpur 3rd January, 1911.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of December, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.870	145.2	80.1	86.0	71.9	14.1	76.1	0.824	73.6	80	Calm.	9.23	1.62
Pudoh Gaol „ „	...	...	...	...	...	...	...	...	...	...	...	10.12	2.31
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	7.15	1.65
„ Klang	...	...	...	87.8	68·4	19.4	...	...	...	...	...	14.57	3.65
„ Kuala Langat ...	...	...	...	85.0	72.8	12.2	...	...	...	...	...	15.92	3.15
„ Kajang	...	...	...	83.5	74.9	8.6	...	...	...	...	...	15.90	2.92
„ Kuala Selangor ...	...	...	...	86.3	74.6	11.7	...	...	...	...	...	9.42	3.50
„ Kuala Kubu	...	...	...	88.6	71.3	17.3	...	...	...	...	...	10.65	1.74
„ Serendah	...	...	...	91.8	70.4	21.4	...	...	...	...	...	18.74	2.74
„ Rawang	...	...	...	88.2	71.0	17.2	...	...	...	...	...	15.28	2.00
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	6.72	0.96

Office of Senior Medical Officer,
State Surgeon's Office,
Kuala Lumpur, January, 1911.

T. O. COOPER,
Senior Medical Officer, Selangor,
N. Sembilan and Pahang, State Surgeon, Selangor.

PERAK.

Abstract of Meteorological Readings in Perak for the month of December, 1910.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Taiping	...	106	81.05	91	70	21	76.65	859	...	82	...	20.72	3.45
Kuala Kangsar	...	...	78.61	90	70	20	75.05	822	...	84	...	10.71	2.21
Batu Gajah	...	108	79.11	91	71	20	75.67	840	...	86	...	12.14	1.67
Gopeng	...	...	79.27	91	70	21	74.97	811	...	82	...	19.11	3.11
Ipoh	...	...	78.72	90	70	20	75.33	834	...	86	...	11.93	1.62
Kampar	...	...	79.10	92	69	23	75.69	843	...	86	...	21.32	2.32
Teluk Anson	...	...	79.87	91	68	23	76.91	888	...	89	...	15.09	3.00
Tapah	...	...	79.07	91	68	23	75.83	851	...	86	...	11.79	2.30
Parit Buntar	...	...	80.07	90	70	20	76.35	859	...	85	...	7.59	1.05
Bagan Serai	...	...	80.76	90	70	20	76.74	866	...	82	...	12.05	3.43
Selama	...	...	80.38	93	71	22	74.98	797	...	78	...	13.84	3.22

S. C. G. Fox,

Ag. Senior Medical Officer, Perak.

Office of Senior Medical Officer,

Taiping, 13th, January 1911

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 3.] MARCH, 1911. [Vol. X

RUBBER SMOKING HOUSE.

So many persons are asking about the best structure for smoking rubber that perhaps an account of our experiences in this direction may be of interest. I will first describe the smoking house in the Botanic Gardens, which has proved quite satisfactory and economical. The building is 55½ feet long and 19 feet wide, oblong in shape, and made of ordinary planking with a high roof. The plank walls are 8 feet high, and the roof of attap, 15 feet high in the centre. The floor is cemented with concrete below. There are two or three windows which can be opened when required and one entrance door. This building is built on a slope of about 1 in 12, and drains run down the side to carry off rain water, inside are wooden posts sunk in the ground between which run thin rattans stretched tight over which the rubber is hung. Near the door are sunk in the concrete and cement floors circular pits one foot wide and 3 feet deep in which the fire is put and then are covered with iron cones with a flat perforated top. These cones are 22 ins. high. They have a small oblong opening at the base to admit air to the fire.

The fires are made of dry old wood of some soft timber. That of *Albizzia moluccana* is found good, but any light wood will do. The wood is cut up into pieces big enough to get into the fire places, and being lit is allowed to smoulder all day. The fires are usually lit in the morning, and renewed once to 4 times a day according to the size of the fire place, one fire takes about 2 baskets measuring 2 feet deep by 1½ across of pieces of wood a day. When the cone is put on no flame is produced but abundance of smoke which soon permeates the whole building and keeps a thick atmosphere of smoke all day. The windows being closed it does not escape except by the spaces between the roof and walls or through cracks, so that none is wasted.

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Three of these fire places keep the room full all day, but there are others at the upper end of the building which can be used to increase the smoke, if required, either for exceptionally heavy smoking or when the building is quite full of rubber. This house will contain 2,000 lbs. rubber sheet or more. The newest made rubber is put nearest the fires so as to get the most smoking and moved further up the slope as it gets drier. The advantage of building the house on a slope is that the smoke starting from the lowest point naturally gradually ascends to the upper end, and the surroundings are naturally drier and there is no accumulation of rain water round the building.

All smoke contains a certain proportion of water, and this and the free creosote, and naptha are practically absorbed by the wood work and attap so that the rubber is not covered with a wet unpleasant layer. At one time we built a brick smoking room with a corrugated iron roof. In this house the fire was outside and the smoke was conducted in by a tube, but we soon found that there were deposited on the floor and elsewhere in the rooms a thick brown liquid consisting of naptha and water. This stuff got, too, on the rubber. This mess is quite absent from the wooden drying house, though the woodwork gets dark brown or black from the deposited products of the smoke, the rubber is dry and of a good colour.

No ventilation other than the cracks is required, as any open windows let out the smoke. The entrance door is usually kept open but as it is at the lowest end, the current of air that enters drives the smoke up to the other end through the rubber. The smoke should be as dry as possible, both for the benefit of the rubber and for coolies in the smoking shed as wet white smoke containing much water is very troublesome to the breathing. Coconut husk can be used instead of wood, but waste coconut dust and sawdust are apt to give off sparks, which being incandescent pieces of wood fly up and settle on the rubber as charcoal. Attempts to improve the smoking by adding creosote did not prove successful. For one thing it is apt to raise the temperature and produce more rapid combustion.

In one estate recently I saw an arrangement of an oven outside the smoke house connected with a passage with the interior. Here the combustion was most rapid in the inner part of the oven, while the slower combustion was going on at the outer open end, so that the best of the smoke escaped to the open air while the more rapid consumption of the fuel in the mounth of the passage increased the heat of the air passing in. Thus much smoke was lost, and a larger quantity of fuel than necessary was used.

In the Gardens smoking house no smoke escapes without having passed over some, at least, of the rubber, and much of it remains in the house nearly the whole day, so none of it is wasted. At the same time the slow smouldering does not increase the temperature, nor is there any risk from fire, as the fire is sunk in the ground in the concrete, and produces no flame. However to avoid risks the fire can be extinguished at night fall.

It is advisable to shift the rubber from time to time in the smoke house so that it may be evenly smoked. If not moved or turned over a pale line is left where the rubber is in contact with the rattan and consequently not smoked, and this spoils its appearance.

The advantages of this style of smoking house are cheapness of erection, economy of smoke, dryness and safety from fire, with complete efficiency.—Ed.

SCIENCE AND AGRICULTURE.

"Nearly £50,000,000 of British capital has been invested in the growing of Indiarubber trees. Many enormous estates are being planted with this profitable crop within the British Empire. Thus, both Brirish money and British land are being used for the production of the material. The question naturally arises: Can British skill and British scientific knowledge take care of these gigantic crops and secure them from the attacks of disease?"

Unfortunately, the question must be answered in the negative. We have within the Empire some of the finest foresters and some of the most expert botanists in the world: but the study of vegetable physiology and plant diseases is a strangely neglected one. Within the last eight months it has been recognised by London financiers, that one of the necessities of the time was a supply of first class economic botanists; of men skilled in the identification and cure of plant diseases. These new plantations of rubber trees have been robbed, so to speak, of the wild habit and brought into a state of domestication. They are often being grown in nurseries, and need something more than the attention of their natural nurses, the planters; they need doctors who will see to their health, watch for the approach of disease, and cure their troubles before they have become serious. There is a certain supply of these plant doctors, mycologists and botanical physiologists, forthcoming from Germany and Austria, and these have been eagerly sought out and employed. In England there is no school where such men are trained. The schools of botany in many parts of England are excellent, notably the one in Liverpool and one under Professor Farmer in the Royal College of Science at South Kensington.

When the latter institution was applied to a little while ago by certain rubber growers who had offices in the City of London, writes the correspondent in question, the reply was given that there were plenty of first-class students. "Then let us have as many as you can," was the request of the City people. Two or three suitable men were found worthy to undertake the work, but before they could proceed to the plantation it was found necessary that they should go

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to Munich to obtain a training in plant pathology. Thus, at present, the new rubber plantations are being grown with British capital on British ground, but with German and Austrian science. Neither London, Berlin, nor Vienna has been idle. The subject is one of great importance. The greatest living authority on plant pathology is Professor Czapek of Prague. He was recently invited to London, and offers were made to him to found a school at South Kensington. For a while it seemed probable that the project would be successful. The money for the necessary building and equipment (£20,000) was forthcoming, and all appeared to be settled. But Berlin offered him a professorial chair. Then Vienna stepped in. Now word has come from Vienna that Professor Czapek is unable to accept the London offer. No doubt this will prove to be a merely temporary setback. There is a very definite intention on the part of both financiers and educationists to set up a school of this kind in England. The man to superintend it is not forthcoming at present, but the very necessity is sure to produce the man we need. When the school is formed it will become part of the Imperial College of Science and Technology."

This letter, quoted from the Standard, is of considerable interest as showing that at last England is waking up to its duty towards agriculture. Professor Czapek was in Singapore in 1908 and stoped for sometime in the Botanic Gardens. There is no doubt that he is one of the great authorities on plant physiology and pathology. We have in England a large number of first botanists able readily to deal with the questions of plant disease, but England in the past has not encouraged these workers. The botanist of the past generation had to make up his mind to the maximum of hard work and the minimum of salary. Those who could manage to live on the smallest possible pay could take up this life, others had to sacrifice their talents for a living wages. Research had to be done at the investigator's expense and at such odd times as he could spare from the long hours spent in making enough to live on. He usually got no chance of visiting other parts of the world, to study the physiology or oecology of plants and animals in other climates or to see what other establishments were doing. Everything of the kind was strongly discouraged, if permitted at all it had to be done at the investigator's own cost and in his own vacations. This kind of treatment did not make for progress, nor make it possible for many scientific young men to enter the profession. Very different was the action of Germany and other of the continental countries. Their system was to encourage work and workers in science. The natural result was first seen in the development of Forestry in India, where the Directors of the Indian Forests for a considerable period as well as much of the rest of the staff had to be drawn from Germany. The same thing appears to be the case now with the great rise of tropical Agriculture. England has been asleep and is waking up but is not ready for the emergency yet.

The Editor of the Malay Mail, who quotes the article in the Standard, suggests the founding of a college in Malaya for students of plant pathology as a memorial of our late King. This seems to us a little premature. It is useless to try to train students in plant pathology when we have no posts to offer them later. Further, it must be remembered that the knowledge of plant pathology and physiology in the Tropics is at present very scanty, except the Buitenzorg Gardens and the Pusa Agricultural Station recently started, there are no establishments at all in the East where such work is being or has been carried on.

We have not yet in the Malay Peninsula the class of Eurasians and natives who would take up planting as a profession as they have in the far older Colony of Ceylon, or in India. This we may hope will come, but it is a matter of slow development of nations. We have no really settled peoples here; the population is a fluctuating one, it comes to make as much money as it can in a short time and then away off Home to spend it. There are, however, signs of a more settled state of affairs in the Colony, where families have become settled into the country, European, Eurasian and a few of the native races, and it is mainly from these that the students of the Medical School are drawn. The medical profession appeals more to such people than Agriculture for many reasons. In Agriculture at present all centres on rubber, and at the present day the rush of planting and ease with which money is made or has been made induces the ordinary class of Agriculturist to plunge into the work with such little training as he can get in a few weeks on any estate.

In the past the Malay Peninsula has not been an agricultural country, it mainly lived on tin and trade. There were cultivations of sugar, gambier, pepper, nutmeg, cloves, coffee and coconuts, and fruit and vegetables for local consumption, but many of these have gone down before the rush of the rubber tree.

This latter has now opened the country to Agriculture, and is founding, we may hope, a race of agriculturists, but this will take many years yet.

A great change in tropical agriculture is taking place at the present era. English governments have hitherto persisted in not realising the importance to the Empire of the wealth of vegetable products she possessed in her tropical colonies. and their importance to the ovorcrowded parts of the Empire, but the results of long years of neglect cannot be remedied in a year or two, and much that was done wrong can never now be set right. However we are moving now, and it is quite possible that in a few years the claims of science, that is to say knowledge of the world and its contents, will be appreciated at their full value by the English people.—Ed.

SOME SUGGESTIONS.

The progress of the industry of cultivated rubber seems now to be settling into a steady business, but it still is capable of improvement in many ways, and the young planter who thinks he has learnt all there is to learn after six months residence on an estate probably will be found to be still ignorant of what he has to learn. In the last number of the Bulletin we quoted some important articles on the irregularity of the product from the manufacturers point of view. It is not that the product is exported merely in different forms, crepe, sheet, block or scrap, the complaint is that the various portions of the samples are not similar and do not vulcanise in the same way. It is absolutely essential that each lot put through the machine in the factory should be homogeneous, and grading the sheet or crepe will be one of the important duties of the planter in the future. It is not always easy to see the cause of the difference in vulcanizing of different sheets. It may be due to differences in the age of the trees tapped, or to differences in preparation. Possibly, there is occasionally too much hurry in the drying shed or possibly when smoking is used there is irregularity in the amount of smoke used or duration of the smoking. It seems quite clear that in future all rubber in sheet or biscuit will have to be smoked, and smoked well. This will require material for making the smoke, which material, whether of wood, coconut husk, or other fuel, must be sufficiently abundant close to the estate, and sufficiently cheap. The estate whose manager has destroyed all timber accessible in order to plant more rubber trees and has no other smoke material to fall back on will probably suffer considerably. It was the exhaustion of firewood and timber accessible to the plantations that was the main cause of the death of the pepper and gambier industries in Singapore.

Some time ago a specimen of crepe was brought to me spotted all over with black stains, the manufacturer alleging this was due to the oil used in the crepe machine which had got into the rubber. The specimen was an extremely weak, rotten rubber, speckled all over with dirty looking spots of some mould or other fungus, and its state was obviously due to careless and dirty work. Probably the water used in washing was foul, or the latex vessels or other apparatus dirty. Now, there is no reason why the rubber sheds should not be kept absolutely clean. I have seen the drying sheds and storing sheds in plantations in contact with the coagulating shed. The floor of the latter mud with puddles of water and latex decomposing, a sloppy mess all round the drying shed. The drying shed, which should be on a slope so that rain should run off, was put on a flat piece of ground which in rain was beaten into muddy puddles. Can anyone wonder that the rubber gets affected by moulds and bacteria breeding in the slops around? The washing and coagulating sheds or any sheds where water is used and likely to lie about in puddles should be a good distance away from the drying and storing sheds which should be put on a dry slope if possible. Again many of the working sheds I have seen are unnecessarily dark, which with the dampness of the floor is a direct inducement to the moulds and bacteria to breed and affect the rubber. Though these moulds, and such things as bloodspot generally appear only after the rubber has been drying for a few days, it seems quite clear that they start their attack as soon as the latex is coagulated and probably in some cases get into the latex itself as soon as it is brought in. There really is no reason why the working sheds should not be dry, light, and airy. Washing sheds or coagulating sheds must necessarily be damp, but they can be kept clean and the rubber removed far away from them as quickly as possible.

Cleanliness in Packing.—In Gow, Wilson, and Stanton's India Rubber market report, January 19, 1911, we read "Complaints are still being received on account of particles of wood, etc., which are found in some of the clean crepe. Also traces of streaky and discoloured rubber are sometimes included with fine qualities. It is most important that the attention of Managers should be drawn to these points, as they are liable to prejudice the Rubber in the market, and too much care cannot be taken to insure that thoroughly clean and well planed wood be used for the cases."

This is not a new complaint, for in the early days of the rubber industry there were great grumbles about the dusty, dirty state of some rubber sent to market. However, there have been great improvements in this matter of late years, and is quite a treat to see the packing and packed boxes most estates now. Still, it is clear that there are cases in which the packing coolies are not sufficiently careful to see their boxes are clean, and it seems a pity good crepe should be spoilt by a little carelessness or hurry on the part of the packer.

HEVEA DISEASE IN CEYLON.

Phytopthora Faberi Maub.

This fungus attacks both Cacao and Para rubber. In 1909 the renewing bark on tapped surfaces died back in some districts and black longitudinal streaks appeared which extended through the bark into the wood.

The diseased bark was reddish purple, often with a well-defined black border, and in advanced cases exuded a purple brown liquid when cracked. The disease was usually discovered by the cessation of latex flow sometimes all the cuts, sometimes one or two only refused to give latex, sometimes the canker only occurred above the tapping cuts and only cuts above it were dry. If between the tapping cuts those above the canker were dry, if at the base of the stem all were dry. The fungus is known as *Phytopthora Faberi*, and is the plant which causes canker in Cacao pads and branches. It seems to have done little harm on pure plantations of Hevea, but where Cacao is grown with it, the disease is more serious. Close planting adds to the risk, and it chiefly occurs in wet weather. It attacks the Rubber capsules as well as the bark.

Cacao is so scantily grown in the Malay Peninsula that it is not probable that here we shall be troubled with this disease, but occasionally old Cacao trees occur near estates, and in this case the planters should keep a watch for the attacks of the *Phytopthora*.—Ed.

JAVA GRASS OILS.

In the C. & D. for December 17, 1910, attention was directed to the results of the examination of a number of carefully authenticated grass oils from Ceylon, and it is of interest to mention a similar investigation of Java grass oils recently carried out by Dr. de Jong. The author states that the source of Java citronella oil is the grass known in Ceylon as "Mahapengiri," while the bulk of the Ceylon oil is derived from "Lenabatu" grass, consequently he proposes to call them *A. Nardus*, Java, and *A. Nardus*, Ceylon, respectively: these names therefore correspond to *Cymbopogon Winterianus* and *C. Nardus, Lena Batu*, assigned respectively by Stapf to these two species in Ceylon (loc. cit.). The former gives a larger yield of better oil than the latter, but requires a richer soil and more careful cultivation. In Java the grass is generally propagated by splitting old roots and planting the separated parts, so that each has a space about 3 ft square to itself. It does fairly well in shade, but better in sunny situations.

De Jong states that the number of crops, which can be taken each year, depends on the soil and climate, and no general rule can be given. When the first leaf is fully unfolded the following yields of oil in c.c. per 100 grams of leaf are obtained: First leaf 7.7, second leaf 3.7, third leaf 3.6, fourth leaf 2 6, fifth leaf 2.4, sixth leaf 2.1. The leaf sheaths contain much less—viz., 3.1 c.c. per 100 grams in the first, 0.2 in the third, and traces in the fifth. If, however, regard is had to the relative bulk of the different leaves, the yields of oil are found, for the same number of each of the first four leaves, to be as follows: No. 2.9; No. 2, 5, 2; No. 3, 5.8; No. 4, 4.7; and consequently the author recommends cutting when the fifth leaf is well developed.

The oil is always obtained by steam distillation, and in Java often with superheated steam under a pressure of three or four atmospheres, the latter method giving a better yield and being much more rapid. It is advantageous to cut the grass into fairly fine shreds before distilling. The yield of oil obtained in practice varies from 0.5 to 0.9 per cent. of the weight of fresh leaves taken.

The oil which comes over first is richest in geraniol and citronellal (these two together constitute the "total geraniol" or better "total alcohols") as the following table shows:

—	Sp. gr. at 27	Rotation	"total geraniol" per
Fraction 1 ...	0.875	-30	87.2
" 2 ...	0.875	-40	82.5
" 3 ...	0.880	-50	77.3
" 4 ...	0.883	-70	77.3

Further, the "geraniol content" increases from the first to the third leaf and then diminishes. De Jong also states that, as a rule Java citronella oil of commerce is soluble in three parts of 80 to 90 per cent. *Andropogon Nardus, Ceylon,* is recommended to planters having poor soil, which they wish to occupy. A corresponding set of determinations was made with this plant, and the results may be summarised thus:

—	Yield from 300 leaves C. C.	Yield from 100 gms. of leaves C. C.	Rotation of oil	"Geraniol content" per cent.
Leaf, No. 1 ..	1.9	5.9	-3° 8′	85.9
" 2 ..	3.4	3.7	-3° 20′	86.3
" 3 ..	2.9	2.0	-3° 8′	81.3
" 4 ..	2.5	2.0	-3° 40′	83.0
" 5 ..	—	—	-3° 12′	81.3
" 6 ..	—	—	-4° 20′	74.8

The yield of oil is therefore smaller and the quality rather poorer than that from the Java grass, but the Ceylon oil of commerce, according to de Jong, contains only from 50 to 70 per cent. "geraniol."

The cultivation of lemongrass is carried on much in the same way as with citronella. The data obtained in the course of the investigation of the grass as grown in Java were as follows:

Number of Leaf used	Yield from 300 leaves C.C.	Yield from 100 gms. of leaves C.C.	Citral content per cent.
1	0.99	2.12	78.1
2	1.29	1.20	79.4
3	1.09	0.96	77.0
4	0.95	0.83	80.5
5	0.91	0.78	80.0
6	—	—	82.5
7		—	83.0

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It is suggested that in this case also the plants should be cropped when the fifth leaf is well developed. The oil from the roots contains 82 per cent. of citral. The citral estimation is carried out by Dr. de Jong as follows: Thirty-five grams of crystallised sodium bisulphite is placed in a "cassia flask" and dissolved in 50 c.c. of water, and to it is added 12 grams of sodium bicarbonate in power and 10 c.c. of oil. The flask is shaken for an hour, then heated on the water-bath for thirty minutes, and water added to the mark, and the flask set aside for twelve hours. At the end of that time the quantity of unattacked oil is read off, the difference between this and 10 c.c. being the citral content of 10 c.c. of oil. The Java oil is derived from a variety of Andropogon citratus, and belongs to the group of "insoluble lemongrass oils," since it does not form a clear solution with two parts of 70-per-cent. alcohol. The author states that the present low price of lemongrass oil is due to the use of the oil of *Backhousia citriodora* as a source of citral, but this is very improbable.

Rusa grass is grown in much the same way as citronella grass, but in differs markedly from citronella and lemongrass in its smaller-leaf production as well-developed stem and flower system. The yield from fresh leaves and stems is generally about 0.6 per cent. The value of the oil (palmarosa oil) depends on its geraniol content, which is generally from 80 to 90 per cent. An unidentified Andropogon sp., which yields an oil rich in geraniol, is also known in Java. This variety is similar to citronella grass in habit and yields only 0.2 to 0.3 per cent. of oil, which contains 40 to 60 per cent. of geraniol, and is said to possess a more pleasantly rose-like odour than ordinary palmarosa oil.

Two varieties of Vetiver or Cuscus grass (*Andropogon muricatus*) are known in Java, one native and the other introduced from British India. The leaves are free from oil, which is obtained only from the roots, to the extent of from 0.4 to 0.9 per cent.—(*The Chemist and Druggist.*)

GADUNG. DIOSCOREA DAEMONA.

This is a well known yam with large trefoil leaves, commonly to be met with in Malay villages. Its tubers are used as food sliced and left in running water for two days before cooking, unless so washed the yams are poisonous. Researches on the poison of this yam, under the name of *Dioscorea hirsuta Bl.* are published in the Bulletin du Department de L' Agriculture aux Indes Neerlandaises XLIV. The principle is known as Dioscorine and Mr. Schutte finds that it produces cramps like those induced by picrotoxine, but it is less poisonous than that drug.

It is mentioned in the old series of this Bulletin as one of the occasional ingredients in the Sakai-dart poison.—ED.

MUSTARD AS A CATCHCROP FOR RUBBER.

A correspondent writes to the local papers under the initials S. W. H. to recommend the planting of mustard as an ideal not remunerative crop among rubber as giving that nitrogen to the soil in which it is so rich and abundant. It also, he says, is "a vermicide and has weed killing properties." The ordinary mustard plants cultivated in cold or dry climates naturally will not grow in our wet and hot one. The Chinese, it is true, grow a variety of which the leaves are eaten, but it is hardly worth while to recommend this plant which requires heavy manuring here. What does he mean by its nitragenous qualities? Not being a leguminous plant it is not provided with the well known nitragenous galls that *Tephrosia*, *Clitoria*, etc., have, and is of no use in that direction. What is meant by its weed killing properties? Does not a mustard plot require as much weeding as any other plant and is it itself not a weed?

Its vermicidal properties would seem to be an allusion to the practice of evicting earth worms from flower pots by the use of powdered mustard seed, as often practised in Europe. The plant itself has no such effect, and if it did it would be a good argument against its use, as one of the greatest defects in the soils of this region is the absence of the earth-worms which if abundant would immensely improve the soil.

It is really regrettable that people should publish such nonsense as this recommendation. We have had a number of such pieces of advice given by people really not at all qualified to give any, recommending the use of quite unsuitable and useless plants for cultivation in strong language. Such plants in late years we *Combretum sundaicum*, the so called anti-opium drug, *Ocimum viride*, the anti-mosquito plant *Commelina nudiflora*, Lucerne, Comfrey as weed killers or valuable forage plants, the Manicoba rubbers which have proved complete failure etc.

These recommendations reprinted in all kinds of papers mislead people into investing money and wasting time in attempting to grow them only to discover they are useless and that the adviser had not experimented with them and was only guessing that they might prove useful.—Ed.

SPANGLE—SCALE ON SOURSOP.

A correspondent from Ipoh sends some leaves of sour-sop, *Anona muricata* bearing the pretty silver spangle scale known as *Lecaninm expansum var metallicum*. This scale is common on Nutmeg trees in Singapore and Penang. I have not previously seen it on Sour-sops, and the correspondent says he has not seen it on any other trees of the garden. The insect is never so far as I have seen abundant as many scale insects are, one sees but one or two on a leaf. It is in the

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form of a flat circular disc about a quarter of an inch across at first greenish but eventually as it dies and reproduces its little pink young ones it becomes silvery and is quite a pretty object. It does not seem to be very injurious though like all scale insects it lives by sucking the juice of the leaves. I have, however, found it usually attacking weak plants of nutmegs, and it may be taken as a sign that the plant it attacks is weak in health and requires manuring. It is easiest removed by hand.—Ed.

RUBBER NOTES.

In the Gold Coast.

Extract from the Annual Blue Book of Gold Coast for the year 1909.

"The quantity of rubber exported during 1909 was 2,764,190 lbs. as compared with 1,773,248 lbs. in the previous year. The systematic cultivation of this product is now rapidly extending, but the whole of the output is still obtained from trees and vines (*Funtumia* and *Landolphia*) in the vast undeveloped forests of the interior."

In Nyasa-Land.

Extract from the Annual Report of Nyasaland for 1909-10.

" It has been conclusively proved that the Shire Highlands are not suitable for the cultivation of Para rubber, in fact, the only locality within the Protectorate where this variety has proved successful is in the West Nyasa District, where 600 acres of Para are doing well.

The rubber of Nyasaland is Ceara, and the area under this has risen steadily to 4.403 acres. The quality of the rubber is satisfactory, two experimental packets having realised 8s. 10d. per lb. in London. The export, including wild rubber, amounted to 27.144 lbs., being an increase of about 11,000 lbs. on the preceding year.

It should, however, be stated that at present the available data regarding the length of life of Ceara trees and their recuperetive capacity under tapping are insufficient to justify any confident prediction as to whether it would be safe for planters to enter into this cultivation on a large scale. So far as local experiments have been carried, at present they go to prove that Ceara trees are successful when planted in suitable soil and properly tended, but the idea, prevalent a few years ago, that Ceara will grow anywhere is quite erroneous. It is worth nothing that rubber seed has been distributed during the year to a number of natives in West Nyasa, and has been planted in the environs of 66 villiages in that district."

Rubber in the Caucasus.

The Hamburger Fremdenblatt states that tea, coffee and cocoa have been proved to be successful in the regions of the Black Sea and that a botanist, Dr. Smolsky, has been to study the cultivation of rubber in South China, and after visiting the different rubber plantations in China, came to the conclusion that the Black Sea would be an excellent place for rubber cultivation and a group of Capitalists have met to organise an enterprise for this purpose. Where are the different rubber plantations of China and what rubber is cultivated there?

Somehow the "frosty Caucasus" does not seem altogether an ideal place for Hevea Braziliensis, but where will not people try to grow rubber now-a-days?

Dieback.

We have received the number of the Annals of the Royal Botanic Gardens Peradeniya for September, 1910, Vol. IV., part VII., containing a long article on *Lasiodiplodia* by Mr. T. Petch. He reduces several described species including *Diplodia rapax* to *Botryodiplodia Theobromae* the die back of Cacao or at least suggests that it is indential. This he says is extremely widespread, but has caused comparatively little damage and it is impossible to resist the conclusion that in the majority of instances it is only saprophytic.

This hardly agrees with *Diplodia rapax* which I have never seen as a saprophyte nor as he says of *Botryodiplodia* have I ever seen it on fruits of Hevea nor in any case has it appeared on healthy stems of Hevea left lying in a laboratory verandah. He had, however; apparently not seen the investigations on the fungus made here and published in the Report (Bulletin, August, 1910). There can be no doubt that whether *Diplodia rapax* is or is not identical with the *Botryodiplodia* of Cacao or not, it is here a parasite and a bad one.—ED.

A New Rubber Journal.

Les Annales des Planteurs de Caoutchouc de l'Indo Chine is a new publication of which the first number appeared in January, printed at Saigon. It contains articles on planting rubber and the Bulletins of the Rubber Planters' Association of Cochin China. The editor states that if the growth of Hevea in Cochin China is not as good as in Malaya, it is quite equal to that of Ceylon, and certainly better than that of Java and Sumatra.—ED.

RUBBER.

Rubber:—1908, a year of depression in the rubber trade of Brazil, was followed by a year in which prices rose to a level which had never before been attained, the value of the rubber exports in 1909 being 18,926,061 *ls.*, as compared with 11,784,637 *ls.* in 1908 and 13,594,018 *ls.* in 1907.

The increase in the quantity exported, however, in no way corresponds with this large increase in the value of exports, and were it not for the greater exports of lower-graded rubbers, chiefly manicoba, the amount of rubber sent by Brazil to the world's markets would have been actually less in 1909 than in the two previous years. Exports

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of Para rubber, almost entirely composed of the wild rubber from the forests of the Amazon basin, fell off in 1909 in spite of the frenzied demand for rubber from so many branches of trade, the orders of the United States automobile industry especially being unprecedented, and so great is the difficulty in obtaining labour to collect the wild rubber in Amazonas and Acre, that the rubber extractors in the limitless forests did not furnish a large quotum during the past year than in those years when the world's consumption was less.

The extent of the natural rubber forests of the Amazon Valley, a vast zone of 1,000,000 square miles producing the finest Parà rubber, is still unknown, and perhaps only a fraction of these forests has been exploited and scarcely more explored. Each year some fresh steam or tributary is discovered whose banks are profusely covered with hevea trees, the most important discoveries in 1909 being those in the valley of the Xingu River. Away from the streams which constitute the naturul means of approach there are still vast tracts of forest about whose commercial possibilities no clear estimate has or can be made. Although it might seem that their output could be made to vary with the demands of the rubber industries, it is the case that the better the conditions are for wild rubber the worse they are of human habitation, and so dense are the forests, so damp their climate, and the means of reaching them so difficult that large plantations of rubber trees are being made in Brazil in regions easier of access and, in proportion to the amount of capital invested in exploiting wild rubber forests, a considerable amount is being invested in Brazilian plantations.

Though no plantations of hevea to any important extent have as yet been recorded from the Amazon Valley, where Federal and State Governments alike encourage plantations, in the States of Parahyba, Ceará and Bahia rubber trees were planted, largely maniçoba and jecquié. In those States manicoba and mangabeira grow wild in some abundance.

Maniçoba and mangabeira rubbers are priced some 40 or 50 per cent. lower than the Pará rubber. When prices become permanently lower, as would seem inevitable in view of the threatened competition of the Asiatic plantations, the Brazilian exports of these two varieties will suffer severely owing to their high cost of production, and the scarcity, as well as the high cost of labour in Ceará and Bahia and the high taxation of agricultural products. Jecquié rubber, which, like the two kinds mentioned above, is grown largely in the State of Bahia, brings almost as good a price as Pará rubber, and from 600 to 1,000 trees can be planted to an acre, as compared with 150 of the Pará variety. They require only five years to be ready for tapping—some two years less than the Pará tree.

The initiative in any reform for protecting the trees and for improving the methods of preparing the rubber for delivery—a reform which is called for throughout the rubber zone of Brazil—is more likely to proceed from the Federal Ministry of Agriculture, which has a department to control the rubber industry in the Federal territory of the Acre, than from the governments of the States concerned. Owing to the defective methods of tapping and coagulating in Brazil, only 45 per cent. of the rubber collected is "fine," the rest being of the inferior grades fetching often only half the price of "fine" rubber. During 1909 a process was invented by Dr. Pinto for preparing crude rubber, and to test the value of this preparation, a ton of hevea and a ton of caucho prepared by this system are to be sold on the open market in New York. Dr. Pinto received a premium of 2,500 *ls.* from the Federal Government for his invention.

The Brazilian Government favours measures to encourage the plantation of hevea on a large scale, and the Governor of Pará has also recommended measures to stimulate plantations, but little seems to have been done in the way of protecting the forests from which the States of Pará and Amazonas draw some 70 per cent. of their revenues. The export taxes on rubber from Ceará and Bahia are less than those of Pará, but it is feared that those of Bahia will be very greatly increased. A rubber factory is to be established in Bahia.

The difficulty of supervising rubber estates is general throughout Brazil, though the plantations do not suffer in the same way as the forests do.

In August, 1909, a congress of proprietors of rubber estates was held in the Acre territory to discuss the best means of maintaining prices and developing the rubber industry. The message which, on the conclusion of their sittings, they forwarded to the President of the Republic, states the chief difficulties under which the rubber industry labours not only in the Acre but throughout the Republic. The remedies they propose fall roughly under the following heads:—

Legislation to confirm actual proprietors of estates in their possession.

Communications. Roads (especially in Alto Purus and Alto Yaco to connect the estates).

Railway (from frontier of Peru to Bocca do Acre).
Steamships, snbvention to.
Colonisation, further Government aids to.
Commission to study rubber plantations in Ceylon, &c.
Taxation, reduction of, especially of export taxes.

The State of Amazonas, which, begin an agricultural State, is suffering from the gradual rise in exchange and the gradual increase of tariff duties, addressed a petition to the Federal Government, pointing out the alarming increase of duties on articles of prime necessity, such as rice, potatoes, beans, dried meat and clothes, the prices of clothes of the simplest description having risen some 50 per cent. in the last 10 years.

The revenues of the Acre territory, derived almost entirely from the taxation of rubber, have increased as follows:—

	Contos.
1903	570
1904	2,376
1905	8,688
1906	9,124
1907	13,468
1908	9,475
1909	14,080

NOTE.—1 conto = 62*l.* 10*s.* when exchange is at 1*s.* 3*d.* per milreis.

In the beginning of 1910 a revolt broke out in the Acre which may disturb trade for some time owing to the great distance from the normal military garrisons.

The term "rubber" includes Pará rubber, "wild" or "plantation," a product containing qualities which may perhaps never be exactly reproduced in rubber in any other country or climate than that of the partly submerged Amazon forest. It also includes maniçoba and mangabeira and other low-priced rubber, poor substitutes for Pará rubber, and for which no special use has been found. Meanwhile a great increase of raw material is in sight, and some 626,000 acres planted with over 21,000,000 of trees in Malay and Ceylon are coming into bearing.

From some estates and plantations in Brazil rubber may still be profitably exported owing to its special qualities, but from others the quality of the rubber is such, that, given the scarcity of labour and the heavy working expenses in Brazil, high taxation, &c., it cannot be profitably exported when prices fall to meet the Asiatic competition or to enable demand to keep pace with the already swelling production.

The world's consumption has risen from 50,000 tons in 1903 to 68,000 tons in 1909. According to the statistics of Messrs. Figgis, the world's supply was:—

	Tons.		Plantation rubber. Tons.
1907	69,000	including	1,333
1908	65,000	,,	2,000
1909	69,000	,,	4,025

The supply for 1910 has been estimated at about 74,000 tons.

The supply of plantation rubber increased 100 per cent. in 1909 over 1908, and this increase will be faster when the Asiatic plantations come into full bearing about 1910 and onwards.

The following amounts of seringa or hevea were exported:—

From—	1908. Met. Tons.	1909. Met. Tons.
Manaos	18,065	17,173
Pará	16,781	17,243
Corumbá	537	670
Ilha do Cajueiro	119	145
Others ports	194	251
Total	35,696	35,404

The countries of destination were:—

	1908. Met. Tons.	1909. Met. Tons.
United States	17,144	19,334
United Kingdom	14,550	12,863
France	2,059	1,886
Germany	1,401	594

The exports of maniçoba or Ceará rubber were:—

From—	1908. Met. Tons.	1909. Met. tons.
Bahia	1,249	1,567
Fortaleza	580	1,032
Ilha do Cajueiro	327	474
Other ports	10	33
Total	2,166	3,106

The countries of destination were the United Kingdom (1,502 metric tons), the United States (744 metric tons), France, Germany, &c.

The exports of mangabeira were:—

From—	1908. Met. Tons.	1909. Met. Tons.
Bahia	107	155
Corumbá	80	86
Rio de Janeiro	53	101
Other ports	105	168
Total	345	510

TOTAL of Rubber Shipped from Brazil.

	Tons.
1907	36,418
1908	38,207
1909	39,020

(*Consular Report on Brazil for* 1909.)

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PLANTATION-GROWN RUBBER.

(Issued by Lewis and Peat, 6, Mincing Lane, London, E.C., on January, 16th 1911.)

LEWIS & PEAT have had so many questions and inquiries regarding the preparation of Plantation Rubber and as to the most approved form, that they have gathered as much information as possible from various sources and put together the followink, hoping it may be useful to Planters and help to promote the best interests the Industry generally, and they will be pleased to value samples for Planters or answer questions with regard to Plantation Rubber when desired.

DETAILS FOR PLANTERS—REVISED JANUARY, 1911.

Shape and Form.

A great improvement in the preparation all round has been evident during the past year and the prices obtained at the fortnightly auctions, have undoubtedly proved that the two most popular forms of preparation are:—

"SMOKED SHEETS" AND "BLANKET CREPE"

(SHEETS should be ribbed, thereby allowing a free passage of air on the voyage).

Highlands and Lowlands may be taken as the best example of Smoked Sheets and Rosehaugh of Blanket Crêpe but many other marks run these two very close.

The lower grades in Crêpe form, especially the thick and gristly lots, have commanded a ready sale and at times the demand for both brown and black has been extraordinary, Buyers greatly appreciating the improved preparation. The Scrap Crêpe should be thoroughly freed from bark and any pieces shewing signs of heat kept separate.

Methods of Preparation, Coagulation, &c.

There seems to be some uncertainty still as to the best method of preparing Plantation Rubber for the market, but the aim of the producer of course is to put on the market the purest possible article in the most convenient form and prepared at the lowest possible cost to the estate. The coagulating agent in more or less general use in Acetic Acid, and though other coagulants have been put on the market, Acetic seems the best. The aim is to produce rubber containing the smallest quantity of foreign matter and coagulants of all descriptions should be used with the utmost care, and the smallest quantity sufficient to bring about a satisfactory coagulation used. Excessive use of Acid in coagulation generally results in a weak and very often unsightly sample.

The question as to whether an estate should manufacture Crêpe or Sheet rubber greatly depends upon the facilities at hand.

Sheet rubber is still popular with a great many consumers, and the Smoked continues to command a premium.

It has been generally noted that Sheet rubber that has been made by heavy machinery is very superior to that made by the old hand rollers or mangle, the machine-made sheets showing very few traces of mould or stains, and from what we can gather from Planters, are very much easier to deal with in the factory than the hand-mangled sheets.

In smoking the Sheet rubber, care should be taken that the sheets are all thoroughly and evenly smoked, and above all, great care should be taken that the smoke-house should not be allowed to become too hot, which results in the charring or scorching of the rubber.

The smoking of rubber generally has not come into vogue as much as we should like to see, but certain estates are regularly sending forward extremely fine lots which are eagerly competed for.

Crêped rubber is now in general demand and used by every manufacturer and is for more easily handled in the Plantation factory, and arrives in London generally in a better state than Sheet. Of late several estates have been very successful in making thick Crêpe in all grades. This Crêpe is approximately three times the thickness of the Crêpe sent forward hitherto. The method employed to obtain this thick Crêpe is to abandon the use of the smooth even-speed rollers for finishing. After crêping and washing in the ordinary way the Crêpe should be passed through diamond or grooved rollers of even speed for finishing, care being taken to see that the rubber is not pressed too thin. The result is a strong tough sample of a hard gristly appearance; this method has met with the approval of consumers generally, and we can safely recommend its adoption for all grades, including the Scrap and Bark qualities. It has been argued that rubber prepared in this way takes a considerable time to dry, and that the size of drying rooms would have to be increased. There is no doubt that thick Crêpe does take longer to dry than thin, but being three times the thickness it takes exactly one-third of the space, so what is lost in one way is gained in the other. If thin Crêpe is first made and partly dried, the lengths can be laid three or four deep and rolled out again, and made into Blanket Crêpe of say to a quarter of an inch thick.

With regard to Smoked Crêpe not much progress has been made, the difficulty being at present that if No. 1 Crépe is smoked it often turns a bad colour and the appearance is not improved; however, we should like to urge Planters not to desist in their experiments, as we have a great belief in the future of smoked rubber generally.

While we are on the subject of Crêpe Rubber, we must warn managers that a good deal of money has been lost through the Scrap and Bark grades not being sufficiently washed, the presence of small pieces of wood or bark making a difference in value of pence per lb.

It has also been noticed that several samples coming forward have contained small pieces of cotton; this is apparently caused by pieces of cotton waste becoming mixed with the rubber and getting rolled in.

Another point that we should like attention drawn to is that Crêpe rubber is continually coming forward showing stains down the edges caused by oil exuding from the bearings of the machines.

We also note that the No. 1 Scrap Crêpe is very often very streaky. This can be avoided by twisting the lengths while passing through the crêping machine, and an immense improvement in appearance is gained.

We may say, in conclusion, that when dealing with large crops, we think that the making of thick gristly Crêpe is extremely hard to improve upon both from the points of view of the producer and consumer.

Block Rubber is still being very successfully produced by the Lanadron Company, but this method of treatment has not been generally adopted by other estates.

Grading and Sorting.

We cannot too strongly advise Planters to pay great attention to the grading and sorting, as if one small piece of inferior or discoloured Rubber is found in a package, this piece, however small, is bound to be shown in the sample drawn, and upon which the Rubber is Sold.

When grading, standard grades should be fixed upon and strictly adhered to, and pieces which vary in colour should be kept separate.

We should say that two grades are sufficient for Sheet, and four, at the outside five, for Crêpe, viz., 1 Pale, 2 Brown, 3 Scrap, 4 Bark and Shavings. (It is possible another pile will sometimes be necessary between the Pale and Brown or between the Brown and Scrap.)

Packing and Weighing, Marking, &c.

The packing and weighing of rubber is of the greatest importance and the choice of a suitable packing case is somewhat limited.

Many Planters adhere to the Veneer case, the best known make being the "Venesta." These cases have many advantages, being extremely strong, and the wood having a smooth surface there is no danger of loose sawdust or splinters adhering to the contents and spoiling the rubber.

The only disadvantage of this case in the past has been that when once opened for sampling purposes it was difficult to close them down again satisfactorily, but the Venesta Company, realizing this now makes a Special Rubber Case which obviates this defect. Messrs. Riddy & Hale, Ltd., London, are also making a Special Patent Veneer

Rubber Case which we think most suitable for the purpose. Other makes of cases that seem to give satisfaction are the Momi and Cochin chests; these have been well tried and the arrival of one in a broken state is most unusual.

In choosing a case for packing rubber the main points to be considered are strength, lightness, and above all that the inside surface of the chest be planed absolutely smooth to avoid the adhesion of splinters to the contents. A case may be rough outside but on no account rough inside.

When weighing in order to ensure the absolutely correct weight being taken, each case should be weighed separately before being filled and due allowance made for the banding-iron and nails used in closing down, as it has been found that the weight of individual cases, although of exactly the same make and appearance vrries from 1 lb. to 2 lbs., which would mean a considerable variance between the shipped weights and the outturn.

Under no consideration whatsoever should paper, except specially prepared, powder or any other packing be employed in packing Rubber.

If it can be avoided the Sheets should not be folded when put into the cases. The lengths should be cut to fit and the case should be filled quite full.

The size most commonly used is 19 x 19 x 24 inches, 10 of these exactly making 1 Shipping Ton of 50 cubic feet; Rubber being shipped by the measured ton, this size is most convenient.

However, now that larger crêping machines are being used it is somewhat difficult to fit the broad Crêpe into the above sized chest, and many estates are using a "Venesta" 21 x 21 x 24, which exactly takes two widths of the broad Crêpe.

The marking of cases should be done with the utmost care, the gross and nett weights being clearly stencilled on the cases, and when a mark has once been settled upon it is advisable to adhere to it, as buyers, if they find a mark that suits them will always look for it again, and are often willing to improve their bids to secure stuff they have used before and they know will give them satisfaction. When dealing with Smoked Varieties it is advisable to mark the case clearly with the word "Smoked."

Sales.

In selling rubber in London, Planters and Shippers have the following advantages:—The rubber is sold by public auction and all grades are competed for by British, Continental and American buyers, the lower grades fetching their respective values. The samples are drawn by dock and wharf officials and fairness thereby assured. The same may be said of weights, which are scrupulously taken and shippers' interests protected. To minimise loss in weight after giving out small samples to the Trade to get orders the remainder of the

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samples drawn for the auctions is returned to the cases, and beyond the merchant's commission and the ½ per cent. brokerage, no intermediate profit is made, and the competition and conduct of the London auction is recognized as being absolutely straight forward and honest.

The following is an example of a London account sale—Say 100 cases Plantation rubber:—

50	cases	No. 1 Crêpe or Sheet at	per lb.
25	"	" "	"
15	"	No. 3 Crêpe or Sheet at	per lb.
10	"	scrap or inferior.	

Dock or Wharf charges, Insurance, &c., come to about ½ per cent.. ½ per cent. draft, and discount 2½ per cent., brokerage ½ per cent., and merchant's commission as agreed upon. The ½ per cent. draft and 2½ per cent. discount are allowed to the buyers. There is no duty, and actual dock charges and payment are guaranteed without any risk to planter or shipper.

LEWIS & PEAT,
Rubber Brokers,
6, Mincing Lane, London, E.C.

RAINFALL.

At Bang Nara, Siam, during the year 1910.

			Inches.
January	...	...	12.55
February	..	...	11.47
March	...	...	5.10
April	...	...	5.90
May	...	...	5.97
June	...	...	8.64
July	...	...	6.72
August	...	...	5.92
September	...	...	8.86
October	...	...	14.40
November	...	...	9.69
December	...	...	24.27

Total for the year = 119.49 inches.

A Teage.

This is a very high and steady rainfall for so far north if it is not an exceptional year. It not only averages for the year a heavier fall than in the south of the peninsula but the rainfall in the dry season March to May is equal to our average here.—Ed.

PERAK.

Abstract of Meteorological Readings in Perak for the month of January, 1911.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Taiping	...	109	81.09	91	69	22	76 55	853	...	80	...	17.02	2.27
Kuala Kangsar	...	...	79.50	90	69	21	74.72	799	...	80	...	9.15	3.52
Batu Gajah	...	108	77.56	90	70	20	74.76	825	...	88	...	6.91	1.40
Gopeng	...	...	79.29	90	66	24	74.63	797	...	80	...	11.04	2.16
Ipoh	...	...	80.48	91	70	21	75.46	814	...	78	...	6.86	1.55
Kampar	...	...	79.55	91	69	22	75.70	840	...	84	...	10.84	1.90
Telok Anson	...	...	80.26	92	68	24	77.83	922	...	91	...	12.79	2.65
Tapah	...	...	79.48	91	66	25	75.57	833	...	84	...	8.83	1.65
Parit Buntar	...	...	80.08	88	69	19	75.76	834	...	82	...	6.01	1.60
Bagan Serai	...	...	80.96	90	70	20	76.47	850	...	78	...	5.44	1.68
Selama	...	...	80.96	94	70	24	76.23	842	...	80	...	6.79	2.75

S. C. G. Fox,

Ag. Senior Medical Officer, Perak.

Office of Senior Medical Officer,

Taiping, 16th, February 1911.

AGRI-HORTICULTURAL SHOW, 1910.

STATEMENT OF RECEIPTS AND PAYMENTS.

RECEIPTS.

			$	cts.
1910	SUBSCRIPTIONS :—			
	Government and Municipal	$5,250		
	Firms and Individuals	7,270	12,520	00
	Gate Money		6,507	65
	Sale of Tickets		3,406	55
	Grand Stand and Sale of Programmes		875	45
	Rents and Lighting		6,226	50
	Sale of Buildings		1,765	00
	Advertisements		372	50
	Refreshments		410	00
	D. Division, Horses		559	00
	Do. Dogs		160	00
	Interest		56	01
			$32,858	66

PAYMENTS.

		$	cts.
1910	Buildings and Turnstiles	11,369	20
	Prizes	2,560	00
	Medals	191	26
	Printing, Stationery and Advertising	1,704	50
	Gratuities	1,660	00
	Salaries and Wages	451	75
	Water and Lighting	646	84
	Payments by Hon. General Secretary	589	80
	Payments by D. Division, Horses	559	00
	Do. do. Dogs	142	35
	Transport	556	50
	Labour	448	28
	Decorations and Badges	370	71
	Music	260	00
	Sundries	133	50
	Exhibitors' Expenses	133	86
	Insurance	60	92
	Government Fees	40	00
	Refreshments	36	90
	Audit Fee	50	00
	Present to Honorary Treasurer	22	00
	Loss on Bad Coins	17	60
	Cheque Books and Discount	7	47
	Compensation	3	00
	Balance at the Bank (19th January, 1911)	10,843	22
		$32,858	66

Audited and found correct. (Subject to our Report of 21st January, 1911).

EVATT & CO., *Auditors.*

20th January, 1911.

R. J. FARRER, *Hon. Treasurer.*

ADDENDUM SUBSEQUENT TO AUDIT.

Balance as per Audited Statement				$10,843.22
Deduct Printing Balance Sheet	(28-1-11)	$12.00		
Repairs to S.V.C. Ground	(do.)	72.90		
		$84.90		
			Final Balance	$10,758.32

R. J. FARRER, *Hon. Treasurer.*

7th February, 1911.

M. RODESSE, *Hon. Genl. Secretary.*

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 4.] APRIL, 1911. [Vol. X

ORNAMENTAL CLIMBERS.

Many are the uses to which plants coming under this heading may be put to, and indeed no garden or house seems complete without them. To appreciate them fully it is only necessary to think for a moment and imagine what like our gardens would be without the gorgeous display given by such plants.

So many varieties are now obtainable, that with a little care and forethought, plants may be had which will adapt themselves to almost any situation be it in shade or sunshine. Nothing can be more pleasing to the nature-loving eye than to see a few of those plants rambling over ugly walls, concealing outhouses and other unsightly places. For fences round tennis courts too, no more effective method could be obtained for concealing the unsightly, rusty wire netting.

In England, no garden of any pretensions whatever, would be considered complete without its arbours, pergolas and wild garden covered with creeping or climbing plants. Here, however, arbours and pergolas are almost out of the question, unless, of course, expense were no deterrent. Were they made of wood, white ants would soon play havoc with them, and perhaps iron uprights would prove too expensive for many, these also soon succumbing to the influences of our weather. However, by a few simple devices, these may be dispensed with and a delightful result obtained.

Trees may be utilized for many of these plants, but care must be taken to select such climbers or creepers as will not ultimately cause the death of the tree itself. Mention may be made of the lovely though expensive climbers in this respect—*Passiflora laurifolia* and *Thunbergia laurifolia*, which are of such luxuriant growth that they invariably strangle any tree on which they become established. Such plants, however, are admirably suited for fences of tennis courts, provided, of course, the erection be sufficiently strong to support their rapid growth and consequent increase in weight.

A good many gardens contain an old Durian or Mango tree which is practically past the fruiting stage and therefore of not much value. This seems to be an ideal support for such plants as—Honolulu creepers, Allamandas and Bougainvilleas. When these become established, they well repay the loss of a few durians or mangosteens which might have been borne on the tree.

To enable such climbers to get a fair start, it will be necessary to provide them with something to cling to. Wire netting having a fairly wide mesh is the most suitable for this purpose. The netting should be fixed loosely round the base of the trunk, allowing fully 2 inches between the wire and the bark of the tree. This gives the plant plenty of room to develop and not suddenly checked by its trying to force a way through too narrow an opening. Seven or eight feet of netting will be sufficient, for, by the time the plant has reached that height it will be able to look after itself as far as climbing is concerned.

Tall growing palms whose stems are destitute of beauty are common. With the help of a coil of wire netting they may be changed into effective and practically permanent pillars.

The height to which the creeper is to go can be fixed according to the variety chosen; but for such creepers as *Aristolochia elegans* good results are obtained if they are only supported for about 6 feet by the netting and then allowed to hang down naturally.

The practice of making a flat wooden framework supported by four posts, on which to grow the plants, is, to my mind at least, neither very artistic nor natural looking, though it may rcecommend itself to many and may certainly be said to have a few good points about it. The one real disadvantage is that the supports are liable to collapse at any time unless precautions are taken to renew any which show signs of decay.

In choosing plants for such positions as these, it must be borne in mind that climbers and creepers are two different kinds of plants and usually are adapted for different situations.

Climbers are the names associated with plants having special organs by which they attach themselves to their supports. Tendrils (*Passiflora laurifolia*) hooks and spines (*Bougainvilleas*) and a peculiar half-leaf half-tendril arrangement (*Flagellaria*) are some of the organs used for the purpose, while again the whole plant may twist or twine itself round the support (*Clitoria*).

On the other hand, creepers are plants which creep along the ground over stones, or on trees by emitting roots from the stem. These roots adhere to their supports, and it will therefore be easily understood that generally such plants require shady and moist situations. Examples of creepers are Ivy and *Ficus repens* of which the latter might well be termed the Tropical Ivy.

Cultivation.

In such a climate as ours they require little or no attention beyond the suggestions given and readily recommend themselves to such as have to put up with the most indifferent of kebuns.

For many, occasional prunings are necessary, but in the subsequent list I will endeavour to mention those which will benefit by such treatment.

An important point in the cultivation of climbers must not be overlooked and that is the question of soil. If trees are utilized as supports, the soil round the base of the trunk must receive the addition of some leafmould and old cow manure mixing all well together. This may apply to all soils in which climbers are planted.

When the plants are well established, top dressings of mixed cow manure and leaves would be beneficial provided it were not considered unsightly. Care must be taken not to put such top dressings too close to the stem of the more succulent varieties. If such is unsightly, occasional waterings of liquid manure may be given.

In the following list only those deserving of a place in a moderate sized garden are mentioned:

Allamanda N. O. Apocynaceae:—Beautiful climbing evergreen plants native of Brazil. Free-flowering and showy, usually yellow, bell shaped. All are very fast growers and climb by twining, delighting in either full sun or partial shade. If space is limited frequent prunings will be necessary to keep them within bounds. Propagation chiefly by cuttings.

A. Williamsii:—Flowers large yellow, one of the best of all Allamandas. Requires plenty of room to grow in and succeeds admirably when allowed to climb trees.

A. Schottii. Brazil:-Strong grower with large rich yellow flowers, having the throat striped with brown.

A. violacea. A medium grower with purplish to violet flowers. This should rather be treated as a shrub than climber.

Antigonum N. O. Polygonaceae:—The well known Honolulu creepers. Evergreen climbers of great beauty, natives of South America. They are moderately strong growers requiring plenty of room with little or no pruning. Propagation by cuttings, suckers or seed.

A. guatemalensis:-Free-flowering plant with rosy-pink flowers. Stems slender and slightly angular.

A. leptopus:-This is one of the showiest climbers we have. The flowers are numerous having the outer sepals of a rich rose colour with the centre a much deeper tint; is a most suitable climber for any of the situations suggested.

A. leptopus alba:—A white form of A. leptopus.

Aristolochia (Birthwort) *N. O. Aristolochiaceae*:—A large genus of wide distribution containing plants with flowers more curious than pretty. They are interesting because of the variety of the forms of flowers. These entice the insects required for fertilization purposes by emitting a most unpleasant odour. Only one species of the genus has a pleasant odour, i.e. A. tricaudata, a native of Mexiço. This species, however, is unsuitable as a climber growing more in the nature of a shrub. The genus is of easy culture, most varieties requiring very little pruning if any. Propagation by seeds or cuttings.

A elegans:—One of the prettiest forms of all the Aristolochias. Flowers solitary, produced on the young wood; perianth a circular, shallow saucer-like expansion, fully 3 inches across, grey and reddish-purple with the throat dark velvet; sack and tube greenish white. Leaves reinform-cordate and glabrous. Moderately strong grower and suitable for small trellis work.

A. gigas var Sturtevantii:—This is the largest form of the genus. Flowers gray, mixed with purple; perianth large and cordate with purple veins going towards the tube which is darker in colour. Tube inflated, limb large, cordate—ovate ending in a long tail often 18 inches long. Leaves downy, cordate-acuminnate. Height 10 feet.

Banisteria N. O. Malphigiaceae:—Many of the genus are very ornamental shrubs or climbers, natives of South America. Flowers usually yellow; calyx 5 parted and petals furnished with long stalks. Leaves simple and stalked. Propagation by cuttings or layering.

B. laurifolia:—Flowers yellow, having a slight resemblance to *Stigmaphyllum* or *Oncidium*. Free grower but moderately floriferous.

Bauhinia (Mountain Ebony). *N. O. Leguminosae*:—Showy evergreen climbers and shrubs. Flowers racemose; petals 5, spreading, oblong and rather unequal in size. Leaves two-lobed. As they require to be of considerable age before they show to full advantage, I only mention them in passing. Suitable for climbing large trees and when in flower are beautiful.

Beaumontia N. O. Apocynaceae:—Very ornamental plants with handsome flowers. Propagation by seed.

B. grandiflora:—A robust grower suitable either for low trellis or as a spreading plant on lawns. Flowers almost pure white, large and trumpet shaped Native of East Indies.

Bignonia N. O. Bignoniaceae:—This is a large genus of scandent plants furnished with tendrils. The flowers are axillary and terminal, usually panicled; corolla with a short tube, a companulate throat and a 5-lobed bilabiate limb. The leaves are opposite. The genus contains some of the most beautiful of our climbers. Propagation by cuttings.

B. magnifica:—By many this is considered the most beautiful of all climbers. It is most floriferous and of easy culture. Flowers large, varying from delicate mauve to rich purplish-crimson; throat lightprimrose-colour; panicles large and branching. A splendid plant for climbing purposes and also suitable as a plant for lawns.

Bougainvillea N. O. Nyctagineae:—This genus contains some of the most gorgeous climbers in cultivation, the beauty of which lies in the colour of the bracts surrounding the flowers. All are strong growers and require plenty of room for development. If trellis work is used for this genus, strong supports will be required as in a short time the plants become exceedingly bulky. Many of the species require occasional prunings. Propagation by cuttings.

B. glabra:—Bracts rose-coloured, smaller than B. speciosa. Leaves bright green and smooth.

B. speciosa:—This is a much stronger species than the former. Stems branched with an abundance of large recurved spines.

The bracts are of a delicate lilac-rose colour. Suitable for full sun or partial shade and may be grown successfully on trees.

Camoensia N. O. Leguminosae:—This is in an interesting genus because of its containing the largest flowered leguminous plant known. Requires to be of considerable size before it commences to flower freely and therefore not one of the most suitable for a small garden. Propagation by cuttings.

C. maxima:—Flowers white about 9 inches long in short axillary racemes. Occasional prunings are beneficial when the plant becomes established.

Cissus (Vitis) N. O. Ampelideae:—Flowers inconspicuous, small greenish yellow with simple, trifoliate or palmate leaves. Propagation by cuttings.

Cissus discolor:—An elegant climber requiring partial shade. The beautiful colouring of the leaves is its distinguishing feature. The upper surface of the leaf is bright velvety-green spotted or mottled with white with the underside of a deep reddish purple. A charming plant suitable for pillars of shady verandahs, etc.

Clerodendron N. O. Verbenaceae:—The genus contains species of two distinct habits, one scandent and the other shrubby. All have terminal panicles of brightly coloured pentamerous flowers with exserted stamens and style; leaves simple.

This is a genus of easy culture and may be grown successfully by all. Propagation by seeds, suckers or cuttings.

C. scandens:—Flowers white, corymbs many, axillary and terminal. Leaves cordate-ovate, acuminate and entire; stems tetragonal. As the name implies the species is scandent.

C. speciosum:—Flowers rich deep rose; calyx large suffused with red. Leaves oblong-ovate and glabrous. Suitable for low fences and walls being easily propagated by suckers.

C. Thomsonae:—Flowers bright crimson with pure white calyces. Leaves ovate, acuminate, smooth and opposite. Very floriferous and most suitable for trees and pergolas. All the Clerodendrons mentioned require very little pruning, if any.

Clitoria N. O. Leguminosae:—Very handsome climbers of easy culture. Flowers axillary; pedicellate, large and elegant. Leaves pinnately-trifoliate with the leaflets stipellate. Propagation by seed.

C. Ternatea:—Flowers very curious and beautiful and can now be obtained in many colours varying from pure white to deep blue. A most suitable climber for small fences.

C. Ternatea fl. pl.:—A double form of C. Ternatea and a delightful acquisition to our climbers.

Combretum N. O. Combretaceae:—Many of the Combretums are of considerable beauty, but like the Bauhinias they require to be of considerable size before they show to full advantage. Propagation by seed and cuttings.

Congea N. O. Verbenaceae:—A beautiful genus of plants of scandent habit. They may be utilised as specimen plants on lawns or allowed to climb trees.

Congea tomentosa:—The beauty of this plant lies in the profusion of showy bright pink bracts which surround the otherwise inconspicuous flowers.

Dipladenia N. O. Apocynaceae:—A very ornamental genus of climbers of which there are many varieties and hybrids. Flowers usually rose or purple and extremely showy. Leaves opposite and entire. Dipladenias succeed admirably when grown in tubs but they show to better advantage if grown on low trellis work or arches. Propagation by cuttings.

D. Harrisi:—This is one of the finest of all climbers. Flowers bright yellow shaded with orange, large and most deliciously scented; of difficult propagation owing to the plentiful supply of latex which exudes from the cut stems.

Faradaya N. O. Verbenaceae:—A genus of strong growing scandent plants, requiring plenty of room for successful culture. Propagation by seeds and cuttings.

F. Papuana:—A climber of robust habit but unfortunately a somewhat shy bloomer. Flowers white in clusters, terminal. Fruits curious, slightly resembling a white potato having many eyes. This climber succeeds well in full sunshine and occasional prunings are beneficial.

Gloriosa (Full of Glory) *N. O. Liliaceae*:—A curious genus of plants climbing by means of the apices of the leaves which are modified into tendrils. Flowers axillary in racemes, terminal. Roots bulbous. Propagation by seeds and offsets. The genus is impatient of root disturbance on account of the brittleness of therhizome.

G. Superba:—Flowers deep rich orange and red; perianth segments narrow, deeply undulate and crispate, erect. Height 6 feet.

G. virescens:—Flowers deep orange and yellow: perianth segments spathulate, margins not crispate but slightly undulated. Height 4 feet.

G. Rothschildianum:—A hybrid Gloriosa of which there are now many.

Ipomoea N. O. Convolvulaceae:—A very large genus of creeping or climbing plants of wide distribution. Flowers purple, violet, scarlet, pink, blue or white and yellow; corolla salver-shaped, campanulate or tubular; limb spreading, entire or angular. Leaves alternate, entire lobed or divided. Propagation by seed or cuttings.

I. Bona-Nox (Good-night):—flowers white, corolla undivided; tube very long; peduncles one to three flowered and deliciously scented. Leaves cordate, entire or angular. Requires frequent renewal. Propagation by seed.

I. digitata:-A strong growing climber of great beauty. Flowers pinkish produced in great abundance.

I. Horsfalliae:—Flowers deep, rich, glossy rose-colour, the peduncles bearing dichotomous cymes of flowers: leaves quintately digitate and leaflets lanceolate, entire with undulated margins. A showy and useful variety, admirably adapted for pot culture.

I. Quamoclit:—Flowers dark red, solitary. Leaves pinnate, pinnae filiform.

Jacquemontia N. O. Convolvulaceae:—Flowers blue, white or rarely violet, sometimes loosely or densely cymose, sometimes capitate, rarely solitary or loosely racemose. Leaves entire. Propagation by cuttings. Very little, if any, pruning is required.

J. violacea:—Flowers pale blue, sessile, pedunclés umbelled, five flowered. Leaves oblong-cordate, acuminate. One of the most useful of all climbers being extremely floriferous and of easy culture.

Passiflora N. O. Passiflorae:—A very large genus of beautiful climbers, many having delicious edible fruits. In some species the flowers are very beautiful and in all they are of singular form and extremely interesting, many of which may be profitably included in all collections of climbers.

P. Laurifolia (Sweet cup or Jamaica Honeysuckle):—Flowers red and violet, sweetscented: bracts obovate, glandular serrate at the apex. Fruit yellow, about the size of a duck's egg. Leaves glabrous, ovate-oblong entire. As previously mentioned, discretion must be exercised in the planting of this species owing to its exceedingly robust habit of growth.

P. trifasciata:—Flowers white, fragrant; leaves trilobate, marked down the centre of each lobe by a broad irregular band of reddish purple. One of the few showy variegated climbers.

P. Watsonii:—An exceedingly floriferous species. Flowers blue and sweet, and scented. Admirably adapted for covering fences, etc. Very little pruning is required for any of the passifloras except the necessary amount for regulating the growth to space available.

Pergularia odoratissima (Asclepiadoe) Small greenish yellow flowers very fragrant. Tonkin creeper.

Stephanotis N. O. Asclepiadeae:—Flowers white, large and simple in umbelliform cymes: leaves opposite, coriaceous. Propagation by cuttings.

S. floribunda:—Flowers of the purest white, highly fragrant, borne freely in large bunches. This is one of the most popular climbers and may be grown successfully in large pots or tubs.

Stigmaphyllon N. O. Malphigiaceae:—Flowers yellow and showy. Leaves usually opposite, of two forms, entire or denticulate, rarely lobed. Propagation by cuttings.

S. ciliatum:—Flowers large, three to six in an umbel, petals fringed with long claws. Leaves opposite, cordate, oblique at the base, smooth, ciliated, glaucous. The flowers of this species somewhat resemble those of Oncidiums and in fact at first sight are often taken as such.

Tristellateia N. O. Malphigiaceae:—A pretty climber found in Mangrove swamps. Propagation by seeds and cuttings.

T. australis:—Flowers yellow, on terminal panicles. It is very floriferous and of easy culture, admirably adapted for trellis work.

Thunbergia N. O. Acanthaceae:—A large genus of beautiful climbing plants distributed throughout the Tropics. Flowers purple, blue, yellow or white, shortly pedicellate, solitary in the axils or disposed in terminal racemes. Leaves opposite, ovate, lanceolate cordate or hastate.

All are of easy culture and many are exceedingly beautiful. Propagation by seed and cuttings

T. *fragrans*:—Flowers pure white and fragrant, one or rarely two in each axil. Leaves ovate or oblong, acute or obtuse, cordate or hastate at the base. Stem slender, climbing retrorsely hairy or glabrate.

T. laurifolia:—The flowers of this species closely resemble those of T. grandiflora. Flowers blue. Leaves elliptic or oblong, acuminate. A more robust grower and requires to be pruned according to space available.

A. W. ANDERSON.

LIST OF CLIMBERS IN THE BOTANIC GARDENS, SINGAPORE.

(Wild and Cultivated.)

This list includes most of the climbing plants, wild or cultivated, in the Botanic Gardens, excluding the climbing palms (rattans) climbing aroids and ferns, which will be found in the lists of these plants already published.

RANUNCULACEAE.

Naravelia laurifolia Wall	Penang
Clematis Jackmanni Hybrid	"
" *flammula*	Europe

DILLENIACEAE.

Tetracera assa D C	Singapore
" *sylvestris* Ridl	"
" *macrophylla* Wall	"
" *fagifolia* Bl.	"
Delima sarmentosa L.	Malaya
Kadsura cauliflora Bl.	"

ANONACEAE.

Cyathostemma Scortechinii King ...	Singapore
Uvaria purpurea Bl.	Malaya
" *Lobbiana* Hook fil	"
" *macrophylla* Roxb	"
" *hirsuta* Jack	"
" *rufa* Bl.	Java
Ellipeia cuneiifolia Hook fil.	Malaya
Artabotrys crassifolius King	"
" *Maingayi* Hook fil... ...	"
" *suaveolens* Bl.	"
" *odoratissimus* Br.	"
" *Wrayi* King	"
Oxymitra latifolia Hook fil.	Singapore
" *calycina* Hook fil.	"
Melodorum fulgens Hook fil.	"
" *latifolium* Hook fil.	"
" *cylindricum* Maing ...	"
" *lanuginosum* Hook fil.	"
" *prismaticum* Hook fil. ...	"

MENISPERMACEAE.

Tinospora cordifolia Miers	India
Tinomiscium petiolare Miers	Singapore
Fibraurea tinctoria Lour	"
Coscinium Blumeanum Miers	Malaya
Limacia velutina Miers	Singapore

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MARCGRAVIACEAE.

Marcgravia umbellata L. ..	... S. America

MALVACEAE.

Hibiscus surattensis L.	India

STERCULIACEAE.

Byttneria Maingayi Hook fil	Singapore

TILIACEAE.

Grewia umbellata L.	Malaya

LINEAE.

Roucheria Griffithiana Planch ...	Singapore

MALPIGHIACEAE.

Tristellateia australis Br.	Malaya
Hiptage Madablota L. ...	Indo Ma'aya
Banisteria laurifolia Rich	Mexico
Stigmaphyllum ciliatum Juss ...	... S. America
,, *lancifolium* Harv. ...	Mexico

RUTACEAE.

Luvunga eleutherandra Dalz	Singapore

OLACINEAE.

Phytocrene bracteata Wall	Malaya
,, *palmata* Wall ...	... ,,
Erythropalum scandens Bl.	,,
Iodes oblonga Planch ...	... Singapore
Cardiopteris lobata Br.	Malaya

CELASTRINEAE.

Salacia grandiflora Kurz	Ma'aya
,, *prinoides* Dec. ...	... ,,
,, *flavescens* Kurz	Singapore
Hippocratea indica L. ...	... ,,

RHAMNEAE.

Zizyphus calophylla Wall	Singapore
Ventilago leiocarpa Benth ...	... Malaya
Paullinia sorbilis Mart. Guaranatea ...	S. America

AMPELIDEAE.

Vitis elegans Kurz	Singapore
,, *lawsoni* King ...	... ,,
,, *polythyrsa* Miq.	Pahang
,, *martinelli* Hort. Kew, Saigon vine	Cochin China
,, *glaberrima* Wa'l	Singapore
,, *discolor* Da'z ...	... Burmah
,, *mollissima* Wall	Singapore
,, *novemfolia* Wall ...	... ,,
,, *quadrangularis* Lindl ...	Africa
,, *vinifera* L., Grape vine ...	... ,,
Pterisanthes polita Miq.	Singapore

SAPINDACEAE.

Cardiospermum Halicacabum L., Balloon vine ...	Tropics
" *hirsutum* Willd	Africa

CONNARACEAE.

Connarus semidecandrus Jack	Singapore
" *grandis* Jack	"
" *oligophyllus* King	"
Rourea pulchella Planch	"
" *fulgens* Planch	"
Agelaea vestita Hook fil.	"
Cnestis ramiflora	"

LEGUMINOSAE.

Abrus precatorius L and var white seeded ...	Tropics
Phaseolus Mungo L.	"
" *Caracalla* L.	"
Pachyrrhizus tuberosus Rich Yam bean	"
" *angulatus* Rich	"
Dolichos Lablab L.	"
" *biflora* L.	"
" *tonkinensis* Hort ...	Cochin China
Glycine Soja L.	China
Clitoria Ternatea L.	Malaya
Psophocarpus tetragonolobus Dec. ...	"
Vigna Catjang Endl	"
Centrosema Plumieri Benth, Butterfly pea ...	S. America
Mucuna pruriens Dec., Cowhage ...	Indo Malaya

VARLLUTILIS.

Dioclea lasiocarpa Mart. ...	S. America, Madagascar
Canavalia gladiata Dec., Sword Bean	Tropics
" *obtusifolia* Dec.	"
Spatholobus ferrugineus Benth	Singapore
" *maingayi* King	"
Millettia eriantha Benth	"
" *maingayi* Bak	"
Wistaria chinensis	China
Derris thyrsiflora Benth	Singapore
" *amoena* Benth	"
" *sinuata* Thw.	"
" *elliptica* Benth, Tuba root	"
Lonchocarpus cyanescens Benth, Yorobu Indigo ...	Africa
Kunstleria Ridleyi King	Singapore
Dalbergia stercoracea Benth	"
Camoensia maxima Welw.	Africa
Bauhinia semibifida Roxb.	Singapore
" *bidentata* Roxb.	Malaya
" *integrifolia* Roxb.	"
" *vahli* Hook. Arn.	India
" *Hookeri* Muell	Australia

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Caesalpinia Bonduc Roxb. ...	... Tropics
,, *Bonducella* Flem. ...	,,
Mezoneurum sumatranum Miq. ...	... Singapore
Entada spiralis Ridl.	,,
,, *scandens* Benth ...	... Tropics
,, *polystachya* Dec.	Trinidad
Acacia pseudo intsia Miq. ...	... Singapore

ROSACEAE.

Rosa centifolia L. Rose	
,, *indica* L. Rose... ...	...
,, *multiflora* L. Rose	China
Rubus moluccanus L. ...	... Malaya
,, *rosaefolius*	,,

COMBRETACEAE.

Combretum grandiflorum Don. ...	Africa
,, *coccineum* Dec. ...	... ,,

MELASTOMACEAE.

Marumia rhodocarpa Bl.	Singapore
Dissochaeta celebica Bl. ...	... ,,
Anplectrum gaucum Tr.	Malaya

PASSIFLORACEAE.

Passiflora foetida L.	Brazil
,, *minima*	... S. America
,, *laurifolia* L. Sweet Cup ...	Trop. America
,, *suberosa* L. ...	,,
,, *quadrangularis* L. Granadilla ...	,,
,, *Watsoniana* Hybr. ...	...
,, *amabilis* Hook	Brazil
,, *ambigua* Hort ...	... ,,
,, *trifasciata* Lem.	,,
,, *vitifolia* H. B. K. Scarlet Passion flower	... ,,
Adenia Singaporeana King	Singapore

CUCURBITACEAE.

Trichosanthes Wallichiana Wt. ...	Singapore
,, *Celebica* Cogn. ...	... ,,
,, *Anguina* L. Serpent Gourd ...	Tropics
,, *Wawraei* Cogn. ...	... Singapore
Cephalandra indica Naud "Pepasa" ...	India
Luffa aegyptiaca Mill Loophar ...	... Tropics
,, *acutangula* Roxb	,,
Lagenaria vulgaris Ser. Bottle Gourd ...	... ,,
Benincasa cerifera Savi. Wax Gourd ...	,,
Citrullus vulgaris Schrad. Water melon .	... ,,
Cucurbita maxima Duch. Gourd ...	,,
,, *moschata* Duch. Musk-melon...	... ,,
Cucumis sativus L. Cucumber ...	,,
Momordica Cochin-Chinensis Spreng ...	... ,,
,, *Charantia* L. ...	...

RUBIACEAE.

Uncaria sclerophylla Roxb	Malaya
,, *pteropoda* Miq	,,
,, *gambier* Roxb	,,
,, *ovalifolia* Roxb	,,
,, *jasminiflora* Wall	,,
Coptosapelta Griffithii Hook fil	Malaya
Mussaenda glabra Vahl	Trop. Asia
,, *macrophylla* Wall	India
,, *erythrophylla* Bull	Congo
Randia penangiana Hook fil	Malaya
,, *fragrantissima* Ridl	Singapore
Canthium molle King	,,
Morinda umbellata L.	,,
var *Ridleyi*	,,
Gynocthodes coriacea Miq	,,
,, *sublanceolata* Miq	,,
Psychotria sarmentosa Bl.	,,
,, *penangensis* Hook fil	,,
,, *ovoidea* Wall	,,
,, *Ridleyi* King	,,
,, *polycarpa* Hook fil	,,

COMPOSITAE.

Vernonia eleagnifolia Dec.	Burmah
Gynura sarmentosa Dec.	Singapore
Mikania Sanderii Hort.	S. America

MYRSINEAE.

Maesa ramentacea Dec.	Singapore
Embelia ribes Burm	,,
,, *Lampani* Scheff	,,

OLEACEAE.

Jasminum bifarium Wall	Singapore
,, *Griffithii* Clarke	,,
,, *Maingayi* ,,	Penang
,, *Officinale* L.	
,, *glandulosum* Wall	Burmah

APOCYNACEAE.

Willughbeia coriacea Wall	Singapore
,, *firma* Bl.	,,
,, *flavescens* Dyer	,,
Chilocarpus enervis Hook fil.	Malaya
Leuconotis eugeniifolius A Dec.	,,
Alyxia lucida Wall, Pulasari	,,
,, *odorata* Wall	,,
Wrightia javanica A Dec.	Malaya
Strophanthus dichotomus Dec.	Singapore
,, *singaporianus* Gilg.	,,
,, *hispidus* Dec.	Africa
,, *Petersianus* Klotsch	,,
,, *longicaudatus* Wight	India

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Urceola brachystachya Hook fil	Singapore
„ *torulosa* Hook fil	„
Parameria polyneura Bl.	„
Chonemorpha Rheedii Ridl.	Ceylon
Ichnocarpus frutescens Bl.	Malaya
Aganosma marginata Bl.	„
Trachelospermum jasminoides Lem.	China
Landolphia Heudelotii A Dec.	W. Africa
„ *florida* Benth	„
„ *owariensis* Beauv	„
Beaumontia grandiflora Wall	India
„ *Jerdoniana* Wt.	„
Allamanda Schottii Hook fil	Brazil
var *Hendersoni*	
„ *violacea* Gardn.	
„ *Williamsii* Hort	
„ *cathartica* L	
Dipladenia Harrisii Hook	Trinidad
Roupellia grata Wall	Africa

ASCLEPIADEAE.

Marsdenia tinctoria Br.	Malaya
Vallaris pergulana Burm.	„
Chlorocodon Whiteii Book fil.	Africa
Cynanchum ovalifolium Wight	Singapore
Pergularia odoratissima Wight. Tonkin Creeper	Malaya
Stephanotis floribunda Brugn	Madagascar
Physostelma Wallichii Wight	Singapore
Hoya coronaria Bl.	„
„ *lasiantha* Bl.	Perak
„ *lacunosa* Bl.	Singapore
„ *fraterna* Bl.	Java
„ *Ridleyi* King and Gamble	Singapore
„ *latifolia* Don.	„
„ *parviflora* Wight	Penang
„ *carnosa* R. Br. var variegata	Australia
Dischidia nummularia Br.	Singapore
„ *rafflesiana* Wall	„
„ *hirsuta* Decne	„
„ *collyris* Br.	„
Ceropegia Woodii Schlecht	Natal

LOGANIACEAE.

Strychnos Tieute Bl.	Singapore
„ *malaccensis* Benth. Ipoh Akar	„
„ *pubescens* Clarke	„

CONVOLVULACEAE.

Erycibe Princei Wall	Singapore
„ *festiva* Pram	„
„ *leucoxyloides* King	„
Porana volubilis Burm. Bridal creeper	India
„ *paniculata* Roxb	„

Jacquemontia violacea Choisy	Mexico
Merremia hastata Hallier	Eastern Tropics
,, *coespitosa* Hallier	,,
,, *convolvulacea* Denns.	,,
,, *nymphaeaefolia* Hallier	,,
Ipomea Bona-nox L.	S. America
,, *pulchella* Roth	Tropics
,, *paniculata* Br.	,,
,, *Batalas* Lan.	,,
,, *sepiaria* Koen	,,
,, *quamoclit* L.	,,
,, *coccinea* L.	,,
,, *dissecta* Willd	,,
,, *digitata* L.	,,
,, *Horsfalliae* Hook	West Indies
var *Briggsii*	,,
,, *aquatica* Forsk	Arabia
,, *versicolor* Meisn (*Mina lobata*)	S. America
,, *purpurea* Roth Morning glory	America
,, *Learii* Paxt.	Ceylon
Operculina tuberosa Meisn	S. America
Argyreia tiliaefolia Wight	India

SOLANACEAE.

Solanum Wendlandi Hook fil.	Costa Rica
,, *Seaforthianum* Andr.	Brazil

BIGNONIAEAE.

Tecoma Curtisii Ridl.	Penang
,, *amboinensis* Bl.	Amboina
,, *ceramensis* Teysm	New Guinea
,, *jasminoides* Lindl.	Australia
Bignonia magnifica Bull.	Columbia
,, *unguis cati* L.	Trop. America
,, *incarnata* Anbl.	,,
,, *capreolata* L.	America
,, *aequinoctialis* L.	S. America
Var Chamberlaynei	
Tanoeceum Jaroba Sar	West Indies

ACANTHACEAE.

Thunbergia laurifolia Lindl.	Malaya
,, *grandiflora* Roxb.	India
,, var *alba*	,,
,, *alata* Boj.	Trop. Africa
,, *fragrans* Roxb.	Malaya

SCROPHULARINEAE.

Maurandya semperflorens Jacq.	Mexico

VERBENACEAE.

Premna divaricata Wall	Malaya
,, *Ridleyi* Gamble	Singapore
Faradaya papuana Scheff	New Guinea

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Gmelina Hystrix Schultz	... ...	Malaya
Clerodendron Thomsonae Balf...	...	Africa
Balfouri Hort.	... ...	Africa
scandens Poir. ...	...	South Africa
speciosum Garden Hybrid...	...	
Hosea Lobbiana Ridl. ...	...	Borneo
Congea tomentosa Roxb	... ...	Burmah
,, var *coerulescens*	...	
Sphenodesma ferruginea Ht.	... ...	Siam
Petraea volubilis L. ...	...	Trop. America
Holmskioldia ferruginea Retz.	... ...	India

NYCTAGINACEAE.

Bougainvillea glabra ...	...	Brazil
,, ,, var *sanderiana*	... ...	
,, *lateritia* Hort.	...	
,, *spectabilis* Willd	... ...	Brazil
,, *fulgens* Hort. ...	...	

ARISTOLOCHIACEAE.

Aristolochia Duchartrei Andr.	...	Upper Amazon
,, *elegans* Mast	... ...	
,, *Forckelii* ...	...	
,, *gigas* L.	... ...	Guatemala
,, var *Sturtevantii* ...	...	
,, *Goldieana* Hook	... ...	Old Calabar
,, *hians* Willd ...	...	Venezuela
,, *Roxburghiana* Klotz	...	Indo Malaya
,, *saccata* Wall ...	...	Himalayas
,, *ungulifolia* Mast	... ...	Singapore

PIPERACEAE.

Piper Betel L. Betel pepper ...	...	Asia
,, *Chaba* Hunter...	... ...	,,
,, *Cubeba* L., Cubebs ...	...	Africa
,, *nigrum* L., Black pepper	... ...	India
,, *porphyrophyllum* N. E. Br.	...	Singapore
,, *argyrites* Hort.	... ...	Malaya
,, *arnottianum* Dec ...	...	,,
,, *caninum* B. ...	... ...	,,
,, *longum* L., Long Pepper	...	India
,, *officinarum* Dec., Long Pepper ...	...	,,
,, *miniatum* Bl. ...	...	Malaya

THYMELEACEAE.

Linostoma pauciflora Griff ...	...	Singapore
,, *scandens* Kurz	... ...	,,

NEPENTHAECAE.

Nepenthes Rafflesiana Jack ...	...	Singapore
,, *Ampullaria* Jack	... ...	,,
,, *gracilis* North ...	...	,,
,, *Reinwardtiana* Miq.	... ...	,,
,, *sanguinea* Lindl ...	...	Malay Peninsula
,, *phyllamphora* Willd	...	,,

EUPHORBIACEAE.

Megistostigma Malaccense Hook fil. ... Malaya
Croton caudatus Geisel ... ... "

URTICACEAE.

Ficus ramentacea Roxb ... ... Malaya
" *villosa* Bl. ... ... Singapore
" *punctata* Thunb ... ... "
" *repens* Willd (form of F. heterophylla) ... Indo Malaya

GNETACEAE.

Gnetum neglectum Bl. ... ... Malaya
" *Funiculare* Bl. ... ... "

ORCHIDEAE.

Vanilla planifolia Andr. Vanilla ... Mexico
" *Pompona* Schiede ... ... Mexico
" *Parishii* Rchbf. ... ... Burmah
" *Griffithii* Rchbf. ... ... Singapore

DIOSCOREACEAE.

Dioscorea doemona Roxb. "Gadong" ... Malaya
" *cornifolia* Kunth ... ... "
" *glabra* Roxb. ... ... "
" *laurifolia* Wall ... ... "
" *sativa* L. ... ... Trapica
" *alata* L. Yam. ... ... "
" *sp.* ... ... Perak

ROXBURGHIACEAE.

Stemona tuberosa Lour ... ... Penang

LILIACEAE.

Gloriosa superba L. ... ... India
" *Rothschildiana* Hort. ... ... Africa
" *virescens* Lindl. ... ... "
Asparagus plumosus Bak ... ... "
var *nanus* ... ... "
" *medeoloides* Thumb. ... ... Cape
Smilax barbata Wall ... ... Singapore
" *megacarpa* Dec. ... ... "
" *myosotiflora* Dec. ... ... "
" *officinalis* Hanb ... ... Venezuela
" *ornata* Lem. ... ... S. America
Bowiea volubilis Harv. ... ... S. Africa

FLAGELLARIACEAE.

Flagellaria indica L. ... ... Eastern Tropics

PANDANACEAE.

Freycinetia lucens Ridl. ... ... Singapore
malaccensis Ridl. ... ... "
valida Ridl. ... ... "

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BROWN ROOT DISEASE OF PARA RUBBER.

(Hymenochaete noxia, Berk*).*

By Keith Bancroft, B.A., Assistant Mycologist, F.M.S.

A root disease of Para Rubber which has been for some time known in Ceylon under the name of "brown root disease," † has been recently brought to the notice of the Department of Agriculture, F.M.S.

The fungus, *Hymenochaete noxia*, the cause of the disease, was discovered by Rev. T. Powell in Samoa in 1875, on a species of *Artocarpus*. In 1905, it was reported in Ceylon on *Hevea*, Tea, Dadap, Cacao, *Castilloa elastica* and Caravonica Cotton; since then it has also been found on Camphor (*Cinnamomum Camphora*), *Cinnamomum Cassia*, Cacao and *Brunfelsia americana*. It is said to be the commonest root disease of *Hevea* in Ceylon. In the early part of 1910, specimens of the fungus were sent to Kew from West Africa, where the fungus was said to be doing some considerable damage to Cacao. The fungus has also been recorded in New Guinea.

A disease, which, from its symptoms, appears to be the "brown root disease," was mentioned by Mr. Gallagher in Bulletin No. 2, 1909, Department of Agriculture, F.M.S., as occurring in this country on *Hevea* and on Camphor; the fungus was, however, not identified. Mr. Ridley‡ mentions the report of the disease from Apia and states that he has observed a species of *Hymenochaete* on Para Rubber in the Malay States.

The fungus was first recorded by the author on roots of Camphor (*Cinnamomum Camphora* in the Experimental Gardens at Kuala Lumpur, where a number of plants were attacked. More recently it has been reported on *Hevea* from some estates in Negri Sembilan. In the plantations it appeared to be fairly common in certain areas although on the whole in this country it is by no means so common as the disease caused by *Fomes semitostus*.

Symptoms.

When a tree is attacked the symptoms above ground do not differ in any respect from those of the root disease caused by *Fomes semitostus* or from the ordinary symptoms of root disease generally, i.e., the leaves wither and death occurs rather suddenly. An examination of the roots shows the presence of well-marked symptoms which characterise the disease. They are encrusted with a mass of earth and small stones which are cemented to the surface of the roots by the mycelium of the fungus. This can be found to occur more especially on the tap root. The surface of the roots becomes dark brown and almost black; for this reason the disease is known to the coolie as "sakit hitam."

† Petch: Circulars and Agricultural Journal, Royal Botanic Gardens, Ceylon, Vol. V., No. 6, 1910.

‡ Ridley: Agricultural Bulletin, S.S. and F.M.S., July, 1909.

The mycelium takes the form of light brown threads when young, and becomes later expanded over the surface of the root in the form of sheets, and collected here and there into nodules. The sheets of mycelium are dark in colour on the surface, and white or light brown beneath.

In Ceylon the progress of the disease is said to be very slow, and observations which have been made in this country up to the present confirm this. In some cases where the tap root was attacked, it has been found that adventitious roots have arisen, and having grown vertically downwards have taken the place of the tap root,—a further indication of the slow progress of the disease. At each centre of infection one or two trees only have been found to be diseased, and each case has been found to be the result of a separate infection.

The mycelium appears to be incapable of spreading independently through the soil, and infection can, therefore, only occur by the contact of a diseased with a healthy root. The growth of the mycelium is, however, so slow that the attacked tree is dead some time before the fungus has spread to the adjacent trees. Where two adjacent trees are attacked simultaneously, each has become infected separately from one or more jungle stumps. If the dead tree be left standing for some time the disease may spread to the adjacent trees. To illustrate the slow progress of the disease Mr. Petch, Mycologist, Royal Botanic Gardens, Ceylon, cites the following instance:—" *Hevea* was planted, 14 feet apart, in single line round the boundary of an old-established Cacao estate. When the trees were eight years old, one of them died, from brown root disease as was subsequently discovered. The tree was left standing and allowed to decay. Two years later the next tree in the line died and was likewise left to decay. After a further two years had elapsed, the next tree in the same direction along the line failed to recover after wintering, and was evidently dying; and an examination of this tree and the two old decaying stumps proved that they had all been killed by brown root disease."

In Samoa and in West Africa, the disease appears to be more serious than either in Ceylon or in this country. When reported at Kew from West Africa the disease was said to spread somewhat rapidly, and in Samoa it has been said to cause considerable injury to breadfruit (*Artocarpus incisa.*)

The youngest age of an attacked tree which has been recorded in this country is three years.

Spread.

From what is known of the fungus it is unquestionably a jungle product, and, from the long list of cultivated plants which it attacks, one might infer that in the jungle it does not confine itself to any small number of hosts.

From observations which have been made up to the present time in this country each case of infection has been referable to the presence of a jungle stump.

The fungus does not apparently fruit in any abundance in this country; in fact, hitherto it has only been possible to find a single fruit, on camphor, and this a badly developed specimen. The fruit takes the form of a velvety, brown, in crusted mass on the base of the plant at the collar. In specimens of the fungus which have been examined on Cacao by the author, the brown mass was observed to ring the stem at the collar for a distance of about three inches. In Samoa and in West Africa, there appears to have been no difficulty in obtaining the fruits of the fungus. The scarcity of fruits in this country would lead one to infer that the propagation of the disease by means of spores is scarcely worthy of serious consideration.

Treatment.

When a tree dies it is necessary to remove it with as much of the roots as possible and burn them.

Old stumps with their roots should also be removed from the infected area and burnt.

Trenching is unnecessary; and the application of quicklime may be dispensed with, providing that all of the diseased roots have been removed.

In each centre of infection the lateral roots of trees adjacent to the dead tree should be examined and any which are diseased should be cut off to a point where they are healthy, and the diseased portion removed and burnt.

There appears to be no reason why replanting should not be done immediately after the area occupied by the diseased tree has been dug over and the wood has been removed.

A DISEASE OF SEEDLINGS OF PALAQUIUM OBLONGIFOLIUM.

(*Laestadia Palaquii n. sp.*)

By Keith Bancroft, B.A., Assistant Mycologist, F.M.S.

A disease of seedlings of *Palaquium oblongifolium*, Burck., has recently been reported from the nurseries of the Forestry Department at Trolak (Perak) where a large number of seedlings are said to be affected. The plants of *Palaquium oblongifolium* are being cultivated along with *Balanocarpus maximus* (Chengal); the latter, however, are not affected.

Symptoms.

When the seedlings are attacked, brown spots appear on the leaves. The spots increase in size and frequently become confluent, so that nearly the whole area of the leaf may become brown. The remaining part of the leaf becomes yellow, and the leaf withers and dies. The death of the leaves is followed by the withering of the young part of the stem, and, finally, by the death of the seedling.

Both young and old leaves may become spotted.

Sometimes, the seedling throws up a new shoot from below. The actual fate of this shoot is unknown.

The Fungus.

Material of all stages of the disease has been forwarded to the Agricultural Department for examination. The tissues of the mesophyll of the leaves are overrun with hyaline, branched, septate hyphae 4 microns in width. On the upper surface of the leaves are produced black perithecia which are not visible to the naked eye. The perithecia are less abundant on the under surface of the leaves; they are closely associated with the internal mycelium, and when viewed under a lens appear as small black dots; they bear asci without paraphyses, each ascus containing eight ascospores.

The fungus belongs to the genus *Laestadia*, and in its characters is sufficiently distinct from any other species of *Laestadia* to be designated a new species. It has been named *L. Palaquii*, n. sp.

Other species of the genus *Laestadia* which have been recorded in the East are:—*L. Theae*, Rac., described on tea in Java, which the new species resembles somewhat in the characters of perithecia and asci, but from which it differs markedly in the nature of the spots and mode of arrangement of the perithecia; *L. Camilleae*, Cooke, described on *Camillea Thea* in Johore; *L. Oxalidis*, Sacc., on *Oxalis corniculata* in Ceylon; *L. Pertusa*, Sacc., on *Dioscorea tomentosa* in Ceylon; and *L. Caesalpiniae* Pat. on species of *Caesalpinia* in Java.

The best known case of parasitism of the genus is that *L. Bidwellii* on the Vine in the United States of America and in France; this fungus which causes the "black rot" is the most dreaded fungus parasite on the Vine in the United States.

Spread of the Disease.

It is not improbable that the rapid spread of the disease is brought about by the presence of a pycnidial form of the nature of a *Phoma*. A small pycnidial form has appeared on the spots previously to the development of the perithecia and has been identified as a *Phoma*; and a careful examination of material is being made for the purpose of demonstrating the connexion between this and the ascigerous fungus.

Treatment.

It has been recommended that all of the dead and badly diseased seedlings be collected and burnt to prevent the spread of the disease by the spores produced on diseased parts.

A better access of light to the seedlings has also been advised.

For the control of the disease it has been recommended that the seedlings in diseased areas be sprayed with Bordeaux Mixture, the 6—4—50 formula being employed for preparation of the mixture, and the mixture being applied as a preventitive.

A diagnosis of the fungus is appended :—

Maculis amphigenis, subrotundatis vel irregularibus, brunneis; peritheciis saepius epiphyllis, sparsis, initio epidermide velatis, nigris, membranaceis, globoso-depressis, 90–100 microns diamr., ostiolo obsoleto; ascis clavulatis, sessilibus, aparaphysatis, octosporis, 32—36 × 8 microns; sporis oblongis, utrinque obtusis, continuis, hyalinis, subdistichis, 10—12 × 3.5—4 microns.

A THREAD-BLIGHT ON PARA RUBBER, CAMPHOR, Etc.

By Keith Bancroft, B.A., Assistant Mycologist, F.M.S.

A disease which from its symptoms may well be called a "thread-blight" has recently made its appearance on Para rubber and camphor (*Cinnamomum Camphora*). The disease was first recorded on camphor, seven years old, in the Experimental Gardens at Batu Tiga (Selangor) where four adjacent plants were affected. Within a few days from this it was reported on Para rubber trees on an Estate in Negri Sembilan. The affected Para rubber trees were approximately seven or eight years old, were near to each other and were situated close to a belt of virgin jungle.

Symptoms.

When a tree is attacked the leaves on the younger parts wither and hang down and may become matted together in dense masses. The younger twigs also wither and the young buds die. Finally, as he disease progresses many of the leaves fall.

A close inspection shows the presence of white strands on the affected branches. These are rhizomorphic strands and constitute the vegetative portion of the fungus. On older parts the strands are usually thin (·1 c.m) and frequently pursue a zig-zag course, being seldom branched. As they pass upwards to the younger branches they frequently become thicker (as much as ·2—·25 cm. in diameter) and are repeatedly branched. Here and there a strand may become frayed out on the surface of a branch and pass into fine fibrils, becoming lost to the naked eye. A branch from a strand passes along to a younger twig and growing along the under side of a petiole of a leaf reaches the under surface of the lamina; here it branches repeatedly and spreads itself over the surface of the leaf until the whole of the under surface of the leaf is covered with a white mass of fine fibrils.

Here and there occur structures which are larger than the strands, have an irregular outline and frequently form starting points for the origin of fresh strands.

When a strand comes into contact with an irregularity or roughness on the surface of a branch, or when it reaches a young bud, it produces a dense growth. This also occurs when the mycelium of one leaf comes into contact with another leaf.

The younger parts of the branches suffer severely from the presence of the fungus.

So efficient is the means of propagation by the strands that when a branch is infected all of the young parts become affected by the strands.

The Fungus.

Each strand consists of a central portion or core which is made up of hyphae running longitudinally: These hyphae are hyaline, measure 4-5 microns in diameter and are septate at long intervals; they are sparingly branched and contain no refractive cell-contents. Branches from the innermost hyphae first arise at right angles to the parent hyphae and then, bending around, pursue a longitudinal course. Branches from the outermost hyphae do not for the most part run longitudinally, but project from the central core and give the strand its soft and shiny appearance.

The larger structures of irregular outline which occur here and there on a strand are composed of dense masses of hyphae and may be looked upon as undifferentiated sclerotia.

When an affected leaf is placed in a moist chamber in contact with healthy leaves the white mycelium first accumulates a dense, fluffy growth and then spreads to the unaffected leaves.

Spread.

By virtue of the superficial strands the fungus possesses an excellent means of propagation. A careful search has failed to demonstrate the presence of any spore-bearing organs, nor were these developed when the mycelium was placed in a moist chamber and kept for several weeks. It may, therefore, be concluded that the primary means of propagation is by the vegetative strands and that this is accompanied by a suppression or partial suppression of the spore-bearing organs.

It has been possible to trace the mode in which infection occurs in the field. Here and there infected leaves have been blown by wind and lodged against a branch. The mycelium on the leaf accumulates a dense growth by which the leaf is made to adhere closely to the branch. From this point strands arise and traverse the branch in all directions. Infection was also seen to pass from a branch on an infected tree to a healthy tree through the leaves of adjacent branches being in contact with each other. Again, in the case of two camphor plants, the strands were seen to pass from fallen leaves on the ground up the branches and to reach the younger twigs.

The mycelium of the fungus is very sensitive to moisture and to contact. The former is illustrated by the dense growth which is accumulated when the mycelium is placed in a moist chamber and when the mycelium reaches the more shaded and damper portions of a branch. The latter is shown by the rapid growth of the mycelium where two leaves or twigs come into contact with each other or where an infected leaf lodges against a branch.

Distribution.

Judging by analogy with other "thread-blights" one may well expect that this fungus comes in from the jungle; and the close proximity of the plants hitherto attacked to the jungle is in favour of this conclusion. In neither case, however, was it possible to make an examination of the jungle adjacent to the infected area.

The fungus on *Hevea* and the one on camphor were, as far as can be ascertained by an examination of sterile mycelium, identical with each other. A fungus which is similar in all respects to the one on Hevea has also been found on Guava (*Psidium Guyava*). From what is known of fungi of this nature it is improbable that in the jungle it should confine itself to even a few different plants.

Other Thread-Blights

Several fungi of a similar nature have been described from different parts of the world. The best known of these is, perhaps, the

Shewing the threads of the Fungus on the stem and leaves of Camphor.

"thread-blight" of tea, *Stilbum nanum*, Massee, in Southern India and Ceylon. A "leaf-blight" of coffee in Porto Rico in 1904 has been attributed to an unidentified species of *Sclerotium*. A "thread-blight" of cacao was described from the West Indies in 1906. And recently a disease of pomaceous fruits known as "hypochnose" has been reported in North Carolina, U.S.A., and has been attributed to *Hypochnus ochroleucus*, Noack.

Indentification of the Fungus.

Hitherto it has not been possible to identify the fungus on *Hevea* and camphor owing to the absence of spore-bearing organs, although a number of specimens have been carefully examined.

Such an occurrence is not unusual in fungi of this nature; the "thread-blight" of tea and "hypochnose" of pomaceous fruits were long known before any fruiting organs were found, while the fungi causing the "thread-blight" on cacao and the "leaf-blight" of coffee have yet not been identified.

Clamp-connexions can be frequently found in the mycelium on the leaves; they occur less frequently in the strands on the twigs. From the presence of these organs the fungus is concluded to be a *Basidiomycete*. From what is known of mycelium of this nature, one might expect the fungus to belong either to the genus *Hypochnus* or to the genus *Corticium*.

Treatment.

The means by which the disease is spread necessitates the sanitation of diseased areas. All fallen leaves and twigs under affected trees should be scraped or gathered into heaps and burnt. The heaps should be small in order to avoid scorching of the surrounding trees.

The diseased trees may be cured by pruning the affected parts. The damage done by the fungus is confined to the younger branches. Threads are seldom met with on the old parts of large branches, and it is only necessary to remove those parts which actually bear the fungus, so that, providing the disease is observed in its early stages, the loss arising from pruning is not great. All prunings should be carefully collected and burnt.

In the case of the *Hevea* trees which were attacked by the fungus the disease was not sufficiently abundant to warrant the application of any preventive treatment to adjacent trees. The disease on camphor was controlled by removing two badly affected plants, pruning the remainder and cleansing the area of fallen leaves and twigs.

In other parts of the world, outbreaks of the disease have been controlled by the application of a lime-sulphur wash of which it will

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be advisable to give here the formula and method of preparation. Into an earthenware vessel* ten pounds of fresh quicklime are placed, and three or four gallons of hot water added. The lime is allowed to slake for a short time and eight pounds of sulphur are added. The heat of slaking of the lime should be sufficient to boil the mixture if the lime is fresh. The mixture is stirred and allowed to change to a yellowish brown colour, when it is made up with cold water to 50 gallons. The mixture is then strained through a sieve or piece of fine sacking, care being taken to work through the meshes any sulphur which remains over. The mixture is now ready for use and is applied by means of a spray.

The above is the method of preparation of what is known as the self-boiled lime-sulphur mixture. Owing to the difficulty in obtaining good quicklime in this country it will scarcely be possible to prepare the self-boiled mixture. It will, therefore, be necessary to make the mixture up to 50 gallons using a zinc-lined** vessel and to boil it for half an hour over an open fire, when the necessary chemical reaction between the lime and sulphur will take place.

The best sprayer for ordinary use in this country is the "Vermorel Eclair." These are stocked by the Borneo Company, Ltd., Singapore, and by Messrs. A. C. Harper & Co., Kuala Lumpur, Klang, etc. The price of each is about $25. An "Eclair" sprayer can reach a height of ten feet, so that it can be readily used in young Rubber, Coffee, Camphor, etc. For the purpose of spraying older trees a more powerful machine is required. The "Eclair No. 3," fitted with accessories, can reach a height of twenty feet. But it is advisable to have a more powerful sprayer and, for this purpose, a Vermorel "Cascade" sprayer has been ordered by the Department of Agriculture, and arrangements are being made to have it stocked in this country. It reaches a vertical height of forty-five feet. The reservoir of "Vermorel" Spraying machines is usually made of copper, but for use with reagents which react chemically with copper, such as the lime-sulphur mixture above, tin-lined reservoirs are supplied.

From what is known of the fungus at the present time it is very improbable that the spread of the disease by spores occurs at all readily. The propagation of the fungus by means of the white mycelium alone requires consideration. For this reason the distance from which infection can spread by wind-blown mycelium is necessarily small. In view of this one might anticipate that only areas which are within a comparatively short distance of jungle are liable to be infected primarily. Repeated outbreaks of the disease in areas adjacent to the jungle will, therefore, necessitate the felling and burning of a portion of the adjacent jungle.

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* A Shanghai jar serves the purpose well.

** An old latex cart will do.

MINUTES OF PLANTERS' ASSOCIATION OF MALAYA.

Held at the Masonic Hall, Kuala Lumpur, on February 12th, 1911, at 10 a.m.

PRESENT.

Mr. C. M. Cumming. Chairman.

For Negri Sembilan Planters' Association:—Messrs J. B. Douglas, W. Buyers, H. Dupuis Brown, A. D. Davidson (by his proxy Mr. J. G. Hubback.)

For Kuala Lumpur District Planters' Association:—Messrs. E. B. Skinner, F. G. Harvey, H. F. Dupuis, H. C. E. Zacharias.

For Klang District Planters' Association:—Messrs. W. H. Trotter, E. B. Prior, J. Gibson.

For Johore Planters' Association:—Messrs. R. Pears, M. J. Hawtrey.
For Lower Perak District Planters' Association:—Mr. M. Maude.
For Batu Tiga District Planters' Association:—Messrs. H. L. Quartley, Carlyle Bell, H. L. Jarvis, H. E. G. Solbe.

For Kapar District Planters' Association:—Messrs. C. T. Hamerton, E. W. Harvey.

For Kuala Selangor District Planters' Association:—Messrs. A. Irving, W. Towgood.

For Kuala Langat District Planters' Association:—Messrs. F. J. Dupuis, R. W. Munro (by his proxy Mr. C. E. S. Baxendale.)

For Batang Padang District Planters' Association:—Mr. A. E Darby.

For M. P. Agricultural Association:—Mr. W. Duncan.

Mr. G. H. Day, Legal Adviser.
Mr. H. C. E. Zacharias, Secretary.

VISITORS.

Messrs. J. H. M. Robson, E. A. O. Travers, R. B. Heinekey J. B. Cruickshank, Norman W. Grieve, A. MacIntyre Glen, E. G. Wilde, C. F. Lushington, H. C. Rendle, J. le Power, G. Lonsdale, R. D. Greenhill, M. Sharpe Smith, I. Gilbert, A. C. Corbetta.

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1. The Minutes of the previous Meeting are taken as read and confirmed.

2. LABOUR.

The Secretary reads the following communications received from the various Constituent Associations:—

17/1/03

Kuala Lumpur District Planters' Association:

"Resolved that the recommnedation of the Sub-Committee appointed by the P. A. M. be supported, viz., 'that a special cess be levied on all locally recruited Indian labour.'

"Carried by 9 to 1."

Malay Peninsula Agricultural Association:

"That in the opinion of this Association an increase of assessment on all Indian labour would be a more advisable way of raising the necessary funds than by increasing that upon locally recruited labour and that this Association therefore do not agree with the recommendation of the Sub-Committee appointed by the Planters' Association of Malaya. Furthermore, that if Government (P.W.D. and the Railway Department) employ labour it is nothing but fair that they should also pay."

Before the conclusion of the meeting the Hon. R. Young moved:

"That any alteration in the rate of assessment for coolies should also provide that the Settlement of Singapore should be brought into line with the rest of the Colony and the Federated Malay States. The exemption of Singapore was unfair to Penang, Province Wellesley and the F.M.S. The coolies employed in merchants' godowns carrying cargo to and from steamers also pay no assessment, the excuse being that a different class of cooly is employed. It would be more equitable to place these coolies all on equal terms and not that the assessment should fall on certain sections of the public only."

Kuala Selangor District Planters' Association:

"That this Association, while sympathising with Mr. Mansergh's proposals re the employment of local (Indian) labour, would suggest as an alternative, in the event of such proposals proving impracticable, that any employer engaging coolies from another estate be liable to the last employer for all expenses to which he has been put in connection with the engaging of such coolies (such expense not to be reckoned at less than $20 a head). We further suggest that the Immigration Department be approached with a view to the enforcement of the law regarding the reporting of cases in which local (Indian) labour is being employed."

Batang-Padang District Planters' Association:

"The Committee are of opinion that a Labour Department, formed somewhat on the lines suggested by Mr. Mansergh, and worked independently of the Indian Immigration Department, would be an advantage to planters. But the Committee consider that the proposed assessment of $20 would be intolerable to other communities; and would, besides, so handicap the Indian cooly that the Government could hardly be expected to consent to its imposition.

"The Committee are of opinion that a small fee for each cooly locally registered, the exact amount to be fixed by the Government, would be sufficient.

"The first object of such a department, after having obtained a census of all employers and employed in its district, should be to enforce local registration of all locally recruited coolies, then to see that all the numerous small native planters, miners and contractors and others comply with various regulations, to which other employers of labour are subject; but which, hitherto, owing to its being nobody's business to enforce, these people have successfully evaded. Later, if such a department became well established, it might devote any surplus funds towards helping immigration.

"The Committee also consider that any such labour department should control Chinese and Javanese in addition to Indian labour. Firstly, because many planters are importing this class of labour and require as much protection as those employing only Tamils. Secondly, because it could not then be urged against the scheme that the Indian cooly was unfairly handicapped. Thirdly, this would help to increase funds.

"Immediately after the census has been taken would be a particularly convenient time to start any such labour department. The Committee also are of opinion that any increase in the poll tax would still further add to the burden of those who at present pay it while those who hitherto have evaded it would still continue to do so."

The Lower Perak District Planters' Association:

"At a General Meeting held here on the 4th instant 8 were against Mr. Mansergh's scheme of assessment and 3 were in favour.

"I am also instructed to write you that on the following being put to the meeting, 'That this Association is of opinion that an increased assessment on all Tamil coolies would be fair, if rebates were allowed in proportion on coolies from time to time recruited from India'—it resulted in 8 being in favour and 3 against."

Taiping Planters' Association:

"At a General Meeting of the Taiping Planters' Association it was unanimously decided to approve of the suggestion of Mr. Mansergh but that the amount of fee to be levied should be $10—and not $20—per cooly.

"That in view of the fact that recently a kangany on an estate was proved to the satisfaction of a Magistrate to be inducing coolies on this estate to give one month's notice and leave, and to be paying money into their hands to enable them to do so, that the clause No. 98 in the Indian Immigration Enactment of 1904 be made to apply to all immigrants and not alone to Statute Immigrants. The idea that a man in a responsible position on an estate and receiving a high rate of pay should be able to sell to another estate, coolies which have cost nearly $20 a head to import, is so absurd that the time seems to have come when the law should protect us from this practice being carried on in future."

Negri Sembilan Planters' Association:

"That this Association approve that every locally recruited Tamil cooly shall be assessed at a rate of $20, and that the sum be irrecoverable from the cooly, and that the amount so obtained be used, firstly, to pay for the proper administration of the scheme, and secondly, to pay a bonus for every cooly imported from India but that this Association are not in favour of the Government being exempt.

"This Association are also in favour of the formation of a scheme for advertising the Federated Malay States in the cooly districts of Southern India on somewhat similar lines to those that Mr. Hill put into practice some years ago when he was Pratector of Labour."

Klang District Planters' Association:

"That the members of the Klang District Planters' Association are of opinion that the decision arrived at by the Sub-Committee appointed by the Planters' Association of Malaya to go into the question of the extra assessment on locally recruited Indian labour, be approved of; and that such cess should be as high as possible and should not be less than $20 per head. The employer of such labour to be liable, in addition, to payment of any assessment in respect of each cooly levied under Immigration Fund Enactment and that the members of the Klang D. P. A. strongly urge the Planters, Association of Malaya to approach the Government without delay, with the object of ascertaining what steps are being taken to see that the existing law regarding registration of coolies recruited locally is vigorously enforced."

Batu Tiga Planters' Association:

"That this Association recognizes that steps are necessary to check local employment of Tamil labour, and authorizes its delegates to vote according to their discretion at future P. A. M. meetings on the subject."

Kelantan Planters' Association:

"We regret we have not been able to hold a meeting and therefore unable to give the views of this Association in time for the P. A. M. meeting on the 12th inst."

MR. CUMMING said that, as they knew, H. E. the High Commissioner had come up to discuss the labour question with them. Opinion among the planters had not been unanimous, but it was no use going to Government unless it was. Briefly touching on the evils of local recruiting, and the suggested remedies, he was uncertain whether a differential assessment could be collected. Some planters were for it, and some against. Another proposal was to raise the assessment from $1.25 to $2.50 per quarter and give an allowance for coolies imported. When the Tamil Immigration Fund Enactment Amendment Bill came up in the Federal Council, he asked H. E. to postpone its consideration. The suggestion came from H. E. that recruiting might be encouraged by a heavy recruiting allowance, and that the Fund might be assisted by a loan sufficient to pay a substantial recruiting allowance. He then suggested that the meeting go into Committee.

After Meeting having been resumed, MR. CUMMING proposes, MR. SKINNER seconds, and it is carried unanimously, that the following two recommendations be submitted to Government:

1. That the F. M. S. Government make a loan during 1911 of $1,000,000 and that the Indian Immigration cess to be levied in the Colony, the F. M. S., Johore and the other British Protected States in the Peninsula be a sum not exceeding $2.50 per quarter so that it be possible to pay a bonus of about $15 per imported Indian coolie.

2. That a Labour Department proper be instituted with control over all labour, Indian, Chinese, Javanese and other, with a sufficient staff to see that the present enactments are carried into effect.

H. E. Sir John Anderson, G.C.M.G., High Commissioner of the F.M.S., then arrived accompanied by the Chief Secretary, Capt. Sir Arthur Young, K.C.M.G., Mr. R. G. Watson, Acting Resident, Perak, Mr. J. O. Anthonisz, Acting Resident, Selangor, Mr. R. J. Wilkinson, Acting Resident, Negri Sembilan, Mr. J. R. O. Aldworth, First Assistant to Chief Secretary, Mr. A. H. Lemon, Acting Legal Adviser, Mr. L. H. Clayton, Superintendant of Immigrants, S.S. and F.M.S., and Mr. Claud Severn, Private Secretary to His Excellency.

MR. CUMMING said that, before proceeding with any further business, he thought all his hearers would agree with him in giving a hearty vote of welcome to His Excellency and all the other gentlemen for attending the meeting that day. It was very gratifying to see the great interest taken by His Excellency in the labour question. It was useless for him to go over the old ground again. Still, to make things clear, he would say that a time had come when, owing to the expansion of the rubber industry and the opening up of the country, they now had trouble in getting labour and there was an expansion of rates all round. Many of the older companies had been importing labour at a large cost and other people had been taking that labour as fast as it came into the country. A short time ago a series of meetings were held at which expression was given to the dissatisfaction felt by planters at this state of things and various schemes had been put forward, regarding assessments and sur-taxes, designed to remedy the matter, but, so far, the planters had not definitely put forward a scheme. On this occasion, before His Excellency's arrival, the matter had been discussed and they had at last come to a decision in favour of a scheme

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which ought to help matters considerably. The scheme had been adopted unanimously and he would ask the Secretary to read the resolution which had been passed.

The Secretary then read the proposals.

Sir John Anderson, who was greeted with applause on rising to address the meeting, then said that he was very glad to have an opportunity of meeting the members of the Planters' Association of Malaya to discuss this matter, because it was recognised as one affecting the whole community of the Federated Malay States and the Colony. The Government was interested in the question of labour for two reasons, not only because the matter was one affecting the whole community but also because the Government was itself a large employer of labour. Therefore they had to regard the matter from two points of view. The resolution which had been read out was one which required a very great deal of consideration. It was proposed to have a recruiting allowance of $15 per head, but he had been told that the average time a cooly stayed in this country was two years, therefore, it would be necessary to get back $7.50 per year. Further the assessment was based on the day's work which reduced it to sixty cents in the dollar so that it would be necessary to recover not only $7.50 but eleven or twelve dollars. He thought that, if the money was going to be recovered in the ordinary time a cooly remained in the country, it would be necessary to make the assessment very much higher. It would be no good making a large loan and then having to take some drastic measure to recover it. He had discussed the matter with his colleagues, the Residents and the Chief Secretary, and they had come to the conclusion that, unless the assessment was increased beyond $2.50, the scheme would not be feasible. The Tamil Immigration Fund, if it was to meet its liabilities, could not pay more than $5 recruiting allowance. Where was the other $10 to come from? It was proposed that the Immigration Fund should pay $15 but it would only recover two or three dollars and there was the difference of $12 to be found somewhere. As far as the Government was concerned, it would, as an employer, pay any increased assessment. As regards the proposed loan, it must be possible to see a way, sooner or later, to replace what had been taken out of the Government's purse. If the Immigration Fund paid $15 he could not see, on the figures supplied to him of the average stay of coolies in the country and the average day's work performed by the coolies, that it would ever get back anything more than $4. There was, however, an alternative suggestion, made by the Resident of Negri Sembilan, and he should like, with the permission of his audience, to ask Mr. Wilkinson to put it before the meeting.

Mr. Wilkinson, Resident of Negri Sembilan, said that the scheme which he was about to detail was one of two alternatives. There were two courses open to them. One was to raise the assessment all round and use the money to pay bonuses to those who recruited labour. The alternative was not to raise the assessment all round but only to raise it for those who did not recruit; in other words, it agreed with the proposal passed by the Negri Sembilan Planters' Association. He proposed that the present assessment of $5 should remain, but that an extra rate of $8 (making in all $13) be put on coolies locally recruited. The next point was one of calculation. He believed that it had been proposed that it should be found out if each cooly had been recruited or engaged locally. But this was not, he considered, feasible. However, there were other ways of arranging the assessment and he proposed that the cess of five dollars should be paid on every cooly imported during the previous year, that the number of coolies so recruited be deducted from the total labour force on an estate, and that the higher rate should be paid on the balance of coolies remaining. This scheme would induce people to import coolies. The planters were, he believed, prepared to pay money if they could retain their labour, but the higher rate would prevent those who did not import labour from getting the labour brought over by those who did import.

Sir John Anderson pointed out that the proposal put forward would mean that the Government would pay very much less. He explained that, if an estate had a total labour force of 2,000 coolies and imported 800 in the previous year, it would pay $5 per head on the 800=$4,000 and $13 per head on the balance of 1,200=$15,600, making a total of $19,600. From this would have to be deducted a bonus of eight dollars per head on the 800 coolies recruited during the previous year—$6,400 making an actual payment of $13,200 or an average payment per head on the total labour force of about $6.80. He put the scheme to them, but would assure them, that as far as the Government were concerned, it was very anxious to help the planters in the matter and if possible to come to an arrangement with them. Labour must be got into the country somehow, and the Government would do what it could to co-operate with the planters in the matter. Regarding the question of a loan, the amount of the loan would not stand in the way of its being granted, if only reasonable provision was made to admit of the Tamil Immigration Fund paying it back. It was not proposed that the loan would have to be paid back in two or three years, its repayment could be postponed for a long period, but the Government must have some assurance about the method of getting back the proposed loan of $1,000,000, or whatever amount might be fixed on, from the Immigration Fund.

H. E. and the other officials then withdrew.

Mr. Cumming proposed that the Meeting go into Committee, to discuss the proposals they had just listened to.

On open Meeting being resumed, it was proposed by Mr. Skinner, seconded by Mr. Gibson and carried unanimously, that a financial sub-committee of four members of the P. A. M. be formed and the Government be asked to appoint as many official representatives as it desired, to join the planting members and consider the merits and details of the various schemes submitted.

14/10/6

Mr. Gibson proposed that the following be the four P. A. M. members, *viz*:—Messrs. Duncan, Skinner, Cumming and Pears. This was seconded by Mr. Hawtrey and carried unanimously.

3. LONDON EXHIBITION.

The Secretary read the following correspondence:

SIR WILLIAM TAYLOR, K.C.M.G.,
Malay States Government Agent,
111, Queen Victoria Street,
London, E.C.

Kuala Lumpur,
24th December, 1910.

DEAR SIR,

I am obliged for your favour of the 2nd ultimo and have also had before me copy of your letter of October 20th to the Federal Secretary.

In the meantime you will have heard from the Director of Agriculture, F.M.S., who has been deputed to carry on all correspondence with you direct, so as to avoid duplication of letters; and I trust you will have gathered from this that we are very much alive to the necessity of making a good show next June.

The exhibit "Malay Peninsula" is a joint undertaking made by the Government of the F.M.S. and S.S. and by this Association on behalf of the whole Rubber Industry of the Peninsula, and it is therefore not at all desirable that individual estates should book space at this Exhibition. Our stand is intended to advertize the Peninsula as a whole by the best it can produce; not specific commercial companies; and I mention this point particularly in reply to your paragraph 7 to the Federal Secretary. For the same reason, Engineering firms should book space individually and not be allowed to exhibit on our stand (v. par. 9). This Association understand that you will act as special Commissioner for this Joint Exhibition, and on behalf of my Association I beg to express the great satisfaction that we feel in knowing the undertaking is in such energetic and sympathetic hands.

sA regards finance, the F.M.S. have so far contributed $4,000, the S.S. $2,000 and I am now trying to to collect the balance of $10,000, that we think will be required. I enclose a few copies of a circular that I have issued in this connection, and to simplify collection, it has been decided to ask you kindly to accept any contributions that may be made at Home, whilst I will continue to receive all dollar payments.

I cannot conclude this letter without expressing the pleasure felt by the Members of this Association both at the institution of this Malay States Government Agency, and at the fact of its management having been entrusted to our late Resident General, whose sterling if unobtrusive work for this country will ever be gratefully remembered by the members of this Association.

I propose to send you in future two copies of all our Minutes and shall endeavour to make up a complete set for your file, and trust that this will prove acceptable to you.

Believe me, Dear Sir,
Yours faithfully,
(Sgd.) H.C.E. ZACHARIAS,
Secretary.

London, 18th January, 1911.

DEAR SIR,

I beg to acknowledge receipt of and to thank you for your letter of the 24th December last on the subject of the representation of the Federated Malay States in the forthcoming International Rubber Exhibition.

The wishes of your Association will not be lost sight of by this Agency in dealing with the subject.

I thank you also for your kind and flattering reference to myself in connection with the establishment of this Agency.

I am, Dear Sir,
Yours faithfully,
(Sgd.) W. T. TAYLOR.

H. C. E. ZACHARIAS ESQ.,
Secretary to Planters' Association of Malaya,
Kuala Lumpur.

London, 24th December, 1911.

C. TAYLOR ESQ.,
Secretary, Rubber Growers' Association,
London, E.C.

DEAR SIR,

I thank you for your favours of the 4th and 9th ultimo duly to hand with enclosures.

RUBBER EXHIBITION.—I beg to enclose copy of a letter I have addressed to-day to Sir William Taylor which I think will fully explain to you our attitude in this matter.

14/107

We are greatly indebted to you for your kind offer of assistance of which we are gladly availing ourselves, and shall be glad if you will co-operate with Sir William accordingly.

FINANCE.—At the 1908 Exhibition, the Government contributed $6514.29 (S.S. £260 and F.M.S. £500). This year the S.S. are paying $2000.-and the F.M.S. $4000-. In 1908 we collected only $2034 worth of donations, charged exhibitors a $10 fee, producing $170-., and made up the deficit of $313.63 from Association Funds. You will therefore see that the total cost of the 1908 Exhibition amounted to $9031.92, whilst this year we intend to spend, if possible, $15,000. With this object in view, I am trying to raise $10,000 and have sent out circulars as per copy enclosed. For the convenience of contributors we have arranged for Sir William Taylor to receive Home cheques, whilst I will continue to acknowledge all dollar donations.

AWARDS.—You will remember that at the last Exhibition competition was discountenanced; but we note that this year apparently awards for competition will be provided for and see with pleasure that your Association will offer Gold, Silver and Bronze Medals.

If in your opinion there is room for another trophy, this Association will be very glad to offer one and I await your advices on this subject with interest.

BRUSSELS EXHIBITION.—I am much obliged to you for the trouble taken and shall get the photos suitably framed and hung up in our offices.

GENERAL.—I shall be only too glad to send you regularly two copies of all publications issued by us (including minutes). Of the latter, I shall try to make up a complete set and forward same to you for your library.

I have subscribed on your behalf, as desired, to the Federated Malay States Gazette for 1911 and trust that the copies will reach you regularly in future.

WATER SCHEME.—I must apologize for not having referred to this correspondence ere this, but as the matter is one concerning mainly the Kapar District, it was referred to their Chairman, viz., Mr. H. W. Bailey, who however has not yet favoured us with his report.

Wishing you and the Rubber Industry in general a prosperous 1911.

I am, dear sir,
Yours faithfully,
(Sgd.) H.C.E. ZACHARIAS,
Secretary.

The Secretary having reported that the total contributions received by him to date amounted to $350, Mr. Cumming impressed upon the meeting the importance of making a first class show, and said that the sooner funds were available the better. An exhibition would be held in the Masonic Hall, Kuala Lumpur, at the beginning of April to pick out the best rubber to send Home. Samples should be 25 lbs in weight. He also mentioned that while subscriptions were voluntary, $200 per thousand acres planted was thought to be a fair basis for subscribing.

4. GRADING OF EXPORTS.

The Secretary read the following letter:

Kirby Estate, Labu, 24th January, 1911.

DEAR SIR,

RE COMPULSORY GRADING OF AGRICULTURAL EXPORTS.—As Chairman of the Conference held by our Sub-Committee with the Commissioner of Trade and Customs and the Director of Agriculture on the 11th instant, I have to inform you of the result of our deliberations.

In the absence of evidence to prove that immature rubber (so called) is inferior to other qualities of rubber it was considered undesirable to recommend the introduction of regulations to compel grading and classification of other exported articles.

Yours faithfully,

(Sgd.) A. DUPUIS BROWN

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

5. STRAITS MEDICAL SCHOOL.

The Secretary reported having received to date donations totalling $779.28.

6. ACREAGE UNDER RUBBER.

The Secretary read the following letter:

24th December, 1910

H. K. RUTHERFORD ESQ.,
20, Eastcheap,
London, E.C.

DEAR SIR,

I thank you for your favour of October 7th, which I have laid before my Association at their recent Meeting.

Much as we would like to compile the statistics you refer to, it has unfortunately been proved to be utterly impossible for us to get together anything like comprehensive information. For years we have tried to get at the close of every year particulars of acreage and coolie population; but, even when the planting industry was still quite small and practically restricted to European planters, all personally known to each other, we have never been able to compile any statistics, that could be called even approximately reliable.

We have therefore been reluctantly obliged for several years to abandon this idea altogether, and to leave the task to the Government, who alone have the machinery to compel the return of accurate statistics.

Under the circumstances we are afraid, that no authoritative statement regarding the present rubber acreage of the Malay Peninsula will be available, until early Spring, when the Director of Agriculture will have his returns for 1910 ready.

Believe me, dear Sir,
Yours faithfully,
(Sgd.) H. C. E. ZACHARIAS,
Secretary.

7. HOSPITAL RULES.

The Secretary read the following letters:

No. 3975/1910.

SIR, 23rd January, 1911.

I am directed to address you with reference to Section 18 of "The Estate Labourers (Protection of Health) Enactment, 1910" which reads as follows:—

"18. The employer shall bear the expenses of the maintenance and treatment in such hospital of every labourer under written contract as long as he remains in such hospital who was at the time of his admission to the hospital or within seven days previously employed on the estate, and shall not be allowed to recover such expenses from the labourer either by deduction from the wages or otherwise, but shall not, except as may be provided in the contract of such labourer, be required to pay wages in respect of any time during which the labourer is in hospital.

In the case of a labourer who was employed under a parol agreement the employer shall defray the expenses of his maintenance and treatment in such hospital so long as he remains in hospital, but may recover from such labourer the expenses of his treatment and maintenance at such rate as the Resident with the approval of the Resident-General, may from time to time prescribe by notification in the Gazette in respect of any period in excess of thirty days during which such labourer shall have remained in the hospital."

2. The Acting Resident-General would be glad to be favoured with the views of the Association as to the rate to be prescribed under that Section.

I have, &c.
(Sgd) J. R. O. ALDWORTH,
Ag. Federal Secretary.

Proposed by MR. CUMMING, seconded by MR. SKINNER, and carried unanimously that the rate to be recommended to Government be 30 cents per diem.

8. ADVERTISING THE PENINSULA IN INDIA.

The Secretary reported that the Negri Sembilan Association has brougt forward a proposal to this effect.

Resolved that the matter stand over until next Meeting.

9. PLANTEURS DE CAOUTCHOUC DE L'INDOCHINE.

The Secretary reported the recent formation of this Association and laid on the Table the first number of their "Annales".

10. MALACCA PLANTERS' ASSOCIATION.

The Secretary read the following letter:

Malacca, 8th February, 1911

The Secretary,
Planters' Association,
Kuala Lumpur.

DEAR SIR,

We have to advise you that at a General Meeting held on 5th instant it was resolved that this Association sever its connection with your Association.

Yours faithfully,
(Sgd.) SIME DARBY & CO., LTD.,
Secretaries

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Mr. Cumming thought it a great pity. The Malacca Industry was quite young and perhaps rather liable to be headstrong. He thought they ought to place on record their regret. The Planters had always done their best to be united, and he did not think that the step was in their (the Malacca planters') interest. For instance at this very moment, the P.A.M. had got what it had never had before—direct communication with the highest authority in the country.

11. CHINESE LABOUR.

The Secretary placed on the table the following letter:

Chinese Protectorate,
Singapore, 7th February, 1911.

S.C.A. No. 9/1911.

Sir,

I have the honour to forward for the information of the members of your association a memorandum on the procedure that should be followed by employers who wish to recruit free labour in China on the 'Kangany system.'

2. The Government and the planters alike look forward to the cessation of indentured labour. It is hoped that free labour recruited on this system will supplant it: the free labourer will be genuinely agricultural and it should be possible to put him on an estate at a cost of $25. If an employer can arrange with an agent in Hongkong to pay expenses there and passage to Singapore, the cash advances to the recruiter will be materially reduced. He will not sign a contract, but will gradually repay the cost of bringing him from China out of his wages. It has been found that free labourers working on an estate at an adequate wage among their relations, friends and neighbours and under a mandore who is also a relation, friend or neighbour, have no wish to go elsewhere.

I have, &c.,
C. J. SAUNDERS,
Secretary for Chinese Affairs.

The Secretary,
Malayan Planters' Association,
Kuala Lumpur.

MEMORANDUM.

1. While the Hongkong authorities are anxious to encourage employers of labour (including labour-contractors) in the Federated Malay States to recruit free labour in China for their own Estates (or for the Estates on which they have a labour-contract) through the medium of recruiters sent back by them to China for the purpose, those authorities are unable to help or even to countenance such recruiting, if it is conducted in an underhand way, i.e., if the labourers recruited are smuggled through Hongkong as free emigrants although they are in fact assisted emigrants.

2. Employers wishing to send recruiters to those parts of China which use Hongkong as its port should first communicate with the Protector of Chinese, Perak or Selangor, as the case may be: Labour-contractors must bring a letter from the Manager of the Estate for which they have a contract. The recruiter must in each case appear personally before the Protector of Chinese with a letter of authorisation from the Employer giving the following particulars:

1. Name of Estate.
2. Situation.
3. Occupation (Manager or Contractor.)
4. Name of recruiter.
5. Recruiting area.
6. Rate of wages.
7. Hours of work.
8. Number of recruits desired.
9. Remuneration payable to recruiter.

3. The recruiter, if the Protector of Chinese approves of him, must produce 2 copies of his photograph and he will then be given a document addressed to the Protector of Chinese, Straits Settlements; this he must take to the Chinese Protectorate in Singapore, where it will be noted and addressed on to the Registrar General, Hongkong. In Hongkong the Registrar General will in turn note it and vise it and return it to the recruiter, who will carry it with him as a protection from interference by the Chinese Police.

4. On his return to Hongkong with his emigrants, the recruiter must bring them before the Registrar General for examination in accordance with the existing practice of Hongkong, and will give the Registrar General such information as he may require.

5. On arrival at Singapore the recruiter will report to the Boarding Officer of the Chinese Protectorate on board or to the Registration Officer at the Chinese Protectorate:

(1) The number of his immigrants.

(2) The place, where they are to lodge in Singapore.

(3) The date on which they are to proceed to the Estate, and the boat by which they are to travel.

The object of the Singapore Protectorate will be to see that they proceed to their proper destination: their departure will be notified to the Chinese Protectorate in the Federated Malay States.

C. J. Saunders,
Secretary for Chinese Affairs.

Singapore, 7th February, 1911.

12. RECRUITING IN BENGAL.

The Secretary placed on the Table the following letter:

9th February 1911,
46, Northam Road, Penang.

Dear Sir,

Indian Labour.

With reference to the above question, I understand that the Government has stopped, or is about to stop, all indentured labour from India to the F.M.S. Under these circumstances, I beg to lay before you the following suggestion. That free labour be imported from the Bengal side of India where the class of labour (agricultural) that is required on rubber plantations is plentiful and easily obtainable. Owing to the failure of the Indigo Industry and the closing down of nearly all the concerns, there should be no difficulty in securing coolies at a cheap rate more especially as I am told no coolies are now being sent to Jamaica as formerly. The districts I refer to are Behar in Terhort and Gurrockpore in the North Provinces. I was an Indigo Planter in Behar and thoroughly know the whole district. Should you think there is anything in the idea, I am prepared to take up the matter and would return to India to recruit and send out coolies from Calcutta to Penang or any other Port. I should make my headquarters in Behar and would put the coolies on board myself in Calcutta as recruited. Should it be deemed advisable, I could come with them. The cost of a cooly's passage from Calcutta is $12, but I think I could arrange for a substantial reduction through Messrs. Apcar & Co., and Jardine.

I am prepared to give this scheme a fair trial for three months starting for Calcutta at once and would accept 400 dol. (four hundred dollars) a month and pay my own expenses in India including the staff of recruiters etc. I should have to engage. I shall expect my steamer passage also from here to Calcutta and back if I returned with the coolies myself.

Should the scheme prove successful, a new arrangement could be made and an agreement drawn up between us, personally I am quite confident of success.

I enclose my credentials and trusting to have the favour of an early reply.

Yours faithfully,
(Sgd). S. Gordon Simes.

C. M. Cumming, Esq.,
Seremban.

13. POST OFFICE HOURS.

The Secretary read the following letter:

Kuala Lumbur, 23rd January, 1911.

Director of P. and T., F M. S.
Kuala Lumpur.

SIR,

I have the honour to draw your attention to the fact that Money Order offices are closed at so early an hour, that estate coolies, wishing to remit money to India, have at present to lose a whole day's wages, in order to be able to do so.

I have therefore been instructed by my Association to submit that all Money Order offices in future be kept open on one weekday; say Wednesdays until 6 p. m., and also on Sunday for a couple of hours in the morning.

I have, &c.,
H. C. E. ZACHARIAS,
Secretary.

The Annual General Meeting having been fixed for Sunday, the 30th of April, the Meeting terminated at 12.30. p.m.

H. C. E. ZACHARIAS,
Secretary.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State of Selangor for the month of February, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.873	152.3	81.2	90.0	75.0	15.0	75.3	0.775	71.4	75	CALM	1.58	1.11
Pudoh Gaol "	...	...	...	...	...	...	...	...	...	...	...	3.35	2.23
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	2.97	1.30
" Klang...	...	...	...	89.2	70.2	19.0	...	...	...	...	...	2.57	1.15
" Kuala Langat	...	...	...	87.5	72.7	14.8	...	...	...	...	...	2.43	1.50
" Kajang	...	...	...	86.3	74.2	12.1	...	...	...	...	...	4.49	1.75
" Kuala Selangor ...	...	...	...	88.2	73.8	14.4	...	...	...	...	...	0.89	0.31
" Kuala Kubu	...	..	...	90.6	67.6	23.0	...	...	...	...	...	0.33	1.33
" Serendah	...	...	...	93.1	70.6	22.5	...	...	...	...	...	0.60	0.40
" Rawang	...	...	...	92.3	68.5	23.8	...	...	...	...	...	0.37	0.17
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	1.50	0.88

Office of Senior Medical Officer,
Selangor, Negri Sembilna & Pahang Kuala Lumpur, 27th March, 1911.

A. J. M. Clovely, Senior Medical Officer
Selangor. Negri Sembilan & Pahang.

PENANG.

Abstract of Meteorological Readings in the District Hospital Penang, for the month of January, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Mean Vapour Tension.	Mean Dew Point.	Mean Humidity.			
	Ins.	°	°	°	°	°	°	°	°	%		Ins.	Ins.
District Hospital Penang ...	29·920	151.5	81·5	88·9	73·4	15·5	74·9	·717	70.4	77.0	N.E.	4·00	2.02

DISTRICT HOSPITAL,
Penang, 21st February, 1911.

E. ARTHUR GIMLETTE,
Medical Officer, District Hospital Penang.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the Month of January, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Mean Maximum.	Temperature. Mean Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
		° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	%		Ins.	Ins.
Kota Bharu	..	147	79.4	83.26	71.92	11.34	77.2	.885	75.6	89.3	...	4 71	.96
* Kuala Lebir	...	...	75.4	84.9	70.7	14.2	73.3	.782	71.9	84.4	...	1.87	.53
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	3.51	.85
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	3.22	.33
Pasir G jah Es'ate	...	...	...	...	...	...	...	...	...	...	...	4.30	1.65
Kuala Pahi Estate	...	...	...	82.58	70.35	12.23	...	...	...	...	...	2.11	.40
Bagan Estate	...	...	...	...	...	...	...	...	...	...	...	6.87	3.04
Pasir Besar Estate	...	...	...	...	...	...	...	...	...	...	...	2.92	59
Chaning Estate	...	...	...	...	...	...	...	...	...	...	...	3.27	1 57
Pasir Jinggi Estate	...	...	...	...	...	...	...	...	...	...	...	2 43	.48
Pulau Laiat	...	...	...	...	...	...	..	...	...	...	...	5.00	1.82

* Supplied by the courtesy of the Planters' Association of Kelantan.

Residency Surgeon's Office,
Kota Bharu, *21th February 1911.*

John D. Gimlette,
Residency Surgeon, Kelantan.

PERAK.

Abstract of Meteorological Readings in Perak for the month of February, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE. Mean Dry Bulb.	Maximum.	Minimum.	Range.	HYGROMETER. Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Taiping	...	107	81.78	93	69	24	76.74	852	...	78	...	3.07	.75
Kuala Kangsar	...	...	80.39	92	67	25	74.44	772	...	74	...	2.41	.72
Batu Gajah	...	114	79.99	92	70	22	75.01	802	...	78	...	1.91	.50
Gopeng	...	...	80.92	91	68	23	75.26	800	...	76	...	5.07	1.29
Ipoh	...	...	80.64	93	69	24	74.75	785	...	76	...	6.27	1.65
Kampar	...	...	80.19	92	69	23	76.05	844	...	82	...	7.46	1.75
Telok Anson	...	...	81.41	92	68	24	75.96	829	...	76	...	3.04	1.50
Tapah	...	...	80.17	92	65	27	74.86	795	...	78	...	4.45	1.76
Parit Buntar	...	...	81.43	91	68	23	75.98	822	...	76	...	1.24	.46
Bagan Serai	...	...	81.25	92	69	23	75.97	827	...	78	...	1.91	1.30
Selama	...	...	80.81	94	68	26	78.94	964	...	93	...	6.85	1.22

H. MURUGON,

Pro Ag. S.M.O., Perak.

OFFICE OF SENIOR MEDICAL OFFICER,

Taiping, 18th March, 1911.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in Negri Sembilan Hospitals for the month of February, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban		143.3	82.2	88.6	70.5	18.1	75.5	0.762	71.0	.69	N	2.18	1.19
Mantin												3.86	1.42
Jelebu												1.53	0.83
Tampin												0.78	0.20
Port Dickson												0.52	0.32
Beri-Beri Hospital, Port Dickson												1.05	0.65
District Hospital, Kuala Pilah		141.2	78.8	88.5	69 6	18.9	74.1	.767	71.0	.78	—	2.99	1.65

Office, of Senior Medical Officer,
Kuala Lumpur, 25th March 1911.

A. J. M. CLOVELY.
Ag: Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

PAHANG.

Abstract of Meteorological Readings in Pahang for the month of January, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° F.	Mean Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Mean Maximum.	Temperature. Mean Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	78.7	85.3	66.7	18.6	75.1	...	...	...	...	4.87	1 17
" Raub	...	...	78.5	90.2	69.2	21.0	73.6	...	...	...	...	6.42	2.07
" Bentong	...	...	78.1	86.3	69.8	16.5	74.3	...	...	...	...	6.98	0.98
" Pekan	...	...	77.8	83 0	71.8	11.2	75.0	...	...	...	...	8 36	1.75
" Kuantan	...	...	78.3	89.7	71.3	18.4	73.1	...	...	...	...	11.05	3.64
Dispensary, Temerloh	...	...	...	85.6	68.2	17.4	...	...	...	...	...	2.44	0 85
" Sungei Lembing	...	...	...	85.2	68.3	16.9	...	...	...	...	...	5.05	1.45
" Bukit Fraser	...	...	...	...	...	...	...	...	...	...	...	5.17	1.00

Office of The senior Medical Officer Selangor,
Negri Sembilan & Pahang.
Kuala Lumpur, 11th March 1911.

Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 5.] MAY, 1911. [VOL. X

THE OCCURRENCE OF BURRS ON THE TRUNK OF HEVEA BRASILIENSIS.

BY KEITH BANCROFT, B.A., ASSISTANT MYCOLOGIST, F.M.S.

For several years repeated attention has been called to the occurrence of excrescences or burrs on the trunk of *Hevea Brasiliensis.* These excrescences not only interfere with smooth tapping, but may attain such dimensions as to render the surface untappable and to necessitate the transference of the tapping area to the upper parts of the trunk. They were first recorded in the "Tropical Agriculturalist" of September, 1905, and have since been discussed by Petch in Circular No. 18, 1909, of the Royal Botanic Gardens, Ceylon.

Burred trees are commonly met with in the Federated Malay States; they occur alike on high and on low land, on well drained and on badly drained soils. The burrs are referable to two distinct sources and will, therefore, be dealt with separately. Those of the one type, although apparently stimulated by wounding, occur on untapped as well as on tapped trees and cannot, therefore, be said to be due entirely to any artificial stimulus; while those of the other type are distinctly the result of wounding.

Burrs of the First Type.

These are far more important than those of the second type. The earliest record of their appearance is on trees of four years of age which had not been tapped; they are most frequently met with, however, on trees which have passed the age of first tapping, and they can be seen to best advantage on old trees.

They originate as small structures for the most part, raising the outer surface of the bark in lumps, and in this condition they have earned for themselves the name of the "pea disease." Arising in the cortex they have at first no connexion with the main wood of the plant. By their continual growth and fusion with each other large structures are produced of irregular shapes and sometimes measureable by feet, the outer surface of the trunk becoming gnarled and warked. At first they are superficial to the latex layer; by further growth, however, they fuse up with the main wood and the intervening latex and cambium layers are squeezed out of existence. Eventually, however, a latex layer is developed superficially to the nodules. The fusion of the nodules with the main wood takes place at first by small points which grow inwards to the main wood.

Each nodule possesses a central woody core composed of vessels which are for the most part irregularly arranged. Outside the core is a cambium, by virtue of which the nodule can increase in size independently of the surrounding tissues. Their rate of growth is slow, the slow growth resulting in the production of a central mass of wood which is excessively hard.

The development of large cores resulting from the fusion of a large number of separate cores frequently renders tapping impossible and is, therefore, of some considerable economic importance.

Such structures are not uncommonly met with on several different kinds of trees. The commonest cause of their production in forest trees is the wounding of the cortical tissues, such as by the grazing of a cart wheel. They frequently develop on the boles of forest trees which are exposed to increased illumination by the felling of their companions, and in such cases the increased illumination of the lower parts is regarded as the cause of their development. In these cases they are essentially "dormant buds" which commence to develop owing to some artificial stimulus; but, having no connexion with the transpiration current, they are robbed of the food necessary for the production of shoots, and the result is the accumulation of a slowly growing mass of wood.

The burrs on *Hevea* are similar in all respects to these abovementioned structures. They are in their nature and mode of origin buds which have failed to develop into shoots. The most convincing evidence in favour of this is the abnormal occurrence in which shoots can sometimes be produced from such burrs, there being a definite organic connexion between the shoot and the core of the burr.

Repeated examination has failed to show that they are caused either by insect or by fungus injury, nor can they be attributed to increased illumination on the lower parts of the plant. That they are stimulated to growth by wounding appears to be clear enough from the fact that they occur far more commonly on the tapping area than on other parts of the plant; and their excessive production on such older trees as have been at one time mercilessly hacked

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about is also good evidence in favour of this conclusion. Their occurrence on untapped trees, however, and on untapped parts of old trees precludes any assumption that they are produced solely as the result of previous injury, while the fact that they occur on all classes of soils in the Federated Malay States is sufficient to do away with any theory of their being connected with nutrition.

With these considerations in view we are led to the assumption that they are the result of a natural habit on the part of the plant and that their development is in some considerable degree stimulated by wounds produced in tapping. Some individual plants tend to produce burrs in larger quantity than others, while other plants, which are grown under the same conditions of soils and illumination and to which similar treatment has been extended in tapping, are apparently altogether free from burrs. The question of the hereditary transmission of the capacity for producing burrs has already been raised by Petch, and it would appear to be distinctly within the realms of possibility. For this reason Petch has suggested that the selection of seed for planting should be confined to trees which do not produce burrs. It is proposed to carry out experiments on as large a scale as possible for the purpose of testing the hereditary transmission of the character of burr-forming ; it will, however, be many years before any conclusions can be arrived at. For the present it is advisable to avoid selecting seed from burred trees or, at any rate, from areas which contain badly burred trees.

If direct treatment is to be applied to burred trees the burrs must be removed early. When they are small and pea-like they can be easily removed by a pocket-knife. As they get larger they require to be carefully cut out so as to cause as little damage as possible to the adjacent tissues. When they have once commenced to fuse with the main wood removal is out of the question. The wounds produced by removal of burrs may be left unprotected. Attempts are made in some places to seal them with a mixture of cow's dung and clay ; this, however, appears to be quite unnecessary. If they are removed when they are young the wounnds left after removal are no more a source of danger to the plant than ordinary good tapping is.

Burrs of the Second Type.

Whenever, in tapping, the cut of the knife descends too deeply, severs the cambium and wounds the wood, and irregularity of surface is produced on the renewed bark. Cases of this are more commonly met with in older tapping, but they are not wanting even in tapping of the present day.

When these swellings occur in large numbers on the tapping surface they resemble scars left by the removal of branches.

If the bark from such a swelling is taken off the surface of the wood beneath is seen to be raised. To examine this more carefully it is necessary to consider what happens when the wood of the tree is wounded. The exposed cells of the wood become brown and the healing of the wound is performed by the activity of the cambium. As the growth of the cambium proceeds a soft cushion or "callus" is formed, looking like a thickened lip to each margin of the cut. The "callus" growth proceed over the surface of the exposed wood and, eventually, by the meeting and fusion of the lips the wound is healed. The exposed surface of wood becomes covered with a layer of what is known as "wound wood," in which the vessels are short and irregularly arranged. This "wound wood" is produced in excess of the amount developed by the surrounding parts of the cambium with the result that the surface of the back overlying the wood which was originally exposed is raised into a bump.

The surface irregularities of this kind are, therefore, easily avoided by obtaining from wounding the wood in tapping.

The ultimate fate of such structures is that they eventually become obliterated by the further production of normal wood by the cambium at those points.

A good example of the origin of these structures is given by Petch, in which a tree had been tapped on the system of separate Vs which had penetrated to the wood; on removing the bark the wood was found to be raised in Vs, each of which corresponded with a tapping cut.

THE CHIEF DISEASES OF PARA RUBBER IN MALAYA AND CEYLON.

The works of M. George Vernet, on Rubber, are always worth reading, and his recent publication Sur les principales Maladies de l'Hevea dans la peninsule Malaise a Java et a Ceylon, is no exception. He describes and illustrates with photographs the chief pests which attack our Heveas. They are the following:—

1. White root fungus (Champignon blanc des racines.) This is known by its fine white filaments which form characteristic strands. This is the mycelium which we have always believed to be that of *Fomes semitostus*. M. Vernet discusses the question at some length. Doubt seems to have been thrown on the identification chiefly on account of the fructification of Fomes not having always been seen on roots or trees attacked by the white fungus. I have not the slightest doubt myself on the subject. Every tree and every root of sufficient size bearing the white fungus will here, especially in wet weather, produce the characteristic brackets of *Fomes*. Where the ground is thoroughly infected with the white fungus, *Fomes* is very abundant and no other fungus usually visible.

"Let us not forget," says M. Vernet "that one only meets with *Fomes semitostus* on dead wood not on living organs." It is true that by the time the fructification is developed the part of the tree that bears it is dead, but it does occur on trees not yet dead and only affected as far as the fungus has gone. There are many of the bracket fungi, such as the little scarlet *Polyporus igneus* and *Schizophyllum commune* that only attack dead and old timber, beams of houses, etc, but I have never seen *Fomes semitostus* doing so. I have seen it on other trees besides *Hevea* but always on just dying trees, not on long dead timber. In the Botanic Gardens, we often have, after a tree killed by fungus, a number of its roots left in the ground where these are exposed as in a drain, the cut ends producing the fructification of *Fomes.* Often in abundance each root bears the characteristic white strands. Wood, however, not affected in the first instance by the white fungus, if left lying on this ground, does not produce *Fomes.*

Strands of mycelium on or near Para roots have been sent to me which are different in colour from the white mycelium strands always associated with *Fomes.* A pink strand has been several times sent usually from new cleared land and also an orange yellow one. These may belong to some other fungus. There may, of course, be other fungi on rubber trees which have white mycelium in strands, which mycelium might be mistaken for those of the *Fomes*, but the characteristic white bands which causes the death of the Para rubber tree and which are well figured by M. Vernet, I think, there can be no possible doubt belong to the *Fomes.*

Directions are given by M. Vernet for checking the disease in the ways already published in the Bulletin and commonly in use.

2. *Corticium javanicum:* this is also described. M. Vernet notes its very rapid appearance on occasions sometimes as quickly as in one night, after long and heavy rain. He discusses the relationship of the little beetles *xyleborus parvulus* and *Ptorelophia melanura* and gives evidence that the *xyleborus* (shot borer) can penetrate the living bark of a Para rubber tree without being killed by the latex, and even thick layers of coal tar, and alleges that the statement that they are killed by the exudation of latex is due to an error of observation, and that they die naturally in the mouths of their burrows. This might be so, but we have seen in a case of attack of shot borers in a dead piece of Hevea, a large number which attempted to escape lower down through the living bark stuck and imbedded in latex. However, one species may be able to make its way through the latex while another cannot.

The connection of *Corticium* with these beetles is this. They live in parts of the tree attacked by *Corticium* and when flying away as adults can carry the spores to other healthy trees. It seems difficult for the mycelium of *Corticium* to penetrate the bark of Hevea except in cases where the bark is already wounded and it is suggested that this is effected by the burrowing of these beetles.

Corticium does not seem to be nearly so common as a pest in the Malay Peninsula as in Java and Borneo, though in rainy weather it is very common in Singapore in Ramie, Strobilanthes and other shrubs. The specimens I have received of Hevea attacked by *Corticium* were not attacked by the shot borer, still the point is worthy of notice. That shot borers have certainly peculiar habits. Not long

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ago a very fine *Brownea grandiceps* in the Botanic Gardens quite suddenly showed a branch completely dead, leaves and all. Investigation showed that the whole of the trunk and many of the branches swarmed with millions of shot-borers, larvae and adults. The tree had shown no signs of sickness previously. The bark was thickly painted with soft soap and kerosine emulsion and then tarred. Immense numbers of the beetles came out of the bark in a dying condition, and the larvae were found to be dying in these burrows, but all was in vain, in a few days the tree was completely destroyed. No other trees were attacked and I never saw a similar case in any other tree.

To return to the direct damage caused by *Corticium,* M. Vernet notes that it developes especially in overcrowded estates. Thus in one estate he visited where the trees were 3 metres (9 feet, 9 inches) apart, *Corticium* had done much damage, while in a neighbouring estate where they were 6 metres apart the *Corticium* was scarcé.

M. Vernet gives a short discussion on the *Diplodia* and a list of the remaining pests of the rubber tree as known. It may be useful here to give a list of all pests recorded to the plant according to the parts they attack:

Roots.
Fomes Semitostus
Poria vincta
Irpex flava
Hymenochoete noxia
Stems and branches
Corticium Javanicum
Diplodia rapax
Nectria diversispora
Eutypa caulivora
Stilbella Heveae.
Leaves
Pestalozzia palmarum
P.———Guepinii
Helminthosporium Heveae
Gloueosporium brunneum
G.———Heveae
Colletotrichum Heveae
Phyllachora sp.
Phyllosticta Heveae
Fusicladium
Animals
Termes Gestroi
Pterolophia melanura (Longicorn beetle)
Xyleborus parvulus (shot borer)
Eumeces squamosus (Beetle, eats the leaves)
Brachytrupes Achatinus (Cricket)
Acari (attack leaves of young plants)
Coccidae several species
Slugs

This may seem a formidable list but it is really small compared with the pests which attack most other cultivated plants.—Ed.

ANALYSES OF HEVEA LATEX.

Messrs. Clayton, Beadle and Stevens have sent an interesting paper on some Analyses of Hevea latex published in "The Analyst" of January, 1911. One of the interesting points is the comparison of latex from the leaf stalks of the Para rubber tree with that of the trunks of trees four and ten years old.

It is now many years since an attempt was made at the Botanic Gardens, Singapore, to extract latex from the leaf stalks of the Para rubber tree. M. Arnaud, the inventor of the extraction of Gutta percha from the leaves, was trying the same process on the leaf stalks and twigs of *Hevea braziliensis*, and a large quantity of boughs, tops, etc., of *Hevea* was supplied to him. His process for extracting the Gutta percha from *Dichopsis gutta* leaves was to grind the leaves and twigs to powder and immerse them in water, the refuse eventually sank, and the Gutta percha floated on the water whence it was skimmed off. He tried, as did I, this process on Hevea twigs and leaves but the only result was a dirty looking solution in which no rubber could be seen.

M. Arnaud got some more leaves and twigs and took them off to try again and some days later I met him, as I was driving out, waving triumphantly a piece of rubber in his hand.

After trying many methods, he had succeeded in making the piece of rubber by rolling the twigs and petioles with a warmed wooden roller. The rubber adhered to the roller and was then peeled off. It was very tacky and soft, and owing to the abandonment of topping trees, which would have supplied material and the poor quality of the rubber produced, the experiments were not carried further.

Messrs. Clayton, Beadle and Stevens have been investigating the rubber from the leaf stalks of Para rubber, and say that "the dried latex is at first rather tacky but on keeping a month or two and passing between steel rolls it is no longer adhesive and somewhat resembles a high class purified Guayule rubber. It is pale in colour, but rather soft, and much weaker than rubber from the bark of mature trees."

The authors give then the analysis of this rubber compared with that of four and ten years old.

	Dried latex from leaf stalks.	From 4 year old.	From 10 year old.
Acetone Extract (resin) ...	7.12	4.06	4.13
Protein	13.02	4.90	5.08
Ash	1.19	0.80	1.75
Caoutchouc (by difference)	78.67	90.24	89.04

Composition of Latex.

		Four year old.	10 year old.
Water	—	70.00	60.00
Acetone extract (resin) ...	—	1.22	1.65
Protein	—	1.47	2.03
Ash	—	0.24	0.70
Caoutchouc (by difference)	—	27.07	35.62

They then examined the aqueous extracts from the total solids of these latices in respect of their reducing action on Fehling's solution and obtained the following results in terms of glucose.

	Before inversion.	After inversion.
Latex from 10 year old trees	none	0.34
Four years old	trace	0.79
Leaf stalks	0.36	2.25

These figures are interesting as pointing to the much larger percentages of Carbohydrates contained in the latex from primary tissue. They are only of relative value and do not show the actual amount of sugars in the original latices as these are partially destroyed by the evaporation of the latex to dryness.

The appearance of the latex from the leaf stalks under the microscope is interesting and suggestive. A relatively small number of caoutchouc globules of the ordinary appearance are to be seen with a much larger number of smaller globules about one-third of their size. These small globules are in rapid Brownian movement and are not so well defined as the Caoutchouc globules having apparently a much lower refractive index.

The latex from the petioles differs from that of the bark chiefly in the much higher content of the nitrogenous matter. There is also nearly another 3 per cent. of resins or other matters soluble in acetone.

The acetone extracted rubber from the latex of the petioles when allowed to stand for a few months is fairly tough and elastic and resembles rubber from mature trees similarly treated.—Ed.

METHYL-INOSITE IN RUBBER.

A paper on this substance was read lately at the Chemical Society (March 2) by Dr. Pickles, who had isolated it from smoked Para Rubber prepared at Singapore and from fine Hard Para of commerce. It is one of the sugars of latex and had previously been found in latex collected in Java by De Jong. It does not occur in biscuit and crepe being soluble and washed out in preparation. The smoked rubber referred to was doubtless the rubber prepared from the latex at the Botanic Gardens. Dr. Pickles suggested as a possibility that methylinosite is the precursor of rubber in *Hevea Braziliensis* and outlined a scheme for the gradual transformation of methylinosite into Para rubber by oxidizing and reducing enzymes assumed to be present in latex (Chemist and Druggist 1911, p. 114 extr).

When talking of constituents of latex of Para rubber one must not forget that in tapping a rubber tree one gets a certain proportion of tree sap into it as well as the contents of the latex tubes as Mr. Bamber suggests, and these sugars occurring in drawn latex may be derived from the sap. It is quite possible that these little known constituents may play an important part in manufactured rubber, and they require investigating.—Ed.

CHONEMORPHA RUBBER-VINES.

The genus *Chonemorpha* (*Apocynaceæ*) comprises about a dozen very ornamental climbers occurring in India, Cochin-China, and Malaya. One of these has been cultivated for many years in the plant house in the Botanic Gardens where rooted in the ground it climbs over an arch of rock and is very attractive from its large fragrant flowers. A specimen was sent to Colonel Prain, of the Royal Gardens, Kew, last year, to obtain the name and place of origin of this plant and he wrote in answer: " Dr. Stapf finds it to be a *Chonemorpha* and the interest of it is that it is one species from Ceylon and Southern India which goes by the name of *Ch, macrophylla* G Don. which is really a distinct Sylhet species. As a matter of fact Stapf finds that the *C macrophylla* of the Flora of British India includes several species. This Ceylon-Malabar one, of which you send material, is the one figured by Rheede in the Hortus Malabaricus vol ix 5 and 6. Dennstedt put it down in his Schluessel, 1818, as *Pergularia tomentosa*, I suppose from Roxburgh's list (Hort. Beng. 20) in 1814. This may have been a guess but if so was a guess that anticipated De Candolle (Prodromus IV 76). VIII p 430.

So far as Stapf can find out no distinctive name has ever been given to Rheede's plant.

Stapf also points out that the Malay Peninsula *Chonemorpha* included under *Ch, macrophylla* in the Flora of British India is likewise distinct and it will have to get a new name."

Certainly the charming but smaller flowered plant of Penang Hill is very different in appearance from the large flowered plant we cultivate in our Gardens.

The three *macrophyllas* in the Flora of British India therefore require distinctive names and Col. Prain and Dr. Stapf suggest that as Roxburgh gave the name of *C. macrophylla* to the Sylhet and Assam plant it should retain that name. The South Indian and Ceylon plant which we have here should be called *C. Rheedei* and I would suggest *C. Penangensis* for the one on Penang Hill.

I will now describe these species:

Chonemorpha Rheedei n. sp.

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A powerful woody climber with a stem attaining a thickness of at the base, young branches, hairy with short brown hairs. Leaves opposite on long petioles 3 inches long, and one-eighth of an inch thick, hairy, blade orbicular-ovate, very shortly acuminate, base cordate, 6 inches long and as wide, above deep green glabrous shining with 8 pairs of impressed nerves, beneath nerves elevate, thickly covered with soft hairs, whitish, whole leaf soft membranous. Flowers in a terminal racemose cymes, opening one or two at a time, about 10 in number on a peduncle 4 inches long pubescent. Bracts ovate, acute, Pedicles half an inch long, Calyx, tubular ¼ inch long with 5 acute, oblong lobes pinkish, but turning dark brown as the flower opens, Corolla tube one inch long and three eighths of an inch through at the thickest part, shortly narrowed at the base, then dilated rather abruptly with thick walls, hairy inside, limb widely spreading four inches across lobes, 5 broadly ovate rounded, clawed at the base, contort, each 1¾ inch across white, mouth of tube and the inner edge of each lobe yellow, Stamons in the lower part of the tube at its thickest part 5 connivent, filament very short, another arrow shaped half an inch long, the base prolonged into two long divaricate points, the tip produced into a long acuminate point all reddish yellow, Ovary conic grooved, style slender cylindric pubescent, pistil oblong 5 ribbed. Fruit 2 "follicles about 12 in linear very pointed smooth, seed beaked, coma 2 inches long copious."

Ceylon rather rare, low country to 2,000 feet, Kandy, Kalutura, Haduganawa. Fl. April, May, Malabar.

I have taken the description of the fruit from Trimer's flora of Ceylon. He says the corolla tube is glabrous within and only the filaments hairy. However, in our plant, the tube is also hairy for great part of its length. The flowers are very fragrant. The latex produces very good Caoutchouc an account of which appeared in Bulletin, February 1910, p. 56, under the name of *Chonemorpha macrophylla.*

The plant is well worth cultivating for its beautiful fragrant flowers appearing in March, though it is not very heavily floriferous. It seems to be somewhat difficult of propagation but can be grown from cuttings. Our plant was obtained from the Peradeniya Gardens on January, 15, 1882. *G. macrophylla* Don, a native of Sylhet, is described by Roxburgh under the name of Echites macrophylla, Flora. Indica II 13. Clarke's edition p. 246. I have seen no specimen of it. From Roxburgh's description it differs from *C. Rheedei* in its short petioled ovate entire leaves 10 to 12 inches long and 7 to 10 inches wide. The tube of the corolla is gibbous immediately above the base, and the cymes are many flowered. It is reported to give a good class of rubber, as all the species appear to do.

Ch. Penangensis n. s. p.

A stout woody climber with hairy stems. Leaves obovate, ovate very broad shortly acuminate, base rounded not cordate 8-9 inches long, 6-7 inches wide, membranous above, hairy beneath pale, hairy, nerves 10 pairs petiole ¼-½ inch long, Peduncle 3 inches long, hairy, terminal. Inflorescence of three or more branches bearing racemose cymes of very numerous flowers, the whole being 6 or more inches long and often 6 inches across, rachis. pedicels, bracts and calyx densely hairy. Bracts ovate acute one-eighth of an inch long, Calyx tubular with 5 acute points, a quarter of an inch long, Corolla tube one inch long hairy, cylindric base narrow for ⅛ inch, then dilated abruptly, hairy within, limb of five spathulate lobes hairy at the base on the back, one inch long; (whole flower 2 inches) and half an inch wide (dry) white with yellow centre, Anthers acuminate above, with 2 descending points, filaments hairy. Style cylindric pubescent, Disc of 5 rounded lobes. Fruit unknown.

Penang Road to Balik Pulau (Ridley 9441) (Curtis 832) Perak Gopeng (King's Collector 6,000) and Larut (3636) Temengoh (Ridley 14271) Malacca Brisu (Derry 543.)

This is easily distinguished from *C. Rheedei* by its leaves narrowed towards each end but not cordate at the base very broadly ovate or elliptic hairy on both sides, and the large cymose inflorescence of many flowers, of much smaller size and more hairy. Derry gives the name of "Akar Gerip-gerip merah" for it, a name applied to several local rubber vines.

Closely allied to these plants is one from the Philippines, Boso-boso province of Rizal, Luzon (Ahern's Collector No. 1141) which has the cordate leaves of *C. Rheedei* but hairy above, and long petioles. The inflorescence resembles that of *Penangensis* but the calyx is very deeply cut into long acute points and the corolla tube swollen at the base and narrowed gradually upwards quite glabrous. It was distributed as *C. macrophylla* but is obviously distinct from any species included under the name. I cannot find it described anywhere in the Philippine Journals though a species, *C. elastica* Merrill, is described in the Journal of Science IV. 314 which is stated to be most important rubber producing vine in the Philippines. The description of this does not fit the Boso-boso plant, which is probably at present unnamed. H. N. R.

NOTES ON CHINESE SWINE CULTURE.

We have received from M. Loudon W. Douglas a copy of an important lecture delivered by him at the Farmer's Club in London on the position of swine husbandry. In his letter accompanying the article he writes: "The subject of swine husbandry has attracted universal attention recently owing to the sudden shortage of pig-products in all countries. It is a matter of very great moment to agriculturists everywhere and I sincerely hope that the counsel offered in my lecture may prove serviceable."

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Everyone will have read in the home papers about the large importations of Chinese pig carcases to England. At first there seemed to be some opposition to this trade but now it appears that a good business is being done in this line.

It would be quite possible, one would think, for the Malay Peninsula with its large number of pig-rearers to get a corner of the business if it were worked up, and the Chinese taught and encouraged to grow sound pork for the home-market as well as for their own use.

Mr. Douglas lays great stress on the correct feeding of pigs, the value of the meat depending much on the kind of food supplied. The feeding recommended for the English pig would not be possible here. Thus one gallon of separated milk, three pounds of potatoes and four pounds of barley meal is stated to be a very common ration for growing pig, and one which seems to pay well. Milk indeed seems to be agreed upon by all breeders as an important item in the diet of the pig. The feeding of the Chinese pig is based on utterly different lines, the most striking thing being the great difference due to the large amount of green vegetable food used.

The following notes on pig culture in Singapore may be interesting to many.

The pigs are kept in shaded styes with a plank or round wood flooring beneath which is a cement tank for receiving the excreta, which are used as a valuable manure for the vegetable garden.

The roof of the sty is usually made of attaps, the sides of a fence of horizontal poles to keep the animals in. This arrangement though not perhaps quite as good as the styes used by high class breeders in Europe is a great deal better than many pig-styes in the country villages in England where the excreta are left on a brick floor in actual contact with the animals.

The pigs are fed thrice a day, on a mixture of farinaceous foods and green stuff all boiled together in a large iron cauldron or "kwali." The following are the chief vegetables used :

1. Kangkong: *Ipomoea Squatica* Forak. an aquatic convolvulus with white flowers, cultivated extensively as a spinage for human consumption and an excellent and rapid growing vegetable.

2. Sweet potatoes. *Ipomea Batatas.* the leaves of this well known vegetable.

3. Keladi Babi. *Colocasia Antiquorum* L. This aroid, an introduction probably from Polynesia, is only used here for pig feeding. In other places the tubers are extensively used for human food, but in the Straits it is not favoured to any extent though the shoots and rhizomes are eaten to a small extent. The plant grows abundantly in ponds and swampy low lying places and is very prolific. Indeed it is a troublesome weed to exterminate in many spots.

4. Lumut Laut. *Ulva Lactuca*, a green thin sea-weed abundant on rocks and old logs in the harbour and round our coasts. This is collected by Chinese and Malays at low tide with the aid of a stick on the end of which is a short transverse piece of wood, forming a kind of wooden hoe or scraper. With this the sea-weed is scraped together and put into baskets. It is then spread in the sun to dry for three days after which it is bundled up and sold at a dollar and a half a picul.

5. The water hyacinth, *Eichornia crassipes*. This ornamental aquatic was first introduced for the beauty of its flowers. The Chinese cultivated it for this purpose and hawked bunches of flowers in the streets, lately they have taken to use the leaves and stalks for feeding pigs and say it is excellent for them.

6. Kiambang. *Pistia Stratiotes*, often known as the water lettuce. This floating plant is cultivated on a large scale, in small ponds, reproducing itself from its sideshoots and has always been a popular pig food.

7. Banana stems, Batang Pisang. The stems of bananas after the fruit is taken are chopped up and added to the mixture. All these vegetables are chopped up fairly finely mixed together and put into the cauldron to boil. To them are added refuse from the sago, and tapioca factories, and rice refuse. The latter is obtained from the eating-houses, and consists of the waste rice and uneaten bits and is known as "Nasi busuk." The pig breeder pays three or four dollars a month for this stuff which is kept for them, and amounts to about two fair sized tubs a day.

The sago and tapioca refuse is rich in starch as owing to the often clumsy methods of washing the pith, only a portion of the starch is washed out and retained. The refuse of sago of which there is usually a large proportion left during the manufacture of the starch from the tree fetches a good price for pig food, and is even occasionally as valuable as the starch itself Deddak is rice dust chiefly imported from Bangkok, as refuse from the rice mills. It is sold at 2 dollars a picul, and used also for feeding cattle and poultry. These farinaceous foods are mixed with the boiling vegetables and when well boiled the pig man allows the food to cool and feeds it to the pigs. The pigs are washed twice a day by pouring water over them, which water runs into the tank below and helps to clean the woodwork of the sty.

Breeding.

The breeding boars are kept by certain men who lead them about from village to village for serving the sows, one man keeps one or two boars for use, and charges from 15 to 50 cents for each service, Six months after producing a litter the boar is left with the sow for about an hour and then another sow is substituted. The boar is not allowed to serve more than seven times in a day. The sow breeds twice a year and the litter suck for a month. From eight to fourteen

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pigs are produced in a litter, and the Chinese keep only as many as the mother can suckle. The boars are castrated at a month old, the sows spayed at three months. This is done by professional men who castrate both pigs and poultry. They get five cents for each pig castrated and live on these earnings.

If properly fed the pigs are ready for sale in six months, but generally take a year to fatten enough for sale. Some poorly fed ones take two years to fetch a good price. A well fed pig weighs two piculs and fetches from 14 to 16 dollars a picul. At one time when wild pigs were more abundant the Chinese used occasionally to allow the sows to run in the woods to be crossed by the wild pig, and formerly at Ang mokio I saw a curious looking breed said to have been derived in this way.

Transport and Trade.

The pigs are largely exported to the mining districts, alive in long rattan baskets, which are piled one on the top of the other, on carts or on ship board. The opening of the rail from Malacca, and the cultivation of tapioca as a catch-crop for rubber a few years ago, increased the pig industry there very extensively, as the refuse tapioca formed a valuable and large feeding stuff supply and by the railway it was possible to do a big trade in pork at the mines.

One of the curious results of the rapid development of rubber cultivation in Singapore has been an extraordinary fall off in the production of food products, fruit, vegetable and poultry, and at least as much marked that of pigs. The Chinese have in fact planted up the ground occupied formerly by thise produce with rubber, in the wildest way. The result has been that pork is being imported largely from Bangkok to replace it. This is regrettable for the rise in price of food-stuffs is a serious matter, both increasing the cost of living, and interfering with the healthy life of those who cannot afford to purchase pork, vegetables and fruit, at these high prices. It will be noticed that in the feeding of pigs farinaceous food is a necessity and the only suitable materials for this produced in the Peninsula are tapioca and sago refuse. As these products also are to a considerable extent going down, before the triumphant Hevea, the difficulty of increasing the pig-cultivation must increase, and it certainly does not seem to be for the benefit of the population that every little scrap of land should be covered with rubber trees cultivated by small Chinese owners in place of the food-products of the people. We should be able to produce our own supply of fowls, ducks, pork and milk ourselves without depending on imports from other countries.

Disease.

Formerly there were serious outbreaks of swine fever causing a great mortality not only among the Chinese pigs but also among the wild pigs in the forests. On one occasion many years ago the wild pigs in Singapore were nearly exterminated by the disease and the tigers which live largely on wild pigs all left the island. In Province

Wellesley on one occasion the mortality among the pigs was very great nearly all dying. The Chinese somewhat increased the spread of the disease by letting sick pigs run away to find a plant which they said it could cure itself with. They attributed the outbreak to the malice of a demon, the marks of whose claws they said could be seen on the pigs. This outbreak was attended by a large invasion of vultures from the north, birds rarely seen so far south unless in the case of cattle or pig disease.—ED.

PAPAYA CULTURE.

Mr. Jesse of Jolo tells of his method of raising papayas as follows: The process of cultivation is divided into four stages.

FIRST.—The sprouting stage. The seed should be planted in boxes, about 18" × 18" × 18", containing rich earth, with which is mixed a couple of handfuls of bone ash and fifteen drops of tincture of iron. Plant the seed about an inch apart and bury about an inch below the surface. The surface should be sprinkled lightly with water about sundown. In about a week the young shoot should appear, and at three weeks the shoot should be about eight inches high.

SECOND.—The stage of preparation of the soil for the transplantation of the young shoot and its early development. Having located the site for the tree, dig a hole about two feet in diameter and one foot deep. Procure enough rich earth mixed with bone ash to fill the hole, and then sprinkle fifteen drops of tincture of iron over the surface. Now dig up your sprout, being careful to retain the earth about its roots, and bury about two inches deep. In order to protect the young shoot from the direct sunlight drive four sticks into the ground around the sprout and suspend a gunny sack. After about two weeks, the young plant will have adjusted itself to its new home and the sunshade may be removed. By this time the plant should be in a flourishing condition and in three weeks should be three inches in diameter at the base.

THIRD.—The forced nourishment stage. Bore a hole into the trunk about six inches from the ground, one inch deep and of a diameter slightly larger than that of the red rubber tubing obtainable at your drugstore. Fill a quart bottle half full of sugar and dissolve in water. When the sugar is thoroughly dissolved, connect the bottle with the hole in the tree by means of the red tubing. In twenty-four hours the tree will have absorbed the contents of the bottle.

FOURTH.—The fruit bearing stage. If the young fruit appears too numerous, it is well to pluck the least promising. Then, if the tree is unable to support itself prop it up. At five months some of the fruit on the lower cluster will show streaks of yellow. Now is the time to hasten the ripening. This is done by wrapping a gunny sack about the lower clusters of fruit and the trunk. Crows are very fond of the ripe fruit, and this expedient serves also to scare them away.

When yellow spots about the size of a peso appear, pluck the fruit and place it in a cool dark place for several days. By this time the fruit should be yellow over the greater part of its suface, and will gently yield to thumb pressure. It is now ready for the icebox. If the fruit is allowed to turn yellow before it is plucked much of its strength is drawn back into the tree, to be supplied to other fruit in a less advanced stage of development. If these directions are followed your trees ought to bear fruit ten to twelve inches in maximum diameter.

Once a year sprinkle bone ash over the surface around the base of the tree. This should be sufficient fertilization.

The tree (Javan) at maturity varies from fifteen to twenty feet in hight and is about seven inches in diameter at the base. *(The Mindanao Herald, March 4, 1911.)*

This rather odd way of cultivating papaya trees may interest some of our readers who might perhaps like to try the method suggested. The papaya grows so readily with us and fruits so well with no further cultivation than the administration of house-refuse that so elaborate a system as this is hardly likely to become the rule here.—ED.

FASCIATION IN EUCHARIS.

The monstrosity known as fasciation, that is the junction of two or more branches or flowers together, is perhaps the commonest monstrosity in plants, but I have not seen one recorded for the flowers of the *Eucharis amazonica* a specimen of which has just been found in the Gardens. In this two flowers are intimately joined together from the stalk upwards the stalk and ovaries are flattened and quite connate as is the perianth tube as far as the petals of the two flowers. Above this both flowers are free, though they are pressed together so that the two inner petals are erect back to back. A section of the ovaries shows that both are distinct though joined by their walls where they are in contact.—ED.

MASCARENHAISIA ELASTICA.

The India Rubber Journal of March 4, 1911, devotes a page to an account of *Mascarenhaisia elastica* Schum, a rubber tree of East Africa. It was discovered by Stuhlmann in 1898, and seed was received in the Botanic Gardens in 1899, and has developed into a low tree about 20 feet tall with a stem circumference of 19 inches. It has constantly flowered and fruited with us. The flowers are described in the Journal as conspicuous and fragrant while here they are quite small and white and certainly sweet scented. The branches are rather strict and do not spread much. The growth of the tree seems very slow, and in the account quoted it does not seem to get bigger than from 30 to 40 feet tall with a diameter of 12-18 inches. A curious thing about it, also noticed in Buitenzorg by the botanists there, is that young plants when cut exude a clear liquid and no latex and it is only when the tree is much older that any milky latex appears. At the best of times it is by no means heavily laticiferous, only a little exuding when cut. The bark is scaly outside but when this is removed a smoother bark ¼ inch thick is seen, which is easily cut but even in its native haunts the latex exudes slowly.

Analysis of the rubber are given in the Journal and show that the rubber as analysed in the Imperial Institute gives from 69 to 90 per cent. Caoutchouc, with 4.5 to 7.6 per cent. resin. Most of the samples contained a considerable amount of water, and vegetable inpurities. The rubber was pronounced to be of good quality when carefully collected. No statistics of return are obtainable but judging from the slow growth of the trees and the small amount of latex which exudes when cut, it is improbable that it would be worth cultivating on a commercial scale anywhere. The rubber is known as Mgoa, or Goa Rubber.

RUBBER NOTES.

Angola.

From the district of Loanda there has been exported during the last 12 months for the first time one ton of plantation rubber. This is the product of the common Ceara species introduced into Angola some 18 years ago. The Panama and Para rubber trees planted during recent years are making satisfactory progress. The Manicoba Jequie have been cut for the first time in March last. The trees were then 2 years old, full of fruit and yielded an average of 35 grammes per tree. By many growers this species is considered inferior to the Ceara Manicoba which grow like weeds in the Coffee belt and is actually preferred to the *Hevea Braziliensis* which requires double the time to develop. Owing to the introduction on the market of a new knife for extracting the milk from the *Manihot Glaziovii* the planters have recently become enthusiastic.

The percentage of scrap rubber is greatly diminished as the milk is diluted on the trunk with a simple alkaline solution which prevents rapid coagulation and permits the preparation of rubber in the form of transparent sheets having a high market value.

All the rubber cultivators are comparatively poor Europeans. There are a few planters who established new plantations exclusively of Ceara Manicoba.

(Report for the year 1909: Trade of the province of Angola.)

[Evidently Angola is suited well for the Ceara rubbers and from what we know of the soil and climate this is what might be expected.]

Uganda.

The Para rubber trees in the Botanic Gardens continue to make most satisfactory growth and tapping experiments show that the prospect of Para rubber cultivation are most encouraging. The growth of *Funtumia elastica* trees is slow compared with that of Para. The results of an experimental tapping of a 6½ years old tree show that they are not of a tappable size at this age. The Castilloa rubber tree grows well but it is very subject to the attacks of a borer (Inesida leprosa) which does very great damage to the trees and accordingly it must be considered to be of very little importance to the Protectorate."

The Manihots all seem to do well here. Total number of plants distributed by the Botanic Gardens during the year was 160,679, The demand for Cocoa and Para rubber seeds greatly exceeded the supply, and in addition to the plants and seeds distributed by the Botanic Gardens a large number of seeds were distributed at Kampala and on behalf of the planters. Large numbers of seeds chiefly of Para rubber were imported by the planters.

The *Kafumbo fibre, Asclepias semilunata* has proved disappointing as a cultural plant. It cannot be grown at a profit. Lemon grass oil made by the department realised from 2s. 3d. to 2s. 8d. per pound. (Report for 1909-1910).

[Uganda seems to be going ahead with rubber, cocoa, lemon grass, and cotton.]

Southern Nigeria exported in 1909, 1,388,009 pounds of rubber, valued at £109,075. This was all jungle rubber. There are 30,000 Para plants in the Eastern province and 10,000 more have been sold to individuals. The average price for rubber exported was 2s. 7d. per lb. The chief produce here is Palm oil and kernals, and attempts are being made to improve the strain. Cotton, cocoa and maize are also important crop (Report for 1909).

Trinidad possesses 80,000 trees of Heve, a 600,000 of Castilloa and 25,000 of *Funtumia*. The Heveas grow well and the cultivation will be increased. *Castilloa* does well too, and small quantities of rubber have been exported for the past few years.

Brazil appears to be making some attempts to combat the invasion of cultivated rubber in other market. Besides giving premiums to cultivations, and at least considering the question of reducing the export tax, a railway is being constructed from Madeira to Mamore to open up the country and not only bringing down cheaply the Bolivian rubber supplies, which are very large but to induce settlements of workers with up-to-date methods along the rail and in the forests where the Heveas are abundant.

Grenada. Two trees of *Hevea Braziliensis* fruited in the Botanic Gardens of Grenada in 1910 and produced 750 seeds sold at a penny a piece, their germination was satisfactory.

TRIALS WITH GREEN DRESSINGS IN DOMINICA.

The following account of trials that have been made recently in Dominca, has been received from Mr. A. J. Brooks, Officer-in-charge at the Agricultural School:—

At the Agricultural School, the horse bean *(Canavalia ensiformis)* is generally grown for the purpose of green manuring, as this plant has given the best results, of all the plants previously tried at the school.

Seeds of two varieties *Crotalaria verrucosa* and *C. striata* were recently received from Trinidad, through Dr. H. A. A. Nicholas C.M.G., for the purpose of testing their suitablity for green manuring.

A plot of land was divided into three equal sections for the trial; the first section was sown with horse beans, the second with *C. verrucosa*, and the third with *C. striata*.

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ALL Members of Constituent Associations have the right to attend and vote at the Annual General Meeting of the P. A. M. (Rule 12).

THE PLANTERS' ASSOCIATION OF MALAYA.

KUALA LUMPUR,
15th April, 1911.

NOTICE.

The Annual General Meeting of this Association will be held at 10 a.m., on Sunday, the 30th of April, 1911, at the Masonic Hall, Kuala Lumpur.

Agenda :

1. Minutes of last Meeting.
2. Accounts and Report of the past Financial year.
3. Election of Chairman and Secretary for current year.
4. Estimates and Subscriptions for current year.

   Motion by Mr. Jno. GIBSON: "That Rule 4 be altered to meet special cases."
5. Advertising the Peninsula in India.
6. Chinese Labour.

   Motion by Mr. F. PEARS: "That in order to avoid excessive charges in the recruiting of Chinese coolies, this Association discuss the advisability of having its own agent in China to recruit free Chinese Labour on the conditions suggested in the circular issued by the Protector of Chinese, Singapore, on the 7th April, 1911.
7. Indian Labour.
8. Javanese Labour.
9. Labour Generally.

   (*a*) Motion by Mr. MACFADYEN: "That a Registration fee of $1 be imposed on every coolie locally recruited."

   (*b*) Absconding.
10. London Exhibition.
11. Hospital Rules.
12. General.

By Order:
C. ST. G. WHEELEY,
Secretary.

MINUTES OF MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA.

Held at the Masonic Hall, Kuala Lumpur, on March, 26, 1911, at 10.30 a.m.

PRESENT.

Mr. C. Malcolm Cumming, Chairman

Delegates for Negri Sembilan Planters' Association:—Messrs. A. Dupuis Brown, A. D. Davidson (by his proxy J. G. Hubback).

Delegates for Kuala Lumpur District Planters' Association:—Messrs. F. G. Harvey, E. B. Skinner, H. C. E. Zacharias.

Delegates for Batu Tiga District Planters' Association:—Messrs. H. L. Jarvis, Carlyle Bell.

Delegates for Kapar District Planters' Association:—Messrs. E. H. King-Harman, R. K. Walker.

Delegates for Klang District Planters' Association:—Messrs. J. Gibson, W. H. Trotter.

Delegates for Kuala Langat District Planters' Association:—Messrs. E. Macfadyen, F. J. Dupuis.

Delegates for Taiping Planters' Association:—W. H. Tate. A. B Milne.

Delegates for Lower Perak District Planters' Association:—Messrs. M. Maude.

Mr. G. H. Day, Legal Adviser.

Mr. C. St. G. Wheeley, Acting Secretary.

VISITORS:

Messrs. L. Lewton Brain, P. W. Parkinson, A. C. Corbetta, M. C. English, J. M. Moir and R. Jarvis.

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1. The Minutes of the previous Meeting are taken as read and confirmed.

2. POST OFFICE HOURS.

The Secretary reads the following letter:

No. 136/1911.

Sir, Kuala Lumpur, 24th March, 1911.

With reference to your letter of the 23rd January last requesting that the hours for the transaction of Money Order business may be extended, I have the honour to inform you that commencing from the 1st April the hours during which Money Order business will be transacted are as follows:—

LARGE OFFICES—Week days 8 a.m. to 6 p.m. Sundays nil.

SMALL OFFICES—Week days 8 a.m. to 4 p.m. Sundays 8 a.m. to 10 a.m.

1. The following are regarded as "large" offices:—

PERAK.—Batu Gajah, Gopeng, Ipoh, Kambar, Kuala Kangsar, Parit Buntar, Taiping, Tanjong Malim, Tapah, and Telok Anson.

PAHANG.—Bentong, Kuala Lipis, and Raub.

SELANGOR:—Kajang, Kapar, Klang, Kuala Kubu, Kuala Lumpur, Kuala Selangor, Port Sweettenham, and Sungei Besi.

NEGRI SEMBILAN:—Gemas, Kuala Pilah, Port Dickson, Seremban, and Tampin.

3. Although the extensions referred to above are not altogether on the lines suggested in your letter it is hoped that they will, to a considerable extent, meet the requirements of the Planters' Association.

I have, &c.,
W. A. WHITE,
Ag. Director of Posts and Telegraphs.

Resolved that the Director of Post and Telegraphs be thanked for the concessions made.

3. LABOUR.

The Secretary reads the following correspondence:

The Chief Secretary to the Government of the
Federated Malay States,
Kuala Lumpur. 17th February, 1911.

SIR,

I have the honour to inform you that at the last Meeting of this Association, held on the 12th instant, it was resolved to submit to your Government the following recommendations on the subject of Agricultural Labor:—

(1) That the F.M.S. Government make a loan during 1911 of $1,000,000 and that the Indian Immigration cess to be levied in the Colony, the F.M.S., Johore and the other British Protected States in the peninsula be a sum not exceeding $2.50 per quarter so that it be possible to pay a bonus of about $15 per imported Indian coolie.

(2) That a Labour Department proper be instituted with control over all labour, Indian, Chinese, Javanese and other, with a sufficient staff to see that the present enactments are carried into effect.

Subsequently it was carried unanimously, that a financial Sub Committee be formed, consisting of Messrs. Cumming, Duncan, Skinner and Pears, and that your Government be invited to appoint a number of official representatives, to join the planting members, and consider the merits and details of the various schemes submitted.

I have, &c.,
H. C. E. ZACHARIAS,
Secretary.

Kuala Lumpur, 17th February, 1911.

SIR,

I am directed to acknowledge the receipt of your letter dated the 17th February, 1911, forwarding a copy of a resolution passed at the last meeting of the Planters' Association of Malaya, held on the 12th February, to submit to this Government certain recommendations on the subject of Agricultural Labour, viz :—

(1) That the Federated Malay States Grovenment make a loan during 1911 of $1.000,000, and that the Indian immigration cess to be levied in the Colony, the Federated Malay States, Johore, and the other British Protected States in the Peninsula, be a sum not exceeding $2.50 per quarter, so that it be possible to pay a bonus of about $15 per imported Indian coolie.

(2) That a Labour Department proper be instituted with control over all labour, Indian, Chinese, Javanese, and other, with a sufficient staff to see that the present enactments are carried into effect.

I am to say that in response to the invitation of the Planters' Association of Malaya, the Government has appointed the Chief Secretary, Sir Arthur Young, K. C. M. G., the Acting British Resident of Negri Sembilan, Mr. R. J. Wilkinson and the Superintendent of Indian Immigrants, Mr. L. H. Clayton, to consider, in consultation with the planting members, the merits and details of the several schemes submitted.

On Sunday, 12th February, it was arranged that a meeting of this sub-committee should be held at Carcosa at 10 a.m., on Sunday, 19th February. The Chief Secretary presumes that you have informed Messrs. Cumming, Duncan, Skinner and Pears of the place and time of meeting.

I have, &c.,
J. R. O. ALDWORTH,
Ag. First Assistant Secretary, F.M.S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

No. 23 in 7158/1910.

Kuala Lumpur, 3rd March, 1911.

SIR,

With further reference to your letter of the 17th February, 1911, I am directed to say that no reply appears to have been sent to you with regard to the 2nd resolution contained in your letter.

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2. The subject of a Labour Department has however been under consideration; the Government sympathizes with the resolution, and steps are being taken in the matter.

I have, &c.,
J. R. O. ALDWORTH,
Ag. Under Secretary to Government.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

The following resolutions are passed by us at a meeting held at Carcosa on the 19th February, 1911:—

1. That this Committee is in favour of increasing the maximum assessment leviable under the Enactment to $3 per quarter, which $3 shall include the surtax mentioned in Resolution number 6.

2. That Section 5 (*i*) of Enactment 6 of 1908, Perak, be amended so as to permit of the assessment being varied half yearly if necessary.

3. That the assessment on employers generally should be fixed as soon as possible at $2 per unit for each quarter.

4. That the minimum recruiting allowance be fixed from the 1st January, 1911, at $5 per cooly.

5. That it is desirable that the recruiting allowance for the second half of 1910 should be paid at the prescribed rate of $4.50.

6. That a surtax of $1 per quarter per unit should be imposed on any excess of the estate-labour force as calculated for assessment purposes over the number of coolies imported during the two preceding calendar years.

7. That the Government be exempted from the payment of the surtax on all coolies departmentally employed.

8. We consider that having regard to the fact that estates are being formed in Singapore, and Tamil labour is being employed thereon, the provisions of the Ordinance might with advantage be extended to Singapore.

9. We are of opinion that our proposals will within a reasonable period result in the fund obtaining the necessary sums required for current purposes, and for repaying any sums which the Government may lend for the purpose of placing the Fund in credit.

(Sgd.) C. MALCOLM CUMMING.
(Sgd.) E. B. SKINNER.
(Sgd.) R. PEARS.
(Sgd.) W. DUNCAN.
(Sgd.) ARTHUR YOUNG.
(Sgd.) R. J. WILKINSON.

I agree with paragraphs 4 to 10 but not with paras 1 to 3 as I think that an increase of the existing uniform assessment to $10 per cooly and the payment of recruiting allowances would give more satisfactory results.

Sgd. L. H. CLAYTON.

Mr. Cumming explains the proposals to the meeting. The committee had increased the maximum assessment to $3 as a guarantee that any sums which the Immigration Committee might borrow would be repaid. Government was willing to grant loans, but wanted to be assured that the Fund would eventually repay them. Under the present Enactment no alteration in the assessment could be made, and it was advisable that the Immigration Department should have power to alter it. At present the finances did not justify a larger recruiting allowance than $5. The surtax was introduced as the thin end of the wedge, whereby local recruiters would be got at eventually It was only a small tax, but it was a matter of principle, and the idea was to raise it eventually to such a sum as would deter local recruiting. The exemption of Government was agreed to as being only fair in view of the Government subsidy to the B. I. S. N. Co.

The position was a difficult one. Although opinions differed as to whether they were on the right lines—many thought they were better off before Government stepped in—still there had arisen that Government interference, and he thought, under the circumstances, they ought to give their approval to these resolutions. The subsidy to the B. I. S. N. Co., out of which arose that interference, would shortly expire, and then, he thought, would be the time for the planters to decide whether they wished to free themselves from interference.

Mr. J. Gibson was prepared to support the resolutions only on the understanding that they were not permanent. Planters had not benefited from Government interference. The Enactment had been tried and founding wanting. The vicissitudes of tropical agriculture were many and advancing taxation would soon be very serious to the industry.

Mr. H. L. Jarvis inquires how it would be possible to break away from Government.

Mr. Trotter thinks that the differential treatment, which local recruiters are to receive, will be much too slight a one, to be felt at all.

Mr. A. B. Milne said it was a question not so much of getting labour but of keeping it. The scheme did not appear to do enough as regards the latter.

Mr. E. B. Skinner said that the only money that would have to be borrowed would be to pay the $4.50 recruiting allowance for the second half of 1910. The tax would cover the rest. No ordinary estate that recruited labour would have to pay the surtax. They had gone into the matter thoroughly, and were convinced that the figures wers correct.

Mr. Cumming summing up, reminds the Meeting, that more and more coolies were going back to India owing to the high rate of wages, but there was a lot of local recruiting. The whole idea of the committee was, by a surtax, to hit the local recruiter. The surtax was small to begin with, but the idea was to raise it. The planting community was a strong body, representing a large amount of capital. If they stuck together and found out what they really wanted, they would get it. Many thought planters were better off under the old system. He believes the initial fault lay in the doing away with recovery of advances.

He would now formally propose:—"That this meeting approves of the majority report of the joint committee appointed to consider the labour cess, as per their minutes of February 19th, 1911, provided the Government will not introduce the necessary legislation as a permanency, but limit it to remain in force only until such time as their present contract with the B. I. S. N. Co. expires, when it is desirable that the whole question of subsidy and cess be re-opened."

Mr. Gibson seconds this proposal, which is carried unanimously.

4. ABSCONDING.

The Secretary reads the following letter:

The Batang-Padang District Planters' Association.

To the Secretary,
Planters' Association of Malaya. Tapah, 7th March, 1911.

DEAR SIR,

I have been instructed by the Committee to write to you reminding you that "The Enactment No. 12, 1910, an Amendment to the Labour Enactment, 1904 No. 1 General" (i.e. Absconding of coolies to be a criminal offence) is not yet brought into force and to ask that the P.A.M. use their influence to have this Enactment made law as soon as possible.

Yours faithfully,
M. E. CALLARD,
Secretary.

Resolved to ask the Chief Secretary, that this Enactment be Gazetted to come in force as soon as possible.

5. CHINESE LABOUR.

The Secretary reads the following letters:

Office of Secretary to the Resident,
Confidential Selangor,

SIR, Kuala Lumpur, 13th March 1911.

I am directed to state that His Excellency the High Commissioner has under consideration the question of improving the immigration of Chinese labourers into the Federated Malay States and would be glad to know if the planters would wish the Government to move in the direction of a Chinese Immigration Fund on the lines of the Tamil Fund.

2. I am to ask you to submit this suggestion confidentially to the Committee of your Association at an early a date as possible and favour the Resident with their views on the subject.

I have, &c.,
E. BURNSIDE,
Ag. Secretary to Resident,
Selangor.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

No. (5) in 1259/11.

Office of Secretary to the Resident,
Selangor.

Kuala Lumpur, 18th March, 1911.

SIR,

In continuation of my letter of the 13th instant, relating to the institution of a Chinese Immigration Fund, I am directed to inform you that, as at the present advised, His Excellency the High Commissioner is of opinion that, if such a Fund is established, Chinese on Mines must certainly be exempted from any assessment rate at least for some years, until the number employed on plantations is at least equal to that on Mines.

I have, &c.,
E. BURNSIDE,
Ag. Secretary to Resident,
Selangor.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Mr. Cumming suggests that the question be shelved until they had time to discuss the matter thoroughly amongst themselves.

Mr. Macfadyen does not see that there can be any other answer than an emphatic negative. He would therefore move:

"That this meeting is of opinion that no useful purpose would be served by Government action on the lines suggested."

Mr. F. J. Dupuis has much pleasure in seconding this motion.

Mr. W. H. Tate proposes as an amendment that "this Association cannot express any opinion on the subject of a cess for Chinese until the proposed legislation applies to all classes of Chinese labour."

Mr. Skinner seconds.

The amendment is put to the meeting and lost by 9 votes to 7.

Mr. Macfadyen's resolution is then put and carried by 11 votes to 3

6. LONDON RUBBER EXHIBITION.

The Secretary reads the following correspondence:

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur,
Federated Malay States.

London, E. C., 10th February, 1911.

RUBBER EXHIBITION, 1911.

Dear Sir,

I note with interest the arrangements made in connection with the Malay Peninsula Exhibit as set forth in your letter to Sir William Taylor, and for the information which you give me direct as regards the finance. I have seen Sir William Taylor, and conferred with him as to the best method for raising the necessary funds, and as result a joint circular letter has been issued on behalf of the Council of the Rubber Growers' Association and the Board of the Malay States Development Agency addressed to British Companies owning rubber properties in the Federated Malay States urging them

(a) to contribute sums of £50 and £25 respectively according to production, and

(b) to instruct their local representatives to forward samples of rubber to the local show at Kuala Lumpur.

I trust this appeal will produce a substantial sum.

GENERAL.—I have duly received some January issues of the F. M. S. Government Gazette, and thank you for so kindly arranging this matter. I anticipate with interest the receipt of your publications, including sets of your minutes.

EXHIBITION AWARDS.—Mr. Gilbert Bayes, the Sculptor, has been asked to prepare a special design for the Gold, Silver, and Bronze medals offered by this Association in connection with this Exhibition, and the medals will be struck from this die. Mr. Bayes is at present working on the new Great Seal for the Crown.

With regard to your intimation that the Planters' Association of Malaya will be pleased to offer another trophy, without offering any positive advice on this matter, permit me to make the following observations.

The announcement of the prizes which will be offered in connection with the Exhibition was sent all over the world early in January last. A trophy offered by your Association between now and the time the Exhibition will come on, would not, therefore, receive as much publicity as the other prizes. Should you desire to offer a trophy it might be borne in mind in drawing up the conditions of competition that there are, in addition to this Association's medals, other prizes offered for plantation rubber, pure and simple. The trophy might, therefore, be offered for the best "exhibit" of plantation rubber in the Exhibition. I do not mean the best sample, but the best stand (this was suggested by Mr. STAINES MANDERS), or perhaps your trophy might be offered for the best sample from the Malay Peninsula. In case you have not seen it, I send you herewith the list of all the trophies which are being offered up to now, together with the conditions of competition, so that you will be able to judge if there is room for another. I may mention that a very handsome silver trophy could be obtained for about £25.

I have, &c.,
C. TAYLOR,
Secretary.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur,
Federated Malay States.

London, E. C., 3rd March, 1911.

DEAR SIR,

With further reference to your favour of the 24th December last, in which you were good enough to supply me with sundry information regarding the arrangements made in connection with the Malay Peninsula Exhibit, to which I referred in my letter of February 10th last.

I enclose herewith copy of the joint circular letter issued by this Association and by the Malay States Development Agency, and have pleasure in informing you, that I am told by Sir William Taylor, that within a fortnight from the issue of the letter, donations amounting to £396-13-4 have been received from the following companies :—

The Bukit Rajah Rubber Co., Ltd.; The Selangor Rubber Co., Ltd.; The Bukit Mertajam Rubber Co., Ltd.; The Rembia Rubber Estates, Ltd.; The Shelford Rubber Estate, Ltd.; The Straits Settlements (Bertam) Rubber Co., Ltd.; The Batu Caves Rubber Co., Ltd.; The Klanang Produce Co., Ltd.; The Sungei Salak Rubber Co., Ltd.; The Johore Rubber Lands (Malaya) Ltd.

I am forwarding, under separate cover, a number of copies of enclosed leaflet giving particulars of the Gold, Silver, and Bronze medals offered by this Association in connection with the Exhibition, and should be obliged if you would enclose these when sending out some general communication to your members.

I am hoping to receive the copies of minutes of your Association, and the back set which you kindly promised to make up if possible.

I have, &c.,
C. TAYLOR,
Secretary.

Rubber Growers' Association, London.

Prizes: Gold, Silver and Bronze Medals, For the Best Commercial Samples of Plantation and other Rubber from any Country.

CLASS I—Hevea Crepe, Sheets, Biscuits or Block (Unsmoked).

CLASS II—Smoked Sheet, from Hevea Latex.

CLASS III—Smoked Crepe (any thickness), from Hevea Latex.

CLASS IV—Any form made from species other than Hevea.

N.B.—A Gold, Silver and Bronze Medal, and Certificate with each, will be given in each Class.

SPECIAL PRIZE.—A Special Gold Medal will be given to the best all round sample at the Exhibition.

Conditions of the Competition:

1.—Estates, Companies or Individuals must enter on or before 1st May, 1911, but entries bearing post mark of that date will be accepted. Entries must be addressed to the Awards Committee, International Rubber and Allied Trades Exhibition, 65, Chancery Lane, London, W. C., and should be sent by registered post, or delivered by hand in order to obtain a receipt.

2.—A Committee of Jurors will be appointed by the Rubber Growers' Association, and their decision will be final.

3.—The samples for competition must be in single cases of not less than one cwt. nett.

4.—All samples for competition must be received by the Awards Committee, International Rubber and Allied Trades Exhibition, Royal Agricultural Hall, Islington, London, N., not later than 20th June or earlier than the 15th June, 1911, with mark and class in which they are entered clearly marked on the outside.

5.—All samples to remain on show during the Exhibition, with the Rubber Growers' Association's announcement affixed.

6.—The competition is open to the world, and samples must be from cultivated Rubber for Classes I, II, and III, and from either uncultivated or cultivated for Class IV.

7.—Any dispute to be settled by the Committee of Jurors.

Entries should be made formally as under :—

I/we desire to enter the RUBBER GROWERS' ASSOCIATION COMPETITION, Class/es No....................
(fill in numbers).
and agree to abide by the published Conditions.

Name of Company, Firm or Individual........................
Signature..
Full Address..
Name of Estate..

Date..........................

Rubber Growers' Association.

MALAY PENINSULA EXHIBIT.

INTERNATIONAL RUBBER EXHIBITION, 1911.

London, E.C., February 15th, 1911.

DEAR SIRS,

The Council of the Rubber Grower's Association and the Board of the Malay States Development Agency, desire to call the attention of proprietors of rubber estates in the Federated Malay States to the forthcoming International Rubber and Allied Trades Exhibition (Agricultural Hall, June 24th to July 11th), and especially to the MALAY PENINSULA EXHIBIT, which is a joint undertaking of the Governments of the Federated Malay States and the Straits Settlements and the Planters' Association of Malaya.

ORGANIZATION AND FINANCE.

The organization of this exhibit has been undertaken by Sir William Taylor, K.C.M.G., the Agent in London of the Federated Malay States Government, at the request of the parties concerned, and inasmuch as it is necessary to raise a fund of $10,000 in order that the rubber products of the Malay Peninsula may be suitably displayed, it is hoped that all companies will contribute to this fund, and will remit subscriptions to Sir William Taylor, at the offices of the Malay States Development Agency, 111-113, Queen Victoria Street, London, E.C.

It is suggested that if companies whose production has reached 200,000 lbs. of rubber annually will contribute £50, and companies whose production is between 50,000 lbs.and 200,000 lbs. will contribute £25, and other companies such amounts as circumstances justify, the required sum of $10,000 would be provided. The Planters' Association undertake in their circular letter of 21st November, 1910, to refund after the books are closed any surplus moneys on a *pro rata* basis. The Governments of the Federated Malay States and Straits Settlements have contributed $6,000, and the $10,000 fund now being raised is for the further requisite expenditure.

PRELIMINARY LOCAL SHOW, KUALA LUMPUR, APRIL, 1911.

The Planters' Association of Malaya have arranged to hold a preliminary local Show in April next, when a committee will select from the exhibits which are offered from the producing estates in the Malay Peninsula those which are considered best suited to advertise the quality of the various grades of rubber produced in the country. It is most desirable that every effort be made to organize a really representative exhibit, and it is therefore hoped that companies with producing estates will request their local representatives to forward samples of not less than 25 lbs. to the Secretary, Planters' Association of Malaya, Kuala Lumpur, not later than April 2nd, 1911. It may be remembered that at the Exhibition of 1908, so few exhibits were sent home from the Federated Malay States that the Malay stand had to be partially completed from stocks held in London.

POSITION OF EXHIBIT.

A prominent position has been secured for the "Malay Peninsula" exhibit adjacent to the main entrance to the Hall. In addition to the Malay House shown at the 1908 Exhibition, and the rubber samples and photographs, a large model is being prepared, showing part of an estate, coolie lines, machinery and drying sheds, assistant's bungalow, etc.

In conclusion, it may be pointed out that the Governments of many countries where indigenous rubber is produced are exhibiting at the Exhibition, and it behoves plantation companies to render every assistance to the efforts which are being made to display the cultivated product of British Malaya to the greatest advantage.

Yours faithfully,

R. K. Magor (Deputy Chairman)
W. D. Bosanquett,
Geo. Corderoy,
A. Gordon Dickson,
Thomas A. Gallie,
T. G. Hayes,
Arthur Lampard,
Geo. B. Leechman,
W. Turing Mackenzie,
John McEwan,
W. P. Metcalfe,
H. Eric Muller,
H. K. Rutherford,
Jno. C. Sanderson,
W. H. Treacher,

Members of the Council of the Rubber Growers' Association.

W. T. TAYLOR,
F. DOUGLAS OSBORNE,
R. W. HARRISON,
W. CONLAY,
F. J. B. DYKES,

Members of the Board of the Malay States Development Agency.

Form return to:

SIR WILLIAM TAYLOR, K.C.M.G.,
Malay States Development Agency,
111-113, Queen Victoria Street,
London, E.C.

INTERNATIONAL RUBBER EXHIBITION, 1911.
MALAY PENINSULA EXHIBIT.

We enclose herewith donation value £...........to the fund which is being raised to defray the expenses of the exhibit of the rubber industry of the Malay Peninsula, on the understanding that any surplus be refunded *pro rata* when the accounts are closed.

SIGNATURE..

ADDRESS..

DATE......................1911.

Mr. Lewton-Brain explains the various steps taken and appeals to all planters to send in their samples of rubber this week so as to give plenty of time for selection, packing, etc.

The following selection committee is appointed:—The Director of Agriculture, Mr. Ridley, Messrs. S. Morgan, F. G. Harvey, E. B. Skinner, J. G. Hubback and A. C. Corbetta.

7. HOSPITAL RULES.

The Secretary reads the following correspondence:

Chief Secretary to Government.
F.M.S.,
Kuala Lumpur.

22nd February, 1911.

SIR,

I have the honour to acknowledge receipt of the Federal Secretary's letter 3975 to me dated the 23rd ultimo.

I have laid same before my Association, who in reply would recommend, that the rate recoverable from parole laborers in estate hospitals be 30 cents per diem, i.e. the same as that charged at present in Government Hospitals.

I have, &c.,
H. C. E. ZACHARIAS,
Secretary.

No. 36 in 3975/1910

SIR,

Kuala Lumpur, 27th February, 1911.

With reference to your letter dated the 22nd February, 1911, I am directed to inform you that the charge for native labourers in District Hospitals is 24 cents per diem and to enquire whether your Association considers that this rate should be adopted in the case of estate hospitals.

I have &c.,
F. E. TAYLOR,
For First Assistant Secretary, F.M.S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

No. 38 in 3975/1910.

Kuala Lumpur, 15th March, 1911.

SIR,

With reference to your letter dated the 3rd March, 1911, I am directed to ask if there is no possibility of obtaining before the 30th April the views of the Planters' Association of Malaya with regard to the rate to be prescribed under Section 18 of the Estate Labourers (Protection of Health) Enactment, 1910, (No. 19 of 1910).

2. It is understood that there is urgent necessity for the rules to come into force as early as possible.

I have, &c.,
J. R. O. ALDWORTH,
Under Secretary.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Mr. SKINNER thinks that Hospitals in charge of a dresser only should be able to recover 24 cents per diem, but that placed under a fully qualified European doctor should able to recover 30 cents.

Mr. MACFADYEN thinks that it would be preferable to have a uniform rate, and proposes 24 cents.

Mr. J. GIBSON seconds this proposal, which is carried unanimously

8. ADVERTISING THE PENINSULA IN INDIA.

The Secretary reminds the meeting that this matter was allowed to stand over from the last meeting.

Mr. Dupuis proposes, Mr. Macfadyen seconds, and it is carried unanimously, that it be recommended to the Indian Immigration Committee to take up this matter.

9 MALACCA PLANTERS' ASSOCIATION.

The Secretary read the following letters :

The Chairman,
Malacca Planters' Association,
Malacca.

DEAR SIR,

27th February, 1911.

At the recent Meeting of the Planters' Association of Malaya, your letter disassociating your Association from the Central Body was read and the feeling of the Meeting was that you should be asked to give your reasons for this step.

As Chairman of the Planters' Association of Malaya, I am exceedingly sorry that the Malacca Planters have taken this step. As many of you are aware, it has been extremely difficult to work up the Planters' Association of Malaya to be representative body of Planters for the whole Peninsula with whom the Government are willing to co-operate on any large planting questions. Again I have reason to believe that many shareholders in Companies in the Malacca District will be very much upset with the decision come to.

I shall be glad to discuss matters with you when convenient.

I am, &c.,
C. MOLCOLM CUMMING.

C. MALCOLM CUMMING, ESQ.,
Chairman, P.A.M.,
Seremban.

Malacca Rubber Plantations, Limited,
Malacca, 7th March, 1911.

DEAR SIR,

I am in receipt of your letter of the 27th ultimo in which you ask me to give you our reasons for breaking away from the P.A.M., in the first place I can assure you, we did not break away without fully considering the matter, and at our meeting after a very full discussion the voting was unanimous, to put concisely the members could see no tangible benefit for the large sum we were contributing yearly to the P.A.M. as the labour conditions in Malacca are quite different to the other parts of the Peninsula. I can also assure you that it was in no unfriendly spirit we broke away, it was simply to save our Association spending money for which as far as we could see we were receiving no benefit.

I hope to be in Seremban about the end of the month and shall be pleased to call on you and discuss the matter.

I am, &c.,
(Sgd.) J. W. COLLINS,
Chairman, M.P.A.

10. SECRETARY.

Mr. Zacharias explains that he is going away on leave on the 1st prox. and suggests that Mr. C. St. G. Wheeley be appointed Secretary until the Annual Meeting.

Passed unanimously.

Mr. Skinner proposes a vote of thanks to Mr. Zacharias for his hard work and the great energy he has displayed. Mr. Gibson seconds, and it is carried nem. con. Mr. Zacharias briefly acknowledges.

11. SUBSCRIPTIONS.

Mr. ZACHARIAS explains that both the Lower Perak, and the Kelantan District Planters' Associations had not been in existence during the whole of 1910 and therefore suggests that, as they had already paid $200 each, the balance of subscription otherwise due from them be erased.

Agreed to.

12. GENERAL.

The Secretary places the following letters on the table:

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur,
Federated Malay States,

London, E. C., 3rd March, 1911.

F. M. S. MEDICAL SCHOOL.

DEAR SIR,

Some of the members of this Association received a circular letter from the Principal some time back asking for donations to be granted to a scholarship fund, and by request this appeal was brought before the Council of this Association, although no direct communication had been received, as it was desired by some companies to ascertain the general feeling on the subject. As a result it was decided to recommend those wishing to subscribe to the fund to do so by annual subscription. No doubt some companies have communicated direct with the promoters of the fund, but I am requested by the Selangor Rubber Co., and the Sungei Way (Selangor) Rubber Co., to state that they have now heard that the fund is being called "The W. W. Bailey Memorial Fund" and they desire it to be indicated to the proper authorities that the Selangor Rubber Co. is willing to subscribe $200 and the Sungei Way (Selangor) Rubber Co., the sum of $100 annually. May I ask therefore that you will be kind enough to intimate to those in charge of this fund that the local agents of the two companies named will pay their subscriptions when called upon to do so, and will continue them annually so long as the work done is for the good of the different plantation rubber companies.

With thanks in anticipation,

Yours faithfully,
C. TAYLOR,
Secretary.

The Incorporated,
Liverpool School of Tropical Medicine,
Johnston Tropical Laboratory,
University of Liverpool, 6th February, 1911.

DEAR SIR,

I send you to-day a copy of a recent book on the prevention of malaria in the Federated Malay States by Dr. Malcolm Watson.

This book has been published by subscriptions from a number of Companies shown on a special page, and will be of great importance for the prevention of malaria in all rubber and other estates in the East. It has been suggested to me that members of your Association might like to buy copies, and I therefore inform you that they can be obtained from this laboratory at the price mentioned, namely 7/6. I also send you a number of advertisement slips of the book, which you might like to issue to your members. Mr. Eric Muller, of the Anglo-Malay Rubber Co., has suggested my writing to you.

Believe me,
Yours faithfully,
RONALD ROSS,
Professor of Tropical Medicine.

The Secretary,
Planters' Association,
Kuala Lumpur.

H. C. E. ZACHARIAS, Esq.,
Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

Huttenbach, Liebert & Co.,
Penang, 20th March, 1911.

DEAR SIR,

We make free to address you on the subject of the Quarantine expenses incurred by Estate coolies arriving from India through the Straits Immigration Department, which expenses as you are no doubt aware are payable pro rata per head of coolie by the Estates receiving such coolies.

The present procedure is that we bill the Estates for each shipment as soon as all expenses are ascertained, the bills being checked and endorsed by the Superintendent of the Immigration Department with the request for prompt settlement.

We regret to say, however, that many Managers do not respond to this request readily and are much behind with their cheques, whereby great inconvenience and delay in closing accounts is caused.

Will you kindly draw the attention of your Committee to this and have the matter brought up at the next meeting of your Association. A few words from the Chairman asking members to settle their Quarantine bills promptly will probably have the desired effect.

If these bills are not settled promptly we would have to arrange that in future a deposit is charged at Madras or Negapatam on every coolie shipped, to cover quarantine expenses.

Thanking you and your Committee for assistance in the matter.

We are, &c.,
HUTTENBACH, LIEBERT & CO.,
Local Managers, Negapatam Line.

No. 2 in 822/1911.

Kuala Lumpur, 18th February, 1911.

SIR,

I have the honour to request that you will be so good as to bring to the notice of the Planters' Association that the Malay States Development Agency, 111 & 113 Queen Victoria Street, London, will be glad to assist in engaging Assistants for Estates, Mines and Mercantile Houses.

I have, &c.,
J. R. O. ALDWORTH,
For Chief Secretary, F. M. S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Mr. GIBSON refers to the departure of the Chairman. He had served them nobly and well, and they should put on record a hearty vote of thanks to him. Carried by acclamation.

Mr. CUMMING, in acknowledging, says he wanted the planters to realise that if they stuck together they would get all they wanted.

The Meeting terminates at 12-30 p.m.

C. ST. G. WHEELEY,
Secretary.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the Month of March, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
		° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%		Ins.	Ins.
Kota Bharu	..	151.4	81.6	88.61	72.81	15.80	78.2	.897	76.0	84.8	...	0 93	0.93
* Kuala Lebir	...	...	78.6	93.0	72.4	20.5	75.4	.820	73.3	94.0	...	1.27	0.80
* Kuala Kelantan	...	...	...	85.5	74.9	10.6	...	...	...	...	...	5.56	5.45
* Pasir Gajah Estate	...	...	...	89.3	71.7	17.6	...	...	...	...	...	0 04	0.05
* Kuala Nal Rubber Estate	...	...	...	89.67	72.87	16.80	...	...	...	...	...	2.21	1.01
* Kuala Pahi	...	...	...	88.48	72.22	16.26	...	...	...	...	...	0.70	0.24
* Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	3.45	1.46
* Charing Estate	...	...	...	...	...	...	...	...	...	...	...	1.18	0 42
* Pasir Jinggi Estate	...	...	...	...	...	...	...	...	...	...	...	0.75	0 58
* Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	0 59	0.59
* Pulau Laiat	...	...	...	...	...	...	...	...	...	...	...	0.19	0.10
* Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	0.28	0.12

* Supplied by the courtesy of the Planters' Association of Kelantan.

RESIDENCY SURGEON'S OFFICE,
KOTA BHARU, *24th April, 1911.*

T. J. DEVOTA
for Residency Surgeon, Kelantan.

PAHANG.

Abstract of Meteorological Readings in Pahang for the month of February, 1911

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Kuala Lipis	...	...	81.1	87 0	65.8	21.2	75.3	...	...	...	...	2 58	1.28
... ... Raub	...	...	78 3	89 7	68.2	21.5	73.7	...	...	...	..	7.16	2.51
... ... Bentong	...	...	78.8	88.5	68.8	19.7	74.5	...	...	...	...	3.90	.98
... ... Pekan	...	...	79.6	84.8	70.8	14.0	75.2	...	...	...	...	12.71	8.22
... ... Kuantan	...	...	79.6	88.8	70.0	18.8	73.2	...	...	...	...	7.64	4 87
... Dispensary, Temerloh	...	...	...	88.5	67.0	21.5	...	...	...	...	...	2.71	1.01
... ... Bukit Fraser	...	...	...	...	...	...	...	...	...	...	...	3 40	1.00
... ... Pahang Rubber Estate ...	...	...	...	...	...	...	...	...	...	...	...	5.99	2.20

Senior Medical Officer's Office,
KUALA LUMPUR
6th April, 1911.

A. J. Mc. Closky,
Ag: Senior Medical Officer
Selango·, Negri Sembil n & Pahang.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of March, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.880	145.1	81.3	89.9	74.3	15.6	76 0	0.804	72.5	75	Calm.	10.88	2.71
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	14.04	3.87
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9.05	1.54
,, Klang	...	...	...	91.5	71.5	20.0	...	...	...	...	...	6.17	2.65
,, Kuala Langat ...	...	...	...	91.0	74.1	16.9	...	...	...	...	...	2.17	1.72
,, Kajang	...	...	...	89.2	75.7	13.5	...	...	...	...	...	5.83	2.37
,, Kuala Selangor ...	...	...	...	90.2	75.1	15.1	...	...	...	...	...	1.82	0.65
,, Kuala Kubu	...	...	...	94.1	64.9	29.2	...	...	...	...	...	13.00	3.60
,, Serendah	...	...	...	93.1	71.2	21.9	...	...	...	...	...	4.72	1.09
,, Rawang	...	...	...	92.5	71.1	21.4	...	...	...	...	...	6.62	1.93
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	4.03	1.90

SENIOR MEDICAL OFFICER'S OFFICE,
Kuala Lumpur, 25th April, 1911.

A. J. MC. CLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

PERAK.

Abstract of Meteorological Readings in Perak for the month of March, 1911.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	110	82.85	93	71	22	77.56	875	...	79	...	17.86	4.10
Kuala Kangsar	...	...	80.85	94	71	23	75.71	822	...	78	...	5.82	1.40
Batu Gajah	...	117	81.48	95	71	24	77.00	871	...	83	...	12.17	2.22
Gopeng	...	...	80.58	92	69	23	74.33	767	...	74	...	13.41	4.55
Ipoh	...	...	81.64	94	70	24	76.68	852	...	80	...	11.42	3.15
Kampar	...	...	80.54	92	70	22	76.31	852	...	82	...	13.32	2.85
Teluk Anson	...	...	80.80	93	68	25	75.17	797	...	76	...	6.97	1.80
Tapah	...	...	81.32	92	65	27	76.29	837	...	78	...	8.86	2.40
Parit Buntar	...	...	82.91	91	70	21	77.41	867	...	77	...	5.84	1.68
Bagan Serai	...	...	82.65	92	71	21	77.38	869	...	79	...	4.68	1.27
Selama	...	...	81.02	98	70	28	79.13	971	...	96	...	10.21	2.03

Office of Senior Medical Officer,
Taiping, 11th April, 1911.

S. C. G. Fox,
Ag. Senior Medical Officer, Perak.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in Negri Sembilan Hospitals for the month of March, 1911.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Seremban		150.2	81.4	90.8	72.1	18.7	75.8	0.792	7 .1	.74	N.	8.00	3.79
... ... Mantin												10 93	4.30
... ... Tampin												2.11	1 16
... ... Jelebu												4.90	1.43
... ... Port Dickson												6.99	6 32
Beri-Beri Hospital, Port Dickson												4.03	3.45
District Hospital, Kuala Pilah		142.8	80.5	91 5	72.1	19 4	74.5	0.752	70.6	.74	—	6.19	1.58

A. J. MC. CLOSKY,
Ag: Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

Office of the Senior Medical Officer,
Kuala Lumpur, 25th April, 1911.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 6.] JUNE 1911. [Vol. X

THE DROUGHT SPELL.

The remarkable spell of drought during the present year has attracted the attention of most people in Singapore. In the Botanic Gardens the rainfall ceased on the 19th of January, and with the exception of half a dozen falls at long intervals no rain has fallen till May. At the same time the heat has been very great. Such a period of rainlessness, though not unprecedented in the Colony, is of very rare occurrence, for Mr. Knight, who has a good record of the rainfalls for many years, shows that similar occurrences have been known before.

As usually happens in our dry spells, the sky is rarely cloudless for more than a few hours at a time, but the clouds instead of collecting and producing rain, pass on usually northwards. During part of the time when the drought in the Gardens was at its worst, heavy clouds with thunder and lightning were seen each afternoon on Bukit Timah, our only wooded hill, with an altitude of five hundred feet, and heavy rain fell there, and it was probably due to this that the reservoirs showed during this period no great falling off in water supply, giving an illustration to those who need it of the importance of conserving forested hills in the tropics untouched.

In May, travelling up through Johore, I was told that about Sedenak they had no rain to speak of since January 14th, but at Labis I met rain and evidently it had been regular, and at Batu Anam rain had been falling well every day or so. A theory had been started that this exceptional drought and heat had been caused by the extensive fellings and burnings for rubber planting, large areas being denuded and the exposure of the bare ground to sun heat had caused a heated layer of air which, rising upwards, had prevented the condensation of the clouds.

Mr. Severn gave me the following notes :— "The months of February and March are practically rainless for the Malay Peninsula from latitude 7 to latitude 3. South of that they are generally wet months. This year they have been practically rainless for the first time since rain guages were used. The rain has approached the area south of latitude three on several occasions during these two months. It has fallen heavily in the China Sea and in the Straits of Malacca, within 100 miles of Singapore. The clearing of the jungle in Johore may be the cause of the failure of the usual heavy rains." The clearing, burning and exposure to sunheat of big areas must undoubtedly affect the meteorology of any country.

The evaporation of water from cleared areas exposed to sun is very great. Anyone who has looked over hill forest after a heavy rain must have noticed the roads marked out by a dense mist of rapidly evaporating water rising from the exposed road surface, while no such mist is appearing among the forest trees.

It is certainly remarkable that the worst of the drought has been over the South of the Peninsula where large areas have been denuded of trees, and so recently planted that the young rubber trees have not developed sufficiently to replace the lost forest.

Mr. Knight, who has good records of the meteorology of Singapore for many years, affirms that articles in the local papers have much exaggerated the drought, and calls attention to a paper of Mr. Vaughan's, printed in Buckley's Anecdotal History of Singapore (p. 736,737), in which reference is made to the longest *actual* drought in record, January and February, 1864, when for 35 successive days no rain seems to have fallen in town while, however, Mr. Knight, on Mount Pleasant, registered seventeen hundredths of an inch. "This year," he writes, "there were very few rainless days in January though the total rainfall of the month was only just over 12½ inches. From the 28th January to February 3, seven days were rainless. The rain registered in February by me was as follows :—

4th	...	...	...	1.23
7th	...	...	...	.08
14th	...	...	...	.05
15th	...	...	...	.94
16th	...	...	...	.36
17th	...	...	...	1.38
22nd	...	...	...	.01
			Total	4.05

From the 18th January to the 19th March, 30 days only, 2/100ths of an inch were registered. The rain I registered in March was as follows:—

17th	...	...	...	.01
20th	...	...	...	.52
24th	...	...	...	.04
25th	...	...	...	.61
26th	...	...	...	.02
29th	...	...	...	.32
31st	...	...	...	.02
			Total	1.54

During this time there was much thunder almost daily, obviously the storms were very partial and doubtless the registers in various stations differed a good deal.

I should say the *heat* during the recent drought was probably unprecedented for the time of year.

I have a table of droughts of 7 days and upwards from 1860 to 1910, founded, of course, on my own record. I have been hunting up complete records of those years and may find time to look up for some more. Meanwhile, I may mention a few cases.

Thus, 1877 seems to have been the driest year on record. I was absent for the greater part of the year but I believe the register was kept except in one month (July).

April 1 to May 5, (35 days) only .51
September 1 to 20 (20 days) .31
September 22 to Oct. 21 (30 days) .28.

In 1883 from February 6th to March 12th (35 days), there were only three slight falls, totalling 19 inches.

In other years, there were numerous shorter droughts, 1885 and 1888 were remarkable for this, and were years of short rainfall, and 1895 and 1896 were similar, and in the former year from January 13 to February 21 (40 days), there was only .40 inch. in six falls."

In Buckley's Anecdotal History of Singapore drought in these months are recorded in the years 1841, 1864 and 1883, approximately at periods of twenty years. It the clearing of forests extensively was the cause of these droughts one would expect to find one or more associated with the extensive felling and opening up of the forests when the Chinese developed the gambier and pepper cultivation in Singapore and Johore. We read that in 1836 the jungle had been extensively felled all over Singapore and even at that time firewood was running short, so that the denudation of the country must have been very great, and certainly a bad drought occurred about five years later than this record, viz., in 1841. One would have thought that if this denudation had influenced the rainfall in 1841 the injury would have continued at least till the abandoned pepper and gambier plantations had grown up in secondary forest, but I cannot find anything to show this. Further, the re-clearing of the ground for the extensive cultivation of pineapples, about 1890, should have shown a decrease in the rainfall, but this does not seem to be the case.

However, it must be remembered that the study of the meteorology of the Colony and the rest of the Peninsula has been practically utterly neglected.

We have a few records of rainfall kept by some amateurs, and also of late years by the Government, but no known records of the early times before the forest was felled, and no proper collation and study of such records as we have. The study of the meteorology of a country is one of very great importance from a hygienic and agricultural view besides its general interest and it is very regrettable that we never had a proper Meteorological Bureau, with a Scientific Meteorologist to record and study the influence of the changes due to clearing the forest, on the rainfall temperature, water supply, health of the people and the numerous other points on which a study of meteorology throws light.

Rainfall at the Botanic Gardens, Singapore, for 1911.

Date	January		February		March		April		May	
1	...	...	..	...	...	...	...	...	...	...
2	1	60	2	60	...	..	...	...		
3	...	...	...	...	...	...	1	70		
4	1	70	...	...	...	...	...	...		
5	2	...	...	...	...	...	...	...	...	10
6	...	...	...	...	...	...	...	..		
7	1	80	...	...	...	...	...	...		
8	...	...	...	...	...	...	...	...		
9	1	70	...	...	...	...	...	...		
10	1	75	...	...	...	...	...	20		
11	...	60	...	...	...	...	...	...		
12	...	20	...	...	...	...	...	...		
13	1	60	...	...	...	...	...	...		
14	...	30	...	...	...	...	...	...		
15	...	60	1	60	...	...	...	...		
16	...	70	...	...	...	...	...	...		
17	...	36	1	50	...	...	...	...		
18	...	...	...	...	...	...	...	...	...	93
19	...	30	...	...	...	...	...	...		
20	...	...	..	...	1	50	...	...		
21	...	...	...	...	...	...	1	50		
22	...	...	...	...	...	...				
23	...	...	...	...	...	...				
24	...	...	...	...	...	...				
25	...	...	...	...	...	...				
26	...	...	...	...	...	...				
27	...	...	...	...	...	...				
28	...	...	...	...	...	...				
29	...	...	...	...	...	...				
30	...	...	...	...	...	...				
31	...	...	...	...	...	...				
Total	15	21	5	70	1	50	3	40	1	03

It requires to be planted about a month earlier, i. e., in the beginning of June, and will not grow successfully when sown among maize, as the other kinds usually are. It would not appear to stand shading and requires to be cultivated as a separate crop on open ground. This is a great disadvantage and probably accounts for the fact that it is not commonly grown. This year a quarter of an acre was grown at the Demonstration Farm among maize and gave very poor results, the outturn being only about 2½ maunds.

The usual method of cultivation of the first five varieties is as follows:—After the maize has received the second hoeing and the weeds have been carefully buried, the seed is sown among it at the rate of about half a maund per acre, at the end of June or beginning of July. After the harvesting of the maize, the top parts of the stalks are cut off and carried away, and the soy bean crop is hand-weeded. Where the plants are thick, the weeds are often tied on to the maize stalks, which have been left standing. After the weeding the crop soon covers the ground with a mass of luxuriant vegetation. Soy beans ripen in November. The leaves usually fall off before the crop is harvested, and add to the manurial residue left by the roots, the nodules of which are very conspicuous. Soy beans are not sold in the bazaars to the same extent as Dal. The price is from Rs. 2–8 to over Rs. 3 per maund according to the season. The straw of this crop is coarse and of little value for feeding purposes as stock do not eat it readily when dry. When used for bedding it finds its way back to the land with the manure.

For green manuring purposes for tea or other crops, the erect-growing varieties would be found the most satisfactory, as they do not climb on the tea bushes, and, moreover, they are much more easily dug or ploughed in No. 6, which does not grow luxuriantly in shade, would not answer very well; No. 4, Barmeli Bhatmas, is probably the best variety for green-manuring, and as this is the one usually grown by the native cultivators, seed could easily be obtained.

Particulars of the cultivation and outturn of the best half-acre of Barmeli Bhatmas grown on the Kalimpong Demonstration Farm are given:—

Date 1910.	**Particulars.**	Cost, Rs.	A.	P.
27th June	—Pulling up the weeds from maize land and burying	0	8	0
,, ,,	Sowing and hoeing in seed ...	1	3	0
,, ,,	10 seers seed	0	15	0
9th Aug.	—Stripping off lower leaves from maize stalks	0	6	6
1st Sept.	—Cutting and carrying off tops of maize stalks	0	9	0
2nd & 3rd Sept.	—Hand weeding	3	3	3
15th Nov.	—Cutting, tying into bundles, and carrying to farm steading	2	12	0
28th Nov.	—Threshing and winnowing ...	1	11	0
	Totat cost of cultivation ...	11	3	9

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Outturn.

		Rs.	A.	P.
Grain, 8 maunds 26 seers @ Rs. 3 2 per maund	=	27	0	6
Straw, 11 maunds 28 seers @ annas 2 per maund	=	1	7	6
Total		28	8	0
Balance		17	4	3

or Rs. 34-8- per acre, which, after deducting a half-year's rent, leaves a very satisfactory profit.

(Mr. Percy W. Goodwin, in Quarterly Journal of Bengal Agricultural Dept).

NOTES ON "SOIL AND PLANT SANITATION" ON CACAO AND RUBBER ESTATES.

This is the title of a small work by Mr. H. Hamel Smith, the Editor of Tropical Life, which has recently been received by us. The book opens with an introduction by Professor Wyndham Dunston, of the Imperial Institute, who calls attention to the proposals to found an Agricultural College in the Tropics, for training young men in tropical agriculture. The book itself consists of notes and articles on the hygiene and sanitation of plants in the tropics, chiefly of Cacao and Rubber, with special articles by Fawcett, Hermessen, Johnson and others on rubber and its cultivation. The question of protective belts is dealt with and their use and value shown. Stump-pulling forms another chapter and some of the machines used are described. Somehow machines for extracting roots have not proved very suitable for the forest trees of the Malay Peninsula, and most planters seem to prefer the wo-k with the changkol. Green manuring is next dealt with and the different plants used are mentioned. Valuable as this form of manuring is, it is difficult to understand exactly what is meant by *Tephrosia* being a suitable plant for "clearing the land of troublesome or dangerous weeds." It may be used as a substitute for other weeds and as a green manure cut down at intervals and dug in, and as a nitrogenous plant may prove useful, but it certainly will not kill out lalang, the only "weed" which seems to be really injurious in the east.

A considerable list of green dressing plants is given, especially of those used in the West Indies, and looking through the list in which such cold climate plants as Cickory, Melilot, Vetches, Rape and Cabbages appear, impresses upon the reader the fact that what will be successful in one part of the warmer regions of the world will be undoubtedly a failure in the hot equatorial regions. The same idea strikes one on reading of the machinery, manures, etc., recommended throughout the book. How often have we of late years seen in various agricultural Journals the strongest recommendations of valuable plants for cultivation in the "Tropics" and have met the unfortunat planter who has spent money on trying to grow these plants in the Malay Peninsula, and is sorry he did it. The whole circumstances of the different portions of the warm regions, which are called in a lump the Tropics, are so different that each requires a special form of agriculture of its own. For instance, the cultivation system of the Deccan Peninsula of India is as different from that of the Malay Peninsula as is the system required in Kent from that of Egypt. Crops, manures, methods and machinery are all different.

The article on Rubber diseases cannot be said to be anything like up-to-date, but the author apologises for cutting it short on account of want of time. The next two chapters on Castilloa, by Fawcett and on Ceara are as good as anything in the book, and of considerable interest.

The final chapter is on Mechanical Appliances, Insecticides and Fungicides and one is glad to see so many English firms mentioned as paying attention to our requirements in this direction. It must be admitted that it is not always easy for a firm in England to realise the class of tool required for the use of native labour in the east, or to appreciate without a series of careful experiments in the Tropics the circumstances under which its insecticides have to be employed. No Malay would use the double backed bill hook figured as used for clearing bush. The English bill-hook is too heavy, too short, and the hooked point is a defect. Manufacturers must study the tools as used by the natives themselves, who know by long experience the most serviceable form of tool. There has been considerable improvement in this direction of late years, but in former years the agricultural implements for native use supplied by English firms were often more suitable as museum curiosities than for any other purpose. The author is rather strong on the Vacuum Dryer but as far as Rubber is concerned this has not been popular with the planter apparently from the great heat to which the rubber is submitted. Mr. T. D. Taylor, in an article on this, declares that this may be obviated by not letting the rubber get "bone-dry," and affirms that vacuum dried rubber obtains the best price that rules in the market. Is this so? One may be pardoned for doubting it.

The parts of the book which deal with cacao are useful and important as might be expected, for the author is well known as an authority on this crop.

The work is well illustrated and is distinctly worth placing on the planter s bookshelf.—Ed.

THE MALAY MEDICAL JOURNAL.

The second number of this useful Journal (April 11) under the editorship of Dr. Brooke contains an account of Rengas-poisoning by the Director of Gardens, with details as to the plants producing it.

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symptoms and methods of treatment, and an article by Dr. Brooke on the Soy bean, giving its analysis and uses. The Soy bean has recently leaped into popularity in Europe on account of its now recognised nutritive properties. Dr. Brooke gives the following list of useful things that can be made from it: *Bean curd*, a nutritious jelly used by the Chinese 2,000 years ago; *Bean milk*, which can be used as cow's milk; *Bean cheese*, a well known local comestible; *Bean flour*, for soup or making biscuits; *Bean oil*, edible or for candles or soup; *Bean cake*, for cattle food; *Bean vinegar*, and Soy, and *Bean Coffee* by roasting and grinding it. It is regrettable that the cultivation of this useful plant seems to have failed in the Peninsula.

Mr. Cowap gives also an account of the potable spirits sold in Singapore. There are other medical notes and papers making quite an important contribution to our local knowledge of medicine and hygiene.—ED.

"THE RUBBER COUNTRY OF AMAZON" REVIEW.

Mr. H. C. Pearson, the well known Editor of the "India Rubber World," has brought out in book form the account of his journey up the Amazons to study the rubber industry as carried out in the Amazon Valley. The book is not only a pleasant and amusing account of his adventures, written in a truly American style, but contains a good deal of information on the area in which Hevea is found, the methods of collecting, preparation,a nd shipment.

Though much of the rubber exported from this region is from wild trees, the idea of planting has taken hold of the minds of many and this idea will probably spread. The Government of Para passed laws for the encouragement of rubber planting, which included a premium for the trees actually planted, free distribution of seeds, a reduction of 50 per cent. on the export duty for ten years and 30 per cent. for the next ten years. Arrangements were also made for Government loans, and as a set off an order that a company must maintain a school for twenty orphans and teach them tropical agriculture! These laws, with the exception of the last, might really put the industry on a sound footing, but, as Mr. Pearson points out, Brazilian Governors only last for four years and Governor B. might so interpret them that they might entirely upset the system carried out by the previous Governor A. Everyone who knows anything of South American ideas of government will admit that this kind of check on progress is more probable than not. Still there are signs that the Government intends to foster the industry, although it does not seem clearly to understand how to do it, and a rationally governed country has a considerable advantage in progressive agriculture over one that is ill-administered.

The figures of returns of the yields of rubber trees in the Amazons vary very much. In the lower Amazon some estates go as low as a pound a tree, others giving 2 to 3 pounds a season. When certain estates on the island of Marajo were sold a yield of nearly 9 pounds a tree was estimated. They worked out however to about 7 pounds a tree. A prospectus of an estate near Manaos claimed 17 pounds, while an expert estimated the amount at 10 pounds a tree. Conway, speaking of yields in Bolivia, estimated that they were never less than 3lbs. nor more than 7, which Mr. Pearson thinks approximately correct, but he points out that trees vary not only in size but in productiveness, and that trees that have been tapped for years give somewhat less than those that have only been tapped for a short time.

There is a great deal more of interest in this nicely got up and charmingly illustrated volume, which is well worth reading by all interested in rubber.—ED.

TRAVELLING OF RUBBER SEED.

In certain correspondence as to success and failure in seed of Para rubber sent from the Malay Peninsula to British Guiana some investigations of Mr. T. B. Harrison, the Director of the Botanic Gardens there, are of sufficient importance to be noted.

Seed from good trees were sent from the Singapore Botanic Gardens, and from a locality in the Native States, in a number of instalments. Of these, on arrival at their destination, after a long journey about fifty nine days, those from Singapore germinated at the rate of 702 per thousand, while of the other sendings only 19 per housand germinated.

Both series were packed in tin boxes with charred rice dust, but with these differences, the seeds from Singapore were packed only 600 in a tin, the others contained on an average 823 in each tin so closely packed that they almost quite touched, and the Singapore boxes were only closed, the others hermetically soldered down.

The percentage of moisture in the charcoal varied from 5 to 9 per cent., but these variations apparently exercised little if any influence on the rate of germination. When the packages of the spoiled seeds were opened they were found to be slightly warm and evolved a strong and penetrating odour. The charred rice husk of the package was examined and found to contain hydrocyanic acid in minute amount, formaldehyde in traces, formic acid in some quantity and acetic acid in abundance. The seeds were in fact pickled in the products of their own decomposition. It was noticeable that the proportion of hydrocyanic acid in the vapours of the seeds varied considerably, the amount present in the last shipment received (of which only 16 per thousand germinated) being enough to cause a transient illness in the persons opening the packages.

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"It appears to me," says Mr. Harrison, "that the main cause of the failure of the shipments were the too close packing and hermetically soldering of the packages. In the Singapore supplies the seeds were able to obtain a sufficiency of oxygen to retain their vitality, although, as was desired, their germination was retarded; in the spoiled seed the [illegible] quantity of oxygen was quickly absorbed by the seeds during their incipient germination and the changes then continued in the absence of free oxygen, the oxygen necessary for the production of the formic and acetic acids being obtained from the decomposition possibly of some of the carbohydrates of the seeds. The presence of formaldehyde, hydrocyanic acid and formic acid show fairly conclusively that the changes which resulted in the destruction of the seed originated largely if not mainly in the glucosides of those commencing to germinate."

Hermetically soldered tins containing seeds, in the case of oily seeds like those of Para rubber, seems always to produce decomposition, but fine thin seeds on the contrary are benefitted by it. Many years ago it was found that the only way of shipping Gambier seed to any distance was in hermetically sealed tins. Here the loss of water by drying in these very fine dust like seeds seems to have been prevented and the seeds being fine and loose retained about them enough oxygen probably to prevent any action of decomposition. Packing too close in the case of rubber seed is certainly a mistake. We have received barrels of rubber seed from Malacca, a two days' journey from the estate, in which, though the barrels were by no means hermetically sealed, the temperature on opening the barrels was as great that the hand could hardly be held in the seeds. The seeds in large quantities in the barrels were loose and had no packing at all.

There seem to be two causes of the death of seeds when exported in packets or boxes, (1) drying up of the embryo, especially in fine seeds or seeds in which the embryo is insufficiently protected by the testa or albumen, as in palm seed, and (2) decomposition of the testa or albumen due to the absence of sufficient oxygen.

To avoid both of these accidents is the real art of exporting seed

The following paper from the Agricultural News has also an important bearing on the subject.—Ed.

THE GERMINATION OF HEVEA SEEDS.

It has been found that the seed of Hevea brasiliensis, which has been imported from time to time for use in Grenada, has shown very unsatisfactory germinating power, and in view of the cost of the seed it was considered expedient by Mr. G. G. Auchinleck, B. Sc., Superintendent of Agriculture, to make observations on seeds grown locally, for the purpose of deciding as to what the low percentage of germination might be due. The result of Mr. Auchinleck's investigations have been presented by him in the form of a report from which the following information is taken. They show that experience in Grenada is confirmatory of that which has been described already from other parts of the world.

Mr. Auchinleck points out that the low germinating power of imported seed is obviously due to actual sterility of the seeds to their rapid deterioration after maturity, or to both causes acting at once. For the purpose of obtaining information in regard to the suggested deterioration, seeds from capsules which had been opened just before dehiscence took place were planted twenty-four hours after the fruits had been plucked, a few being kept, however, for three days. The number of seeds collected altogether was 975, and 160 of these were set aside as being too light. That there is a great difference in weight between the heavy and light seeds is shown by the fact that 100 of the former were found to weigh 16 oz; while the weight of the same number of light seeds was only 6 ozs; there was, however, no observable difference in size between the two kinds.

In the continuation of the experiment, all the light seeds were planted in a bed, while of the heavy, eighty were sown at stake and seventy-five in pots. None of the light seeds germinated; of the heavy, nineteen of those at stake, and thirteen in pots, gave sprouts. These results appear to justify the rejection of light seeds when those of Hevea are being selected for planting.

Observations on the rapidity with which the seeds lose weight together with the consideration that from two weeks to several months are required for germination, led to the supposition that the rate at which heavy seeds become lighter in the soil might result in a serious diminution of their power to germinate, before the young plant has had time to pierce the hard seed coat. This led to the following experiment, undertaken to find how quickly heavy Hevea seeds may lose weight.

For the purpose, ten heavy seeds were packed in thoroughly dried charcoal, in a flask; while ten others were placed in a flask open to the air. Each lot was taken periodically from its flask, at the same time, and weighed, with the following results:—

DAY OF WEIGHING.	SEEDS IN AIR. GRAMS.	SEEDS IN CHARCOAL. GRAMS.
1st.	48.8	49.0
5th	48.5	43.5
9th	47.0	40.5
15th	45.5	38.7
20th	44.4	38.0
25th	43.0	37.5
30th	41.8	37.2
42nd	39.0	37.0
49th	38.0	37.0
54th	37.5	37.0

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Calculation of the results shows that in two weeks the seeds kept in air had lost 6 per cent. of their weight, and those in dried charcoal 20 per cent. the latter being about the extreme limit of desiccation: the light seeds took fifty days to reach this.

Further observations, made for the purpose of ascertaining the cause of the decrease in weight, gave negative indications that this is due to the loss of water; and it is thought that it takes place on account of the presence of a definite ferment in the seed.

The fact that the trials were commenced late in the bearing season make it impossible to ascertain if the poor germinating power is the indirect result of some imperfection in the flower, or irregularity in fertilization. It was noted, however, that the embryos of all the seeds examined appeared to be normal, and there was the interesting observation that out of about 320 capsules all were trilocular and three-seeded, except two, which possed four loculi and four seeds. The seeds in the abnormal capsules were subjected to a germination test, and three out of the eight gave sprouts. Attention is drawn to the faint possibility that a tendency toward irregularity in the floral organs of Hevea brasiliensis is indicated, with the consequent production of a low germinating power in the seed that is eventually borne The improbability of the correctness of such a suggestion is, however pointed out.

The final conclusions from the investigation are given as follows:—

(1) Seeds of Hevea Brasiliensis lose weight rapidly after maturity, the loss being apparently due to desiccation.

(2) The loss of weight appears to coincide with loss of germinating power.

(3) Desiccation apparently takes place, in some instances, even before dehiscence of the capsule.

(4) Probably, without special precautions, Hevea seeds will lose their germinating power within two or three weeks after the ripening of the capsules.

The matter of practical importance that can be deduced from these results is that no Hevea seed should be sold until it has been selected rigorously by weight, and there is the additional indication that no unnecessary exposure, or loss of time in planting, should be allowed after the seeds have been received.

(*West Indian Agricultural News. Vol. X. No. 233 p. 111*).

STUMPING ON ESTATES.

Some time ago I was asked to settle a dispute as to when the removal of stumps from an estate should take place, one of the disputants holding that it should be done in two and a half years, after planting. One would have thought perhaps that there could be no question at all in any planter's mind on the subject, but as there is obviously some doubt as to the matter in the minds of some, it is perhaps worth while pointing out, that the object of removing the stumps is to clear out and prevent the development of the termites and Fomes.

Now both these pests attack living or dying trees, not dead and rotten ones. I have never yet seen *Fomes semitostus* on trunks that were actually rotten. The danger lies in the half dead trees on the estate after the burn. In two and a half years, many will be rotten altogether and harmless, though even then there will be some which still retain enough vitality to start a Fomes attack under ground, but it is in the first six months or year that the real damage is done though the Fomes may not show itself in the rubber tree till later when the roots of the tree are big enough for the mycelium to attack them.

It is obvious then that the stumping should be done before planting if possible, and not deferred till later. Again stumping is not so easy after the trees are two years old; there is a great risk of burning or otherwise injuring the young trees, while getting the stumps destroyed.—ED.

PRELIMINARY NOTE ON ANOTHER WHITE ANT CAUSING DAMAGE TO NEW CLEARINGS.

Some cases have recently been brought to the notice of the Department of Agriculture, F.M.S., Kuala Lumpur, in which *Termes carbonarius* has been found killing newly planted stumps by stripping them of their bark.

Up to the present this has only been noticed on old tapioca estates.

These termites were previously considered harmless and it is important to find out as soon as possible how far their ravages have been noticed elsewhere.

Termes carbonarius may be distinguished from other "White Ants" or Termites, as they are more correctly called, by the large size and sooty colouring of the soldiers.

The soldiers of this species are of two kinds; the larger over half an inch long including the mandibles or nippers, which can inflict an unpleasant bite; the smaller, about three eighths of an inch.

The mandibles are curved upwards to the tips and do not possess teeth between the base and the tip.

The queen is as large as that of *Termes Malayanus*, attaining a length of one and three quarter inches. These Termites are often found in the same nest as *Termes sulphureus*, the little sulphur yellow species, which lives in hard cased mounds sometimes five feet high. The queen of *T. sulphureus* averages only one and a quarter inch in length.

Termes sulphureus and *carbonarius* are both described in books as harmless being fungus (or "mould") eaters. The fungus grows on cakes or masses of vegetable matter which are stored in specia chambers in the nest.

Up to now analyses of these masses have failed to show any traces of rubber, but further samples are wanted for analysis with notes of the depth at which they are found, as those examined may only have been collected by *Termes sulphureus*.

If *Termes carbonarius* makes a separate nest, it has not yet been described.

The stumps are reported to be attacked at night and in the early morning after and during rainy weather.

This would be a dangerous pest to young estates, but for the fact that the nest of *Termes sulphureus*, which it inhabits, is easily found on well weeded estates and the inmates, both *sulphureus* and *carbonarius*, can be easily killed with the fumes of arsenic and sulphur applied through the nozzle of the Universal White Ant Exterminator.

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Or carbon bisulphide may be poured on to a large piece of cotton wool placed in one of the upper chambers of the nest and the hole above stopped with clay. The vapour of carbon bisulphide being heavy and very poisonous, sinks along the passages, killing all insects with which it comes in contact.

A third improved method would be to find and destroy the queen and then poison the rest of the inmates of the nest.

Specimens of the various forms of this Termite, preserved in spirit, and the queen chamber in the nest, as well as information about the nesting habits, distribution and damage caused, will be most welcome if addressed to:—

The Director of Agriculture, F.M.S.,
Kuala Lumpur.
Selangor.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State for the month of March, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	83.3	90.8	67.8	23.0	75.9	...	...	...	...	4.01	1.60
,, ,, Raub	...	...	80.4	91.6	68.6	23 0	74.1	...	...	...	...	7.30	1.62
,, ,, Bentong	...	...	79.1	90.4	71.2	19 2	74.6	...	...	...	...	7.45	1.77
,, ,, Pekan...	...	...	81.4	88.5	70.9	17.6	76.9	...	...	...	...	2.84	1.13
,, ,, Kuantan	..	...	82.0	91.0	71.2	19.8	74 0	...	...	...	...	1.59	1.18
Dispensary, Temerloh	...	...	...	92.9	69.6	23.3	...	...	...	...	...	3.37	3 03
Pahang Rubber Estates, Raub	...	...	...	...	...	...	...	...	...	...	...	7.91	2.27

Senior Medical Officer's Office, Selangor, Negri Sembilan, & Pahang.
Kuala Lumpur, 27th April, 1911.

A. J. McClosky,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan, & Pahang.

PAHANG.

Abstract of Meteorological Readings in Pahang for the month of April 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	80.6	90.0	68.4	21.6	76.0	...	...	...	...	6.92	1.70
... ... Raub	...	...	80.7	91.1	68.1	23.0	74.8	...	...	...	...	11.96	3.42
... ... Bentong	...	...	80.1	90.3	70.9	19.4	75.8	...	...	...	...	6.84	3.24
... ... Pekan	...	...	81.3	88.7	73.3	15.4	77.6	...	...	...	...	6.99	1.95
... ... Kuantan	...	...	81.8	91.8	71.4	20.4	74.9	...	...	...	...	3.26	1.50
Dispensary, Temerloh	...	...	...	91.5	69.1	22.4	...	...	...	...	...	12.25	2.91
Sungei Lembing	...	...	...	87.2	66.2	21.0	...	...	...	...	...	9.52	2.06
Pahang Rubber Estate	...	...	...	...	...	...	...	...	...	...	...	8.67	2.06

A. J. McCLOSKY,
Ag: Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

OFFICE OF SENIOR MEDICAL OFFICER,
SELANGOR, NEGRI SEMBILAN & PAHANG.
Kuala Lumpur, 25th May, 1911.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of April, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur ...	29.86	150.3	81.9	90.6	79.4	11.2	76.7	0.824	73.3	75	Calm.	15.39	4.12
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	16.44	4.28
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	11.30	3.18
,, Klang	...	...	...	90.5	70.8	19.7	...	...	...	...	...	6.59	1.58
,, Kuala Langat ...	...	...	...	88.4	73.8	14.6	...	...	...	...	...	9.56	2.50
,, Kajang	...	...	...	86.8	75.7	11.1	...	...	...	...	...	10.90	3.03
,, Kuala Selangor ...	...	...	...	88.6	74.8	13.8	...	...	...	...	...	6.95	1.95
,, Kuala Kubu	...	...	...	92.0	71.0	21.0	...	...	...	...	...	13.24	3.00
,, Serendah	...	...	...	91.4	72.0	19.4	...	...	...	...	...	14.68	2.63
,, Rawang	...	...	...	90.2	71.6	18.6	...	...	...	...	...	15.08	4.16
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	8.24	1.68

A. J. McCLOSKY,
Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Office of the Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.
Kuala Lumpur, 24th May, 1911.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the Month of April, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Mean Maximum.	Temperature. Mean Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
		° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%		Ins.	Ins.
Kota Bharu	..	151.2	81.1	88.28	74.66	13.61	77.2	.848	74.3	80.2	...	5.95	1 72
* Kuala Lebir	...	...	80.9	91.2	73.6	17.9	76.8	.851	74.4	81.6	...	2.15	.85
* Kuala Kelantan	...	...	...	86 53	74.63	11.90	...	...	...	...	...	4.80	3.50
* Kuala Pahi	...	...	...	88.26	72.93	15.33	...	...	...	...	...	2 38	0.62
* Chaning Estate	...	...	...	...	...	...	...	...	...	...	...	3.31	0.66
* Pasir Jinggi Estate	...	...	...	...	...	...	...	...	...	...	...	1 86	0.69
* Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	2.26	0.84
* Pasir Besar ...	...	...	...	...	...	...	...	...	...	...	...	2.41	1.00
* Pulau L[illegible]	...	...	...	...	...	...	...	...	...	...	...	6.46	1.85
* Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	2.68	1.11
* Kuala Na[illegible] Rubber Estate	...	...	...	89.30	74.43	14.86	..	...	...	...	...	1.81	1.09

* Supplied by the courtesy of the Planters' Association of Kelantan.

Residency Surgeon's Office,
Kota Bharu, 22nd May. 1911.

T. J. Devota,
for Residency Surgeon, Kelantan.

PERAK.

Abstract of Meteorological Readings in Perak for the month of April, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point.	Humidity.			
Taiping	...	109	82.75	95	72	23	77 59	876	...	79	...	8.26	2.25
Kuala Kangsar	...	...	80.69	94	69	25	75.99	834	...	80	...	6.53	1.65
Batu Gajah	...	120	81.49	93	71	22	77.31	883	...	83	...	8 01	3.38
Gopeng	...	...	80.12	93	68	25	74.64	788	...	78	...	10.84	2.50
Ipoh	...	...	80.97	94	71	23	76.16	838	...	80	...	7.09	2.20
Kampar	...	...	81.10	94	70	24	76.47	849	...	80	...	17.15	[illegible].60
Teluk Anson	...	...	80.65	93	70	23	76.74	869	...	85	...	11.43	2.50
Tapah	...	...	80.60	93	68	25	76.13	844	...	82	...	9.70	3.60
Parit Buntar	...	...	82.[illegible]7	92	72	20	77.41	879	...	81	...	8.84	2 02
Bagan Serai	...	...	82.27	91	72	19	77.17	864	...	79	...	7.79	1.89
Selama	...	...	81.49	94	70	24	76.65	835	...	80	...	12.45	3 70
Lenggong	...	...	79.62	93	66	27	74 99	806	...	80	...	8 08	2 76
Tanjong Malim...	...	...	80.52	94	67	27	77.07	885	...	87	...	10.54	1.93
Grit	...	...	79.85	95	67	28	75.01	806	...	80	...	5 97	2.60
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	6.07	2.13
Pulau Pangkor Laut	...	...	...	...	...	...	...	...	...	...	...	4.06	1.01
Kuala Kurau	...	...	...	...	...	...	...	...	...	...	...	7.12	1.65
The Cottage	...	...	...	...	...	...	...	...	...	...	...	12.92	4.30
Maxwell's Hill	...	...	...	...	...	...	...	...	...	...	...	11.13	3.85

OFFICE OF SENIOR MEDICAL OFFICER,
Taiping, 13th May, 1911

S. C. G. FOX,
Senior Medical Officer, Perak.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 7.] JULY 1911. [Vol. X

A NOTE ON THE CANKER OF HEVEA BRASILIENSIS.

By Keith Bancroft, B.A.

Assistant Mycologist, Department of Agriculture, F.M.S.

The "canker" of Para rubber was first investigated by Carruthers in Ceylon in 1903-04. Like the "canker" of cacao it owes its name rather to the fungus *(Nectria sp.)* to which it was first attributed, than to the effects produced by the disease. On *Hevea* plantations in Ceylon there has not been much damage caused by "canker", but in mixed cacao and *Hevea* cultivations the disease is regarded as being more serious. Hitherto there has been no record of its occurrence in this country.

The symptoms are the following:—

External symptoms at first are obscure; on young trees the bark may appear to be a little darker in colour, but on older trees there are no observable external symptoms at the commencement. The first symptom which is usually recorded is the cessation of the flow of latex; when this occurs, if the outer bark be scraped away, a black layer is found under which the latex layer is obviously discoloured. When recently diseased the inner tissues possess a grey or neutral tint with a well-defined black border, but in advanced cases of disease they become of a claret or purple colour. In some cases a purplish red liquid is exuded from the diseased parts. These are briefly the symptoms described by Petch in the Circulars and Agricultural Journal, Royal Botanic Gardens, Ceylon, Vol. V, No. 13, 1910.

Cessation of the flow of latex is, however, by no means always a sign of "canker". Trees may cease to give latex through over-tapping or during periods of drought; but it is not uncommon to find trees, here and there, which have stopped yielding from other causes, the nature of which it is not easy to determine. Sometimes these trees are poor in foliage and are unhealthy in appearance, but in many cases the cause of the cessation of the flow of latex is obscure. Such trees commence to yield again after some months or even, perhaps, a year. It is, however, desirable that tapping coolies should be made to report at once such trees as cease to yield, in order that an examination may be made for the purpose of determining whether the effect is pathological.

The presence of a black border or rim to the diseased tissues, as mentioned above, requires some consideration. The normal colour of the outer tissues of the older bark of *Hevea* is either white, yellowish or light or deep red. In barks which possess a light colour it is not uncommon to find a dark brown layer just external to the latex layer; this layer may be 1/15 of an inch in width. The presence of this layer has been repeatedly put forward as a symptom of "canker" by some who have read or heard of the disease. An examination has, however, shown that the cells composing this layer are in a normal condition of health and that the colour is due to the presence of brown colouring matter in the cell-walls.

It has been mentioned above that the disease has not yet been recorded in this country. Ridley has, however, reported a blackening and decay of fruits of *Hevea* in the Federated Malay States* which he attributed to a species of *Phytophthora*. Petch, in 1905, investigated a blackening of fruits of *Hevea* in Ceylon and attributed it to a *Phytophthora sp.*, now known as *P. Faberi*, Maubl., a fungus which is regarded in the light of recent work by Rorer† as the cause of the "canker," and "pod disease" of cacao. The blackening and decay of *Hevea* fruits was previously recorded by Carruthers in Ceylon in 1903-4 and was attributed to a new species of *Nectria*, with the spores of which Carruthers claims to have reproduced the "canker" disease of the stem. Petch examined this fungus in 1906 and described it as a new species, *Nectria diversispora*, which he regarded as a saprophyte. Subsequently Petch described some inoculation experiments with spores of the *Phytophthora*, at wounds made on the trunk of *Hevea*, both by excising a small piece of bark down to the laticiferous tissue without drawing latex and by a slanting cut which did not extend so deep as to cause a flow of latex. Distinct infection was observed after 24 days in three out of five of the first series; but none of the second series showed any signs of infection. The spread of the disease was said to be much slower than on cacao. From these results Petch concludes that the "canker" of the stem and the blackening of the fruits is due to *Phytophthora Faberi*, the same fungus which causes the "canker" and "pod disease" of cacao.

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* Agri. Bull. Straits and F. M. S., Vol. V. p. 39*.

The "canker" fungus of *Hevea* requires further careful investigation; it is desirable that a large number of inoculations be performed with the fungus both on the pods and on the stem, for the purpose of establishing with some certainty its effect on the plant. Much remains to be done on the dispersal of the fungus and on its mode of entrance into the host, its capacity for living and reproducing itself on dead parts of the plant and its range of hosts in this country, in order that some accurate knowledge may be obtained of such important factors as the facility with which the disease may be spread by a tapping knife, the capacity of the fungus for passing from the fruits into the young branches with production of disease in them,—in fact, in order that some accurate knowledge may be obtained of the methods of treatment which are likely to prove most serviceable in combatting the disease.

In view of these considerations, it is proposed during the fruiting season to form an estimate of the amount of the disease in this country, and to carry out such inoculation experiments as will lead to some knowledge of the life-history of the fungus and of the disease which has been attributed to it.

Before concluding this note on the "canker" disease of *Hevea* it is desirable to refer somewhat briefly to two fungi which occur on *Hevea* in this country, and which are regarded by some as being the cause of a disease to which the name "canker" is given. One of these fungi, *Nectria diversispora*, has been mentioned above; the other is *Stilbella Heveae*. The fact that these two fungi are regarded by some as parasites on *Hevea*, coupled with the fact that they are frequently associated with effects on the tapping surface, which at first appear to be pathological, has led me to make investigations on the two fung in order determine whether they existed merely as saprophytes or whether they were capable or causing any injury to the plant.

Nectria diversispora was originally described by Petch on dead branches of *Hevea* and of *Thea viridis*; it was considered by him to be a saprophyte. Inoculation experiments described by him in the Tropical Agriculturist, Dec., 1909, served to show the harmless nature of the fungus. In this country the fungus occurs freely on dead twigs and branches of *Hevea*, on the dead parts of the trunk, and on the wood exposed by the splitting or breaking of the trunks. It takes the form of minute, red points which are sometimes aggregated in large numbers, each individual body being just visible to the naked eye. This is the mature form of the fungus, the *Nectria* stage. This stage is usually preceded by a white mould which is composed of two forms, a *Spicaria*-form, and a *Fusarium*-form.

The ripe ascospores of the *Nectria* were found to germinate in a 1% cane sugar solution in about 24 hours and to give rise to a mycelium which produced the *Spicaria*-form. In plate cultures, on agar-agar and a 10% extract of the juice of the sugar cane, the *Spicaria*-form appeared in five or six days and almost simultaneously the *Fusarium*-

form made its appearance in the cultures. Cultures derived from the conidia of the *Spicaria*-form reproduced the same form in four or five days, and after some weeks the *Fusarium*-form appeared in small quantity. Cultures derived from the *Fusarium*-form produced both the *Spicaria*-form and the *Fusarium*-form simultaneously. Pure cultures were obtained and used for inoculation. The results which attended the progress of the growth in the cultures showed that *Nectria diversispora* was possessed of two conidial forms and the *Nectria*.

The conidia of the *Fusarium*-form and the *Spicaria*-form were obtained for inoculation from the pure cultures of which eighteen had been prepared and studied. Three modes of inoculation were employed; one consisted in applying conidia and mycelium from a culture on to the freshly tapped surfaces of healthy four-year-old trees and keeping the surfaces moist for four days; the second consisted in removing small squares of the bark to the depth of the latex layer, allowing the exposed tissues to remain for a few hours, when any latex which had exuded from the wound was removed, transferring conidia and mycelium to the exposed tissues and replacing the square of outer bark in position. The third consisted in cutting by means of an oblique cut down to the wood on the one-month-old and two-months-old tapping surface, and transferring conidia and mycelium to the cut surfaces of the wood. In the two last named methods the trees were healthy and were ten years of age; control cuts were made on each tree and all of the cuts were kept moist for six days. The ascospores were obtained by crushing ripe perithecia in a small quantity of recently boiled distilled water and transferring them to the wounds; they were employed for inoculation in the second and third methods. Altogether eighteen trees were employed, six being used for each of the methods described above; and in the second and third series each tree was inoculated at three wounds with conidia of the *Spicaria*-form, with conidia of the *Fusarium*-form and with ascospores of the *Nectria*, making nine inoculations on each tree. At the end of eight weeks the inoculations were examined. In those of the first series no effect could be observed on the tapping surface; in those of the second series the wounds were healing, and the squares of bark which had been replaced in the cuts were being forced out by the healing of the wounds; in those of the third series the wounds were healing well. A further examination at the end of ten weeks failed to show any symptoms of disease. It was concluded that the fungus was incapable of inoculating either at the newly tapped surface or at a wound on the trunk. These results serve to corroborate Petch's conclusions as to the harmless nature of the fungus.

*Stilbella Heveae** was described by Zimmermann from Java in 1902 on branches of *Hevea*. This fungus, or a species which in its characters and measurements is indistinguishable from it, occurs

* Renamed ***Stilbum Heveae*** Sacc. and D. Sacc.

commonly on dead parts of *Hevea*, similarly to *Nectria diversispora*. It takes the form of pin-like structures, about 1/20 of an inch long, each consisting of a red stalk and a rounded pink head. The spores germinate readily in a 1% solution of cane sugar and reproduce a white mycelium. Pure cultures were obtained from the spores on agar-agar and a 10% extract of the juice of the sugar cane. The mycelium grows somewhat rapidly, a good growth being obtained in a week. Both the mycelium obtained in the pure cultures and the spores taken from the "heads" of the fruits were used to inoculate ten-year-old trees through cuts which were made on the two-months-old tapping surface. The cuts were of the same two types as in the previous experiments; and three cuts of each kind were made on each of four trees. At the end of nine weeks an examination showed no signs of disease; while the dead portions of the outer bark, which had been severed in making the wounds, were observed to bear the conidiophores of the fungus, thus shewing clearly its saprophytic nature.

Both of these fungi have been found to be associated with an effect on the tapping surface, which at first appeared to be pathological, but which on further investigation was found to be only temporary. This effect has been recorded here and there in isolated cases on several plantations, and on one plantation it was present in some abundance on trees of seven and ten years; it has also been recorded in Ceylon. The newly tapped surface shows it first; here sunken patches make their appearance externally and an examination shows that the bark, which should be renewing, is dead. If the dead bark be removed the wood beneath it is found to be discoloured, and the area of discoloured wood is greater than the external surface of dead bark would indicate. The dead area increases in size and the tapped surface may be affected for the whole length of the tapping cut and for a vertical distance of one or one-and-a-half inches. The effect may occur separately on either of the cuts or it may occur simultaneously on all the cuts. After a time the wounds commence to heal over and the effect, which is, therefore, only temporary, is remedied. There may be, however, considerable damage done by the entrance of boring insects on the dead bark. On the outer, dead bark, a white mould composed of the two conidial forms of *Nectria diversispora* frequently occurs, as also do the sporophores of *Stilbella Heveae*.

Repeated attempts to inoculate with the organisms present in the dead tissues have failed; these, in addition to the two fungi given above, are species of *Penicillium* and *Aspergillus* and two kinds of bacteria. The fact that the trees are capable of healing after a time is sufficient evidence to show that the initial effect is not due to a parasitic micro-organism. The death and decay of the wood is in all probability due to the entrance and percolation of water containing organisms of decay; and it seems probable that the death of the newly tapped bark at the commencement is due to the presence of an excess of water on the tapping surface. In Ceylon, the effect has only been recorded during the rainy season, and in this country, in the case of the single plantation quoted above, the period of commencement of the trouble corresponded with a period of heavy rains. The occurrence of the effect on either cut independently of the other is regarded as good evidence in support of the belief that it is in no way connected with nutrition or weakness on the part of the plant. In Ceylon, Petch regards it as being due to the accumulation of water on the freshly tapped surface.

When trees show this effect, tapping should be stopped on the affected cuts. A more rapid healing of the wound may be obtained by removing the dead bark, so as to leave a ring of healthy bark around the wound, and by tarring the exposed surface of the wood with coal tar, the tar also serving to keep out borers. It is better to warm the tar before using it; but, since in such a case it is more liable to run over the surface of the healthy adjacent bark, it is advisable to recommend the use of cold tar. Care should be taken to apply the tar to the exposed surface of the wood only.

CRYPTOSTEGIA GRANDIFLORA IN MEXICO.

The India-rubber Journal of May 20 gives an account by Mr. Charles S. Dolley of the occurrence of Palay rubber, *Cryptostegia grandiflora* in great abundance in Mexico. This charming climber has long been known to produce a good quality of rubber, but cultivation for this purpose has previously failed, owing to its slow growth. In Mexico it appears to have become even a pest. "There are lands about Rosario in which the plant has made such extraordinary growth, as to invade the fields so completely as to be regarded by the farmers as a plague, owing to the frequency with which the fields must be cleaned and the impossibility of extirpating it, for cutting only serves to make it grow more vigorously." It is said to propagate itself readily by seed and grow to a height of one to two metres a year, droughts do not kill it, and pruning or cutting back only makes it sprout more vigorously. This plant is almost certainly the species commonly cultivated for ornament in gardens in the Straits Settlements. There are two species known in cultivation, one *C. Madagascariensis*, the other *C. grandiflora*. The former is figured in the Botanical Magazine, the latter in the Botanical Register. The main difference appears to be in the shape of the Coronal processes, some projections in the throat of the corolla. In *C. grandiflora* they are described as bifid at the tip in *C. Madgascariensis*, they are entire. In examining many flowers of the plant cultivated here I find that nearly in all, two or three of these processes are split at the tip, the others entire. The colouring of the Corolla is given as lilac in *C. Grandiflora*, and whitish rose in the Botanical Magazine figure, of *C. Madagascariensis*, the centre being darker. In our plant the flower is lilac with a dark centre, so that the differences seem very slight.

The plant cultivated here is easy of cultivation from cuttings or seed, but it has never established itself, though cultivated commonly for upwards of 30 years or probably more, and it has by no means the rapid growth attributed to it in Mexico.

It is a shrubby climber readily forming a thick bush, and apparently requires to be treated by a special process something like that employed for Guayule. The plant is too small to tap, but the proposal is to crush out the latex. In crushing, however, the green juice of the plant combines with the latex and the rubber fails to coagulate. However, this difficulty has apparently been overcome, as good rubber has been obtained from it. There seems to be little doubt that the plant was originally a native of Madagascar but perhaps of India also. Mr. Dolley, however, is in error in stating that "In India it is called Palay, a Malayan word and I believe written incorrectly Pulay or Palai." Palay is not a Malay word, and there is no name for the plant in Malay as it is only known of recent years in the Malay region.

It is hardly likely that the plant would ever come into cultivation as a source of rubber in this part of the world, but if it has run wild to the extent described by Mr. Dolley, in Mexico, it might certainly be worth while working up there.—Ed.

LONGEVITY OF SEEDS.

An important contribution to our knowledge of the longevity of seeds and the structure of the seed-coat is published by Miss Bertha Rees in the proceedings of the Royal Society of Victoria 23, II, p. 393. In an earlier paper Professor Ewart divided seeds into three classes.

Microbiotic seeds which do not live for more than 3 years.

Mesobiotic seeds which last from 3 to 15 years.

Macrobiotic seeds which may be able to germinate from 15 to 100 years.

All the hard seeds are included in the last class. These seeds do not swell when soaked in water. They are more abundant in a dry climate than a wet one and seeds of the same species may vary in hardness according to the climate in which they are grown. Plants with hard seeds are most abundant among the *Leguminosae*, but occur in other orders. The hardness of the seed is due in most cases to the presence of an outer membrane or cuticle, but in Canna seed the ends of the outer layer of long cells (palisade cells) are hardened and there is no true cuticle. This cuticle is believed to be formed by the deposition of particles of wax or fat in the cell walls. This prevents the introduction of water.

In order to let the water into the seed and so start the germination, several methods can be used. The most practical way is to scratch or remove the outer cuticle. If this is broken through at any one point, water will enter and spread to all parts of the seed, so that a single scratch that penetrates the cuticle is sufficient to render a seed permeable. This scratching is done with a file in the case of large seeds, or in smaller ones by shaking them up with sand or passing them through revolving cylinders lined with cement in which sand is imbedded. Another method is to treat the seeds with some strong corrosive agent such as concentrated sulphuric acid, which if the treatment is prolonged sufficiently, will completely remove the cuticle.

The second method is to remove the waxy substances from the cuticle by certain chemicals known as fat-solvents, such solvents are chloroform, ether or hot alcohol. This method is, however, not practicable, owing to the expense of the solvents and the length of time required to dissolve the wax, usually from three to four months. The principle of soaking hard seeds in hot water to make them swell may be explained in the following way: the effect of the heat is to melt the particles of wax which are distributed through the wall. When they are melted they will tend to run together to form larger isolated drops, and in this way spaces will be left through which the molecules of water can push their way into the seed, causing it to swell and germinate.

In the long list of seed that germinated or failed to germinate after a long period of years the Acacias and Albizzias stand out as very long lived. *Acacia acinacea*, after 40 years, gave 55 per cent germination. *A. decurrens* after 16 years on immersion in acid for 8½ hours, gave 100 per cent., and *Albizzia lophantha* after 23 years all germinated.

The time required for the action of sulphuric acid at 12-15° C to produce the swelling of the seed due to the permeation of water varied with different seeds. In *Albizzia lophantha* it required 40 hours at 20 C., or 7 hours at 30° C., Indigo seed (*Indigofera arrecta*) required 15 to 30 minutes.

The long duration of seeds in the ground only germinating when the ground has been cleared and burnt over, is well known to many persons. Ground is cleared and burnt over and plants which had not previously been seen perhaps for very many years suddenly reappear, the seeds having remained quiescent in the ground till the heat of the sun or of fire has started them into germination.—Ed.

ADULTERATION OF PRODUCE.

The loss caused to the planter by the free use of adulterants of his produce is one of those injuries which as a rule he does not appreciate, yet it is nearly as injurious as the invention of a synthetic, the idea of which hangs as a nightmare over him. Unscrupulous dealers invent the most preposterous adulterants for tea, coffee, tobacco, spices and all kinds of genuine vegetable foods, and the buying public sometimes gets so accustomed to the rubbish that they think there is no better to be had, and end sometimes by preferring the refuse to the true substance. This, of course, must eliminate from the producer a large portion of his market. It is true that there are adulteration laws carried out more or less, but these are certainly not efficiently enough carried out so as to defend the producer against the rogue.

At a meeting of the Society of Public Analysis, Messrs. Umney and Bennett read a paper on the valuation of certain spices used in veterinary medicine, curry powder, so there are no means of catching the vendors of adulterated or imitation curry stuffs.

In all these adulterations and fraud the producer suffers from the loss of a market and the reduction in value of good sound produce, and it is to his interest that such swindling should be suppressed rigorously.

Many years ago when coffee was the standard crop of the Malay Peninsula, the editor urged the planters to combine to employ an analyst at home to pursue and carry the dealers in faked coffee, an enormous trade, and to push at the same time the sound genuine coffee of the Malay Peninsula. The cost would have been trivial compared with the profits in the increased sale. Everyone knows the horrible liquid served as coffee at many railway stations and restaurants, and there is also the decoction sold in vast quantities to the "working man" in the morning as coffee, before he starts to work. There does not seem to be the slightest check on what can be sold in these big businesses, the furnishing of which is quite lost to the coffee planter.

Large quantities of spices are used in cattle medicine or cattle foods, and apparently the adulteration acts were not framed to cover these manufactures.

Two forms of adulterations seem to be popular, one is simply to add sand or warehouse sweepings or anything else that was not wasted by anybody and could be mixed with powdered spice so as to be difficult to see. In a sample of gentian it was difficult to find the gentian among the six other ingredients which included Bean flour, quassia and starch. Ground pepper used to be adulterated with ground olive stone and dirt.

Another method is to use the spice twice over, "one firm alone drew the oil from 250,000 pounds of cloves per year, distilling when half or two-thirds of the oil had been yielded, the residue being dried and put into circulation, going chiefly to France and Russia. Cumin and other spices of this type are also used for the extraction of the oil, and the valueless refuse sold to make curry powder and condiments. Spices as a rule, says Mr. Parry in the discussion on the paper, are not as a rule sold as such, they are shipped to India and come back as curry powder.

(To be continued.)

CASTILLOA IN MEXICO.

A report of Mr. Harry S. Smith made to the Board of Agriculture in Trinidad and published in the India-rubber Journal gives an account of the cultivation and tapping of Castilloa in Mexico and Central America. He mentions the great size of the trees, one at Tuntepec measuring 156 inches at three feet from the ground, and those of 120 inches seem to be not uncommon. Bell in his travels in Nicaragua mentions trees of 5 feet in diameter with an output of 50 lbs. when tapped for the first time. The largest wild trees were seen at San Cristobal de Vega in the northern part. In comparing this size with that of Para rubber as we know it, it must be remembered that these big trees are wild and are probably of very great age. Mr. Smith viewing, however, the great size attained by Castilloa, urges distant planting and doubts the wisdom of letting it stand for eight years at 300 to 1,200 per acre. Certainly this does seem pretty closely packed.

The seed seems to be ussaly planted at stake. Clean weeding seems not to find favour with the Mexican rubber planter. "In the early days such fields were kept absolutely clean weeded with the hoe, but it has now been found better to only clean with the machete (parang), hand weeding round the young plants, letting the weeds come up to between the rows, only taking care not to let the bush cover the heads of the plants. This custom I found very general throughout Mexico, many of the older fields being cleaned but once a year just to free the trees from fines, and when the trees were being tapped traces were cleared and the tappers cleared round the trees before putting on the cups, so that the upkeep of the property is very small indeed." The tapping formerly done with a machete is now done with a knife with a V shaped blade. "The trees are tapped with long V cuts connected with a shallow vertical channel to carry the latex in a single cup at the base of the tree, and it was most interesting to see the skilful way in which these men tapping to a height of 30 feet led the latex down a vertical channel without losing a drop even though the tree had a considerable overhang. After making the cut with the V tool, it is opened down to the wood with the point of a sharp knife. The men are supplied with a small line with a weight attached, this they throw over a-branch of the tree, afterwards putting a stronger rope over the branch fitted with a sling in which they sit, pulling themselves up to a height of 30 feet or more, tying the rope to the sling at each foot, so that they may have both hands free to work with."

	Age	Girth	Cuts	Yield
I	14 years	48 inches	Vs 25,16 to 18 inches apart	3 oz dry
II	14 „	46 „	30,14 - 16 „ „	3¼
III	14 „	27½	6,11 - 12	1 oz
IV	14	26	36 cuts with a chizel	¾ oz
V	8	36	V 24,15 - 16 inches apart	3½
VI	8	27	17,14 - 15 „ „	1
VII	8	26	17,13 - 14 „ „	1

The rubber was coagulated with juice of the moon-flower (*Iqomoea bona-nox*.

The rainfall from Mr. Harvey's meteorological returns for 12 years averages 90 inches, the heaviest falls being from July to September, from 12 to 20 inches (July), the lowest May and April, 1 inch. The temperature varies from 55 to 100 (May), but the extreme minimums are not of frequent occurrence, but occur about six times in the season, being caused by winds coming south from Saskatchewan. Of soils he says that Castilloa will not thrive on a stiff clay soil nor on low lying swampy lands. From these notes it will be seen how entirely different the cultivation, tapping soil, and climate for Castilloa from that which is found best for Para Rubber.—Ed.

Extracts from the Administration Report on the Settlement of Malacca for the year 1910,

CROPS.

The padi crop in the Central District and Jasin District was not good. The reasons assigned are a certain amount of disease in the nurseries and lack of rain at ploughing time. In the Alor Gajah District the crop was late ripening, but reported to be heavy where it escaped the ravages of rats. These rodents are very destructive in some mukims. The fruit crop was fair. In the latter part of the year there was quite a quantity of musim salah fruit, (fruit at the wrong season.)

Tapioca and Gambir.

Decrease in the cultivation of tapioca continues and in all cases it is a preliminary to or interplanted with rubber. The price was good and the planters found it profitable to import "roots" from surrounding countries and manufacture tapioca—the price of refuse for pig feeding was specially high. The export figures less import totals show a drop from 140,000 pikuls to 133,000 pikuls. The quantity of gambir produced and exported was almost exactly the same as the year before. Many planters think gambir as a catch crop to rubber is harmless, and in very dry weather the shade to young rubber is thought to be beneficial. Tapioca, on the other hand, is agreed to be more exhausting to the soil and to retard the growth of rubber, it has further been found an active source of fomes.

Rubber.

The quantity of rubber exported increased from about 2,500 piculs to 6,700 piculs with values of $807,000, and $2700,000, respectively. The cultivation of the product continued throughout the year with the greatest vigour, and labourers were able to obtain very good wages. In the spring and early summer 75 cents and $1 a day were being paid to Chinese weeders and tappers. Towards the close of the year

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the efforts of planters to obtain more Tamil labour and a stream of Chinese sinkehs reduced prices to a more normal level. Malay boys of 12 years of age are able to earn 40 or 50 cents a day as tappers, and work is over by 10-30 or 11 a.m.

The formation of companies continued with unabated activity and there are now 35 companies at work in Malacca with a capital of over $15,000,000. Several large blocks of lalang land—formerly tapioca estates—were taken up on special terms as to premium and rent. It has been practically shown that lalang land can be brought into a state of cultivation without excessive expenditure, and Government will be able to demand for the future a small premium. The leading company is the Malacca Rubber Plantations, and the directors and managers have done much in 1910 to consolidate and improve its position. It is a matter for regret that in the case of one company floated at the zenith of the boom the capitalization is much inflated. It is estimated that about 100,000 acres will be planted with rubber by the end of 1911.

One would really have liked a fuller report of the Agriculture of Malacca than this, which, short as it is, however, gives some idea of the vast progress made in Malacca since the cultivation of rubber was started.

Tapioca is said to be "exhausting to the soil" and naturally the amount of material taken out in removing the roots is so much loss to the soil, but there is no reason why some of the actual waste should not be replaced on the land. There is, as nearly always has been, a great feeling against tapioca as a catch crop, based originally on certain very bad cultivation, but it must be remembered that there are not a few thriving rubber estates which were started with tapioca as a catch crop.

The statement that it has been found an active source of *Fomes* does not seem ever to have been proved. At present we have not yet seen a sample of tapioca attacked by *Fomee.* This point should be investigated. It is not usual for a hard wood-eating fungus like *Fomes* to attack a soft pulpy thing like a tapioca root.

It is quite clear that the cultivation of rice and means of dealing with the pests of it requires much attention. In former days District Officers used, we beleive, to report to the Resident Councillor as to the state of local crops from time to time. These reports were, however, never kept or put on record, we believe. They would have been invaluable records to any Agricultural Department investigating the state of cultivation in previous years, and in working out the causes of disease.

DISCOVERY OF A VALUABLE RUBBER TREE IN NORTHERN NATAL.

It is a remarkable fact, states the Financial News, that an imperative demand for any commodity has the effect of unlocking hitherto unsuspected sources of supply; and apparently rubber is not to be the exception to the rule. Whilst millions sterling are expended in planting Hevea Brasiliensis, explorers have been busy testing the properties of the juices of other species of trees and recent news from South Africa has it that a discovery has been made in the portions of the State of Natal, particularly in the neighbourhood of Greytown and Krantzkop, in the Tugela Valley, where a tree known as the Tirucalli abounds. It attains very large size from a few inches to some 15 ft. in circumference, and has long been known, when cut or gashed, to yield a sticky fluid congealing to a putty-like mass. It has now been discovered that this "milk," or "latex," promises to add considerably to the world's rubber supply.

The exudation of the Tirucalli tree has been submitted to analyses, and is stated to be found to contain from 10 per cent. to 20 per cent. of fine rubber and about) 50 per cent. of a valuable resin, from which fine varnish has been made. The quality is stated (on the authority of Dr. Philip Schidrowitz) to be equal to 60 per cent. of best hard Para, and when the latex is still further deprived of its resinous content a rubber is obtained that is scarcely less valuable than the finest plantation smoked sheets. The Natal native Trust has granted a concession for the Tirucalli Rubber Concessions, Limited, to tap and fell the rubber-bearing tree over an area of some 600 square miles. This company will issue its first subsidiary at an early date. Cable advices recently received, signed jointly by three experts (Mr. Herbert Noyes, a well-known Malay planter, Sir Salter Pyne, M.I.C.E., and Mr. Stanley Stiebel), are of promising character. The following are extracts from their cables :—

April 15.—"2,000,000 rubber trees ready to tap, others innumerable."

April 17.—"From personal inspection through the middle of concession, rubber trees ready to tap innumerable, 10 to 48 ins. in diameter. Within a distance of ten miles estimate 3,840,000 trees extending indefinitely."

April 21.—"Investigations continue to be of an extremely satisfactory character. We can certify as to 10,000,000 trees. Cost of production is 1½d. per pound (this refers to cost of collecting the latex and coagulating same)."

Euphorbia Tirucally is a large shrub attaining sometimes a height of 20 feet which, orginally a native of Africa, has long been planted in India as a hedge, and also used for shading young Mango trees from sunlight. The latex which is very poisonous, causing excruciating pain if it gets into a cut in the skin or in to the eye, was formerly at least used in the Straits, (where the plant used to be very common in gardens) for making the recognition marks in cattle, cuts being made in the animal's skin and this latex put into the wounds, causing a permanent elevated mark. Attempts to utilize the latex of Tirucalli as a source of gutta-percha, or a similar substance, were made in the early eighties, if not before, but without any success, and the danger of collecting the latex appears also to have deterred experimenters from continuing researches in this direction. Dr. Riddell (Watts Dictionary) says "that the milk when it hardens after boiling becomes brittle, whilst warm it is as ductile as gutta-percha."

Attempts have also been made to utilize the latex of several other Euphorbias of this type but no satisfactory result was obtained, but further chemical experiments might make it possible to use these also.

The excitement caused by the great development of cultivation of Para rubber in the East set people, especially those living in countries where *Hevea* will not grow, searching for anything that produced any form of rubber, some of their discoveries but only a very few, such as Guayule, did really prove a success, at least for a time. In many other cases in spite of enthusiastic commendation, the plants proved practically or completely a failure. We remember the future of Tonkin was to depend on *Bleekrodea tonkinensis,* rubber trees in the form of the Chinese *Euconia* were to be planted all over Europe, *Cryptostega Parameria* were to make the fortunes of the dwellers in Assam, and *Erangipamie* (*Plumieria*) and *Jatropha-urens* were to form the cultivation of parts of Brazil. The *Sapiums,* too, in British Guiana were to become a substitute for *Hevea braziliensis.* All these plants are practically abandoned and forgotten now. They utterly failed to do what laboratory experiments suggested they could. They grew too slowly, or yielded too little or in some cases gave no rubber at all, or the rubber when it was procured was nearly or quite worthless. We have now a new source of rubber come to the front, a very well known old friend the Milkhedge of India, *Euphorbia Tirucallis,* concerning which we give the following extract from the Financial News taken from the Straits Times. To those who know the tree in the East Indies the size of the plants in the reports 10-48 inches through sounds almost incredible, and the number averaging 60 to the acre also seems enormous. It is a big plant when it is a foot through in India and that only at the base. Welwitsch describes it in Londa in the forests as 8 to 12 feet high with the trunk 6 to 8 in. in diameter, 8 to 12 feet high, the older branches leafless, the younger ones with linear leaves. In other parts of Angola he describes it as a low-shrub two feet high. The trunk has a grey, somewhat rough bark. It usually branches much about 3 or 4 feet from the ground, the branches are cylindric jointed smooth, succulent, and green, with at first a few very small narrow leaves about half an inch long. The flowers are rarely if ever produced here, they are very small and yellow. It is very readily grown from cuttings. It will be interesting to see the results of this venture,—ED.

"DOLLAR SHARE VALUES" (REVIEW.)

This is a very handy little work on the Dollar Share Companies of Malaya published by the Editor of the Straits Times. The valuation of the sterling Companies has been already done by Messrs. Parry and Muraour, but the author considers their scale of valuation is rather too high and adopts the scale known now as the Sengat scale, which, as he says, errs if at all on the side of caution. In the output per acre the both scales estimate 100 lbs. for the first tapping year, 200 for the second and 300 for the third. In the 4th and successive years to the 7th the Parry scale estimates 400, and the Sengat 300 lbs. per acre. In profit per pound we get in the both scales, 1910, 5/- per pound; 1911, 4/-; 1912 3/-; 1913-4, 2/- per lb: then from 1914 onward the Parry scale estimate is 2/- and the Sengat 1/- per lb. The cost of collecting, curing, and placing on the market is 1/6 a pound. It is assumed that all development is charged to capital, and the net profit is the difference between the selling price and the harvesting and marketing price, 1/6 per pound. The scale adopted in the handbook, the Sengat scale, is lower than the early estimates often given when the rubber boom was at its height, but in many cases the estates were originally planted in a loose, unscientific way by Chinese owners, and it depends on the way in which these are handled as to whether they will come up to the estimates of the Sengat scale, as the writer points out. No investor can expect that in a handbook such as this, his actual profits can be definitely stated for even the next few years. Agricultural investments depend on a good many factors the action of which cannot be foreseen. With the various improvements in cultivation and preparation that will be made in the next few years, the output may be increased and the cost reduced much below the 1/6 given as an estimate of production and marketing; but the Sengat scale forms a very reasonable standard by which the investor can judge the value of his investment.

Details of the position, area planted, etc., of each company is given often with what may be called critical notes. Interplanting with coconuts, gambier and tapioca is condemned by the writer. It has always been understood that tapioca among the rubber, unless treated with special care, which was seldom the case at least in Chinese cultivation, did retard the growth of the rubber, though at the same time in other instances it was really the making of the estate, which could not for want of funds at the same time have been brought into bearing. Interplanting with coconuts cannot be justified and such rubber is excluded, properly by the writer who only values such ground by the coconuts. At the end of the book is a scheme of outputs and valuation per acre on three scales, the third of which gives the lowest basis on which a reasonable valuation should be made, the other two are based on the Sengat scale in its entirety and the Sengat scale minus the 5/- which was taken as the rate of profit in 1910. With these scales an investor ought to be able to readily value his investments in an estate. The book will be of interest and importance to all who have interests in the Dollar Rubber Companies in the Malay Peninsula.—ED.

TIMBERS AND TREES OF THE MALAY PENINSULA.

PART I (Review.)

This is the commencing number of a series of descriptions and photographs of the more important timber trees of the Malay Peninsula from the forester's point of view, by Mr. A. M. Burn-Murdoch, the Conservator of Forests in the Peninsula. It is a practical guide for Forest Officers. There are, says the author, at least 100 useful kinds of timber in the Malay Peninsula and he has taken the most important first irrespective of their Botanical position.

The ones selected are Chengal.

Balanocarpus maximus King, *B. Wrayi* King, and *B. Heimii* King; the Merbau *Afzelia palembanica*, (Merbau Paya) and *Afzelia retusa* (Merbau Bukit); Balau Betul *Shorea materialis* Ridl. and Balan Bukit (*Shorea Collina Ridl.*) Durian Daun *Durio malaccensis* and Durian hutan *Durio oxhyanus*; Keledang Plauch *Artocarpus lancifolia* Roxb; Jelutong *Dyera Costuluta* Hook, fil and *Dyera laxiflora* Hook fil. The photographs of the trees and wood sections are specially good. The work is published by the F.MS. Government an costs a dollar.—ED.

AGRICULTURE AND FORESTRY IN HAWAII.

The Report of the Board of Commissioners of Agriculture and Forestry of Hawaii for 1910 shows a record of much important work done during the year. In Forestry much has been done in planting, and the photographs showing the growth of Eucalyptus, evidently a suitable tree for the island, leave nothing to be desired. The area recommended to be reserved for forest is 575,154 acres and that already reserved is 386,547 acres. Besides this, there is a considerable area of privately owned forest. A valuable address on the part played by the Forest in Conservation by Mr. Ralph S. Hasmer is printed, urging the importance of protection, especially from the point of view of the water supply and protection from erosion. He is strong on the point that every plantation company which has waste land should plant up definite areas with forest trees quite as regularly as it harvests its cane, and it ought also to fence off and protect the native forests from which it derives its water. The Entomological division is a very important one in Hawaii, and the precautions against the introduction of exotic insects are perhaps more elaborate here than anywhere else. It is probably easier to prevent the landing of injurious insects in Hawaii than in most countries, as a check can be kept to a large extent by supervision of imported fruits and plants, the Mediterranean fruit-fly, however, has in spite of all precautions effected a landing, and settled down in one of these islands. It is really practically impossible to prevent the invasion of exotic insects into any country. A ship may come to the harbour bringing say, fruit, and not land a single fruit, yet the fruit-fly may easily leave the ship and land. Again many insects can fly very great distances. Were it not so distant, islands like Hawaii would have no indigenous insects. It seems almost hopeless to prevent some pests from landing anywhere, but the authorities are taking the utmost care to check the importation of infected vegetable produce. It does seem, however, carrying matters a little too far when five poisonous snakes belonging to a showman were refused a landing and carefully destroyed. It was hardly likely that the showman would let a breeding pair of snakes escape, and certainly in this part of the world we find the dangers of our poisonous snakes enormously exaggerated, while their use in destroying rats and other vermin is much in their favour. Besides, however, the work of keeping out injurious insects the Entomological department has spent much time and work in introducing enemies of the pests in the form of parasites, and also fig insects without the aid of which first class figs cannot be obtained. This latter introduction has proved a great success. Insectivorous-birds, too, are to be introduced to keep in check the insect pests. The introduction of parasites on pests is a most important work especially in a country so isolated as Hawaii. In countries connected with an extensive hinterland area, or not too far from a mainland, the matter usually soon settles itself. An insect or troublesome weed invades a country and soon becomes too abundant, when it has become sufficiently abundant a parasite turns up, or is evolved, and the pest gets a check which often reduces its damage to insignificance. Such a case is recorded from Hawaii where the local blackberry (*Rubus*) which overrun the islands and become a nuisance, was found to be attacked by a fungus *Clypeosphoeria* and to be dying out, and attempts are to be made to destroy this plant everywhere by infecting it with the fungus.

The report concludes with the report of the department of animal industry. Altogether the work of the year is very creditable.

The staff of the departments comprise six officials for forestry and botanical work, eleven for entomology and fruit inspection, seven for the animal industry and three on the clerical staff, altogether 27 Europeans working under five Commissioners. The expenditure is about 43,000 dollars (American)per year.

AGRICULTURE IN BRITISH NORTH BORNEO.

Rubber and tobacco have been the chief objects of attention, but there are signs of an awakening interest in coconuts.

Rubber.

Para rubber still holds the field, only a very few acres being devoted to other varieties. The system of clean weeding has been generally adopted in preference to the use of catch crops and weed-killers, except in the Interior where *Passiflora* has been found very successful. No serious outbreak of disease has been reported. Work was started on 7 new Estates on the West Coast during the year. Sekong and Sapong shipped rubber and obtained prices near the top of the market. Woodford and Beaufort commenced tapping. 54, 631 lbs. of Estate rubber were shipped from the State, of which Sekong accounts for 49,000 lbs.

Tobacco.

Tobacco was planted on 12 Estates. The crop on the whole is reported as satisfactory and prices since received by telegram have been good. A total of 14,819 bales was exported as against 15,672 bales in 1909. Kudat shipped 1,360 bales less than in 1909, but the figures for two consecutive years vary relatively according to whether part of a crop is shipped in December instead of January. Native tobacco trade has been normal.

Padi.

Although statistics are not available, it is reported that a smaller acreage than usual was placed under padi. This is no doubt due to the fact that the extension of rubber planting has attracted a large number of villagers to work on Estates. The Commissioner of Lands deplores the decrease, and advocates serious attention being paid by Government to this industry. Although the country is capable of producing far more than enough rice for all local requirements, the trade returns shew that 185,000 pikuls of rice, flour and grain (the bulk of the total being rice) were imported.

The crop on the whole was a good one, with the exception of Segama and Tuaran, damaged by flood and rain, and Kaningau where pig and deer are said to have committed extensive ravages. On Banguey Island, with a population of 700, the crop was an entire failure and Government had to come to the assistance of the people who were theatened with starvation.

Coconuts.

Production is steadily increasing, the export of copra being 7,700 pikuls against 5,200 in 1909. The cultivation is principally on the East Coast, but there are indications that it will receive attention also on the West Coast.

Cotton.

The results obtained by the Kultur Syndicate have been disappointing. The West Coast native crop was very slightly below that of 1909.

Sago.

Sago, like rice, suffered from lack of attention, a large number of workers having sought employment on Estates. The Membakut factory closed down.

Market Produce.

The production of vegetables, pigs, and fruit has received a stimulus from the opening of the Estates, and many fresh allotments have been taken up, especially in Beaufort and Membakut.

General.

The Resident of the Interior urges the suitability of the Kaningau district for a stock farm. Such an undertaking should prove very paying if attention were confined to a local market within the State. Some 5,000 beasts were imported, mostly for slaughter, and there seems no good reason why these should not all have been grown in the country.

METEOROLOGICAL.

Rainfall returns were submitted by eight Government Stations and twelve Estates. The largest rainfall was recorded by Kaningau, with 182.58 inches, rain falling on 156 days. This record, if a correct one, is evidence of an exceptionally wet year. Second in order is Kudat with 168.98 inches, followed by Bongawan Estate with 149,04 inches and Bongon Estate, Marudu Bay, with 146 inches. The lowest rainfall was recorded on Sapong Estate, 63.07 inches falling on 229 days, while Melalap, situated halfway between Sapong and Kaningau, reports 63.91 inches on 182 days.

On the East Coast, Sandakan reports 123.22 inches on 209 days, and Tawao 95.15 inches on 160 days. There has hitherto been no systematic compilation of the Meteorological returns of the various parts of the State, the only record of real value being a graphic table compiled some two years ago by Mr. A. B. C. Francis, at that time Secretary to the Governor, from figures collected wherever in existence. From this chart and inspection of all available returns it may be said, that, while the East Coast has a fairly clearly defined wet season from October or November until March or April, the West Coast and Interior have no very definite wet or dry seasons. A combined curve for all stations falls slightly from January till June, rising again towards December.

No abnormal temperatures were recorded.

Estates.

The returns submitted with the Protector's annual report shew that there are 29 Estates planting Rubber only, and 8 Tobacco only. Three plan both these products. Five confine their attention to Coconuts, and one to pepper and gambier. In addition 4 companies were employed in cutting timber, in 10 Camps, two companies worked mangrove for cutch, one prospected for oil and one for minerals.

Labourers.

On January 1st, there were in the State 10,842 persons working on verbal or written contracts under the Labour Laws; this number had increased to 17,594 by the end of the year, the nationalities being as follows:—Chinese 10,683, Javanese 3,726, Malays and Natives 3,185. The total number of labour contracts signed during the year was 11,877.

DISEASES OF PINE-APPLES.

Part I.

In the last number of the *Agricultural News,* some account was given of the fungus *Thielaviopsis paradoxa*, which causes diseases of the pine-apple, as well as of other host plants. It is proposed to give, in this and a subsequent article, an account of the pine-apple diseases due to this parasite, and of certain other diseases of different origin found on pine-apples in Hawaii. These are described in Bulletin 10 of the Experiment Station of the Hawaiian Sugar Planters' Association. The matter is believed to be of some interest, as most of these diseases would appear to occur in the West Indies also, more particularly in Antigua, where they have been made the subject of one or two preliminary investigations; the latest of these was conducted during the pine-apple season of last year. This investigation yielded some information as to the insects commonly found on pine-apples in Antigua, and on their distribution throughout the parts examined. Owing however, to the fact that the black heart disease, which was that especially under investigation, cannot be detected form the outside of the fruit, and to the fact that this was much rarer in that year than it had been for some time, nearly all the specimens examined were found to be remarkably healthy. The few unhealthy specimens were attacked by soft rot, or were bruised, while not a single instance of black heart was found.

FRUIT ROT: To return to the subject of diseases found in Hawaii, the fruit rot or soft rot is undoubtedly the most important according to the account of them given by L. D. Larsen in the Bulletin referred to above. This disease attacks ripe pine-apples in the field, and occurs at the cannery to some extent, but is most destructive on crated fruits during shipment. Such fruits, as well as those in store-houses, are often attacked when still quite green. In the field, direct infection usually commences at the base of the fruit. Here a moist chamber is formed between the bracts which occur on the stem, and the base of the pine-apple; the moisture enables the spores of the fungus *Thielaviopsis paradoxa* to germinate, and the existence of the chamber prevents them from being killed by the sun. Infection in the field may also occur on other parts of the fruit where there is a wounded surface. On crated fruit during shipment, the rot commences at the top or on the sides, almost as frequently as at the base. Here again, the presence of wounds favours the entry of the fungus, but, under the dark, moist conditions that prevail in this case, the fungus is able to penetrate the fruit directly. This it does espesially at points in the cracks between the individual fruitlets of which the pine-apple is composed. The dry conditions and the destructive effect of sunlight on the spores of the fungus prevent direct penetration of the fruit in the field except, as already stated, at the base.

The symptoms of this disease are as follows. The affected tissue has a water-soaked appearance, is of a slightly darker shade of yellow than the normal, and has a characteristic odour. It is very soft, even in the early stages of decay, and, as the disease progresses, becomes so disintegrated as to yield to the slightest pressure. The rot spreads very rapidly, and is found to destroy half the fruit in four days from the date of inoculation. On cutting open a diseased fruit and exposing the infected tissues to the air, an immense number of black macroconidia of Thielaviopsis is formed, giving all the portion attacked a black appearance. These symptoms agree very closely with those of the disease described by Howard on packed pines in Antigua, which was attributed by him to the macro- and micro-conidial stages of *Trichosphaeria sacchari*, which was then regarded as almost certainly identical with *Thielaviopsis paradoxa*. This fungus was found in at least one instance on ripe pine-apples from the same island, in the examination carried out during last season, and refered to above; the symptoms of the rot produced was similar to those observed in Hawaii.

The wounds which enable the fungus to gain an entry, especially in the field, may be due to sun scald, or damage by animals, or by implements during field operations. One considerable source of injury is that inflicted by insects, of which the most important in

Hawawii are: a mealy-bug (*Pseudococcus bromeliae*), a fruit beetle (*Carpophilus humeralis*), vinegar flies (*Drosophila ampelophila* and others), and a grasshopper (*Xyphidium varipenne*). It may be of interest to note that a similar mealy-bug (*Pseudococcus* sp.) is of common occurrence in Antigua on pine-apples; more rarely a scale insect, probably a species of Diaspis, is found, while different species of mites are numerous; vinegar flies and various grasshoppers are common in the islands generally.

The preventive measures suggested by Larsen are:—

(1) Cutting the fruit with long stems in place of the usual short ones.

(2) Cutting the fruit bracts at some distance from the stem instead of pulling them off.

(3) The use of straw for packing material, in preference to excelsior (wood wool).

(4) Wrapping the fruit in paper.

(5) Fumigating with formaldehyde gas.'

It has not yet been determined if the use of this last reagent on a commercial scale will be practicable, as recent work by Flora W. Patterson, of the United States Department of Agriculture referred to in the last article, has shown that a concentration of the gas sufficient to kill the spores of the fungus and to prevent rot, produced a slight change in colour and loss of turgidity in the fruit.

BASE ROT OF CUTTINGS: This is another disease due to the fungus *Thielaviopsis paradoxa*. According to the information given in the Bulletin mentioned above, it was found in some instances that many cuttings were killed when newly planted out in the field, and that death was due to a rot which had spread through the heart and the underground portion. A gentle pull would remove the diseased plants from the soil, and would often separate the leafy top from the base. Occasionally, plants were found to have recovered from a slight attack of the rot. These showed indentations near the base, where the tissues had been destroyed. The disease also occurred on crowns or suckers left in bags, or in piles in the fields and on cuttings during shipment.

Infection appears to occur principally in two ways, either directly from the fungus present on the surface of the cutting at the time of planting, or by means of the mycelium or spores present in the soil. It was found that the disease was much more prevalent when the weather was dry after planting than when it was wet; it may be noted that the harm done to cane cuttings by the same fungus is much more noticeable in dry weather than in wet.

The remedies suggested by Larsen consist of drying the cuttings by placing butt end upwards in the sun for a week; this should be combined with low stripping, that is the removal of as few as possible of the leaves at the base of the cutting. The effect of sulight in killing the spores which is made use of in this instance has been referred to above.

A similar disease was reported by W. V, Tower from Porto Rico in 1906, in the Annual Report of the Experiment Station of that island.

LEAF SPOT: Spots varying considerably in size and shape were found to oocur on the leaves of the pine-apple. In typical instances, the spots consist of a straw-coloured central area surrounded by a dark margin. A black central portion may occur within the straw-coloured area, or scattered black blotches may be found; both of the appearances are due to the formation of the macrospores of *Thielaviopsis paradoxa.* Sometimes, long white arms extended from the black border, at others the spots are white or straw-coloured throughout. The internal tissue is soft and decayed at first, but soon dries and leaves the injured area dry and sunken.

The fungus gains an entry through wounds in the surface. These may be due either to grasshoppers, which feed on the leaves, or to the effect of the spines and edges of other leaves. The punctures made by a scale insect (*Diaspis bromeliae*) do not appear to act as sources of infection. The disease is much more prevalent in damp, shady weather than at other times, as in bright, sunny weather the spores of the fungus are killed. The injury caused by this disease in Hawaii was not sufficient to justify the expense of remedial measures. It is clear, however, that any means tending to reduce the general prevalence of the fungus would not be without their effect on this disease also. A similar disease was reported by G L. Fawcett from Porto Rico, in 1908.

(The Agricultural News of West Indies Vol. X p. 142).

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PAHANG.

Abstract of Meteorological Readings in the various Districts of the State for the month of May, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Kuala Lipi	...	...	81.2	90.5	68.4	22.1	76.6	...	...	...	...	10.84	1.60
" " Raub	...	...	79.2	91.0	67.9	23 1	73.6	...	...	...	...	5.21	.79
" " Bentong	...	...	77.3	90.0	71.4	18 6	71.9	...	...	...	...	3.97	1.68
" " Pekan...	...	...	82.0	89.7	72.3	17.4	77.5	...	...	...	...	2.15	.89
" " Kuantan	...	...	82.2	91.6	72.6	19.0	77 2	...	...	...	...	7.33	3.97
Dispensary. Temerloh	...	...	...	91.1	68.8	22.8	...	...	...	...	...	8.57	3 35
Pahang Rubber Estates, Raub	...	...	...	...	...	...	...	...	...	...	...	4.23	.78
Sungei Lembing	...	...	...	86.8	68.7	18 1	...	...	...	...	...	14.91	2.87

Senior Medical Officer's Office, Selangor, Negri Sembilan, & Pahang.
Kuala Lumpur, *4th July*, 1911.

A. J. McClosky,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan, & Pahang.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in Negri Sembilan Hospitals for the month of April, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban		152.3	80.8	88.8	72.8	16.0	76.1	0.816	73.0	.77	N. W.	6.66	2.78
District Hospital, Kuala Pilah		140.1	8 .9	90 8	72.6	18 2	75.4	0.799	72.4	76	—	4 54	1.31
... ... Mantin												7.26	2.11
... ... Jelebu												9.27	3.05
... ... Tampin												7.76	3.16
... ... Port Dickson												5.36	1.40
Beri-Beri Hospital, Port Dickson												6.87	1.68

Office of the Senior Medical Officer,
Kuala Lumpur, 10th June, 1911.

A. J. McCLOSKY,
Ag: Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in Negri Sembilan Hospitals for the month of May, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban		155.3	79.6	87.8	72.3	15.5	75.8	0.826	73.4	.81	NW	9.69	2.77
Do. Kuala Pilah		136.4	81.3	90.6	72.8	17.8	75.9	0.799	72.5	.75	—	3.18	1.35
Do. Mantin												3 68	0.91
Do. Tampin												7.27	1 50
Do. Jelebu												5.95	1.01
Do. Port Dickson												12.70	2.34
Beri Beri Hospital Port Dickson												11.56	2.75

A. J. McCLOSKY,
S. M. O.
Selangor, Negri Sembilan & Pahang.

Office of the Senior Medical Officer,
Kuala Lumpur, 27th June 1911.

PERAK.

Abstract of Meteorological Readings in Perak for the month of May, 1911.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Taiping	...	106	81.59	92	70	22	76 82	860	860	80	...	15.96	3.15
Kuala Kangsar	...	...	80.34	93	71	22	76.11	846	...	82	...	4.47	1.23
Batu Gajah	...	116	80.14	94	72	22	76.70	883	...	87	...	6 10	2.10
Gopeng	...	...	80.48	91	70	21	74.96	794	...	76	...	7.13	2.00
Ipoh	...	...	80.77	93	70	23	76.45	854	...	82	...	7.99	1.95
Kampar	...	...	8[illegible].92	92	71	21	77.08	879	...	85	...	7.27	1.34
Teluk Anson	...	...	81.87	93	69	24	77.54	877	...	81	...	7.42	2.30
Tapah	...	...	80.85	93	69	24	76.28	844	...	80	...	6.75	1 30
Parit Buntar	...	...	82.33	93	72	21	77.43	876	...	81	...	1.10	.35
Bagan Serai	...	...	82.49	91	71	20	77.11	862	...	79	...	4.65	1.25
Selama	...	...	81.16	94	70	24	77.68	903	...	87	...	14.99	3.98
Lenggong	...	...	79.04	93	70	23	75 40	833	...	84	...	7 21	1.62
Tanjong Malim...	...	...	80.2[illegible]	93	68	25	76.86	879	...	87	...	6.40	2.08
Grit	...	...	78.19	95	68	27	75.03	828	...	86	...	12 44	4.37
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	15.62	2.50
Pulau Pangkor Laut	...	...	...	...	...	...	...	...	...	...	...	5.10	1.12
Kuala Kurau	...	...	...	...	...	...	...	...	...	...	...	3.09	1.15
The Cottage	...	...	...	...	...	...	...	...	...	...	...	28.05	4.57
Maxwell's Hill	...	...	...	...	...	...	...	...	...	...	...	27.37	4.50

Office of Senior Medical Officer,
Taiping, 13th June, 1911.

S. C. G. Fox,
Senior Medical Officer, Perak.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the month of May, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE. Mean Dry Bulb.	TEMPERATURE. Mean Maximum.	TEMPERATURE. Mean Minimum.	TEMPERATURE. Mean Range	HYGROMETER. Mean Wet Bulb.	HYGROMETER. Vapour Tension.	HYGROMETER. Dew Point.	HYGROMETER. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%	...	Ins.	Ins.
Kota Bharu	...	151.2	82.1	88.56	74.58	13.98	78.0	.877	75.3	80.3	...	6.48	2.60
Kuala Lebir	...	...	79.3	89.09	72.09	17.00	76.2	.843	74.1	84.3	...	5 87	1.02
Kuala Kelantan	...	..	...	87.68	74.45	13.22	...	...	...	...	...	5.91	1.79
Kuala Pahi	...	...	...	86.61	72.8	13.81	...	...	...	...	...	5.88	1.12
Kuala Nal	...	...	...	88.12	74.16	13.96	...	...	...	...	...	8.11	1.45
Pasir Gajah Estate	...	...	...	...	...	...	...	...	...	...	...	10.33	2.50
Chaning Estate	...	...	...	...	...	...	...	...	...	...	...	5.79	.96
Pasir Ginggi a	...	...	...	...	...	...	...	...	...	...	...	5.85	1.25
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	7.35	2 04
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	14.20	3.33
Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	8.28	1.49
Pulau L[illegible]iat	...	...	...	...	...	...	...	...	...	...	...	11.48	2.21

RESIDENCY SURGEON'S OFFICE,
Kota Bharu, 26. 6. 1911.

T. J. DEVOTA,
Residency Surgeon, Kelantan.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of May, 1911.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur ...	29.844	145.5	80.9	90.4	79.9	10.5	76.7	0.833	73.7	79	Calm.	3.04	0.93
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	3.64	1 34
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	3.55	0.85
,, Klang	...	...	...	90.3	70.6	19.7	...	...	...	...	...	5.15	1.61
,, Kuala Langat ...	...	...	...	87.3	73.8	13.5	...	...	...	...	...	7.22	1.60
,, Kajang	...	...	...	85.9	75.5	10.4	...	...	...	...	...	5.57	1.19
,, Kuala Selangor ...	...	...	...	87.3	74.5	12.8	...	...	...	...	...	1.49	0.30
,, Kuala Kubu	...	...	...	92.0	70.2	21.8	...	...	...	...	...	5.45	1.00
,, Serendah	...	...	...	91.1	71.5	19.6	...	...	...	...	...	4.08	1.55
,, Rawang	...	...	...	90.5	71.9	18 6	...	...	...	...	...	6.87	1 76
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	0.76	0.31

Office of The Senior Medical Officer,
Selangor, Negri Sembilan and Pahang,
Kuala Lumpur, 27th June, 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 8.] AUGUST 1911. [Vol. X

BIRDS AND CROPS.

The counsel for the defence of the plumage trade has a very difficult case to deal with. He is represented to some extent by the Editor of "Tropical Life," who read a paper on the subject at the First International Congress of Tropical Agriculture, and has also published some letters to the "Times," in which he puts up presumably the best defence he can for an utterly-indefensible position.

It is unnecessary probably to give any of the accounts of the merciless slaughter in thousands of the most beautiful birds of the world, and the still worse feature of the death from starvation of myriads of nestlings, in order to decorate the hats of European women. The story has been told and illustrated many in papers, and should bring shame to the wearers of such millinery. The first point in the subject which attracts the attention of the ordinary thinker is that this destruction in no way benefits the human race. The birds are slaughtered merely for temporary use in the place of artificial flowers, ribbons and such ornaments of hats. The millinery trade is, says the counsel for the defence, naturally protesting against such vexations and "uncalled-for" (!) legislation as Lord Curzon's notification that the trade is prohibited in India. This argument will not, however, appeal to any naturalist nor to any lover of birds or admirer of nature.

"For twenty-five years and more that I have been mixed up in the East and West Indian business, I have always understood that parrots, paroquets, peacocks and other birds abound in the tropics in very large numbers, and taking the world as a whole are not decreasing but at times are on the contrary a serious nuisance, danger and expense to the planters," so says the counsel. The destruction of the paddy crops by peacocks, parrots, birds of paradise, egrets, hummingbirds, and seagulls the chief victims of the plume-hunter is, however, hardly as great as we think as he estimates. But he says not only do these (mostly insectivorous birds) damage the crops but also acting as seed distributors, they distribute weeds and proscribed plants more freely than useful ones. This is rank nonsense, the troublesome weeds are almost invariably herbs with windborn seeds, compositae, grasses, and sedges, etc. On the other hand, the re-afforesting of waste ground by trees and shrubs, a very important matter is almost invariably done for us by birds helped, it is true, by bats. If we had no weeds or "proscribed plants," whatever those may be, but what were dispersed by birds, we should hardly have any weeding to do at all. The dispersal of tree seed to islands, or again throughout our woods by birds is of the utmost value, and we can well pardon the birds for bringing a few plants which we do not want, as long as they bring larger quantities of the ones which we do. But the humour of this argument lies in the fact that most of the birds slaughtered by the plume-hunter are insectivorous-birds, such as egrets and bee-eaters, great enemies to grass hoppers or birds living in forests far from the plantations such as peacocks, birds of paradise, fairy blue-birds, pheasants, etc. Of course there are birds which eat a little fruit. Here for instance we have the bulbul, (*Pycnoxotus analis*) our commonest bird. He certainly does carry off some fruit which often we do not wish to lose, but amply does he pay for this in this destruction of grass-hoppers, locusts and other injurious insects. It is, however, not this common class of bird that the plume-hunter ever hunts.

After discussing the question of cruelty, he goes on "neither is there any waste for the natives having killed the birds, often to save their paddy and wheat crops from destruction take the trouble to skin them instead of only plucking them, and the skins are sold to collectors of the export dealers whilst the flesh is eaten, for needless to say in half starved India nothing is wasted." This picture is too deliciously funny to require any comment, and serves well to show the utter ignorance of the writer and how hard he is put to it to find arguments for his defence. He gives the advantages of the death of the bird as four: (1) a pest is removed (2) food is supplied to those who badly need it, (3) an article of commercial value passing through several hands is obtained, (4) those engaged in the feather trade are benefitted. The last two advantages are practically one and the same thing, and the first advantage is negatived by the fact that the greater part of the birds destroyed are valued friends to agriculture or perfectly harmless. While the second is absolutely ridiculous. How many of the myriads of egrets, birds of paradise, gulls, bee-eaters, humming-birds, or even peacocks, against the flesh of which the Malay at least has a strong prejudice, are eaten by the bird-hunters?

The sole argument left is that the beautiful birds of the tropics should be destroyed for the benefit of the dealers in plumage in London and Paris. Who, except those who make money in this criminal trade would be worse off, if no woman ever wore the fragments of a bird in her hat again?

A good many years ago a French plume-hunter took up his abode on the slopes of Mount Ophir and proceeded to exterminate all the most beautiful birds he could find. The Government put a stop to this by passing the Bird Protection Ordinance, and he migrated to Negri Sembilan where the same ordinance was passed, whereupon after selling, it is said, the goodwill of the business to some one else, who did not know it was illegal, he left the country. When I first visited Mount Ophir I was struck by the paucity of birds in the district, due to this plume-hunter, and I met one of his native assistants who applied to me for a job in collecting birds; on a later visit to this district I was pleased to see a great increase in the number of birds of all kinds, and especially the beautiful fairy blue bird, *Irene Pulchella*. Now, this kind of ordinance which saved the birds from being utterly exterminated has not in any way interfered with the prosperity of the rices, field and it is a similar Ordinance passed in India by Lord Curzon that is so strongly objected so as being most injurious to the Agriculturist.

The story of the Hawaiian islands in which agriculture is very seriously checked by the absence of insectivorous birds, exterminated long ago for their feathers, is a warning to those who defend the plume-hunter on the score of improvement of agriculture. In the latest report of the Board of Commissioners of Agriculture and Forestry of Hawaii, we read the struggles of the agricultural department against the insect pests, and the work and money that is being spent to introduce the enemies of these pests, both insect parasites and insectivorous birds, to do the work that an undisturbed bird-fauna would have done at no expense to the country.

In selecting birds for the Hawaiian islands Mr. Henshaw is sufficiently cautions not to recommend for introduction those that are mainly seed or fruit eaters, and it is true that there are birds which have been found in a certain number of places to have proved very injurious in this way, especially. in cold climates where cereals are cultivated over large areas, but here in the tropics whence most of the bright plumaged birds are derived for the trade, the little trouble even in the ricefields caused by the seed-eaters, is compensated for by the valuable work done in the destruction of insect pests. The enemies to our fruit trees are all mammals, chiefly bats, musangs, squirrels and rats. It is very probable that in cases where the seed eating sparrows and finches are in excess, and thus destructive, this is due to destruction of the hawks which keep them in check. In the first series of the "Bulletin" under Notes on Sugar Cultivation, I pointed out that in the sugar fields small birds were rare as in these open fields, they had no

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place to roost or nest in, and in flying over the sugar fields they were very liable to the attacks of hawks, which were remarkably abundant. The sugarcane suffered very much consequently from insect pests, and I urged that trees should be planted about the estates to give the insectivorous birds a chance of doing their work.

The value of these insectivorous birds is absolutely incalculable, and it is most unfortunate for Mr. Hamel Smith's argument in defence of the plumage trade, that the plume-hunter is a benefactor to the agriculturist, that most of the birds he destroys are either valuable insect-eaters, or birds that living far away from cultivation, do no harm at all to anyone. The trade is unnecessary, indefensible and injurious and should be rigorously suppressed everywhere.

CINNAMOMUM DECSHAMPSII.

In describing the *Lauraceae* of the Malay Peninsula, Mr. Gamble describes a new species of Cinnamon from Singapore and Penang under the name of *Cinnamomum Deschampsii.* This tree is by no means uncommon in cultivated places in Singapore, and I took it for a form of the true Cinnamon *Cinnamomun Zeylanicum.* It does not appear to be wild anywhere here, but has apparently been introduced and occurs in deserted village sites. The tree has a stout stem, and when growing free from crowding by other vegetation, a rounded head of considerable size. The bark is thick and very aromatic, grey outside, red within, the flavour is more like that of Cassia, *(Cinnamomum Cassia),* than that of Cinnamon, very pleasant. The leaves are smaller and rounder than those of the true common Cinnamon, dark shining green when adult, bright red when young.

The inflorescence is rather more lax and not so much branched as that of true cinnamon, but in general details seems to be closely similar. The chief differences are the somewhat longer pedicels of the flower and the elliptic petals slightly narrowed at the base, those of the true Cinnamon being shorter, ovate and slightly acuminate. The stamens are more slender, and the anther not quite so wide. The fruit much resembles that of cinnamon but the cup formed by the enlarged sepals is thicker, with longer more acute points to the sepals. The tree is said by the Tamils to be a native of the hill forests of Madras, where it is known as Karuvapattai Maram. The bark is collected from old trees and ground up, used to flavour curries, and meat, beef, mutton or fowl but not used with fish. It is collected in the forests and sold in bundles in the market. The name Karuvap-pattai is given as Tamil in Watt's Dictionary for Cinnamon, but this plant is quite distinct from that, which is not a native of S. India.

FEDERATED MALAY STATES.

Report of the Director of Agriculture for the Year 1910.

The year has been marked by numerous changes in the staff of the Department of Agriculture. The resignations were:—Director of Agriculture and Mycologist, Mr. W. J. Gallagher, on 1st June; Mr. J. W. Campbell, Superintendent of Government Plantations and Assistant to the Director, on 23rd June; and Mr. F. R. Long, Superintendent of Government Plantations, Perak, on 30th June. The new officers are:—Director of Agriculture, assumed duties, 13th November; Mr. B. J. Eaton, Agricultural Chemist, transferred to this Department, 1st October; Mr. C. K. Bancroft, Assistant Mycologist, assumed duties, 8th August; Mr. C. B. Holman-Hunt, Assistant Entomologist, transferred to this Department, 1st December; Mr. F. G. Spring, Superintendent of Government Plantations, assumed duties, 21st October; Mr. C. E. B. Pratt, Assistant Inspector of Coconut Plantations, assumed duties, 11th May; and Mr. W. L. Wood, Superintendent of Government Plantations, Perak, assumed duties, 7th October. A second Assistant Mycologist has been appointed and is expected early in 1911. The only officers who were attached for the whole year were:—Mr. L. C. Brown, Inspector of Coconut Plantations, Mr. H. C. Pratt, Government Entomologist, and Mr. T. C. Nock, Assistant Inspector of Coconut Plantations, Selangor and Negri Sembilan.

With so many new officers, most of whom did not join the Department until nearly the end of the year, it has been impossible to originate much new work and they have been chiefly occupied in gathering the threads of their predecessors' work and endeavouring to discover a starting point for new work and new experiments. I have had but little opportunity of visiting plantations during my six weeks in the States. There was a considerable accumulation of office and experimental work that demanded immediate attention and this has occupied the greater part of my time.

RUBBER.

The year 1910 has been a remarkable one in the history of the rubber industry. The high price of rubber during the early part of the year and the realisation by the European investors of the value of rubber shares brought about the so-called "rubber boom" and the price of shares reached very high figures. That the industry came through this period with so few failures is one of the strongest proofs that could be offered of its inherent soundness.

The price of rubber fluctuated considerably during the year. Starting at 7*s.* per lb. in January (sheet and biscuit), it rose to 8*s.* 2*d.* in February, to 9*s.* 7*d.* in March, and finally reached 11*s.* 10½d. in April-May, after this there was a fairly steady decline to 8*s.* 5*d.* per lb. in July and to 5*s.* 5*d.* in December. The lowest figure was 4*s.* 9*d.* in October. The cost of production has probably increased above that given in the Director's Report last year, and might be given now as 1*s.* 6*d.* per lb. It is obvious that the industry should be fairly prosperous even if the price of rubber fell considerably below the minimum of 1910.

The acreage opened in the Federated Malay States in 1910 was 48,813 acres against 28,905 acres in 1909 and 41,813 in 1908, the largest proportionate increase being in Negri Sembilan. Perak shows the greatest increase over 1909.

The rubber output for the Federated Malay States again increased by over 100 per cent., and is almost four times as great as that of 1908. The output for 1910 was 12,563,220 lbs. against 6,083,493 lbs. for 1909.

The "output," as given here, for the Federated Malay States, is about 400,000 lbs. in excess of the "export" of rubber as returned by the Commissioner of Trade and Customs (12,212,526 lbs.) The difference, of course, represents largely the amount of rubber on hand, in drying houses and stores, on the plantations at the end of the year. The largest excess was in Perak, where a number of factories were making blanket crêpe towards the end of the year, and this requires a much longer drying period than the thin crêpe, and consequently larger amounts were in the stores than previously.

The percentage of increase for 1910 in the various States is in:

Selangor	90 per cent.
Perak	190 ,,
Negri Sembilan	100 ,,

while Pahang now appears on our columns for the first time with an output of 2,483 lbs.; this last is probably not as high as it should be, as the Commissioner of Trade and Customs' figures show a much larger export.

The total output for the Peninsula also increased by over 100 per cent., and amounted to over 6,400 tons as against 3,000 tons in 1909. Large increases are shown by Province Wellesley and Johore, while Kelantan and Kedah now appear as exporters for the first time with an output of nearly 19 tons. The increase in Malacca is also large, but the figures for both last year and this are very uncertain.

The increase in output in the Colonies and Protected States for 1910 is in:

Province Wellesley	50 per cent.
Johore	100 ,,

The total acreage planted up in rubber at the end of 1910 in the Federated Malay States was 245,774 acres, an increase of 25 per cent. over that of 1909. The total acreage for the Peninsula was 362,853 acres, an increase of 23 per cent. on the acreage of the previous year.

It is difficult to prophesy with regard to rubber, but I should judge that for the next four years the increases for Malaya should be at least 10,000,000 lbs. for 1911, 15,000,000 lbs. for 1912, 15,000,000 lbs. for 1913 and 20,000,000 lbs. for 1914, provided that the supply of labour is sufficient to perform the necessary tapping and other agricultural operations on the acreages opened up during the past few years. After that the output should show a steady increase for the following four years, provided, of course, that nothing unforeseen arises to cause the abandonment of already planted land, after which the increase may be slighter. In 1916 the output for Malaya should be at least 65,000 tons, on the present acreage alone.

Crops grown with rubber may be divided into two classes: catch-crops and cover crops. Catch-crops are those grown with the object of obtaining revenue for the land, during the first four or five years, up to the time when the rubber is at the producing stage. Agriculturally they are not to be recommended. The growth of the rubber is materially retarded, the catch-crop yields returns for only a few years, then unless the stumps of these plants are left to serve as reservoirs for root disease, there is considerable expense to be incurred in clearing them out. The principal catch-crop in Malaya is coffee. In the Federated Malay States only less than 6 per cent. of the rubber acreage is planted with catch-crops as against 10 per cent. for 1909, while for the Straits Settlements the percentage is only 28 per cent. against 40 per cent. last year. Evidently the practical planter is realising more and more the disadvantage of the method of cultivation.

Cover crops are planted between rubber, at present principally with the object of reducing the expenditure on weeding, until the rubber trees have grown sufficiently to kill out the weeds by their shade. Where labour is insufficient to keep an estate clean weeded, the use of a cover crop may be recommended as it may require less keeping in order than the original weeds and at the same time be less harmful to the trees. There is, however, no cover crop that can be unconditionally recommended in Malayan plantations, and undoubtedly the best procedure at present is absolute clean weeding, where the labour force is sufficient to obtain it. If a leguminous cover could be introduced, which could be easily kept under control, it might be preferable even to clean weeding, particularly if it could yield sufficient revenue to pay for the cost of its own cultivation. At present the department is experimenting with ground-nuts, to determine if this crop will satisfy the conditions named, besides a number of non-revenue producing covers.

Tapping is a subject that demands mention. In spite of numerous new inventions, the favourite instruments are still the simpler tools, the gouge (straight or bent) and the farrier's knife or jebong. Which of these is best depends really on which the tapping cooly is used to. Where there is sufficient European supervision and a stable labour force, the tapping in Malaya is usually excellently done, with consequent good renewal of the bark. Where one or other of these

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conditions does not obtain, it is common to see wounds right down to the wood. The results of bad tapping will be noticeable in about four years' time when the irregularly renewed surface comes to be tapped again; the tapping will then be very difficult to carry out and still more difficult to carry out without again increasing the damage. Some of the oldest trees in various places in the Federated Malay States are an object lesson in what may be accomplished by bad tapping; little blame can be attached to the original workers, who had to learn by experience how to tap and how not to; but estates with trees now being tapped for the first time should profit by others' experiences, as upon the quality of the present tapping a good deal of their future prosperity will depend. I strongly recommend that all wounds to the wood in tapping be immediately painted with cold coal tar. This draws attention to bad tapping and saves attack by wound-fungi and borers.

Overtapping, especially of young trees, is another procedure to be avoided, though still too common doubtless owing to the high price of rubber. No system that does not provide a four years' renewal of the bark can be described as sound, and I think this is recognised by most planters, although some may not be able from various reasons to adopt such a system.

The manufacture of rubber may best be described as still in the experimental stage, neither buyers nor sellers knowing sufficiently the kind of rubber that is best for manufacturing purposes. What is most wanted in the industry is a simple and reliable test for the strength of rubber as it leaves the plantation factory, comparable to the polariscope test for sugar; I may add that such test is, so far as I can tell, not in sight, and rubber now can only be judged by colour and general appearance, until after it has been vulcanized. At present there seems to be preference for smoked rubber, and many estates are contemplating the erection of smoke houses and will be turning out smoked sheet largely in place of the hitherto favoured crêpe. The smoke houses are usually two-storied, the rubber being hung, as taken from the rollers, in the upper, while fires are kept going below; openings of various sizes and descriptions are made in the floor between the two stories. Cocount husks form about the best fuel obtainable in large quantities, and it is quite probable that estates which have coconuts planted up as a secondary crop will find them of great value for this purpose alone, as the demand for husks will increase considerably in the next few years. The movement appears to be quite a sound one, as there is little doubt that properly smoked rubber is actually stronger and better than unsmoked, apart from all temporary fashionable demands.

Two fungoid diseases of rubber alone call for mention: root disease due to *Fomes semitostus*, and die-back due to *Thyridaria (Diplodia) tarda*. These with other diseases are treated more fully in the report of the Mycologist appended. Root disease is very commonly present in plantations and is responsible for a considerable loss of trees per acre every year. Fortunately, it differs from most other root diseases caused by related fungi, in that the *Fomes* is not able to exist for long periods in ordinary soils apart from the plants it is parasitising. On this account energetic and early treatment of individual cases as they occur should in the course of a few years almost entirely rid most estates of this fungus. The department has rendered advice and assistance to many estates on this subject and is always ready to do so.

Die-back has been shown by the Mycologist to be due to the same fungus that causes a similar disease in cacao in many parts of the world. On a well-conducted estate, where the trees are healthy, it is not a disease to be feared, but it must be watched. I have known *Diplodia* for many years and have never found it causing serious trouble except when the trees were originally unhealthy, thus predisposing them to attack. Careful attention to all wounds produced either by natural or artificial causes and cutting off diseased branches, well below the apparently attacked region, in early stages, should ward off serious trouble on most estates in Malaya. Where the trees are originally unhealthy, either from bad drainage or other unfavourable soil conditions, there *Diplodia* may cause very serious losses, and special efforts made to ward off infection and to improve the external conditions.

Of insect pests, *Termes gestroi* is still commonly present and requires steady attention. The Entomologist has visited a number of estates in this connection and given advice as to treatment. Most estates now treat this pest with success following the Entomologist's recommendations.

Borers have also received attention, they usually enter at a dead surface, but often proceed from this into the living tissues, where they may do considerable damage. Here, again, is seen the need of careful attention to wounds especially those made in tapping.

Another phenomenon that may be described as a disease is the formation of large lumps of woody tissue covered with bark, too often seen on old rubber trees. These appear to be buds developing under pressure. The power to develop these seems latent in most rubber trees, but usually some external stimulus is necessary to bring out this power. Occasionally no such stimulus can be traced, but the vast majority of lumps can be at any rate strongly suspected to be caused by bad tapping. Where the cut goes down to the wood, such a development is probable, but it may be that a cut, which does not go quite so deep and only grazes the cambium, may be sufficient stimulus. The lumps do not interfere with the health of the tree but they considerably reduce its value for tapping purposes.

COCONUTS.

I attach the report of the Acting Inspector of Coconut Plantations, which shows a steady and gratifying increase in this valuable crop, an increase shared in by all States. The increase in the area under cultivation amounts to 6,529 acres corresponding to 5 per cent., the total area now under cultivation being 130,344 acres. A welcome feature of the increase is that a large part of it is due to Europeans. This should in time cause a considerable increase in quality as well as the quantity of the output of copra. Large acres of land have in addition been taken up this year, especially in Perak, for future planting in this crop.

The Inspector of Coconut Plantations and his staff have continued to devote attention to the pests which, on the whole, are kept well under control.

The export of copra amounted to 125,770 pikuls, an increase of more than 16 per cent. over that for 1909. This, of course, does not represent nearly the whole of the production; in Negri Sembilan, for instance, the greater part of the produce is sold as nuts and converted into copra in Malacca. I have already pointed out that one effect of the increase of the output of smoked rubber is likely to be an increase in the area planted on estates in coconuts.

OTHER CROPS.

Although padi is such an important native cultivation I have no statistics showing the amount produced. Most of it, of course, is consumed by the growers, and so the crop is not one that lends itself to statistical treatment. Again I regret to report that no experiments in rice cultivation were carried out.

COFFEE.

The total area under coffee at the end of 1910 was 6,475 acres, almost entirely in the Federated Malay States and the greater part of it in Selangor, against 5,885 acres in 1909 and 8,431 in 1908. Practically the whole of this coffee is grown as a catch-crop: over 5,000 acres with rubber and 1,000 with coconuts. The planting of coffee as a catch-crop with rubber is not recommended by the department as agriculturally sound, particularly as the coffee is also a host plant of the *Fomes* of root disease. The *Hemeleia* leaf spot is present in most cultivations and seems to attack all varieties of coffee.

SUGAR.

The area under sugar again decreased, the total for the Federated Malay States being 3,759 acres against 7,128 in 1909. For the Straits Settlements there was an increase to 5,315 acres against 3,638 last year. Of the total of 3,759 acres in the Federated Malay States, 1,405 acres were interplanted with rubber, which means that this area will soon be under rubber alone; practically the whole of the decrease from 1909 to 1910 comes under the head of sugar planted with rubber.

EXPERIMENT STATIONS.

The experimental work of the department has suffered severely owing to staff changes. The Superintendent of Government Plantations has been able to do little but begin to get the previously started experiments into order. It does not take long under Malayan conditions for an experimental, or indeed any, planting to get overgrown with weeds.

The tapping experiments started at Kuala Lumpur in 1909 were continued. The result for the first year's work are being collected and arranged and will be published in due course. These experiments were on too small a scale to form a reliable guide to tapping on plantations, owing to the large individual variations in yield among rubber trees, but they will serve to indicate the lines on which future experiments may be carried out. About four hundred trees planted in 1906 will be ready for tapping next year.

The experiment in growing Para rubber at varying elevations on Gunong Angsi in Negri Sembilan has been kept in order. Though all the trees are in good condition, those at the higher plots show distinctly the retarding influence of elevation on growth. A fair proportion of the trees in plots 1 and 3, planted in 1905, will be ready for tapping in 1911. This experiment will probably give interesting results for several years to come.

The camphor experiments at Batu Tiga and Kuala Lumpur were kept in order and the trees have made good growth at both places. No distillations were made during the year, so that the yield of distilled camphor per acre cannot yet be given. It, therefore still remains to be proved whether this cultivation will give a profitable return in Malaya.

Further details of the experimental work are given in the reports of the Superintendent of Government Plantations and Superintendent of Government Plantations, Perak, which are appended.

I attach also reports by the Acting Inspector of Coconut Plantations, Government Entomologist and Mycologist. The Agricultural Chemist was attached for such a brief period, during part of which he was on leave, that he was only able to carry on routine work and plan future investigations.

The following bulletins were issued during the year:

Bulletin No. 7. Coffee Robusta, by W. J. Gallagher.
" 8. The Cultivation and Care of the Para Rubber Tree (in Malay).
" 10. A Lecture on the Para Rubber Tree, by W. J. Gallagher.
" 11. Coconut Cultivation, by L. C. Brown.

Two others are in course of preparation.

The tables of Agricultural Statistics for the whole of Malaya are appended. These are substantially complete with the exception of those for Malacca, which as last year are not reliable owing to the number of estates which did not fill in the forms issued by the department.

L. LEWTON-BRAIN,
Director of Agriculture, F.M.S.

Report of the Government Entomologist, F.M.S., for the Year 1910.

During the past year the staff of the Entomological division has been increased by the appointment of Mr. C. B. Holman-Hunt, B.A., as Assistant Entomologist.

The collections of the department have been greatly increased, about 15,000 specimens having been obtained during the year. These are now being classified as far as possible.

The Entomological division has suffered for several years through a lack of reference collections, and through there being no cabinets wherein to keep the collections. This latter deficiency has now been remedied, and as much has been done to obtain as good a reference collection as the time has permitted.

For several months during the past year it was necessary to spend a greater time in the departmental offices than was advisable: this was due to a considerable decrease in the staff about the middle of the year.

Before the retirement of the late Director of Agriculture some five or six tours were made in his company over many of the estates in the Federated Malay States, my object being to detect pests which might be present.

In regard to these the worst noted was *Termes gestroi*, the most prevalent pest in these States. It is, however, kept well under control by the managers of estates.

There are a number of minor pests of which only one need be mentioned here; this is a species of *Xyloborus* (a small boring beetle). It has made its appearance on many of the estates in Malaya.

So far as my experience goes trees are not usually attacked if in a healthy condition. An entrance may be afforded for this insect either by bad tapping or by bark diseases. Occasionally they attack healthy trees, attempting to reach the wood through sound bark. A few are successful. The latex is a great protection against the attacks of this beetle, and nearly all are caught before an entrance is effected.

Pollarded trees are frequently attacked, more often when care is not taken in the cutting and tarring. They form, also, a source of contamination for other trees.

With careful supervision and complete destruction of affected trees this insect does not spread.

The small number of the trees affected does not justify the introduction of any expensive remedial measures. The loss of a few trees when they are attacked counts but little if by their destruction the surrounding trees are saved.

The duties of Honorary Secretary, Selangor, for the Agri-Horticultural Show, were carried out by me. I have to thank the Railway authorities for their co-operation and the facilities they gave.

During the year the notes gathered referring to the methods of padi planting in Krian were prepared for publication as Bulletin No. 12 of the department. Several visits were paid to Krian while the rice was under cultivation, and the necessity for carrying out experiments to try and improve the poorer lands of Krian was pointed out to Government. A grant of $2,000 has now been given and this will be spent during the forthcoming year.

It is hoped to drain a considerable portion of the peaty land in the Simpang Tiga district, and to improve the cultivation of padi on those lands which are considered fair, but which yield but a poor crop.

H. C. PRATT.
Government Entomologist, F.M.S.

Report of the Mycologist for the Year 1910.

I assumed my duties on the 18th of August. The first month of service was devoted to getting the laboratory and literature into working order, to dealing with local correspondence and to establishing communication with other tropical Agricultural Departments, and to visiting rubber estates for the purpose of becoming acquainted with the conditions under which *Hevea brasiliensis* is cultivated in the Federated Malay States. Ten estates were visited during that period.

Later work has been directed towards a study of the "die-back" disease, of the common root disease and of other diseases of Para rubber, to investigations on certain fungi which were associated with pathological effects of the plant for the purpose of ascertaining their capacity for causing disease, to investigations on fungi which are parasitic on robusta coffee, camphor, tapioca and Ceara rubber, to a study of bacterial disease of tomato and potato, to the answering of correspondence, which consisted mainly in the diagnosing of pathological effects caused by fungi and by physiological influences, and to visiting estates for the purpose of recommending treatment for disease.

The laboratory is at the present time not sufficiently well-equipped for the study of micro-organisms which are associated with disease.

The library is well-equipped, both in periodicals and in standard works on mycology.

FUNGUS DISEASES.

Four and one-half months were available for work up to the end of the year, and this afforded time to commence investigations on the "die-back" fungus, on the common root fungus and on the "thread-blight" fungus of Para rubber. My investigations on the "die-back" fungus had been commenced before my departure from England and were practically completed by the end of the year, the establishment of the identity between this fungus and the "die-back" fungus on cacao in other parts of the tropics has been made, and a fairly accurate knowledge of its life-history has been obtained. A preliminary note on these points was issued in the *Agricultural Bulletin* of December, 1910.

An account of a bacterial disease of potato and tomato was published in the same issue of the *Agricultural Bulletin.*

Greater attention has been paid to the diseases of *Hevea brasiliensis* than to those of other plants. To review the diseases of this plant from a general aspect, it may justly be said that the plant compares most favourably with the staple plant industries of other tropical countries. It must, however, be admitted that the continued cultivation of one plant in pure culture over large areas, without the intervention of other crops or, in many cases, of belts of natural jungle, lends itself somewhat readily to the development and spread of fungus disease. It should not, therefore, be surprising if there were an increase of its parasitic fungi, both in quantity and in number; this will call for the application of methods of treatment other than those which are employed at the present day.

Some danger may arise both from the importation of pests and from the absence of proper treatment of disease in native cultivations.

DISEASES OF PARA RUBBER.

ROOT DISEASES.—*Fomes semitostus,* Berk., appears to be more prevalent in this country than in Ceylon. The amount of the fungus which is present on young clearings is directly proportional to the amount which is present in the original jungle. The fungus, therefore, continues to make its presence felt among younger rubber, where a death-rate of as many as 16 per cent. of the trees has been recorded in 18 months. Consequent upon the removal of timber, the isolation of diseased areas by a system of trenches, the removal of trees which have succumbed, the digging over and subsequent liming of diseased areas, the fungus gradually disappears as the rubber grows older, until on those estates where careful treatment has been practised it is practically absent among the older rubber. The rate of spread of the fungus mycelium in the soil is directly proportional to the water-content of the soil or, in other words, to its capacity for drainage. Whereas on the lighter soils there is no appreciable spread of mycelium independently of actual contact with roots, on the lowlying, damp, heavy and badly drained soils an independent spread of the mycelium occurs, and the rate of growth, and consequent period of retention of the fungus by the soil, are much increased. This is a factor which has not hitherto been brought to light and which should be borne in mind in the opening up of land for planting and in the drainage and removal of timber of the heavy, lowlying soils. The

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application of quicklime does much to loosen the soil and has also marked fungicidal properties. As much as one or one-and-a-half tons to an acre may well be applied.

The fungicidal properties of good quicklime are well-known, but there is much difficulty in obtaining good quicklime in many places, and the material which is sent out by business houses is frequently completely slaked. Attempts are being made to introduce a powerful fungicide which is applicable to a large area of soil. An experiment was conducted with carbon bisulphide, the object being to kill the mycelium which was present in the soil by the vapour of the liquid. For this purpose a badly infected area of one half of an acre was selected and injected on 26th September with carbon bisulphide by means of a Vermorel's "Pal Excelsior" injector, the injections being three feet apart and, hence, about 4,000 to an acre. An examination at the end of five weeks showed that the fungus mycelium was just as abundant as before. The failure of the vapour to kill of the mycelium was attributed to the rapid vapourisation of the liquid at the temperature of the soil and to the small diffusion of the vapour in damp soils. A formaldehyde compound, which has recently been put on the market and which appears to have met with some success, will shortly be experimented with as on a large a scale as possible. It must, however, be borne in mind that the application of such a fungicide is only regarded as being necessary where the land is lowlying and almost swampy, and where, as the result of scarcity of capital or labour, of the absence of removal of timber or of the previous cultivation of another crop which harboured the fungus, or of the absence of good methods drainage and of treatment of isolated cases of disease from the outset, the fungus mycelium is widespread through the soil. Its application is, therefore, secondary to the establishment of good methods of cultivation.

The work on the life-history of the fungus and on such factors as the spread of the disease and its method of treatment is in progress and will be published in a separate Bulletin of the department.

Hymenochaete noxia, Berk., appears to be present in this country only in small quantity. The fungus is said to be the commonest root fungus of *Hevea* in Ceylon. Essentially a jungle product, it was recorded in Samoa as early as 1875, and it is now known to be somewhat widely distributed through the Eastern tropics. Both in this country and in Ceylon there appears to be some considerable difficulty in obtaining fruiting specimens, while in Samoa, and on material which I have examined from West Africa, the fungus appears to fruit abundantly. The disease is known as the "brown root" disease, and, in spite of the absence of fructifications, it is easily identified by the presence of fawn-coloured strands on the roots when the mycelium is young and by the production of dark-brown or almost black sheets of older mycelium which aggregate earth and small stones into masses on the surface of the roots; it is more specially observable on the tap root. The fungus spreads very

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slowly and only in contact with roots; isolation is, therefore, unnecessary, and so also is liming, providing that the diseased roots are removed and the wood from the affected area taken up and the area dug over. An examination of the laterals of trees which are adjacent to the dead tree should be carried out, and such as are diseased should be amputated to a point where they are healthy.

STEM DISEASES.—*Thridaria tarda*, Bancroft, of which the *Diplodia* stage causes the "die-back" disease, has been investigated and the life-history completed. The fungus, which is common as a saprophyte on dead material, can infect the plant at wounds. Investigations have shown that the fungus can be transferred from cacao to *Hevea* and that the *Diplodia* condition of the fungi on cacao and *Hevea* are indentical. This, coupled with the work of other authors, shows that the fungus is widely distributed through the cacao and rubber-producing countries of the Tropics. The fact that the fungus only infects at a wound which involves the exposure of the wood, and, therefore, not a good tapping surface, coupled with the fact that its effect on the plant depends largely on the condition of health of the plant, classes it as an ordinary wound parasite.

The disease has been reported from all the Federated States of the Peninsula. There is, however, a great tendency to attribute far more effects to the fungus than are in reality initiated by it, and the reckless removal of branches, which are shedding their leaves from some physiological cause, must be guarded against.

The work, which furnishes an account of the life-history of the fungus, the spread of the disease and its method of treatment, will be published shortly in Bulletin IX of the Department of Agriculture.

Corticium javanicum, Zimmermann, the "pink" fungus has been reported from two districts, where it was, however, present in small amount. It is a well-known parasite of *Hevea*, tea and other plants in India and in Ceylon. The disease originates most usually at the fork, where the fungus produces a pink patch which extends to the sides of the trunk below and to the branches above the fork. It is easily identified by means of the colour. The removal of the fungus with adhering bark when it is young and the sealing of the wound has been recommended. Such branches as are ringed by the fungus must be amputated, and when young trees are affected they must be cut off below the affected part. These are direct methods of treatment. In places where the disease occurs repeatedly it is proposed to spray in the fork with Bordeaux mixture as a preventative; a Vermorel's cascade sprayer is being obtained for the Department and arrangements are being made to have these sprayers stocked in this country. There has been up to the present, however, no necessity to put such a method of treatment into force.

The "thread blight" fungus has been reported on one estate. The fungus has not yet been indentified owing to the absence of spore-bearing organs; to judge from analogy, however, it may be expected to be a species of *Corticium* or *Hypochnus*. It takes the form of white threads which run over the surface of the branches and leaves causing the younger parts to wither and die:—its effect is not unlike that of a bacterial blight. The disease is spread by means of dead leaves which are blown and lodge against branches, and by the passage of the threads from one branch to another in contact with it. The disease, which was present in small amount, was got rid of by pruning off shoots which possessesd the threads and by burning them together with all leaves and twigs which had fallen from the trees. A spraying method of treatment is also applicable in this case.

Leaf Diseases.—*Pestalozzia Guepini*, Desm., and *Phyllosticta Hevea*, Zimmermann, have been observed to cause spots on the leaves, more especially of seedlings. They are few in number and are at present not of any economic importance. *Pestalozzia Guepini* has not yet been observed to attack the stems of seedlings as is said to occur in Ceylon. The plant sheds its leaves and renews them readily; by this habit it possesses a strong power of resistance to leaf diseases.

Physiological Effects.—The penetration of the tap root into acid soil or into a heavy, impenetrable clay bottom results in the checking of the growth of the tap root and the rapid shedding of the leaves. The plant, however, responds by expension of the lateral and more superficial roots, and recovers. This occurs on peaty soils and on soils with a heavy clay bottom. The plants grown on such soils possess little or no tap root and are easily blown over by wind.

Other Effects.—Burrs occurs in some quantity more especially on old trees. They are referable to two distinct causes. In the one case they are due to the development of an excess of "wound wood" at points where the knife is allowed to wound the wood tapping; in the other case they are apparently stimulated by bad tapping, but also occur on untapped trees in small quantity. Those of the first type are prevented by avoiding the wounding of the wood in tapping; while those of the second type, which may attain dimensions measurable by feet and may necessitate the transference of the tapping surface to the upper portions of the trunk, must be removed early when they are young and pea-like and before they fuse up with the main wood.

Examples of *Fasciation*, which consists in the development of strap-shaped structures, produced by the fusion of stem and leaves, and which may take the form of antlerlike structures, sometimes occur, though they are rarely met with.

DISEASES OF ROBUSTA COFFEE.

Leaf Diseases.—*Hemileia vastatrix*, Berk. and Broome, which was originally supposed to produce little or no disease in robusta coffee, has been found to be as prevalent on that plant as it is on Liberian coffee. In introducing a disease-resisting species of coffee the fact that wild Liberian coffee is unattacked by *Hemileia vastatrix* had evidently been lost sight of. It is only reasonable to expect that with the continued cultivation of the plant the amount of the disease will increase. On the other hand, it must be borne in mind that the epidemic in Ceylon will in all probability never be repeated in another coffee-producing country. The conditions of cultivation in Ceylon were especially favourable to the spread of an epidemic, and the disease had probably been gathering force for several years before it was noticed. Again, it is doubtful as to whether *Hemileia vastatrix* was responsible for all of the damage to the industry, since the plant is known to be susceptible to more than one root fungus in Ceylon. The disease occurs in districts in this country where Liberian coffee is cultivated, but it appears to produce little or no appreciable effect on the yield of fruit.

The propagation of the disease by uredospores lends itself readily to treatment by spraying with a fungicide. A preliminary experiment was carried out on 15th October for the purpose of determining whether the 4-4-50 formula of Bordeaux mixture would be injurious to the younger leaves of the plant. This mixture was prepared by the approved method from 4 lbs. quicklime, 4 lbs. copper sulphate and 50 gallons water, and was sprayed on to 100 plants of robusta coffee, a Vermorel's "Eclair" sprayer being used, and examination at the end of four weeks showed that the application of the mixture had in no way injured even the youngest leaves.

The experiment was sufficient to demonstrate that this strength of mixture, which is the strength recommended by the Board of Agriculture of England, could be applied without injury to the plant. Robusta coffee is cultivated in this country principally as a catch-crop with rubber to be removed when the rubber comes into bearing, and there is at present a tendency to do away with the cultivation of catch-crops in rubber, so that a spraying method of this kind, which to be successful must be carried out on a large scale, would scarcely recommend itself to the planter.

Fomes semitostus has been found to attack robusta coffee both in the field and by artificial infection.

Hymenochaete noxia has been found to attack robusta coffee,

DISEASES OF TAPIOCA.

Fomes semitostus readily attacks tapioca.

Cercospora Cearae, Petch., has been found to cause spots on the leaves, the spots being particularly abundant on a patch of tapioca in in the Experimental Gardens at Batu Tiga.

DISEASES OF CAMPHOR.

Fomes semitostus and *Hymenochaete noxia* attack the roots of camphor *(Cinnamomum Camphora)*.

The "thread blight" fungus was observed on camphor at Batu Tiga previously to its being recorded on *Hevea*. By pruning the affected trees and by santitation of the affected area the disease was controlled.

DISEASES OF CEARA RUBBER.

Cercospora Cearae, Petch., has been found to produce spots on the leaves of Ceara rubber *(Manihot Glazovii)*.

Future work will be devoted mainly to the completion of the life-history and methods of treatment of *Fomes semitostus*, to a further study of *Hymenochaete noxia* and of the "thread blight" fungus, and to investigations on the diseases of the coconut palm in so far as occasion is offered.

It is proposed, as time permits, to indentify the "moulds" occurring in the country, and to collect and name fungi other than those which are associated with the disease, for the purpose of forming the nucleus of a mycological herbarium for future reference.

C. K. BANCROFT,
Assistant Mycologist.

Report of the Inspector of Coconut Plantations for the Year 1911.

The area under coconuts in the Federated Malay States at the end of 1910 I estimate, approximately, at 130,344 acres, apportioned to the four States as follows:—

Perak	66,088 acres
Selangor	28,667 ,,
Negri Sembilan	19,246 ,,
Pahang	16,343 ,,

and I value the whole at $29,000,000.

INCREASE.—Six thousand five hundred and twenty-nine acres were opened up and planted throughout the States during the year.

CHANGES IN STAFF.—Mr. C. E. B. Pratt was appointed Assistant Inspector of Coconuts, *vice* Mr. Hope, transferred to the Chandu Department, and took up his duties on the 3rd of June. He is stationed at Telok Anson.

Kamarudin bin Haji Sulieman was appointed Sub-Inspector of Coconuts, Kuala Lumpur, on 3rd February.

STATE OF PERAK.

The area under coconuts in this State shows an inceease of 2,863 acres as compared with 1909, of this area, 1,240 acres were planted by Europeans.

Mr. Pratt reports that whereas the "red beetles" have been kept well in check the "black beetles" still cause a little trouble in some districts, especially in Krian, where the insects breed in the refuse from the sugar cane.

White ants destroyed about 100 trees in the Lower Perak district, while squirrels were very destructive in the up-river mukims.

Pigs continue to do a great deal of damage to young plants.

During the past year 17,000 acres have been taken up for coconut cultivation by European companies in the Bagan Datoh mukim, 5,000 acres in the mukim of Likir, and 2,000 acres have been applied for at Telok Anson.

The native holdings generally are maintained in a fair condition, though in most of the mukims lalang is very troublesome.

The Government have widened and deepened the main canal from Rungkup to Sungei Tiang, a distance of about three miles, and from Bagan Pasir to Sungei Batang (about half a mile). This canal when finished will not only facilitate transport, but will help to drain the land in the vicinity, which is very much required.

About 500 coconut trees were cut down during the construction of the canal and no compensation has yet been awarded to the owners.

At Bagan Pasir many coconut trees have been damaged by sea-flooding, in some instances the water remaining on the land for five or six days.

The trees at Pusing Bharu which were attacked by *Brachartona catoxantha* during 1909 have entirely recovered and are looking healthy. There was no recurrence of this pest during the year.

In the Kuala Kangsar district 300 trees were cut down to make room for rubber on one estate and left to decay. The rotting trees became infested with black beetles, of which 1,650 were collected. All the trees were subsequently buried and all larvæ destroyed before any serious damage was done to surrounding trees.

STATE OF SELANGOR.

During the year under review 2,849 acres were opened up under coconuts in this State.

As in the preceding year beetles gave little or no trouble, all breeding places being thoroughly destroyed as soon as discovered.

In March a caterpillar pest made its appearance in Kuala Selangor, and although many of the trees were defoliated they rapidly recovered

Spraying is, of course, the remedy, but it was found impossible to spray the higher portions of the trees without a very powerful sprayer. With the exception of the loss of crop during the attack and immediately afterwards the trees appear to be none the worse and are now bearing well.

The abandoned plantations on the Klang-Kuala Selangor road were again a source of much trouble, constant attention being required to prevent a serious outbreak of the beetle pest.

I understand that a large area of land in the Bernam district has been granted to European planters who intend planting up coconuts.

The price of coconuts in the Coast district has risen from 2½ cents to 5 and 6 cents each, owing to the increase in the demand by Chinese merchants who make copra.

STATE OF NEGRI SEMBILAN.

The area under coconuts in this State at the end of 1910, I estimate at 19,246 acres, an increase of 209 acres as compared with the preceding year.

During the year under review the plantations were maintained in good order. Beetles gave little or no trouble, but as in previous years bears and squirrels were very destructive.

STATES OF PAHANG.

I estimate 16,343 as the approximate acreage under coconuts in this State at the end of 1910, an increase of 608 acres as compared with the year before.

As a whole the progress and improvement of the native holdings throughout the State is very satisfactory, especially in the mukims between Kuala Lipis and Temerloh. The owners take more interest in their kampongs than formerly and an increased yield is the result

Mr. Brown made his usual inspection visit down-river towards the end of October and was well satisfied with the general condition of the plantations. He had interviews with many of the Penghulus and owners of kampongs and gave them advice as to the means of the improvement of the cultivation which they promised to follow.

COPRA.—I am indebted to the Commissioner of Trade and Customs for the following figures showing the export of copra from the various States during the year:—

Perak	...	...	91,265 pikuls.
Selangor	...	...	31,451 „
Pahang	...	...	2,585 „
Negri Sembilan	...	...	469 „
	Total	...	125,770 pikuls = 7,500 tons.

an increase of 21,301 pikuls = 1,250 tons as compared with the year before.

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The average price per pikul was $9.50.

The standard of copra manufactured by Europeans continues to be excellent, but the native manufacturers are still very careless and use unripe nuts.

AVERAGE PRICE OF COCONUTS:

Perak—	
Lower Perak	3 to 4 cents each
Kuala Kangsar	3 to 4 ,,
Krian	3 to 4 ,,
Upper Perak	3 to 4½ ,,
Kinta	3 to 6 ,,
Batang Padang	5 to 6 ,,
Selangor—	
Kuala Selangor and Bernam ...	2 to 5 cents each
Klang and Kuala Langat	5 to 6 ,,
Kuala Lumpur, Ulu Selangor and Ulu Langat	4 to 8 ,,
Negri Sembilan—	
Cost	2 to 3 cents each
Seremban and Jelebu	2 to 6 ,,
Tampin	3 to 4 ,,
Kuala Pilah	4 to 6 ,,
Pahang	2 to 16 ,,

GENERAL.—In August, Mr. Brown published a pamphlet on coconut cultivation, being Bulletin No. 11 of the Department of Agriculture.

PROSPECTS.—Referring to the previous report in which it was anticipated that further extension of the cultivation might be looked for I am pleased to able to report that this expectation has been fully realised, in fact at no time has the future of the industry appeared more promising.

It seems to have dawned upon the Europeans at last, now so much interested in rubber, that it would be well to have two strings to their bow; and where could be found, considering the very favourable conditions under which coconuts grow on the flat alluvial land near the coast, a safer or sounder investment than the cultivation of "the Consols of the East"?

In consequence, during the year under review, many thousands of acres have been alienated for coconuts while the demand for further land for the same purpose is as strong as ever.

Under these circumstances it would not be surprising to find in a few years time that the area under the cultivation of coconuts may equal if not exceed that under rubber.

T. C. NOCK,
Acting Inspector of Coconut Plantations.

Report on the Experimental Plantations for the year 1910.

EXPENDITURE.

The total expenditure on the Kuala Lumpur, Batu Tiga and Gunong Angsi Experimental Plantations for the year 1910, exclusive of establishments, was $19,132.24.

STAFF.

Mr. J. V. Sankarapillay, Overseer and Clerk, Experimental Plantations, Kuala Lumpur.

Mr. W. Valauthampillay, Overseer and Clerk, Experimental Plantations, Batu Tiga.

Mr. Gnananthampillay, Overseer and Clerk, Experimental Plantations, Gunong Angsi.

BUILDINGS.

At the close of the period under review, the new cooly lines at Batu Tiga, and the repairs to office and cooly lines, Gunong Angsi. were nearly completed.

The roads and drains throughout the plantations have been kept in good repair during the year.

LABOUR SUPPLY.

The labour supply for the Kuala Lumpur Plantation has been good, but at Batu Tiga fever has been very prevalent amongst the coolies and considerable difficulty is experienced in keeping up the force.

PARA RUBBER *(HEVEA BRAZILIENSIS)*.

Tapping Experiments.

The tapping experiments at Kuala Lumpur and Batu Tiga were continued during the year. Careful records of all experiments are being kept and the results will be published in due course. The following is an account of rubber shipped to England during the year:

Shipped.	Rubber.		Sold at s.	d.	s.	d.
30th January ...	1,043½ lbs.	crêpe	10	2		
" ...	111½ "	scrap crêpe ...	10	1½		
21st May ...	2,815½ "	crêpe	9	0¼	9	1
" ...	257 "	scrap crêpe ...	8	7½		
" ...	134¼ "	bark " ...	8	2		
11th November	1707¼ "	crêpe	4	9½	4	8
" ...	130 "	scrap crêpe ...	4	3½		
" ...	125 "	bark " ...	4	5½		

Totals: crêpe, 5,566¼ lbs.; scrap crêpe, 498½ lbs.; bark crêpe, 259¼ lbs., from 984 trees.

WHITE ANTS.

During the year, 31 trees, attacked by white ants, were treated with the Universal White Ant Destroyer with very satisfactory results.

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RUBBER CURING HOUSE.

The machine ordered in the latter part of 1909 for the making of sheet rubber arrived on the 19th of January, 1910, and has proved successful.

PARA RUBBER PLANTED AT KUALA LUMPUR PLANTATION DURING THE YEAR.

West-side of Plantation.

Clearing No. 1.—Planted in August with stumps. Distance of planting $25 \times 12\frac{1}{2}$ feet, acreage 19.

Clearing No. 2.—Planted in February with stumps. Distance of planting $25 \times 12\frac{1}{2}$ feet, acreage $1\frac{1}{2}$.

North-side of Plantation.

Interplanted in old plot of Castilloa. Planted in February with seed. Distance of planting $25 \times 12\frac{1}{2}$ feet, acreage $1\frac{1}{2}$.

PLANTINGS OF PREVIOUS YEARS.

The girths of all the rubber trees were taken, with the result that 394 trees were found to be ready to tap in the Kuala Lumpur Plantation.

CLOSE PLANTING EXPERIMENT, 4×2 FEET.

	Average girth measurements 3 feet from ground.
Seeds sown at stake, 1907—	
1907	Planted
1908	$2\frac{7}{16}$ inches
1909	$4\frac{7}{16}$,,
1910	6 ,,

OPEN PLANTING EXPERIMENTS, $25 \times 12\frac{1}{2}$ FEET.

	Average girth measurements 3 feet from ground.
Seeds sown at stake, 1907—	
October, 1907	Planted
,, 1908	$3\frac{3}{16}$ inches
,, 1909	$6\frac{1}{8}$,,
,, 1910	$9\frac{3}{10}$,,

STUMPS FROM NURSERY 2 MONTHS.

	Average girth measurements 3 feet from ground.
Seeds sown in nursery, October, 1907—	
December 1907	Planted
,, 1908	$2\frac{9}{16}$ inches
,, 1909	$5\frac{3}{5}$,,
,, 1910	$9\frac{2}{5}$,,

STUMPS FROM NURSERY 6 MONTHS.

	Average girth measurements 3 feet from ground.
Seeds sown in nursery, October, 1907—	
Planted out in April, 1908	$\frac{15}{16}$ inches
,, ,, ,, 1909	$3\frac{1}{8}$,,
,, ,, ,, 1910	$9\frac{1}{16}$,,

STUMPS FROM NURSERY 13 MONTHS.

	Average girth measurements 3 feet from ground.
Seeds sown in nursery, October, 1907—	
Planted out in November, 1908	—
,, ,, ,, 1909	$2\frac{2}{3}$ inches
,, ,, ,, 1910	$6\frac{3}{5}$,,

STUMPS FROM SPECIALLY SELECTED SEEDS.

	Average girth measurements 3 feet from ground.
Seeds sown in nursery, 1907—	
Planted out 1908	$3\frac{3}{8}$ inches
,, ,, 1909	$7\frac{1}{2}$,,
,, ,, 1910	$11\frac{1}{8}$,,

NOTES ON ABOVE.

Close Planting.—Although the trees are healthy and increasing in size yearly, the effect of close planting will be seen in the continually diminishing proportionate girths when compared with those in the open planting experiment, planted in the same year.

Open Planting.—It is obvious from the above that plants should not be left too long in the nursery before planting out.

RUBBER WEEDING EXPERIMENTS.

The weeding experiment at Batu Tiga, mentioned in 1908 Report, in which four 1-acre plots were treated as under, was conducted during the year:

Plot A. Planted with mimosa and not weeded after mimosa has got established;
,, B. Clean weeded;
,, C. A circle of three feet round each plant is weeded; rest of field unweeded
,, D. Not weeded.

	1908. Girth.		1909. Girth.		1910. Girth.
A. ...	5.19 inches	... ...	6.08 inches	...	13.20 inches
B. ...	6.75 ,,	... ...	11.15 ,,	...	14.00 ,,
C. ...	4.56 ,,	... ...	5.43 ,,	...	7.01 ,,
D. ...	5.19 ,,	... ...	7.08 ,,	...	10.37 ,,

Notes on Above.

Owing to changes of supervision the conditions were not strictly adhered to, and therefore the results of the experiment are rather misleading. Special attention is now being given to them.

RUBBER SEEDS.

Six hundred thousand rubber seeds were sent to Trinidad. Two hundred thousand rubber seeds were sent to Mr. B. O. Stoney, Labuan. Requests were receieved from Trinidad and Java for 1,000,000 and 100,000 rubber seeds, respectively; 482,000 and 91,000 have been forwarded. The order will be completed early in 1911.

EXPERIMENTS ON GUNONG ANGSI.

The girths on these rubber trees on the various experiment plots were taken with the following results:

Clearing. No.	Elevation.	No. of Trees ready to tap.	Total No. of trees	Percentage of trees ready to tap.
1	300	365	529	69
2	600	32	180	18
3	1,000	321	665	48
4	1,200	(not planted)		
5	1,600	24	90	27
6	1,800	17	91	18
7	2.100	[illegible]	66	
8	2,400	2	90	2

Notes on Above.

Although plot No. 2 has not done well, the results tend to show that the higher the elevation the slower the growth of the tree. The trees at an elevation of 2,400 feet look as healthy as those at 300 feet.

SPECIES OF RUBBER OTHER THAN PARA.

Purple Manicoba Rubber (*Manihot* sp.)

Planted in November, 1907, Kuala Lumpur:

Average girth 3 feet from ground,	1908	... ...	$5\frac{5}{8}$ inches
,, ,,	1909	... ...	$6\frac{13}{16}$,,
,, ,,	1910	... ...	$9\frac{3}{16}$,,

Notes on Above.

The girths of the above trees show similar growth to that of Para of the same age.

Juquie Rubber (*Manihot dichotoma*).
Romango Rubber (*Manihot piauhyenses*).
Manihot Heptaphylla.
Central American Rubber (*Castilloa elastica*).

The four varieties of rubber mentioned above have not done well. Most of the plants are attacked by white ants and will have to be taken out. Neither the soil nor the climate at the Kuala Lumpur Plantation favour the development of the plants. Experiments are to be conducted at Gunong Angsi, at an elevation of 1,200 ft., where there are more likely to succeed.

PRODUCTS OTHER THAN RUBBER.

CAMPHOR (*Cinnamomum camphora*).

The camphor plots at Kuala Lumpur and Batu Tiga Plantations continue to do well, although four trees were attacked by white ants and died. We also find that they are favourite food plants of *Attacus atlas* (the atlas moth) but this can be kept in check by hand picking.

Owing to the unreliable germination of Japanese camphor seed, experiments are being carried out in the propagation of this plant from root cuttings.

Details of the distance planting experiment are mentioned in 1909 Report. The young camphor beds are now thoroughly clean weeded, but the growth of the plants must have been considerably affected by lalang in the early part of the year.

COFFEE.

The plots of *Coffea robusta* and *Liberica* continue to do well. A few of the young plants died but have been replaced. Robusta seeds were received from Java in March, nearly all of them have done well.

Twenty katis of robusta seed were sent to Sungei Krian Estate by request. In the latter part of the year an order for 2,000 to 3,000 robusta seedlings was received from Mr. J. Shaw Hellier, Toungoo, Lower Burma. The order will be completed early in 1911.

COCONUTS.

The coconut trees at Kuala Lumpur are looking remarkably well. Several are now beginning to bear fruit. The planting out from nursery is completed.

CACAO.

A few of the cacao plants obtained from Ceylon and planted at Kuala Lumpur continue to do well but the majority have failed. This is most probably due to the poor soil and dry situation.

FRUITS.

The fruit collection has not been added to during the year.

NURSERY.

The nursery beds at the close of the year presented rather an overgrown appearance. Steps are being taken to put in fresh plants.

Plants were distributed to the Railway Stations and to various persons in the Federated Malay States.

My supervision of the Experimental Plantations commenced on the 21st October, 1910, hence I am not in a position to make an extended report.

F. G. SPRING

Superintendent, Government Plantations, F.M.S.

Report on Government Plantations, Perak, for the Year 1910.

ADMINISTRATION.

1. I arrived on 6th October and assumed duties on the 7th. Mr. F. R. Long resigned on the 30th June, and during the intervening months previous to my arrival Mr. B. H. F. Barnard was acting.

REVENUE.

2. The total revenue collected by this department during the year amounted to $6,326.98. This shows an increase of $2,570.03 over last year's returns and compares with previous years as follows:

1907.	1908.	1909.
$2,688.67	$2,767.77	$3,756.95

3. The principal items were:

Rubber	$3,497.94
Hill produce	2,395.39
Shade trees	210.00
Sale of cattle	186.05
Rubber seeds	31.00
Miscellaneous	6.60
Total ...	$6,326.98

LARUT HILL STATION.

4. The total expenditure for the year amounted to $6,998.93.

5. The total revenue for this station amounted to $2,588.04, items as follows:—

Vegetables and flowers	$1,629.67
Milk	673.44
Butter	87.28
Sale of cattle	186.05
Roses	5.00
Miscellaneous	6.60
Total ...	$2,588.04

VEGETABLES.

6. The output of vegetables shows an increase over last year's returns. Towards the end of the year the heavy rains proved disastrous to many vegetable beds, especially beet-root, carrots, spinach and celery.

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MANURES.

7. About 250 sacks of Bat Guano were collected from the caves at Padang Rengas, for general purposes this manure has proved itself most valuable for the Hill.

8. Weeds and grass cuttings are still collected and buried with cow manure till well rotted, and used on the beds to help to hold together the loose sandy soil.

VIOLETS.

9. The output of bunches for the year amounted to 551, not including those supplied to the bungalows, showing an increase over last year's figures. A disease has appeared in the form of leaf curl and is gaining ground in spite of carefully searching for affected parts and burning them.

10. Many new beds have been prepared from apparently healthy plants and the old beds discontinued. Diseased plants will be submitted to the Mycologist for his inspection and report.

ROSES.

11. The output of bundles for the year amounted to 3,222, showing a decrease of 271 over last year's returns, probably due to the changes in staff during the year and also the exceedingly heavy rains in October and November.

The above figures do not include those supplied to the bungalows.

12. About 100 plants were distributed during the year and many cuttings propagated, amounting to approximately 1,000.

DECORATIVE PLANTS.

13. Flowering plants in pots have been well maintained during the year. Camellia japonica vars, brought from England by P. Moss, Esq., and given to this department, died but one, and this flowered in late December at the "Box" bungalow. It appears to be healthy and it is to be hoped has become established.

14. Amongst those flowered under glass includes *Lobelia* tenuior, Mignonette pelargoniums (commonly known as geranium), Carnations, Gladioli, Gloxinias, Calanthe vars, and many Chrsyanthemums, both single and double.

HILL ROADS.

15. These have been well maintained during the year, and although many slip occurred none were really serious. The most important occurred on the 24th December, at the 8 mile-stone, this was speedily repaired and the larger grass (*Arundo donax)* planted to hold together the loose soil and so prevent wash.

COTTAGE GROUNDS AND ROADS.

16. These grounds have also been well maintained. A new plant house was erected at the early part of the year and is now filled with many of the best jungle orchids and aroids.

Several new beds were opened by the lower tennis court and also more on the upper lawn above the croquet lawn.

17. Periodical dressing of Bat Guano have made the lawns almost equal to English turf.

No serious slips occured and the roads being in a bad state were taken in hand towards the end of the year.

RAINFALL.

18. The total rainfall for the year amounted to :—

Maxwell's Hill	...	..	201.88 inches.
Cottage ...	...	...	282.99 ,,

19. January was the driest month at Maxwell's Hill, with a fall of 6.61 inches; and July at the Cottage with a fall of 10.05 inches.

October was the wettest month at both stations; at Maxwell's with a fall of 31.08 inches and the Cottage 45.11 inches.

CATTLE HERD.

20. The cattle herd at Maxwell's Hill has been fairly well maintained during the year, the output of milk showing a decrease over last year's returns, likewise the butter.

This may be best explained by the changes in the official staff.

21. Eleven calves were born during the year as follows :—

Australian.		Indian.		Half-bred.		
Cow.	Bull.	Cow.	Bull.	Cow.	Bull.	Total.
1	3	2	—	4	1	11

22. Four cattle died during the year. One half-bred bull calf, the result of a sting, one Indian cow, the result of slipping over a rock and two half-bred cow calves, the result of dysentery.

23. Dysentery appears to be a common complaint amongst the cattle on the hill especially among the half-bred cow calves.

These calves appear to be very hard to rear successfully when young.

24. Eleven of the herd of cattle were sold in December by public auction in the Market Square, Taiping, and realised the total of $186,05.

The eleven included nine bull-calves of the two breeds and two old and useless Indian cows.

25. Cream cheese-making has been discontinued owing to poor quality and no sale.

GRASS LAND.

26. Much has been done during the year on this important item. During the early part of the year a large area of jungle was felled and burned and Guinea grass planted.

This has become established and is now being cut for fodder.

27. Now that a supplementary vote has been granted for the extension of the fodder land, much will be done during the ensuing year, more jungle felled and large areas planted.

28. After reading previous experimental reports on fodders and also consulting and hearing the opinions of previous Superintendents, I consider it waste of time and money experimenting with European and Indian fodder plants such as clover, lucerne, sainfoil, trefoil, etc., as these have been tried before and proved unsuccessful, owing to the exceedingly heavy rainfall. I propose to devote attention on the culture of Guinea grass and paspalium, also the jungle water grass seen in many native orchards for the damp valleys. These are likely to prove the most successful for such a wet hill station as Maxwell's.

PUBLIC GARDENS, TAIPING.

29. These gardens have been well maintained during the year, beds being continually replanted to ensure a constant supply of flowers. The old road leading to the Residency has now been discontinued and a new one made by the Public Works Department through the late Commandant's gardens.

RESIDENCY GARDENS, TAIPING.

30. The gardens have also been well maintained and the supply of pot plants constant.

LAKE GARDENS.

31. Towards the end of the year an ornamental bridge was erected at a cost of $350 to connect the footpath on the newly formed gardens with the paths on the older parts.

32. The vote for cleaning of lakes and laundry having been expended in August the work of cleaning lakes was discontinued for nearly three months. A supplementary vote of $300 was granted and work continued in November.

33. Five new notice boards were made and placed at various parts of the gardens. The notices are written in Chinese, Malay and Tamil.

34. Draining, levelling and planting operations on the new parts of the Lake Gardens were commenced at the latter part of the year and already improvements are seen. To bring the entire gardens into cultivation is a work of time, and before beautiful effects can be attained much levelling and draining must be done. The soil is exceedingly poor, nothing more or less than sand, and in many places exceedingly stony. To obtain good results when planting beds, this soil must be taken away and new soil added. However, with Taiping rainfall, planting can be done at all times of the year with no serious checks on the plants when shaded.

35. The waterlilies (*Nymphaea* species and *Nelumbium* species) have not proved such a success as hoped for, but experiments will be made again during the coming year.

NURSERIES, TAIPING.

36. These are well stocked with flowering shrubs and plants and will furnish the necessary plants for the new parts in the Lake Gardens.

37. The fruit nurseries are also well maintained and large collections were sent to Matang and Grit towards the end of the year.

PARA RUBBER TREES.

38. One hundred and ninety-eight trees were tapped during the year and gave splendid yield of rubber. Five thousand three hundred and seventy-five sheets were made during the year and 83 blocks of scrap, 1,294 lbs. of dry rubber and 121 lbs. of scrap were packed up and shipped to England and realised the sum of $3,497.94.

KUALA KANGSAR PLANTATIONS.

39. I visited these plantations in November and found them in well-kept condition. Nurseries well stocked with young coconuts and rubber stumps.

40. Some bad tapping had been performed on the old trees near the river and in consequence tapping was stopped. The sub-lessee was required to give greater attention to tapping in future with the result that he dismissed his tappers and engaged experienced men. A great improvement is now seen.

PEOPLE'S PARK AND OPEN SPACES, IPOH.

41. Plants and shrubs were sent during the year to the People's Park and Residency grounds and periodical visits paid and advice given in planting and opening up new beds.

FRUIT NURSERIES, MATANG.

42. I visited these nurseries twice and gave advice on planting and general culture of fruits.

DISTRIBUTION ON PLANTS AND SEEDS.

43. Well over 2,000 plants were distributed during the year, including a large case of orchids collected on the Larut Hills and sent to the Director, Botanic Gardens, Singapore.

44. Approximately 100 packets of hill-sowed seeds of flowers and vegetables were sent out.

Amongst the principal recipients may be mentioned the Assistant District Officer, Tasik, Superintendent, Government Plantations, Kuala Lumpur, Assistant Engineer, Ipoh, Assistant Engineer, Grit, A. D. Machado, Esq., Mrs. G. A. Robinson, Mrs. Cobham and many others.

45. Over 300 plants and about 70 packets of seeds were received during the year from the following to whom thanks are due. Regius-keeper, Royal Botanic Gardens, Edinburgh, Superintendent, Government Plantations, Kuala Lumpur, Botanic Gardens, Singapore, Sir E. W. Birch, K.C.M.G., Mrs. G. F. Robinson, P. Moss, Esq., R. L. Munro, Esq., and C. Goldham, Esq.

AGRI-HORTICULTURAL SHOW.

46. The Seventh Agri-Horticultural Show was held on the 17th, 18th, 89th and 20th August at Singapore. Mr. F. R. Long acted as one of the Judges in the Plants, Fruits, and Vegetable Section and also as Honorary Secretary for the Perak Division.

47. The usual exhibit of English vegetables from the hill, together with a large collection of flowering plants, attracted a deal of attention and was one of the leading features of the Show.

48. Perak I understand was well represented and succeeded in gaining quite its share of prizes and medals.

W. L. WOOD,
Superintendent of Government Plantations, Perak.

TABLE I.—Agricultural Acreages in the Federated Malay States, 1909 and 1910, excluding Padi and Horticulture.

	Selangor.		Perak.		Negri Sembilan.		Pahang.		Total.	
	1909.	1910.	1909.	1910.	1909.	1910.	1909.	1910.	1909.	1910.
Coconuts	25,818	28,667	63,225	66,088	19,037	19,246	15,735	16,343	123,815	130,344
Rubber	93,853	113,114	68,278	83,890	31,945	44,868	2,877	3,902	196,953	245,774
Coffee	5,152	5,532	207	390	526	546	..	..	5,885	6,468
Other cultivations	800	23	2,240	55	23,696	13,595	..	..	26,736	13,673
Total ..	125,623	147,336	133,950	150,423	75,204	78,255	18,612	20,245	353,389	396,259

TABLE II.—Agricultural Acreages in Malaya, 1910.

	Federated Malay States.	Straits Settlements.	Johore.	Kelantan and Kedah.	Grand Total.
Rubber alone	231,797	50,928	38,222	12,011	382,958
,, and coffee	5,236	...	..	..	5,236
,, ,, coconuts	4,106	1,000	2	350	5,458
,, ,, sugar	820	676	..	..	1,496
,, with other crops	3,815	7,964	5,292	634	17,705
Total ..	245,774	60,568	43,517	12,995	362,853
Coconut alone	123,213	7,293*	..	1,367*	131,873
,, and coffee	1,036	7*	..	..	1,043
,, ,, other crops exclusive of coffee	6,095	9,279*	38*	650*	16,062
Total ..	130,344	16,579*	38*	2,017*	148,978
Coffee alone	79	..	...	..	79
,, with other crops	6,389	7	..	..	6,396
Total ..	6,468	7	..	..	6,475
Sugar alone	2,354	4,639	..	..	6,993
,, with rubber	1,405	676	..	..	2,081
Total ..	3,759	5,315	..	..	9,074

* Native kambongs not included.

Table III.

Rubber Statistics, Federated Malay States, up to the 31st December, 1909 and 1910.

—	Selangor.		Perak.		Negri Sembilan.		Pahang.		Total.	
	1909.	1910.	1909.	1910.	1909.	1910.	1909.	1910.	1909.	1910.
No. of estates	157	190	139	155	68	78	13	12	377	435
Acreage in possession	212,015	225,013	163,734	191,285	110,756	149,675	13,926	13,625	500,431	579,598
Acreage planted up to 31st December, 1909 and 1910	93,853	113,114	68,278	83,890	31,945	44,868	2,877	3,902	196,953	245,774
Rubber alone	88,868	108,257	57,130	77,760	29,803	42,203	2,867	3,577	178,668	231,797
Rubber interplanted with catch-crop ..	4,985	4,857	11,148	6,130	2,142	2,665	10	325	18,285	13,977
Planted during 1909 and 1910	11,607	19,261	11,572	15,612	4,640	12,923	1,086	1,025	28,905	48,821

Table IV.

Rubber Statistics, Malaya, up to the 31st December, 1909 and 1910.

—	Federated Malay States.		Straits Settlements.		Johore.		Kelantan and Kedah.		Total.	
	1909.	1910.	1909.	1910.	1909.	1910.	1909.	1910.	1909.	1910.
No. of estates	377	435	99	109	40	44	18	44	534	632
Acreage in possession	500,431	579,598	168,527	155,498	156,607	221,869	30,427	57,449	855,992	1,014,414
Acreage planted up to 31st December, 1909 and 1910	196,953	245,774	57,587	60,568	33,344	43,516	4,151	12,995	292,035	362,853
Rubber alone	178,668	231,797	41,405	50,928	28,883	38,222	4,111	12,011	253,067	332,958
Rubber interplanted with catch-crop ..	18,285	13,977	16,182	9,640	4,461	5,294	40	984	38,968	29,895
Planted during 1909 and 1910	28,905	48,821	7,466	2,981	12,400	10,172	2,126	8,844	50,897	70,818

TABLE V.

Comparative Tables of Rubber Crops, Malaya, 1906 to 1910.

Year.		Selangor.	Perak	Negri Sembilan.	Pahang.	Malacca.	Province Wellesley.	Johore.	Kelantan and Kedah.	Total.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1906	...	620,033	94,848	146,891	...	*12,000	*13,560	47,724	...	935,056
1907	...	1,131,086	272,804	586,864	...	23,490	82,131	182,495	...	2,278,870
1908	...	1,846,384	383,073	963,253	...	52,080	92,600	201,632	...	3,539,922
1909	...	3,676,451	1,060,543	1,346,499	...	†36,865	293,516	327,635	...	6,741,509
1910	...	7,052,975	2,962,218	2,599,707	2,483†	599,918	445,659	664,352	41,551	14,368,863

In Province Wellesley are included nine estates in Singapore and six estates in Penang.

* These figures are approximate. † This is the figure returned, but the actual output was probably a good deal higher.

TABLE VI.

Estate Labour, Federated Malay States, 1910.

———	Selangor	Perak.	Negri Sembilan.	Pahang.	Total.
Tamil men	35,787	21,987	6,402	571	64,747
,, women	11,073	6,476	2,800	109	20,458
Javanese men	2,718	3,717	935	31	7,401
,, women	873	1,568	438	3	2,882
Malays	742	4,164	1,539	261	6,706
Chinese	4,538	10,040	9,824	687	25,089
Others	294	415	395	59	1,163
Labour Total ..	56,025	48,367	22,333	1,721	128,446

TABLE VII.

Estate Labour, Malaya, 1910.

———	Federated Malay States.	Straits Settlements.	Johore.	Kelantan and Kedah.	Total.
Tamil men	64,747	7,506	1,677	1,036	74,[illegible]66
,, women	20,458	2,914	365	285	24,[illegible]22
Javanese men	7,401	2,157	3,386	59	13,003
,, women	2,882	1,322	553	...	4,757
Malays	6,706	4,526	967	2,059	14,258
Chinese	25,089	9,886	7,160	3,528	45,663
Others	1,163	579	503	116	2,361
Labour Total ..	128,446	28,890	14,611	7,083	179,030

PRELIMINARY NOTE ON ANOTHER WHITE ANT CAUSING DAMAGE TO NEW CLEARINGS.

Some cases have recently been brought to the notice of the Department of Agriculture, F.M.S., Kuala Lumpur, in which *Termes carbonarius* has been found killing newly planted stumps by stripping them of their bark.

Up to the present this has only been noticed on old tapioca estates.

This termites were previously considered harmless and it is important to find out as soon as possible how far their ravages have been noticed elsewhere.

Termes carbonarius may be distinguished from other "White Ants" or Termites, as they are more correctly called, by the large size and sooty colouring of the soldiers.

The soldiers of this species are of two kinds; the larger over half an inch long including the mandibles or nippers, which can inflict an unpleasant bite; the smaller, about three eighths of an inch.

The mandibles are curved upward to the tips and do not possess teeth between the base and the tip.

The queen is as large as that of *Termes malayanus*, attaining a length of three inches. These Termites are often found in the same nest as *Termes sulphureus*, the little sulphur yellow species, which lives in hard cased mounds sometimes five feet high. The queen of *Termes sulphureus* averages only one and a quarter inch in length.

Termes sulphureus and *carbonarius* are both described in books as harmless, being fungus (or "mould") eaters. The fungus grows on cakes or masses of vegetable matter which are stored in special chambers in the nest.

Up to now analyses of these masses have failed to show any traces of rubber, but further samples are wanted for analysis with notes of the depth at which they are found, as those examined may only have been collected by *Termes sulphureus*.

The nests constructed by *Termes carbonarius* are large mounds, often 6 feet high, very massive and irregular in shape. The exterior is chiefly composed of earthy matter with oval or round chambers distributed throughout the nest. These contain the fungus beds mentioned above. The centre of the mounds is composed of delicate laminae of clay and below or in the centre of this the Queen cell is to be found. When disturbed, ants of this species have the habit of hammering their heads against portions of the nest, which produces a clicking noise. As many as four kinds of termites may be found within the mound made by this species.

The stumps are reported to be attacked at night and in the early morning after and during rainy weather.

This would be a dangerous pest to young estates, but for the fact that the nest which it inhabits is easily found on well weeded estates and the inmates can be easily killed with the fumes of arsenic and sulphur applied through the nozzle of the Universal White Ant Exterminator.

E. HOLMAN HUNT.

EFFECT OF CLEARING OF FOREST ON RAINFALL.

An article in the Agricultural Bulletin of June, 1911, on the "Drought Spell" refers to this subject. As is there stated the only available records are not to be implicitly relied upon for accuracy. The rainfall records of the Federated Malay States are kept at Government Hospitals. It is questionable whether the rain gauges are always placed in such position as to give accurate records, but the figures obtained are probably a very fair indication of the relative quantity of rain that fell during certain periods, even if they are not quite accurate as to the actual rainfall.

The following records are of interest :—

In Taipeng, from 1897 to 1903, the annual average rainfall was 165 inches. From 1904 to 1910 the average was 166 inches. There is little to be deduced from these figures, as no large clearings have been made in the immediate vicinity of Taipeng since 1897. The rainfall during 1910 was only 149 inches, the lowest record since 1903. During 1910 a considerable amount of jungle (mostly secondary growth) was felled and burned on Scott's Hill.

At Ipoh for the decade 1891 to 1900 the annual average was 99 inches. For the decade 1901 to 1910 it was 93 inches. There was probably more jungle cleared immediately round Ipoh during the first of these periods than during the second. There has been a great deal of clearing and burning in the country within 10 miles of Ipoh, during the last few years, but so far from this having caused a diminution in the rainfall, the records show that the average for the last four years is nearly 102 inches, or 6 inches over the average for the last 20 years.

Records are available in Kuala Lumpur from 1879. During the 16 years 1879 to 1894, the annual average was 100 inches, during the following period of 16 years it was 95 inches. There was more felling and burning in the immediate vicinity of Kuala Lumpur during the first period than during the second. 1910 was exceptionally dry; only 68 inches of rain were recorded. From the Klang records, which date from 1885, it appears that during the second half of the period 1885 to 1910, the annual average was one inch more than during the first period.

It can hardly be argued from these records that clearing of the forest has affected the total rainfall. The effect of such clearing in temperate climates is still a matter of discussion. It should also be remembered that in almost all cases of clearing of forest the land is only bare of tree growth for a comparatively short period. The obvious exception is, of course, abandoned land upon which lalang establishes itself. It seems probable that, although the clearing and burning of forest may cause a diminution of the rainfall in the immediate neighbourhood of the clearing, and for a short time, the factors which regulate the rainfall in this country, surrounded as it is by the sea, are too powerful to be seriously affected by such a cause. The question would have a different aspect if there was any reasonable probability of vast areas of land being cleared and becoming permanently bare of trees, particularly if such clearings were made on the hills. The Peninsula has not proved itself suitable for stock raising. There would therefore seem to be no danger of large tracts of country being cleared for grazing. It is this practice which in the past wrought such havoc in parts of India which are far from the influence of the sea, and which have a defined dry season. It would not be wise, however, to presume upon our safety from drought. The records are insufficient, and as far as I am aware, no expert meteorologist has studied the subject. As long as there is doubt on the question, the reservation of large tracts of forests is, for this reason alone, fully justified. Particularly should the forest be maintained on the hills. There are, of course many other reasons for forest reservation, but they are outside the present subject.

B. H. F. BARNARD.

RUBBER NOTES.

Patents.

Mr. Derry who has been for some time in England, has filed his specification for his patent, for smoking rubber latex, which we may hope will be very shortly before the planters. Patents for an invention for coagulating and disinfecting the latex of rubber plants, and for improvements in the manufacture of Pyroligneous acid, generally known as Crude Acetic Acid, for coagulating and disinfecting the latex of rubber trees, are also granted to Martia Hohl of Colombo, in the Government Gazette.—Ed.

NOTICE.

Note on sending Specimens for Examination.

It is particularly asked that planters and others sending specimens for examination and report to the Department of Agriculture, Federated Malay States, would be careful to affix a label, containing the name of the estate, not only to the outside of the package but to the specimen itself. It has happened lately that a number of specimens have been received on the same day, none of which bore any distinguishing mark, except the railway label which is usually rubbed off before reaching the Office. It has been a matter of some difficulty to determine which specimen belonged to which letter of inquiry.

It is also asked that all letters connected with the work of the Department be addressed to the

Director of Agriculture,
Federated Malay States,
Kuala Lumpur.

and not to individual officers. It is only in this way that communications can be referred to the proper officer to deal with, without unnecessary loss of time.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of May, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.864	146.0	84.4	91.0	73.9	17.1	77.0	0.775	72.2	67	Calm.	1.97	1.73
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	2.18	1.58
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	2.41	1.71
,, Klang	...	...	...	92.5	70.4	22.1	...	...	...	...	...	1.66	0.55
,, Kuala Langat ...	...	...	...	89.4	75.1	14.3	...	...	...	...	...	3.12	1.10
,, Kajang	...	...	...	88.6	76.1	12.5	...	...	...	...	...	1.53	0.38
,, Kuala Selangor ...	...	...	...	89.4	75.1	14.3	...	...	...	...	...	0.43	0.28
,, Kuala Kubu	...	...	...	92.9	70.3	22.6	...	...	...	...	...	2.33	1.15
,, Serendah	...	...	...	93.3	70.9	22.4	...	...	...	...	...	0.98	0.46
,, Rawang	...	...	...	92.9	72.9	20.0	...	...	...	...	...	3.45	1.66
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	1.43	0.80

Office of The Senior Medical Officer,
Kuala Lumpur, 28th July, 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the month of June, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity			
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%	...	Ins.	Ins.
Kota Bharu	...	152.0	81.5	87.85	74.95	12.90	78.2	.897	76.0	84.8	...	7.20	1.72
Kuala Lebir	...	...	80.0	90.9	73.6	17.3	76.8	.877	75.3	85.8	...	9.18	1.74
Kuala Kelantan	...	..	...	87.03	73.07	13.96	...	...	...	...	...	8.95	1.89
Kuala Pahi	...	...	...	86.93	73.36	13.57	...	...	...	...	...	7.58	1.48
Kuala Nal Rubber Estate	...	...	...	88.16	74.40	13.76	...	...	...	...	...	5.54	1.70
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	9.89	2.00
Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	4.95	1.30
Pulau Laiat	...	...	...	...	...	...	...	...	...	...	...	6.96	1.95
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	5.71	2.31
Chaning Estate	...	...	...	...	...	...	...	...	...	...	...	7.48	1.63
Pasir Ginggi Estate	...	...	...	...	...	...	...	...	...	...	...	8.03	1.51
Pasir Gajah Estate	...	...	...	...	...	...	...	...	...	...	...	6.98	1.78

T. J. DEVOTA,
For Residency Surgeon, Kelantan.

RESIDENCY SURGEON'S OFFICE,
Kota Bharu, 25th July, 1911.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of June, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Seremban	...	149.3	81.6	89.4	72.1	17.3	77.2	0.851	74.3	.78	N.W.	1.88	0.48
Do. Kuala Pilah	...	135 7	81.7	91.4	71.9	19.5	75.9	0.791	72.2	.74	...	1 36	0.52
Do. Mantin	...	...	...	...	...	...	...	...	...	...	...	1.16	0.40
Do. Tampin	...	...	...	...	...	...	...	...	...	...	...	1.73	1 39
Do. Jelebu	...	...	...	...	...	...	...	...	...	...	...	2.45	1.05
Do. Port Dickson	...	...	...	...	...	...	...	...	...	...	...	1.49	0.76
Beri Beri Hospital Port Dickson	...	...	...	...	...	...	...	...	...	...	...	1.61	1.12

Office of the Senior Medical Officer,
Kuala Lumpur, 25th July, 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

PERAK.

Abstract of Meteorological Readings in the various Districts of State of Perak for the month of June, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point.	Humidity.			
Taiping	...	106	82.44	94	72	22	77.13	862	...	79	...	3.87	1.10
Kuala Kangsar	...	...	81.85	94	70	24	76.43	839	...	78	...	4.51	1.51
Batu Gajah	...	116	83.34	94	71	23	78.85	879	...	77	...	.71	.26
Gopeng	...	...	82.31	93	69	24	75.32	784	...	71	...	2.75	1.34
Ipoh	...	...	82.54	93	70	23	76.34	825	...	75	...	3.34	1.27
Kampar	...	...	83.62	94	70	24	77.28	851	...	75	...	3.38	1.78
Teluk Anson	...	...	82.63	93	68	25	77.62	880	...	79	...	1.22	.80
Tapah	...	...	82.84	93	68	25	76.90	848	...	77	...	1.91	.45
Parit Buntar	...	...	83.16	94	72	22	77.55	869	...	77	...	5.22	3.24
Bagan Serai	...	...	82.86	92	72	20	77.73	882	...	79	...	1.79	.64
Selama	...	...	81.67	93	72	21	77.07	867	...	81	...	4.63	1.80
Lenggong	...	...	79.92	91	68	23	75 58	828	...	82	...	2.61	.69
Tanjong Malim...	...	...	82.23	94	67	27	77.29	870	...	81	...	1.80	.75
Grit	...	...	80.43	94	66	28	75.76	829	...	80	...	1.41	3.64
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	7.42	2.12
Pulau Pangkor Laut	...	...	...	...	...	...	...	...	...	...	...	1.84	1.29
Kuala Kurau	...	...	...	...	...	...	...	...	...	...	...	9.90	4.59
The Cottage	...	...	...	...	...	...	...	...	...	...	...	12.25	1.80
Maxwell's Hill	...	...	...	...	...	...	...	...	...	...	...	9.05	1.42

S. C. G. Fox,
Senior Medical Officer.

Office of Senior Medical Officer,
Taiping, 12th July, 1911.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 9.] SEPTEMBER 1911. [Vol. X

LATEX AND ITS RELATION TO THE LIFE OF THE PARENT PLANT.

There are present in many plants chemical substances which, although recognised as products of activity of the living cell, neither in their exact mode of formation nor in their full significance are clearly understood. Among such substances are the alkaloids, glucosides, colouring matters, ethereal oils, resins and caoutchouc or india rubber. Many of these products are of some considerable economic importance. The alkaloids include strychnine, quinine, morphine and other drugs and violent poisons. Of the glucosides, which are compounds of sugars with various substances, some too are poisonous, yielding on decomposition prussic acid. The Lima bean or Java bean contains such a glucoside; and when it is growing wild the percentage of prussic acid in the stems and leaves may be sufficiently high to be fatal to animals which feed on it. There is good reason to believe that such a glucoside occurs in the shoots of the Para rubber; and an example of its poisonous properties occurred several years ago, when some Para rubber trees growing in the garden of the Residency in Taiping were felled because they had proved poisonous to horses.

The presence of such poisonous substances in plants serves no doubt to check the ravages of animals; but this can scarcely be regarded as a primary function.

The colouring matters in plants serve to attract insects, whose association with plants is frequently beneficial.

The ethereal oils and resins are recognised as products of excretion. But the significance of the relation of these bodies to the economy of the parent is not clear.

The significance of the presence of caoutchouc in plants is, perhaps, still less clearly understood. Caoutchouc occurs in the latex of plants of different natural orders, among which are the *Euphorbiaceae*, including *Manihot*, Ceara, and *Hevea*, Para rubber, the *Urticaceae*, containing *Ficus*, Rambong, and *Castilloa*, and the *Apocynaceae* of which *Willughbeia* and *Leuconotis*, Borneo rubbers, are members, along with the various natural orders which contain numerous species yielding so-called "gutta-percha." Latex is the name given to a fluid which is either watery or viscous, colourless, white, yellow, orange or red, and is contained in specialised cells, called latex tubes. The cow tree of Venezuela (*Galactodendron utile*) yields a sweet milk of good flavour; the dried latex of the Poppy *(Papaver somniferum)* is the opium of commerce; the milky Agarics, fungi of the mushroom type, yield white, orange or red latex; and may other species occur which are of interest or of economic importance.

Latex is an emulsion of various substances in a water-basis; these are resins, caoutchouc of different kinds, oils, tannins, proteids, sugars, starch, alkaloids, ferments and salts. The tubes in which the latex occurs are divided into two classes according to their mode of origin, viz.—laticiferous vessels and laticiferous cells; the former arise by the fusion of independent cells, this class including *Manihot* and *Hevea*, while the latter originate by the growth of special cells which are said by some to be differentiated in the undeveloped embryo of the seed. These tubes, when fully formed, are living cells connected by branches and frequently forming a close network; they occur in all parts of the plant.

The tubes, when present, are associated in the stems and leaves of plants with those special tissues to which the function of conducting plastic food-material is ascribed. And this close association, coupled with the richness of the latex in food substances, such as proteid, starch and sugar, suggests at once that the latex tubes function as a conducting system by means of which food material is conveyed from one part of the plant to another. There is other evidence in support of this suggestion. For example, where latex tubes occur, those particular tissues which are normally concerned with the conduction of so-called elaborated food-material are deficient and are frequently badly developed. Again, in *Euphorbia*, as the young plant commences to develop in the seed the latex becomes poorer; when it has germinated the latex grows richer. And abnormal conditions which stop certain of the life-processes, notably that of *assimilation*, make the latex poor.

Assuming, then, that the tubes serve to conduct food-material in the plant, the question arises "Is the latex actually in circulation in the plant?" That it is so there is no doubt, since Schwendener has actually seen it in transparent seedlings of *Chelidonium*.

From this evidence we conclude that latex bears some actual relation to the economy of the parent, and this relation must be the conduction of plastic food-material. When, by some interference with the normal life-processes of the plant, the latex becomes poor, on the resumption of the normal condition it becomes again rich, and the richness in food material has been found to commence in the leaves and to extend to the roots. We can have no stronger corroborative evidence than this of the supposition that the latex tubes are a path by which food-material is conveyed in the plant. We, therefore, conclude in the light of modern conceptions of the nutrition of plants that the laticiferous system in plants serves the purpose of conducting plastic food material.

In addition, however, to containing food substances the latex contains bodies which are regarded as "excretory substances." The plant has no means by which it can excrete its useless products outwardly; and the excretory substances are stored in different parts of the plant body. Such substances are regarded as "end-products" in the metabolism of the cell and are incapable of being utilised for purposes of nutrition. The resins, gum-resins and gum-mucilages are recognised as excretory products. Such substances are known to occur in latex; the latex tubes are, therefore, regarded as serving the function of excretion. The caoutchouc in all probability does not exist as such in the latex, but is produced during coagulation from simpler bodies similarly constituted chemically. It is itself a compound of carbon and hydrogen and is chemically comparatively inactive. There is, therefore, some probability that it is an end-product and incapable of being further utilised by the parent. Much more requires to be learnt, however, concerning the changes which occur in latex in different parts of the plant and under different conditions, before any accurate conclusions can be arrived at as to the significance of the presence of caoutchouc.

Enzymes have been demonstrated in the latex of some plants. *Ficus Carica* and *Carica papaya* (papaw) contain peptonising enzymes. The presence of an oxidase has been demonstrated in the latex of *Hevea*; the occurrence of black latex is ascribed this enzyme. The presence of enzymes is significant of the occurrence of active changes in the latex.

In addition to the above mentioned functions of latex two others occur, viz.—the sealing of wounds and the protection of the plants from animals. Latex containing caoutchouc coagulates quickly, and the coagulated mass serves to seal wounds more or less effectively. In some plants the latex tubes branch close to the surface and thus facilitate the sealing of wounds by the juice. In other plants hairs containing latex are present on the floral bracts and are thus regarded as serving to protect the flowers from animals; while the occurrence of poisonous substances in latex is no doubt an efficient means of protection against certain animals. It is not uncommon to find insects in the neighbourhood of *Hevea* plantations bearing masses of coagulated latex on all parts of their bodies in such quantity as to considerably hinder their movement; and it is believed that the insects pests of *Hevea* would cause considerably greater damage, were it not for the protection offered by the latex.

The occurrence of these two functions of latex is clear; but, they are in all probability not primary functions and can only be regarded as incidental. With regard to the two first named functions, the one of conducting food-material and the other of receiving products of excretion, it is uncertain as to which was the primary one.

The relation of latex to the life of the parent possesses far more than a mere scientific interest. The recognition of the laticiferous tubes as a means of conducting plastic food material is of itself of primary importance, inasmuch as such problems of practical importance as tapping, systems of tapping, bark renewal, etc., are closely connected with it, while an accurate knowledge of the significance and mode of formation of caoutchouc must be of considerable value to the practical cultivator.

KEITH BANCROFT, B.A.

RAINFALL OF SINGAPORE.

Dear Mr. Ridley,

Register of rain for the first seven months of this year.

The following years show similar results for the months January to July:—

1872.—36.42 inches.

In January only 4 rain days—2.49 inches.

1874.—36.51 inches.

In February 15 rain days—only 1.81 inches.

1896.—32.20 inches.

In none of these years, however, were there such long actual droughts as have been registered this year.

In the details which you printed in the Bulletin, June number, from my letter there are some slight misprints, one of which is rather important: the first line of page 183 should read:—

"From the 18th February to the 19th March 30 days, only 2/100ths"

I do not agree with Mr. Severn that South of latitude 3, February and March are generally wet months: my records show most droughts in these months. Last year February was the wettest month of the year. But you know the uncertainty of our climate: December, I suppose would be admitted to be the wettest month of the year, but some years ago the rain registered in that month was only 2½ inches—the driest month of that year.

I have great doubts, too, whether the actual rainfall is much affected here by the removal of forests, situated as this island is. Moreover, in he neighbourhood of the town and to 3 or 4 miles out there is probably more wood than there was several years ago. Further, the mean rainfall does not seem to have changed. The last two years were exceptionally wet. What seems to me most remarkable is that the great thunder-squalls which years ago were so frequent in the S.W. monsoon half of the year, are now rare. It is a pity there is no rain register on Bukit Timah. If the fall is greater there, I should judge it would be rather from the elevation than the forest.

One of the most remarkable things in this year's droughts has been that the sky has been so frequently nearly cloudless day after day, which as you say, is not usual here.

The Rainfall at the Botanic Gardens, printed in the Bulletin page 184, is hardly, I should think, correct. I notice that nearly all the entries end with "O," showing that exact returns are not taken. That may not, perhaps, be very important, but none of the months seem to me to be complete—certainly not May!

When I arrived at Singapore there was a sort of Observatory here. I think it was in Gaylang Road. I don't know why it was given up. But J. D. Vaughan and others kept registers, and I have quite a collection of these.

Yours Truly,

(Sd) A. KNIGHT,

9/8/11.

Rain Register, Killeney Estate, 1911.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	
1st	33	..	...	84	...	11	...	
2nd	91	...	...	03	...	41	06	
3rd	1.54	...	...	37	...	01	...	
4th	1.21	1.23	...	15	...	...	...	
5th	14	...	...	01	04	...	...	
6th	86	...	...	...	04	...	39	
7th	1.14	08	...	07	02	...	16	
8th	86	...	...	...	...	...	..	
9th	34	...	...	...	12	13	60	
10th	41	...	...	16	01	...	...	
11th	35	...	...	03	...	...	...	
12th	1.46	...	...	...	...	...	...	6 months, February to July, 25.08
13th	01	...	...	...	...	1.28	...	
14th	61	05	...	...	...	..	...	
15th	34	94	...	...	...	...	...	
16th	91	36	...	06	61	...	..	
17th	18	1.38	01	...	05	...	...	
18th	02	...	...	...	...	...	...	
19th	22	...	...	...	...	..	...	
20th	...	...	52	01	12	07	...	
21st	17	...	...	1.32	22	. .	...	
22nd	04	01	...	..	28	...	16	
23rd	...	...	...	13	08	...	...	
24th	...	...	04	07	1.78	...	...	
25th	03	...	61	...	3.02	..	55	
26th	43	...	02	06	17	1.06	66	
27th	04	...	...	...	...	12	...	
28th	.	..	...	26	1.04	21	14	
29th	...	...	32	...	13	...	...	
30th	...	...	...	...	1.05	...	45	
31st	...	...	02	...	...	...	57	
Total	12.55	4.05	1.54	3.57	8.78	3.40	3.74	= 37.63

Mr. Knight's letter is a further contribution to our knowledge of the Meteorology of Singapore. It must seem remarkable to the Colonial Governments of other nations that here, where the study of Meteorology is of such importance to the Agriculturist, there has been practically no attempt made to record or make observations on rainfall, sunshine, etc., except by amateurs. A kind of Meteorological report has been issued from time to time, but it is by no means of an up to date standard. In most countries there is a proper Government meteorological bureau, permanent so that the records in lapse of years become absolutely invaluable. If this had been started 50 years ago and properly maintained we should by this time have a clearer idea as to the effects of clearing ground for cultivation on the rainfall, and water supply, and incidentally too, probably some evidence as to the relations of variations in climate to epidemic disease.—ED.

14/193

AQUATIC PLANTS.

When we consider the large and varied Flora of these parts it is surprising to find how few true aquatic plants we possess, endemic or introduced. True, we have many plants of a water-loving nature (Colocasia Antiquorum, L.) but among these we find only roughly representatives of about 20 genera, which can be truly called Aquatics.

Even in other parts of the World, the culture of Aquatics has been sadly neglected in the past, why, it is difficult to say, as they are all of easy culture and most of them of easy propagation, while a collection of such plants adds charms to any Garden. However, during the last few years, not a few gentlemen interested in floriculture, have made a speciality of this class of plants thereby increasing their popularity. Much, however, yet remains to be done.

As a general rule it may be taken that Aquatic Plants do not require a great depth of water, though *Nymphaeas* (true Aquatics) will thrive exceedingly well when in a depth of 6 or 8 feet provided they are planted in a good strong soil. One thing however, must be borne in mind, that is that such plants prefer to grow in moving water.

It is difficult to give a concise definition of an Aquatic Plant, but perhaps this inability to thrive in stagnant water might be considered distinctive of nearly all true Aquatic Plants.

In many gardens concrete tanks are built in which Aquatic Plants are intended to be grown, but unless there is a proper circulation of water it turns out a miserable failure and and causes endless worry, both plants and water having to be continually renewed. Such a one we have in the Gardens and it cannot be said to have ever been at all satisfactory, in fact it is quite the reverse.

If it were necessary to use such a tank, the inlet should be at one side with the overflow either at the other end or in the centre, the top of the overflow pipe being covered with a raised piece of wire mesh.

In this part of the world, however, it is not advisible to add to the existing number of mosquito-breeding grounds, so I shall confine my further remarks to the utilization of already existing water-courses.

As is the case with Ferns, Aroids and Climbers, Aquatics require care in the selection of suitable situations. Many require strong sunshine (Nympheas), others partial shade *(Eichornia)*, while others thrive luxuriantly in dense shade (Lasia), no hard and fast rule can be followed, only the amount of sunlight is the most important factor.

I have endeavoured in the list given, to mention the most suitable situation for each.

Papyrus, N.O. *Cyperaceæ*. A small genus of sedges, mostly natives of tropical and warm regions, now included under *Cyperus*.

P. *antiquorum* correctly *Cyperus Papyrus,* is the ancient Paper Reed or Rush. The stems are dark green, triangular and jointless, supporting at the top an umbel of pendent leaves, which are exceedingly graceful. "The pith-like tissues of the larger flowering stems cut into thin strips, united together by narrow overlapping margins, and then crossed under pressure, by a similar arrangement of strips at right angles, constituted the Papyrus of antiquity" (Oliver).

The plant is of easy culture and is best treated as an aquatic. It requires a good rich soil and delights in almost full sunshine. Propagation by seed when obtainable, and by division of rhizomes. Height 10 feet. Native of Asia Minor, etc.

Eichornia, N.O. *Pontederiaceæ*;—A genus of interesting, beautiful and useful Aquatics, natives of South America and Tropical Africa.

Propagation by division of rhizomes. Plant in partial shade and remove all decaying leaves as soon as they appear, otherwise culturally they require no further remarks.

E. crassipes (thick stalked). A very ornamental aquatic with handsome violet coloured flowers which, when massed in clumps and flowering freely, gives a particularly pleasing effect.

Leaves large and fleshy, more so towards the base. This plant also finds favour with the Chinese in the feeding of Swine.
Syn. Pontederia azurea.

Hydrocleis, N.O. *Alismaceæ*:—A small genus of Aquatics of great beauty. Natives of tropical Southern America. Flowers solitary, large, hermaphrodite, on long, thick peduncles. Leaves fascicled, floating, ovate, with thick petioles. They are of easy culture and can be readily increased by seed or runners.

H. Commersonii, Rich:—A native of Brazil is a pretty and valuable acquisition to our list of Aquatics, well deserving the name of "Water Poppy." Leaves small, ovate, 2½ inches long and 2 inches broad, dark green in colour, floating on the surface of the water, coriaceous.

Flowers erect, cup-shaped, pale yellow with a dark centre. The plant is very floriferous though the individual flowers last but a short time.

The plant requires a good strong loamy soil and may be grown in tubs in which the loam is covered with water. In the Gardens we find it thrives exceedingly well when thus treated and kept in the shade, but fails altogether when transferred to a similar position in the Lake, the leaves becoming smaller and smaller until the plant disappears altogether.

It benefits greatly by occasional mulchings of cowmanure. Propagation by seed and division. Syn. *Vespuccia Humboldtii* and *Limnocharis Humboldtii.*

Lasia, N.O. *Aroideæ:*—A monotypic genus of robust, marsh-loving plant requiring similar treatment to many Aroids.

L. heterophylla:—Leaves very variable, hastate when young, when older long and broad, borne on very prickly petioles.

This is not a particularly handsome plant. It succeeds admirably when planted in partial or dense shade. Propagation by seed and division of rootstock. SYN. *L. aculeata, L. spinosa, Dracontium spinosum.* It is a native of the Malay Peninsula.

Montrichardia. N.O. *Aroideæ (Araceæ):*—A genus comprising three or four species of Aquatic or marsh plants, natives of tropical America. Propagation by seeds or by division of the rootstock. They require no special mention here as all are of easy culture.

M. aculeata:—A noble tropical Aroid which grows to a height of 8 to 10 feet. The stem is of robust habit of growth, annulate and spinulose. Leaves large, often more than a foot long, hastate to the middle, bright green above with pale yellow midrib and nerves. The spathe is about 8 inches long, yellow green externally, inside red and yellow being borne on a very stout, short peduncle. Propagation by seed and division of rootstock. This plant succeeds admirably if treated as semi-aquatic or marsh plant and delights in partial or even dense shade. Native of Brazil.

Nelumbium, N. O. *Nymphaeaceae* (Sacred or Water Bean);—This is a genus of beautiful and useful aquatic plants and is probably better known under the name of "Sacred Lotus".

The leaves and flowers are borne on long stalks, and in the case of the leaves, a pleasing effect is seen as the wind stirs them, exposing their metallic undersurfaces. The flowers are exceedingly handsome being rosy, red or white in colour. The fruit resembles an enlarged funnel-shaped pepper-box and contain many seeds.

Not the least important property of these plants is their many medicinal uses. The yellowish-white fibre extracted from the stalks (which are used as a vegetable) finds favour with Hindu doctors as a febrifuge. The filaments (anther stalks) have astringent and cooling properties, the seeds are considered medicinal and used to check vomiting, and are also eaten by the natives as an article of food either raw, roasted, or boiled, while the large leaves are used as cool bed-sheets in cases of fever accompanied by much heat and burning of the skin. The root is employed as a paste in ringworm etc., or as an article of food.

Nelumbiums do not require a great depth of water, neither do they thrive when deeply planted, but they prefer a rich compost and are greatly benefited by occasional mulchings of cow manure. In planting these plants care should be taken not to injure the rhizome or rootstock as when once injured they are liable to be destroyed by rot. An average depth of 9 inches to 1 foot in planting with a foot of water is sufficient.

In manuring, the most satisfactory method is to drain off the water, place the manure round the base of the stems and setting a coolie to stamp it into the existing mud, allowing the water to flow into the pond or tank on conclusion of this operation. Beyond removing withered leaves and occasional mulchings as described, very little cultural attention is required.

Propagation by seeds and division of rhizomes. The seeds are often difficult to obtain owing to their many valuable properties. Division of the rhizomes is best performed by a sharp knife and the cut should be clean, a new growth being left to each division.

N. speciosum;—Of this species there are many varieties, differing chiefly in the colour of their flowers. *N. speciosum* or the Egyptian Bean of Pythagoras, has deliciously scented large, white flowers tipped with rose and is spoken of as an emblem of fertility. The leaves are large and exactly peltate in the centre, supported on long, cylindrical pedicels.

N. speciosum var. *album* is similar to the above with white flowers. The Japanese have several varities varying in colour from pure white to deep rose. The plant is wild in the Malay Peninsula, and is particularly abundant in the ditches of Province Wellesley, where the native children gather and sell bunches of the flowers to the railway passengers.

Nymphaea, N.O. *Nymphaeaceae*;—A large genus of beautiful and popular aquatics of wide destribution, the majority coming from the Northern Henisphere or Tropical Regions and a few being found in South Africa and Australia.

The flowers are solitary, often large, white, blue or red and exceedingly showy. Their opening is of short duration, lasting only from early morning until a few hours before midday at latest. In artifically heated houses in Europe, one variety N. devoniensis, is exceedingly peculiar with regard to the opening of its flowers. They open very early in the morning (about 4 a.m. or earlier) and close up shortly after 7 a.m.

When a *Nymphaea* flower has faded (and this holds good in nearly all aquatics) it disappears under water so that when seed is required of these plants, the water must be thoroughly searched for them.

Pedicels cylindrical, short or long as required by the depth of the water. When mature, they are always of sufficient length to allow the leaves to float on the surface of the water. Leaves large, cordate or peltate.

Nymphaeas may be cultivated successfully in tubs or barrels, tanks or ponds as desired, but in all cases full sunshine is essential. Whatever method of cultivation is practised, the corms must *not* be planted deeply, 6 inches being sufficient for all.

A good example of the injurious effects of deep planting was seen in one of the Garden Lakes lately. Formerly Nymphaeas grew luxuriantly therein, but owing to the silting up of the lake by soil washed down by road drains, they gradually disappeared. Some few weeks ago, 2 feet of mud was removed from the bottom of the lake and immediately the Nymphaeas started into growth again with renewed vigour and seem to be none the worse of their premature burial.

They require a rich soil i.e., one containing plenty of cow manure, and greatly, benefit by occasional mulchings of the same material. Perhaps the most successful method of cultivation for these plants is to fill tubs with suitable soil, place the corms (if they are very small and of the same variety) in a little sand in the centre of the tub. This prevents the corm from rotting before they start into growth. Sand to the depth of ½ inch may be sprinkled all over the surface soil of the tub which will prevent the straws contained in the manure escaping and becoming unsightly. Submerge the tubs in their permanent quarters and in a short time the tubers will become active.

If you are raising Nymphaeas from seed, place the seeds in small pots using a light compost, submerging as many as possible of these pots in a shallow tub or tank of water. Pot on as required using richer soil for successive pottings until the plants are large enough to place in tubs.

Nymphaeas may also be lifted from a reserve pond or tank and planted in the existing soil composing the bottom of the lake, but they benefit greatly by the addition of some manure to such soil. They do not seem to require any resting period in this part of the world.

Propagation by seeds and division of corms.

There are many species of Nymphaeas but the following is a list of the choicer ones suitable for this neighbourhood, not including all of the many new hybrids lately raised by lovers of this class of plants.

N. Lotus or "Egyptian Lotus" is one of the ancient Egyptian flowers sacred to Isis and were sometimes engraven on their very ancients coins. It is distributed throughout the Tropics of the Old World and in India it is spoken of as the "Queen of Indian Flowers."

Flowers large, white or red, with the sepals red at the margins. Leaves peltate and sharply serrated.

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According to G. Watt, M.B., C.M., in the Economic plants of India, "The flowers are used as a dry and cold astringent in diarrhoea, cholera, fever and diseases of the liver and are also recommended as a cardiac tonic. The powdered root is prescribed for piles as a demulcent, also for dysentry and dyspepsia. The seed forms a cooling medicine for cutaneous diseases, leprosy, and are considered an antidote for poisons."

In some districts of India, all parts of the plant are eaten by the natives as articles of food;—"The roots, which contain a large quantity of starch, are usually boiled though sometimes eaten raw; the stems are cooked in curries; the unripe fruit is eaten as a vegetable and the seeds are parched."

N. L. dentata:—A lovely variety of Nymphaeas having very large, pure white flowers from 6 to 14 inches in diameter. Leaves peltate, very large and serrated at the margins. A very floriferous variety and one of the easiest to cultivate.

N. stellata (starry):—Flowers blue and delicately scented, floriferous. Leaves peltate, nearly entire. Tropical Africa.

N. S. zanzibarensis Zanzibar:—One of most beautiful of all the Nymphaeas. Flowers intense blue, anthers slightly shaded with violet; sepals green outside and purple within.

There are now many varieties of Nymphaeas, the following being among the choicest:—

Deaniana, flowers rosy-pink, large; leaves bronzy; vigorous and free. *Kewensis*, flowers bright rosy-red, shading of lighter towards the base of the petals, large and freely produced.

O'Marana, flowers bright rosy-red; leaves bronzy, deeply toothed at margins; free.

Sturtevantii, flowers bright rosy-red, cup-shaped, large and broad-petaled; leaves bronzy and the upper surface deeply toothed at the margins; shy flowerer but a beautiful variety.

Thermalis, flowers white, with a pink tinge, faintly scented.

Pulcherrima, flowers light blue, remaining a long time expanded, vigorous and free.

Ouviranda, N. O. *Naidaceae*;—A small genus of curious, rare and singularly beautiful plants, both in colour and structure; natives of Madagascar. The graceful leaves, 9 or 10 inches long and 2 or 3 inches broad, rise on slender stalks, and spread out horizontally just beneath the surface of the water and resemble a living fibrous skeleton rather than a perfect leaf. The flower-stalk rises from the centre of the leaves and the fork-like inflorescence is curious.

The cultivation of this plant often presents no little difficulty owing to the tender net-like structure of its leaves. Water in which this plant is grown must not be above one-and-a-half feet deep, with a temperature not exceeding 75°. They require a compost consisting largely of loan and decayed vegetable matter. This plant may be successfully grown in pots, placing them in large glass jars or glass Aquaria having the desired depth of water, provided the water is renewed weekly. Partial shade.

In Madagascar this is a valuable plant to the natives as the name implies (Ouvirandrano—literally Water-Yam or yam of the water). At certain seasons of the year, they gather it as an article of food. the fleshy root when cooked, yielding a farinaceous substance resembling a yam.

O. fenestralis (window-leaved) The Lace-leaf or Lattice Plant. Flowers greenish white. The leaves are merely a network of vascular tissues resembling lace or a lattice window.

Pistia, N.O. *Aroideae (Araceae)*. A rapidly increasing stemless plant which often completely covers tropical ponds and watertanks, its chief beauty lying in the leaves, the flowers being inconspicuous.

P. Stratiotes, Tropical Duckweed, Water Lettuce;—Flowers greenish, very small borne in little spathes at the end of the leaves, each spathe containing one male and one female flower attached to an adnate spadix.

Leaves wedge-shaped, slightly concave, notched or round topped, of a delicate, pale pea-green, hispid, and connected together into a rose-shaped tuft. They send out runners bearing other plants in all stages of growth. As has already been mentioned in the Bulletin (Vol. page) this plant forms a valuable fodder in the feeding of swine.

The culture of this plant in tanks in artifically heated glass houses suffers occasionally from a fungus; which completely disfigures the plant, many of the leaves turning yellow with occasional black blotches.

Propagation.—This plant (as mentioned above) is of very easy propagation, i.e., by offsets. If grown for decorative purposes, it requires to be rather severely thinned out occasionally, and thrives luxuriantly in partial shade. The depth of water is immaterial, though larger rosettes of leaves are obtained if shallow water is used with a layer of rich soil at the bottom, the long, soft, feathery roots having ready access to it.

Susum, N.O. *Flagellariæ*, Aquatics or terrestial plants with creeping rhizome. Leaves closely crowded, ensiforme or lanceolate. Flowers small sessile green or yellow.

S. Anthelminticum Bl. A very large aquatic plant, emitting long floating stolons, stem 1 inch through, creeping. Leaves erect 6 ft. or more, tall, 6 inches broad, swordshaped. In Sumatra this plant forms great floating masses and occasionally almost blocks the Siak River.

Victoria, N. O. Nymphaeaceae ;—A monotypic genus, the species of which is one of the most remarkable productions of the Vegetable Kingdom. Probably no other plant has created such a stir among Botanists and Horticulturists as did the introduction of this plant to England in 1838. It is found growing in still or sluggish waters, 4 to 6 feet deep, in Central Ameriea. In its native country the leaves are said to be large enough to enable a good-sized child to sit on the the upper surface of the leaf provided the weight is distributed over the whole of it.

V. Regia, Lind., Queen Victoria's Water Lily ; Water maize ; Water Platter :—The Root is perennial large and tuberous. Leaves usually floating, of prodigious size when well-grown, 4 to 6½ feet in diameter (12 to 19 feet in circumference), peltate, flat, but having a margin of 2 to 5 inches broad which is turned up so to form an elevated rim like that of a tea tray. The upper surface of the leaf is full-green and reticulated ; the under side is deep purple (sometimes green) and copiously veined, beset with sharp and horny prickles. The peticles or leaf stalks are long and covered with sharp prickles.

Flowers solitary on thick, prickly peduncles, in bud pear-shaped, when expanded fully 1 foot in diameter. The sepals are large, oval, purple-brown and prickly. The outer petals are white, the inner ones becoming deeply coloured with purple or full rose.

The flowers on opening in the morning are practically pure white in colour, but before the day is finished they have changed to a lovely full-rose colour,

The *Victoria regia,* as might be expected from its enormous size, requires a strong soil consisting largely of strong loam and plenty of decayed cowmanure. It delights in full sunshine in slow flowing water and requires frequent heavy mulchings of cowmanure.

Propagation by seed, which require similar treatment to Nymphaeas.

Jas. W. Anderson.

Acorus calamus :—(*Araceae*) sweet flag, Jeringu grown from cuttings of the rhizone suitable for pond edges—whole world.

A gramineus :—A narrow leaved form—from China.

Azolla :—A minute reddish aquatic floating on the water like a duckweed, suitable for aquaria—common in Singapore.

Barclaya Motleyana (*Nympheacae*) :—A curious kind of jungle waterlily with flowers of a dull brown and pink, cultivated in shallow tanks, in pots—native of Singapore.

Blyxa Malayana Rid. (*Hydrocharideae*) :—A long grassy-leaved submerged Aquatic, suitable for acquaria.—Singapore.

Cryptocoryne (*Aroideae*) :—Aquatic aroids cultivated in pots beneath water, the spathe with a purple or yellow limb rises to the surface. There are several species here.

Cyrtosperma Lasioides, Thw. (*Aroideae*) :—A tall aroid with sagittate leaves for ponds.—Malaya.

Ceratopteris thalictroides (*Filices*) :—The waterfern, a very pretty aquatic fern for edges of ponds.—Malaya.

Cyperus papyrus L. (*Cyperaceae*) :—The Papyrus.—Africa.

C. alternifolius :—A shorter species from Madagascar, of which variegated forms may be had.

Eichornia crassipes (*Pontederiaceae*) :—America.

E. Martiana :—A tall plant with a panicle of blue pink and yellow flowers.

Enhydrias angustipetala, Rid. (*Hydrocharideae*) :—A feathery submerged plant of very rapid growth. Any fragments will grow readily, very suitable for aquaria.—Malay Peninsula.

Hydrocleis Conmersoni, Rich. (*Alismacae*) :—Brazil.

Ipomea aquatica, Forsk. "Kangkong" (*Convolvulaceae*) :—Africa and Asia.

Jussieua natans, Humb. (*Onagraceae*) :—A floating aquatic with white flowers with a yellow spot at the base of each petal, suitable for ponds.

Lagenandra toxicaria, Dalz. (*Aroideae*) :—Broad leaved aquatic for ponds.—Ceylon.

Lasia spinosa Thw. (*Aroideae*) :—Malaya.

Limnanthemum cristatum (*Gentianaceae*) :—White flowers for ponds.—Tropical Asia.

Monochoria hastaefolia, Presl. (*Pontederiaceae*) :—A tall plant with clusters of light blue flowers.—Malaya.

Monochoria vaginalis, Presl. :—A smaller dwarf species with darker blue flowers for ponds.—Malaya.

Montrichardia aculeata (*Aroideae*) :—Brazil.

Naias graminea (*Naiadaceae*) :—A submerged plant with fine foliage for aquaria.—Tropics.

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Nelumbium speciosum, Wild. (*Nympheaceae*) :—Tropical Asia.

Neptunia Oleracea, Lour. (*Leguminosae*) :—The water sensitive plant, a floating plant with sensitive leaves, and heads of yellow flowers. Formerly cultivated as a vegetable.

Ottelia alismoides Pers. (*Hydrocharideae*) :—A pretty aquatic for pot cultivation, flowers white.—Malay.

Ouvirandra fenestralis (*Naiadaceae*) :—Madagascar.

Philydrum lanuginssum (*Philydraceae*) :—A stiff leaved plant with yellow flowers for pond edges.—Asia and Australia.

Pistia Stratiotes L. (*Aroideae*) :—Tropics.

Sagittaria Sagittifolia, L. (*Alismaceae*) :—Europe and Asia.

Susum Anthelminticum, Bl. (*Flagellarieae*) :—Malaya.

Trapa Nanoutans L. (*Onagraceae*) :—The water chestnut. A floating aquatic.—China.

Utricularia exoleta R. Br. *and U. flexuosa* Vahl. (*Lentibulariaceae*) :—Submerged aquatics with bright yellow flowers borne above the water.—Tropical Asia.

Victoria Regia Linde. (*Nympheaceae* :—Brazil.

THE APPLICATION OF LIME IN AGRICULTURAL PRACTICE, WITH PARTICULAR REFERENCE TO PARA RUBBER TREES.

By B. J. Eaton, F.I.C., F.C.S., Agricultural Chemist, F.M.S.

Considerable interest is now being taken by planters in the Federated Malay States in the subject of manuring, and requests for soil analyses and advice re-manuring are being constantly received by the Department of Agriculture, F.M.S.

A number of enquiries has been received asking particularly for advice re-lime, its method of application, and the benefits to be derived from it, in consequence of which it has been thought advisable to publish this article, which, although it makes no claim to originality, it is hoped will explain the value of lime as a factor in agriculture.

Soils of the Federated Malay States.

In general it may be stated that soils in this country are deficient in the essential mineral constituents, viz., lime, phosphates and potash and as a rule contain fairly large quantities of nitrogen, especially where the land has previously been under virgin jungle.

The deficiency in lime or calcium salts is particularly marked and is greatest in the peat formations of the coast overlying clay subsoils.

As is well-known, the peaty soils are very sour or acid in character when first opened out and the drainage water remains acid for months or even years after such lands are first opened out for cultivation.

The Advantages of Liming.

(*a*) *Peaty Lands:*—In earlier days of agricultural practice in Europe, peaty lands were first opened out by through drainage, to carry off the excess of water and to aerate and dry the soils.

The surface was then broken up by ploughs and the earth heaped together and burnt, the combustion being allowed to proceed slowly. In this way the mineral constituents were increased proportionately and the acidity of the soil was neutralised by the alkaline ashes—chiefly carbonates of the alkalis (soda, and potash) formed by burning the organic salts of these substances.

The great disadvantage of such a process is the loss of nitrogen in the organic matter of the soil.

This method has now been replaced by thorough drainage of land in such cases, the land after drainage being allowed to remain for some considerable time, in order to become consolidated, since, as is well known, and can be easily observed in the peaty soils in our coast districts, considerable shrinkage takes place when such land is opened out, and the land frequently sinks a foot or even more in many cases. The soil is then thoroughly limed to neutralise any acidity and to render the essential constituents more available for the plants subsequently cultivated on the land. To show the effect of lime on peaty land it is only necessary to collect the dark brown peaty drainage water and add to it a little lime water or solid lime—when, on standing for about 5-10 minutes, the whole of the organic matter is precipitated and a clear colourless water left.

(*b*) *Clay Lands:*—Clay soils were originally improved in a similar way, the clay after ploughing being heaped together with organic debris and slowly burnt at a low temperature. The physical texture of clay soils is improved in this way. The same disadvantage in the application of this method to clay soils exists as in the case of peaty soils, *i.e.*, loss of organic nitrogen.

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In addition to the advantages of improved physical texture in both cases, there is no doubt, in the light of recent discoveries, that the well known effect of this burning was partly due to the partial sterilization of the soils which subsequently increased the bacterial flora.

This no doubt occurs to a considerable extent when virgin jungle is felled and burnt in countries such as the Federated Malay States, as, although probably in some parts the beneficial and other bacteria are completely killed by the high temperature on the surface, the temperature at a depth of say one foot would be only sufficient to partially sterilize the soil and thus give rise to the benefits of such a process. Clay soils are improved to a remarkable extent by liming—the effect being principally an improvement of the texture of the soil.

The finer soil particles are coalesced by the addition of lime and lime salts and become flocculated into large particles, so that such soils after treatment become more open in texture, retain less water, which is often a desideratum in this country, particularly in flat lowlying lands.

(A simple experiment can be easily carried out to demonstrate this flocculating effect of lime on colloidal clay particles. Two tall glass cylinders are taken and in a separate vessel a mixture of clay and water is made. The supernatant liquid from this mixture is then decanted into the two cylinders—the liquid contains only the finest clay particles which remain suspended in the water, for the most part for an indefinite length of time. If a trace of lime, slaked or quicklime or a solution of lime water be added to one of the cylinders, the whole of the clay particles suspended in the cylinder will quickly fall as a sediment to the bottom of the liquid leaving a clear liquid above. This experiment is simple and elementary but very instructive).

Clay soils after treatment with lime are more easily cultivated and do not crack or cake when dry.

(c) *Sandy Soils:*—Although it may appear somewhat paradoxical, lime has also a beneficial action on light sandy soils, rendering them more cohesive by cementing the loose particles together. This is easily understood when we consider the use of lime as a binding agent in the preparation of mortar.

General Effects of Lime.

The general effects of the application of lime can be conveniently classified as follows:—

1. Mechanical or Physical.
2. Chemical.
3. Biological.

The chemical and biological effects of the action of lime on soils are closely connected, since the biological effects are productive of changes in the chemical compounds present in the soil.

These effects are general, to a greater or less extent, for all types of soil.

1. *Mechanical effects of lime on soils.*—The first of these has been sufficiently dealt with above in discussing the application of lime to peaty, clayey and light sandy soils.

2. *Chemical effects of lime on soils.*—Lime acts directly as a plant food, some plants requiring comparatively large quantities;—one of its principal functions appears to be to strengthen the woody portions of trees.

The effect, however, of lime as a direct plant food is of minor importance as compared with its indirect action on soils, due to its action as a base.

It acts indirectly by rendering available the dormant fertility of all soils. It liberates potash from the insoluble silicates with which it is combined. Quicklime or slaked lime is preferable to lime-stone for this purpose. It also assists the decomposition of organic nitrogenous matter, when not present in excessive quantity, and is thus especially beneficial in this respect on peaty soils.

It corrects soil acidity which is generally harmful to vegetation. Many coarse grasses, sedges and other weeds which only flourish on acid soils disappear after the application of lime.

It also renders phosphoric acid available by liberating it from its combination with iron and alumina with which phosphoric acid must be usually combined in the laterite soils in this country.

It is also essential after the application of repeated dressings of other manures such as Ammonium sulphate, Kainit and Superphosphates, the accumulated effects of which are to produce acidity. Thus in general the application of artificial manures necessitates a corresponding increase in the application of lime.

Biological effects of Lime:—The biological effects of lime on soils, as stated before, are intimately connected with the chemical effects.

It is essential to the successful action of nitrifying bacteria, to combine with the nitric acid produced by these bacteria. It generally assists other fermentative actions in the soil, since those which are of benefit only occur in the presence of some base such as lime, whereas deleterious fermentation changes occur in sour soils in which nitrogen is actually liberated and escapes into the atmosphere.

Another important function is its inimical action on a number of fungoid root diseases, the particular instance in connection with the cultivation of para rubber trees being its action on Fomes semitostus.

Compounds of Lime:—It must be remembered that the benefits to be derived from liming so called are almost entirely dependant on its value as a base and not because of the calcium it contains as a direct plant food, so that it must be applied in one of the following forms:—quicklime, slaked lime, or chalk (or other forms of the carbonate such as limestone).

Whether applied as quicklime or slaked lime, which are both oxides of calcium or "lime" it is converted eventually into carbonate by the carbonic acid present in the atmosphere or the soil.

The application of lime in the form of chalk (a soft limestone) so common in many parts of England, is probable known to most planters in this country. There are, however, no deposits of this nature in the Malayan peninsula. It is preferable, however, to apply lime in the form of quicklime or slaked lime rather than as chalk or limestone as, although eventually the lime is carbonated in the soil, the particles of quicklime or slaked lime are much finer than either chalk or limestone can be reduced to by grinding and are thus more readily incorporated in, and absorbed by the soil.

Methods of application.

If quicklime is employed as a dressing it should first be heaped and slaked with water and allowed to fall to a dry powder—"Slaked lime," as if quicklime is spread broadcast over the soil it tends to form lumps and is not easily converted to a powder.

If "Slaked lime" is used, it can be immediately spread over the surface of the soil.

"Ground lime" which in the end is more economical cannot be obtained in this country (unless perhaps at the Marble works at Ipoh, Perak, F.M.S.)

With trees under two years old, the preferable method would be to dig shallow circular trenches with a radius of about two feet round each tree, and apply to each tree individually.

On older clearings where the roots of trees interlace it would be more economical and equally effective to broadcast the lime, and fork over the whole surface of the area treated.

An application of at least 5 cwt. per acre should be used, or four times the quantity on peat soils and on heavy clay soils. A second application of 5 cwt. might be applied in the subsequent year.

General Remarks:—It should be borne in mind that all manurial treatment of this kind should be carefully checked in order to ascertain whether the effects produced are sufficient to warrant the expense incurred.

It is useless, as some planters and even some supposed trained investigators do, to carry out field experiments of this kind or any other, without checking the effects on a sufficiently large area. At least 100 trees should be kept as a control, adjoining the area treated, and these, together with at least 100 trees that have been "limed," or manured as the case may be, should be measured before treatment and subsequently, and if tapping has commenced the dry rubber yield should be checked in each case over a long period.

The effect of "liming" is unlikely to be felt within 6 months or even a year, even in a hot humid climate such as this; more especially is this the case, when lime is applied during such a drought as has recently been experienced. It is preferable, however, to apply lime and other manures in this country of copious rainfall, during a comparatively dry season.

Lime is not a very soluble manure and its action is consequently slow.

MINUTES OF THE PLANTERS' ASSOCIATION OF MALAYA.

A Meeting Held at the Masonic Hall, Kuala Lumpur, on July 9th, 1911, at 10 a.m.

PRESENT:—

Mr. E. B. Skinner,—Chairman.

Delegates from Kuala Lumpur District Planters' Association:—Mr. H. F. Dupis, Capt. A. J. Fox, and Mr. F. G. Harvey.

Delegates from Negri Sembilan Planters' Association:—Messrs. J. le P. Power, J. G. Hubback, P. W. N. Farquharson.

Delegates from Johore Planters' Association:—Mr. W. R. J. Hawtrey.

Delegates from Kuala Selangor Planters' Association:—Messrs. A. Irving and G. H. Anderson.

Delegates from Kapar District Planters' Association:—Messrs. J. G. Cruickshank, E. C. Ash, E. P. Howard and E. W. Harvey.

Delegates from Batu Tiga Planters' Association:—Messrs. H. E. G. Slobe, H. L. Jarvis, H. R. Quartley and C. G. Arnold.

Delegates from Klang District Planters' Association:—Messrs. Jno. Gibson, E. C. Wakefield, W. H. Trotter and C. A. Buxton.

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Delegates from Kuala Langat District Planters' Association:—Messrs. R. W. Munro and E. Macfadyen.

Delegates from Lower Perak Planters' Association:—Mr. J. M. Counsel.

Mr. G. H. Day—Legal Adviser.
Mr. C. St. G. Wheeley—Secretary.

VISITORS:

Messrs. L. Lewton Brain, Dr. M. Watson, F. O. Sanders, W. S. Reene Tucker, H. L. Lamotte, H. Case, G. W. Templer, W. G. Dobson.

1. The Minutes of the last Meeting (held on April 30th) are taken as read and confirmed.

2. CORRESPONDENCE.

(A) 1. Indian Labour.

The Secretary reads the following correspondence:—

W. R H. CHAPPEL, Esq.,

Kuala Lumpur, 11th May, 1911.

Ipoh.

DEAR SIR,

At the Annual General Meeting of this Association held on 30th ultimo, I was instructed to forward to you and the other unofficial members of the Federal Council a copy of the enclosed letter, to which I have as yet received no reply.

I have, &c.,
C. St. G. WHEELEY,
Secretary.

and reports that a similar letter had been addressed to the other unofficial members of the Federal Council.

Ipoh, Perak, 12th May, 1911.

The Secretary,
Planters' Association, Malaya,
Kuala Lumpur.

DEAR SIR,

I am in receipt of your letter of May 11th, enclosing copy of letter to the under-Secretary, F. M. S., contents of which are fully noted, and with which I agree, and if the occasion arises your Association may depend upon my support.

I have, &c.,
W. R. H. CHAPPEL.

2. QUARANTINE EXPENSES.

10th May, 1911.

The Under-Secretary,
Federated Malay States,
Kuala Lumpur.

SIR,

I have the honor to inform you that your letter of 11th ultimo, numbered 3 in 2335/1911 was laid before my Association at their Meeting on 30th ultimo.

2. My Association are in favour of the suggestion that quarantine expenses should be paid from the Immigration Fund.

3. I was instructed to enquire whether coolies imported into the State of Johore would be placed on the same footing as those for other States.

I have etc.,
C. St. G. WHEELEY,
Secretary.

Kuala Lumpur, 19th May, 1911.

No. 3 in 3399-1911.

SIR,

I have the honour to acknowledge receipt of your letter dated the 10th May, 1911, informing me that your Association is in favour of the suggestion that quarantine expenses should be paid from the Immigration Fund.

2. With reference to your paragraph 3 in which you ask whether coolies imported into the State of Johore would be placed on the same footing as those for other States, I am to enquire whether your question refers to quarantine or to other matters.

I have, &c.,
J. R. O. ALDWORTH,
Under-Secretary, F.M.S.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

No. 7 in 3399/1911.

Kuala Lumpur, 10th June, 1911.

SIR,

I am directed to acknowledge the receipt of your letter dated the 20th May, 1911, with regard to the quarantine expenses of coolies imported into the State of Johore,

2. In reply, I am to say that the Chief Secretary is advised that the ultimate destination of coolies arriving at Singapore, Penang or Port Swettenham is immaterial as regards the authority of the Committee to pay their quarantine expenses from the immigration Fund.

I have, &c,
J. TAYLOR,
Under Secretary, F.M.S.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

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(B) JAVANESE LABOUR.

The Secretary reads the following correspondencc:—

May 10th, 1911.

Messrs. HOOGLANDT & Co.,
Singapore.

DEAR SIRS.

I am instructed by my Association to ask you if you can give me any information as regards the present conditions of recruiting labour in Java.

I have, &c.,
C. St. G. WHEELEY.
Secretary.

and reports that a similar letter had been written to Messrs. KENNEDY & Co., and Messrs. BEHN MEYER & Co.,

The Secretary,

Singapore, 12th May 1911.

The Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,

In reply to your favour of the 10th instant, we have much pleasure in informing you herewith that we have received telegraphic information from our Java Recruiters that the Netherlands Indian Government will allow again Javanese labour to be recruited for the Federated Malay States.

We have received this information briefly by cable a couple of days ago and are now awaiting full particulars in writing and we shall make free to write you again mentioning the lowest possible price and time of delivery. In the meantime.

I have, &c.,
Per Pro. HOOGLANDT & Co.,
G. J. M. KENHMANS.

The Secretary, Singapore, 16th May, 1911.
The Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,

In pursuance to our respects of the 12th instant. we herewith beg to inform you that we have received a cable from our Java Recruiters mentioning that they have quoted you by telegram for First Class Javanese labour F. 95 per man and F. 100 per woman free Singapore including F. 5 advance paid at Java.

Should you require some more particulars kindly let us know and we shall be very pleased to procure same for you.

Soliciting your esteemed commands.

I have, &c.
Per Pro. HOOGLANDT & Co.,
G. J. M. KENHMANS.
Kuala Lumpur, 18th May, 1911.

MESSRS HOOGLANDT & Co.,
Singapore.

DEAR SIRS,

I am in receipt of your favours of 12th and 16th instant, for which I thank you.

The information that my Association requires is as to the conditions of recruiting in Java.

I am informed that the number of Recruiting Licences is limited. and that it will be some time before the present applications are worked off.

Trusting that you will be able to give me further information on the matter.

I have, &c.,
C. ST. G. WHEELEY,
Secretary.

Singapore, 23rd May, 1911.

The Secretaries,
The Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIRS,

With reference to your favour of the 18th instant, we have much pleasure in informing you herewith, that the Netherland Indian Government has decided to consider again all applications for recruiting Javanese labour for Estates in the Federated Malay States.

It will certainly be some time, before the applications are worked off as the number of recruiting licenses is limited to 2000 coolies (in all) per month.

I will therefore be advisable to send applications in as soon as possible and we should feel very much obliged if you would kindly mention our name to the members of the Association in this respect.

We enclose a specification of particulars required and we shall be pleased to draw up the necessary official (stamped) letters of applications to the Netherland-Indian Government.

I have, &c.,
Per Pro. HOOGLANDT & Co.,
G. J. M. KENHMANS

1. Name of Company	1.
2. Capital	2.
3. When and where registered	3.
4. Directors' names	4.
5. Name of Estate	5.
6. Situation of Estate	6.
7. Name of Estate Manager	7.
8. Acreage under cultivation	8.
9. Nature of cultivation	9.
10. Total production this year, or last year	10.
11. Number of coolies employed	11.
12. Hospital accommondation and staff employed in Hospital.	12.
13. Any European medical supervision?	13.
14. House accommodation available for Javanese labourers	14.
15. Water supply, where obtained and how treated?	15.
16. Death rate during each of the last three years	16.
17. Number of coolies proposed to recruit within twelve months after permission has been obtained	17.
18. Length of coolies' contract	18.
19. Has permission to recruit natives of Java for labour on the estate been granted previously?	19.
20. If so, state date and number of such permission and number of labourers recruited thereunder so far.	20.

Labour Bureau,
Penang, 12th May, 1911.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,

We are in receipt of your letter of the 10th instant asking us if we can give you any information as regards the present conditions for recruiting Javanese labour in the F. M. S.

14/205

We understand that the Governor General of Netherlands India is now prepared to grant permits to recruit Javanese. Applications so far received will be considered on their own merits and according to the date presented. Arrangements will be made wherby all permits granted will not be able to exceed in recruiting over 1000 coolies per month, After the permits already presented have become exhausted, then those permits now going in will be taken in rotation and according to the date received.

We learn that pemits have already been received applying to recruit 25,000 coolies and if the above arrangements are enforced then it will take over 2 years for the permits already applied for to become exhausted, and we think therefore the chance of obtaining Javanese labour is a very poor one.

Yours faithfully,
KENNEDY & CO.,
Secretaries.

Messrs. Singapore, 19th May, 1911.
The Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIRS,

We are in receipt of your favour of the 10th May, 1911, and beg to thank you for your enquiry for Javanese labour. We have submitted same to our Batavia branch and shall communicate with you again as soon as a reply is to hand.

Yours faithfully,
Per Pro. BEHN, MEYER & CO., LTD.,
E. ASBENZ.

At this point the Chairman says that as the correspondence is evidently long he proposes that the Meeting should consider it under its headings according to the agenda.

2. INDIAN LABOUR.

The Chairman says that the meeting had heard the Government's reply in regard to quarantine expenses. Since the last meeting he had received a telegram from various District Associations down on the coast asking him if he could meet their representatives on the previous Sunday. They had met, the meeting being due to a rumour having got about that recruiting was to stopped, and steamers would take no more coolies from India owing to the Quarantine Camp being full. The matter was discussed very fully, the result being that he was asked to go and see the Chief Secretary. He had been to see him on the Monday. There had been certain correspondence since, but he (Mr. Skinner) would ask the meeting to into Committee as he did not wish it made public.

On open meeting being resumed the following Resolution proposed by the Chariman and seconded by Capt. Fox, is put to the meeting and carried unanimously :—

That the delegates from the Klang District Planters' Association, strengthened by Dr. Watson, with power to add to their numbers be appointed to negotiate with Government over the erection of a temporary Quarantine Camp at Port Swettenham."

The Secretary reads the following :—

RESOLUTION PASSED AT THE KLANG D.P.A. MEETING, 1ST JUNE, 1911.

In view of the great importance to the F.M.S. of the arrangements for quarantining coolies, of the fact that the recent epidemics of cholera and smallpox suggest that the present arrangements are not entirely efficient, while the complaints made by coolies of these arrangements indicate a serious danger to the continued smooth work of recruiting, it is expedient in the opinion of this association :—

(*a*) that the control of the quarantine station be placed under the authorities of the F.M.S. Medical Service.

(*b*) that immediate steps be taken to ensure that coolies who have been in contact with smallpox or other infectious disease be dealt with by vaccination, disinfection or other appropriate method, be detained at Penang until free from infection, and the risk of conveying infection to others, and no longer.

(*c*) that coolies who have not been in contact with infectious disease be sent on at once to Port Swettenham, and undergo vaccination there before being discharged,

and we desire, these resolutions be placed before Government with a view to their consideration by Medical Authorities.

The Chairman remarks that this has already been dealt with.

3. LABOUR.

REGISTRATION OF LOCALLY RECRUITED COOLIES.

Mr. E. Macfadyen then rises to speak on the following resolution :—

"That a Registration Fee $1 be imposed on every coolie locally recruited."

He says he thinks the Enactment which prescribes for the registration of coolies had always been rather neglected both by Government and by planters. Employers had failed in a good many instances to register the coolies they had taken on locally, and he believes that the reason they had not done so is because there is no compulsion about it, practically speaking. Government had taken no trouble about it, because there is no money in it (Laughter). It was an Enactment from which all hoped a great deal when introduced, as it might do a great deal to prevent crimping if it was enforced, and the way to get it enforced is to make a fee of some kind. If this were done planters would think twice before omitting to register coolies on whom a registration fee is due. Government would take the trouble to collect the money which might result from the imposition, because Government always takes the trouble to collect money (Laughter). His motion is intended to secure that the money should be handed over to the Immigration Fund for its general purpose and he has it at the back of his mind that it is possible that the use of any registration fee collected in this way for this reason would provide an alternative means of raising revenue for the Immigration Committee. He does not know whether the motion as it stands expresses the idea that the money so raised should be devoted to the Immigration Fund, and he thinks it might take the following form:—"That a registration fee of one dollar be imposed on every coolie recruited locally, and the amount produced be paid to the Immigration Committee for its general purpose.

Mr. Gibson seconds. The Chairman says he thinks that the idea of a registration fee may be a very good one indeed. Government will collect it because it is to their interests, and at the end of the year they will be able to tell from the records thus secured how many coolies have been recruited locally, and from what districts. This will give them something useful to work on.

Mr. Jarvis suggests that it might be a case of "Pay your money and take your coolie."

Mr. Trotter says the collection of the money would have the important effect of securing a record as to the extent to which local labour was recruited.

The Chairman remarks that there are many people who considered that the present tax of $4 a head is very stiff and if they had to pay another dollar in addition he does not think they would take on local labour, but recruit in India. The tax will enable them to see where the coolies are going. He cannot see any reason why the planters should be against it.

In reply to a question as to the staff necessary to look after the registration, the Chairman says this must be left to the authorities.

The motion is carried with only one dissentient.

4. JAVANESE LABOUR.

The Chairman remarks that the meeting has heard the correspondence and enquires whether the Association wishes to do anything more in the matter?

No further action is taken.

5. CHINESE LABOUR.

The Secretary reads the following correspondence:—

The Secretary, Singapore, 9th May, 1911.
The Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,

You are doubtless aware of the attempts to institute the system of importation of free Chinese coolies into the Straits Settlements and Malay Peninsula. In most quarters we understand this movement is being favourably considered and we now write to ask you if you will kindly lay this letter before your Directors at their next Meeting.

This Company has been for some time actively engaged in the importation of indentured labourers 'from China and have their own Depots both in Hongkong and Singapore. The Company's Managing Director is in Hongkong and personally attends to and supervises the recruiting of the coolies. The Depot here is under the supervision of Europeans, and, we may add, is the only depot as far as we are aware, that is not owned and controlled by Chinese.

It occurs to us that if the free labour movement matures, as appears very likely, it will be necessary for your Association to have Official Agents in much the same way as the Madura Co., at Negapatam looks after the Tamil labour that is exported from India. We are well acquainted with the whole form of procedure for sending away coolies as regards medical examination, shipping and looking after any Kanganies that may be sent to Hongkong. In Singapore we could arrange for the distribution of the coolies and could house them in our depots, if necessary, until shipment can be arranged.

We shall be glad to hear from you after your Directors have given this matter their consideration.

We are, dear Sir,
Yours faithfully,
for the KITLANG CO., LTD.,
for the PATERSON SIMMONS & CO., LTD.,
C. W. DARBISHIRE,
Director,
Secretaries.

The Secretaries, 11th May, 1911,
Kitlang Co., Ltd..
Singapore.

DEAR SIR,

I am in receipt of your favour of 9th instant, for which I thank you, and will lay same before my Association at their next Meeting which is to be held in July.

Believe me, &c.,
C. ST. G. WHEELEY,
Secretary.

+/207

Singapore, 16th May, 1911.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Dear Sir,

Thank you for your letter of 11th inst. As you are not to have another Meeting of your Association until July we shall be glad if you can arrange to bring the subject of our letter of 9th inst., to the notice of your Directors at an early date. The matter is of considerable importance as a good many free coolies may soon be coming through Singapore and we should like the proposition to be considered as soon as possible.

We are, &c.,
for the Kitlang Co., Ltd.,
for Paterson Simons & Co., Ltd.,
C. W. Darbishire,
Director,
Secretaries.

The Chairman says he does not see that it is any use dealing with this matter at the present time. It is advisable to wait until Mr. Pears has returned from China and made his report.

6. ADVERTISING THE PENINSULA IN INDIA.

The Secretary reads the following correspondence:—

10th May, 1911.

The Chairman,
Indian Immigration Committee,
Penang.

Sir,

At the Annual General Meeting of the Association held on 30th ultimo, I was instructed to ask you to lay Mr. Zacharias' letter of 29th March, before your Committee.

I have, &c.,
C. St. G. Wheeley,
Secretary.

Penang, 15th May, 1911.

No. 450/1911.

Sir,

In reply to your letter dated May 10th, I have the honour to inform you that the correspondence originating with your letter of March, 29th will be laid before the Immigration Committee at their next meeting.

I have, &c.,
L. H. Clayton,
Superintendent of Immigrants,
S. S. and F. M. S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

7. GENERAL.

The Secretary reads the following correspondence :—

10th May, 1911.

The Editor,
Agricultural Bulletin,
Singapore.

DEAR SIR,

At the Annual General Meeting of this Association held on 30th ultimo, I was instructed to ask you whether you could make any reduction in the subscription charged us of $1,000 per annum.

Believe me, &c.,
C. ST. G. WHEELEY,
Secretary.

Botanic Gardens,
Singapore, May 16th, 1911.

DEAR SIR,

In answer to your letter as to the subscription of the Planters' Association to the Bulletin, I would point out that the subscription for this year has been already paid, and that as I am leaving the East at the end of the year, the Bulletin will then naturally cease to exist, so that there will be no more subscription to pay.

I remain,
Yours truly,
HENRY N. RIDLEY.

Mr. Gibson remarks that this is unfortunate and asks whether it would be advisable to ask Dr. Ridley's successor to continue the work. He would suggest that the Association ask Dr. Ridley to ask his successor to continue on the same lines. He says that Dr. Ridley's contributions have been highly valued by the Planting Community and it would be a distinct loss if the Bulletin were discontinued.

14/208

This is agreed to.

Mr. Skinner reads a letter from the General Manager of the F.M.S. Railways saying that it was proposed to open the railway from Triang to Sementan on August 1st; and inviting leading planters to attend on that occasion.

It is decided to leave the matter in the hands of the Secretary.

WICKHAM FUND.

The Secretary reads the following correspondence:—

Kuala Lumpur, 18th May, 1911.

The Secretary,
Rubber Growers' Association,
1 Oxford Court,
Cannon Street,
London, E. C.

DEAR SIR,

WICKHAM TESTIMONIAL.

In response to your telegrams I have laid this matter before my association at the last meeting and was instructed to circularise the District Associations.

I enclose specimen subscription list issued by the Kuala Lumpur District Association.

I trust that the Planting Community of Malaya will respond generously and that I shall therefore be able to remit you a large sum by June 15th.

I have, &c.,
C. ST. G. WHEELEY,
Secretary.

Victoria Commemoration Buildings,
Kandy, 26th April, 1911.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur,
Federated Malay States.

DEAR SIR,

WICKHAM TESTIMONIAL FUND.

In continuation of my letter of 19th instant, I beg to forward herewith copy of may reply to cablegram, received from Rubber Growers' Association, London, and specimen of subscription list referred to.

I have, &c.,
ALEX. WARDROP,
Secretary, Planters' Association of Ceylon.

Copy.

Victoria Commemoration Buildings,
Kandy, 26th April, 1911.

The Chairman,
Rubber Growers' Association,
London.

DEAR SIR,

WICKHAM TESTIMONIAL FUND.

I had this pleasure on 19th instant, and to-day am in receipt of your cablegram:—

"Subscriptions being collected here—present handsome Memori-
"al Wickham—introducer para seed in East also plate Kew Gardens—
"Collect local subscriptions limit £50, each producing Estate £20
"nonproducers and individuals—Remit to Ru ber Growers' Associ-
"ation by 15th June. Advise Roles."

Referring to the suggested presentaion of a piece of plate to Kew (Sir Joseph Hooker) I enclose a specimen of the subscription lists now being circulated here and beg to point out that, considering the terms of the appeal made therein on behalf of Mr. Wickham, I do not think Ceylon subscribers would favour the idea of any portion of their contributions being used as proposed, and I would suggest that any allocation for such a purpose should be made from the funds collected through your Association.

I am sending a copy of your cablegram and of this letter to Mr. Crosbie Roles for his information.

I have, &c.,
ALEX. WARDROP,
Secretary, Planters' Association of Ceylon.

TELEGRAM.

London, 9th May, 1911.

Planters' Association of Malaya,
Kuala Lumpur.

Intention present plate Kew and Wickham money Wickham Kew includes Hooker Servitude.

Kuala Lumpur, 13th May, 1911.

DEAR SIR,

(To all Secretaries of District Associations.)

It is the intention of the Rubber Growers' Association to present Mr. Wickham with either an Annuity or a sum of money, preferably the former.

Mr. Wickham was the introducer of the Para Seed in the East, and has therefore largely contributed to the present prosperity of the Federated Malay States.

Mr. Wickham, it seems, is now in somewhat straitened circumstances and it falls to the Planting Community of Malaya and Ceylon to show their appreciation of his services by generously subscribing to the fund to be raised for him.

4/209

It is further the intention of the Rubber Growers' Association to put up a plate at Kew to Mr. Wickham and Sir Joseph Hooker.

I shall be obliged if you will circularise your members as soon as possible with a view to obtaining subscriptions and remit to me on or before June, 10th.

Subscriptions are limited to £50 for producing estates, and £20 for non-producing estates and individuals.

I have, &c.,
C. St. G. Wheeley,
Secretary.

The Secretary,
Rubber Growers' Association,
1 Oxford Court,
Cannon Street,
London, E. C.

29th June, 1911.

Dear Sir,

WICKHAM TESTIMONIAL.

I remitted to you on 16th instant, the sum of £108-15-9 being donations to the above fund and shall be glad to have your acknowledgement in due course.

The sum was made up as follows:—

Negri Sembilan Planters' Association (£50) ...	$428-09
W. L. Bennett, Esq	25-00
F. Pears, Esq.	50-00
Planters' Association of Malaya (£50) ...	428-33
	$931-42

This at exchange 2/4, 1/32 equals £108-15-9. I have to-day received $50, from Mr. A. D. Davidson and $25, from the Seremban Rubber Estate, Ltd. These sums I will remit after the meeting of this Association on 9th proximo.

I greatly regret that more donations have not come in, but it is practically impossible to obtain money for a charitable object except from individuals, as Estate Managers are not allowed to spend money in this way. The usual procedure is for the Estate Manager to refer the matter to his Agents in Kuala Lumpur or elsewhere, the agents again refer the matter to the Directors of the Company in London and the payment is then made in London. Hence I trust you have received a large number of donations direct.

I have, &c.,
C. St. G. Wheeley,
Secretary.

The secretary reports that he has received further subscriptions amounting to about $200.

REAR LIGHTS ON VEHICLES.

The Secretary reads the following letter:—

Kapar District Planters' Association.
Klang, July 6th, 1911.

Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,

At a Meeting of the Members of my Association I was requested to write and ask you to put on the Agenda of your next Meeting the re-lighting of bullock carts and slow moving vehicles as it was in the opinion of the Members likely that serious accidents would happen if this was not brought into force. The idea was that each bullock cart and slow moving vehicle such as rickshas, steam rollers, transport waggons, transport motors, and gharries should all be ordered to carry a red light situated so that the tail end of their load could be easily seen. Government has already been approached on the matter but seemingly no notice was taken.

I have, &c.,
E. P. HOWARD,
Hon. Secretary.

The chairman suggests that the reply be that it would be better if the Kapar Association or any other association interested wrote to the Motor Union and asked them to take the matter up. It would come better from that body than the P.A.M.

Mr. Cruickshank says he takes it that this Association is not in sympathy with it.

The Chairman says no he does not think that at all. The Association can express sympathy with it, but the Motor Union may probably be able to get more in this way from the Government than the P.A.M. It is decided eventually to write to the Motor Union and ask them to act.

The Secretary reads the following correspondence :—

Census No 87/1911.

Superintendent of Census Office,
Kuala Lumpur, May, 1911.

SIR,

I have the honour to forward herewith 20 copies of a return giving the provisional totals of the population of the estates in the Federated Malay States by sex and race.

I have, &c.,
A. M. POUNTNEY,
Superintendent of Census,
Federated Malay States.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Kuala Lumpur, May 10th, 1911.

Messrs. KENNEDY & CO.,
Secretaries, Malay Pen. Agr. Association,
Penang.

DEAR SIRS,

I am in receipt of your favour of 8th instant enclosing cheque for $170 for which please find receipt enclosed.

It is somewhat disheartening to see so large an Association as yours being the first to reduce the number of delegates.

The smaller subscription was introduced, not with the idea of letting the large Associations off lightly, but with the idea of getting Associations to increase the number of delegates and to take the heavy burden of $200 per delegate off the shoulders of the smaller (and less rich) Associations.

I shall be obliged if you lay this letter before your Association at their next Meeting.

I have, &c.,
C. ST. G. WHEELEY,
Secretary.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Penang, 12th May, 1911.

DEAR SIR,

We are in receipt of your letter of the 10th instant enclosing receipt for this Association's subscription to the P.A.M., for which we thank you.

We note your writing regarding the Association only sending two delegates, which matter will be brought before the Committee at their next meeting when we shall write you further in reference to same.

Yours faithfully,
KENNEDY & CO.,
Secretaries.

Malay Mail Office,
Kuala Lumpur, July 7th, 1911.

The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur.

DEAR SIR,

Dr. Watson of Klang has asked me to write to you pointing out that we have copies of his book on the prevention of malaria on sale in this office. He thinks that very possibly you might care to call the attention of the District Associations to it. I may add that the book is one which contains much matter of the greatest value to any really practical planter.

Yours faithfully,
H. N. MARRIOTT,
Manager.

A copy of the book referred to in the last letter is laid on the table.

Mr. Macfadyen proposes that in future meetings of the Association be held in the reading room of the Selangor Club, "where there are no steam engines" (Laughter). This is put to the vote and carried unanimously.

The meeting then proceeds to discuss the advisability of an occasional change of the venue from Kuala Lumpur to other parts of the F. M. S., but Mr. Gibson asserts that meetings held in Ipoh and elsewhere had been a fiasco. He says he has been to Ipoh, when there were more members in attendance from this end than Perak. Kuala Lumpur is central and convenient for the majority. There is no objection, however, to an occasional change he adds.

Mr. Counsel says if he may be allowed to speak for Perak, it would held the aims of the Association if meetings were held now and then in Perak. He thinks in that State they are not so regular, perhaps, in their attendance as they might be owing to the great distance they have to come, and perhaps one is apt to feel that when the Selangor planter's foot is on his native heath, he is rather prone to devote a considerable amount of time to planters' interests in the more southern parts of the Peninsula.

He thinks the idea of holding meetings elsewhere excellent, and says it would add enormously to their efficiency in Perak if meetings are held there. He moves that the next meeting be held in Ipoh.

The Chairman says he is in favour of meetings being held occasionally in other States because it tends to good feeling. Ipoh or Taiping, either might be chosen.

Only one votes against the motion to hold the next meeting at Ipoh—in October if possible.

There being no further business, the meeting terminates.

C. St. G. Wheeley,
Secretary.

ERRATA.

Vol. X p. 235, for DECSHAMPSII read DESCHAMPSII, p. 196 Preliminary Note etc. This was reprinted in the following number by request of the author, whose corrected proof was never received in Singapore.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of July, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.873	144.7	82.4	90.9	73.6	17.3	76 6	0.814	74.1	73	Calm.	2.43	0.98
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	2.78	1.24
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	1.65	0.73
,, Klang	...	...	...	92.6	70.2	22.4	...	...	...	...	...	5.13	3.18
,, Kuala Langat ...	...	...	...	90.4	75.2	15.2	...	...	...	...	...	0.34	0.24
,, Kajang	...	...	...	88.7	75.7	13.0	...	...	...	...	...	2.51	0.83
,, Kuala Selangor ...	...	...	...	88.4	74.4	14 0	...	...	...	...	...	3.71	1.80
,, Kuala Kubu	...	...	...	91.6	70.0	21.6	...	...	...	...	...	2.70	0.72
,, Serendah	...	...	...	92.6	70.7	21.9	...	...	...	...	...	1.70	0.62
,, Rawang	...	...	...	93.1	72.3	20 8	...	...	...	...	...	1.44	0.50
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	0.85	0.60

Office of the Senior Medical Officer,
Kuala Lumpur, 29th August, 1911.

A. K. COSGRAVE,
For *Ag. Senior Medical Officer,*
Selangor, Negri Sembilan and Pahang.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the month of July, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity			
	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	%	...	Ins.	Ins.
Kota Bharu	...	151.0	82.8	88.33	75.27	13.06	79.2	.927	77.0	84.8	...	2.64	1.03
Kuala Lebir	...	...	80.1	91.2	73.7	17.4	77.4	.883	75.5	86.0	...	4.52	1.26
Kuala Kelantan	...	..	...	88.16	75.39	12.77	...	...	...	...	...	1.21	0.58
Kuala Val	...	...	...	88.96	75.03	13.93	...	...	...	...	...	3.13	1.35
Pasir Gajah Estate	...	...	...	...	...	...	...	...	...	...	...	3.07	1.77
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	3.68	1.59
Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	3.80	1.48
Pulau Laiat	...	...	...	...	...	...	...	...	...	...	...	6.11	1.64
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	2.44	1.17

RESIDENCY SURGEON'S OFFICE,
Kota Bharu, 28th August, 1911.

T. J. DEVOTA,
For Residency Surgeon, Kelantan.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of July, 1911.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban	...	148.3	81.5	89.8	71.3	18.4	76 2	.805	72 7	.75	N.W.	1.19	1.00
Do. Kuala Pilah	...	135.2	82.3	92.3	71.6	20.7	75.8	.778	71.7	.72	...	1.24	0.51
Do. Mantin	...	...	...	...	...	...	...	...	...	...	...	1.69	0.52
Do. Tampin	...	...	...	...	...	...	...	...	...	...	...	3.65	0 90
Do. Jelebu	...	...	...	...	...	...	...	...	...	...	...	0.62	0.37
Do. Port Dickson	...	...	...	...	...	...	...	...	...	...	...	2 88	0.90
Beri Beri Hospital, Port Dickson	...	...	...	...	...	...	...	...	...	...	...	2.58	1.08

Office of the Senior Medical Officer,
Kuala Lumpur, 29th August, 1911.

A. K. COSGRAVE,
For Ag. Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

PERAK.

Abstract of Meteorological Readings in the various Districts of State of Perak for the month of July, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Taiping	...	109	84.59	96	72	24	77.32	841	...	72	...	.88	.33
Kuala Kangsar	...	...	82.12	95	70	25	75.81	810	...	74	...	1.30	.56
Batu Gajah	...	102	84.19	96	70	26	77.19	837	...	72	...	.70	.42
Gopeng	...	...	81.56	92	69	23	74.43	758	...	71	...	4.80	3.30
Ipoh	...	...	83.03	94	70	24	75.96	802	...	71	...	1.10	.75
Kampar	...	...	83.36	95	69	26	76.14	805	...	71	...	4.10	2.05
Teluk Anson	...	...	81.93	93	69	24	76.52	836	...	78	...	2.80	2.00
Tapah	...	...	83·38	93	67	26	76.18	805	...	71	...	.90	.45
Parit Buntar	...	...	83.95	93	72	21	77.39	850	...	73	...	3.78	1.40
Bagan Serai	...	...	83.30	92	71	21	76.83	838	...	75	...	2.18	.81
Selama	...	...	82.17	94	71	23	76.25	827	...	77	...	1.00	.63
Lenggong	...	...	80.13	95	68	27	74.78	792	...	78	...	1.74	.60
Tanjong Malim...	...	...	82.12	94	68	26	76.54	840	...	77	...	1.24	1.20
Grit	...	...	80.13	93	66	27	75.06	802	...	78	...	2.08	1.06
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	1.98	1.35
P.P. Laut	...	...	...	...	...	...	...	...	...	...	...	.98	.35
Kuala Kura	...	...	...	...	...	...	...	...	...	...	...	3.38	1.35
... ...	...	...	...	...	...	...	...	...	...	...	...	...	...
... ...	...	...	...	...	...	...	...	...	...	...	...	...	...

Office of Senior Medical Officer,
Taiping, 14th August, 1911.

S. C. G. Fox,
Senior Medical Officer.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 10.] OCTOBER, 1911. [Vol. X

ON THE OCCURRENCE AND NATURE OF SPOTS ON PARA SHEET AND CREPE.

A Preliminary Note.

By Keith Bancroft, B.A.

Since the market value of rubber is considerably influenced by its appearance, it is desirable that there should be no deviation from the normal colour when the product is placed on the market. The occurrence of spots of different colours on sheet and crepe lowers the market value considerably. Pink or red, bluish and black spots were found to occur first on sheet in this country and then on crepe. During this and the previous year spotted sheet and crepe have been reported from several plantations, and the quantity of spotted rubber appears to be on the increase.

Similar red spots have been reported from Borneo by Brooks where they were said to occur in some quantity, as many as 288 being present in one square foot in some samples. Brooks claims to have obtained an organism in strong crimson culture on bread and agar-agar which appeared to be *Bacillus prodigiosus;* and he concludes that the organism was introduced into the latex by the use of pool water.

Petch also reports the occurrence of red and black spots on "biscuits" in Ceylon, but says that he is unable to associate them with mircro-organisms.

Samples of a pink spot occurring in this country were sent to England and were identified first as being due to a yeast and later to *Bacillus prodigiosus.*

It had been found that these spots do not occur on smoked, rubber; and, since smoked sheet and crepe commanded a higher market price, the spots were regarded as being of little or no economic importance. Recently, however, there has been a decreasing demand for smoked plantation rubber; and this, coupled with the increase in the quantity of spotted rubber in this country, renders the matter of some economic importance.

Investigations were, therefore, commenced for the purpose of of ascertaining the cause of the spots. It was inconceivable that they were due to chemical changes in the substance of the rubber and it appeared probable that they might be due directly or indirectly to the growth of a micro-organism. The fact that a pink spot had been attributed to *Bacillus prodigiosus*, which occurs in tap and pool water in this country, rendered it likely by analogy that the blue or bluish brown spot was due to another bacillus and, perhaps, *Bacillus violaceus.*

Attempts were made to isolate chromogenic bacilli by transfering sections of the the spots to bouillon and by grinding the spotted rubber with sand in a mortar and making "poured plates" in bouillon-agar. All attempts to isolate chromogenic bacilli, however, failed.

Recently a method of observing directly the organisms present in the spots has become available. It consists in cutting thin sections of spotted rubber and dissolving the caoutchouc by means of xylol or benzene. If the section be placed on a slide the caoutchouc may be thus dissolved and the organism may then be mounted in Canada balsam and examined under a microscope. By this method the foll lowing observations have been made:—

The pink spot contains the mycelium of a fungus whose celwalls are coloured pink. The hyphæ vary in size from 3 microns to 5 microns and their walls possess an irregular outline. They are much branched and frequently septate and at the ends of the branches are borne singly what appear to be spores. These spores are unicellular and contain refractive globular masses which afterwards become brown.

The pink discolourations on rubber may take the form of small isolated spots or may attain a size of one inch in diameter. In some cases the discolouration is, however, more diffuse.

The blue spots may be present on the same sheets as the pink spots or they may occur on separate sheets. They contain a mycelium composed of hyphæ of a dark colour which give rise to globose structures occurring in a single chain; these may or may not be spores. Attempts are being made to isolate this organism and to identify it.

The black spots sometimes exhibit a definite radial growth from a central point. They contain a mycelium which is composed of dark-brown hyphæ; so far no structures have here been observed which can be regarded as spores.

The black and the bluish spots have not been observed to exhibit a diffuse growth through the sheet. They have always been found to be limited to definite small areas.

The spots appear after the rubber has been placed in the drying house. They continue to increase in size at first, but later the growth ceases. The discolouration is retained parmanently for several months at least, since the spots on sheets which have been kept for five months have in no way lost any of their colour. The colour of the pink spot is soluble in methylated spirit after prolonged soaking; but this is not the case with the blue spot. Solvents of this nature, however, render the rubber tacky.

So far no chromogenic bacilli have been observed in the spotted rubber in this country. The attribution of the discolourations to the mycelium of fungi sheds a new light on the subject. Since the fungi are in all probability capable of being reproduçed by conidia, the principal mode of contamination is through the air and not through the water. The fact that the spots had been previously observed to spread from an infected sheet to its neighbours in the drying house had indicated that the infection might be air-borne; while the occurrence of the pink spot on the exposed parts of sheets and its absence from those parts which were in contact with the hanging bars in the drying house suggested that these sheets had been infected from some external source after they had been prepared.

It will be necessary to study the occurrence and exact methods of reproduction of the organisms before any accurate knowledge of the methods of treatment can be obtained. It is unlikely that any solvents will be applicable owing to the difficulty in obtaining a solvent which does not affect the rubber. At present all sheets which are spotted should be removed from the drying house at once and should be kept apart from those which are not spotted.

As rapid a drying as is conveniently possible should be effected, and the drying house should be well ventilated. Where spotting of the sheets occurs in quantity the walls and woodwork of the building may be sprayed with a solution of potassium permanganate in water; the permanganate should be bought in the form of crystals and added to the water until the liquid is pale rose in colour.

A study of the organisms will lead to a knowledge of their occurrence and the means by which infection is spread, and will, therefore, enable us to draw conclusions as to the most suitable means of keeping them under control.

A NEW PEPPER DISEASE.

There have been several complaints lately of disease attacking the pepper vines in Sarawak, both the fruits and the roots. A number of spikes of fruit were sent, and these were examined. On some of the fruits a fungus was detected. Specimens were sent to

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Mr. Massee of the Royal Botanic Gardens, Kew, and the fungus was discovered to be a new species of *Colletotrichum* to be named *Colletotrichum necator Massee.* On examining pepper vines cultivated in the Singapore Botanic Gardens, I found the same parasite. The pepper spikes while still green, and unripe, show at first a yellowing on some of the fruits. These, instead of becoming deeper green and eventually red, blacken and eventually become dry and quite black, the whole interior becoming black and powdery. Then on the outside of the pepper appear small black processes, the fruit of the fungus. As a rule only a few of the fruits on the spike are affected, and these generally in the middle of the spike. The fruit-spike is quite spoilt and generally falls off before it is fit to gather.

The disease is easy enough to see as the blackening and withering up of the fruits, here and there on the spike.

The disease could be stopped by picking off all infected spikes as soon as detected and burning them at once. Care should be taken not to leave any about on the ground of the pepper-garden. Disinfecting the ground with copper sulphate and lime would probably be beneficial and the plants should also be sprayed,

One of the difficulties in a case like this would be that the Chinese planters would be unwilling to destroy a spike of fruit if it only had one or two infected fruits on it, and so allow the infection to go on to other spikes, but this destruction is necessary to save other plants being infected.

As to the root disease complained of we have little information as yet. Specimens of stems and roots were sent, but no fungus could be detected, except that in one case some *Diplodia* *was found, but this appears to have been accidental and not the cause of the injury. A good many diseases of pepper vines in Southern India have been described, but this does not appear to fit any of them.

Pepper is practically always cultivated from cuttings, that is to say continuously asexually, for many generations. In cases like this it generally happens that after a lapse of years, varying in length in different plants, the stock gets weak, degenerate, and liable to disease. It then becomes necessary to renew the stock from seed. This a slower process but should be done from time to time.—ED.

*The following letter was received from Mr. Lewton Brain :—

"SIR,

With reference to your letter of the 3rd., Mr. Bancroft reports that he has secured an almost pure growth of *Diplodia* from the wood of the diseased pepper roots. It may be of interest to record this, although, as the specimens were not entirely fresh, it may not be of great importance."

PADI EXPERIMENTS.

By L. Lewton Brain.

The Department of Agriculture, Federated Malay States, has this year commenced to carry out some experiments on padi cultivation in the Government irrigation area in Krian, Perak. The experimental areas were selected by the Director of Agriculture with the assistance of Mr. Pratt, Government Entomologist early in the present year, and now some 18 acres of the worst land in the district is being tried. Next year it is hoped that a larger area will be taken in to the experiments.

It must be distinctly understood that these trials by the Department of Agriculture are purely experimental, and are not in any sense demonstration plots. Until the trials now begun are completed it is impossible to forecast what the results will be. Later on when it is known what course of treatment is advantageous, demonstration plots might and probably would be useful.

The experiments have been in charge of Mr. H. C. Pratt, Government Entomologist, with the assistance of Mr. E. Bateson, Assistant Mycologist. Both insects and fungi attacking padi are also being studied.

Note on the Padi Experiments in Krian.

In the following notes no attempt can be made to give the results of the padi experiments which are now in progress in Krian. It may be of interest, however, to some readers to know the line on which it is intended to carry out these experiments during the three forthcoming years.

In the beginning of 1911 nearly one hundred acres of land were selected in those parts of Krian where the return from the land was either nil or very poor. Of these one hundred acres it was found practicable to cultivate only 18 acres this year, the remaining fields to be used for experimental purposes during 1912, 1913 and 1914.

The 18 acres are in three blocks, one 13 acres at Simpang Tiga, one 2½ between Simpang Tiga and Simpang Lima, and one 2½ acres at Sungei Bogak. The average return from these lands for the past three or four years has been practically nil varying from 20-50 gantangs per acre.

The object in selecting these lands is to determine whether they are, when properly cultivated, suitable for the profitable cultivation of rice. The work partakes of the nature of reclamation, and in Sungei Bogak it is reclamation from a very peaty bog.

The work commenced on February 6th of this year, the last of padi being transplanted on August 26th.

The most important question over all these fields has been thorough drainage and bunds of sufficient strength and density to keep out water if there be too much surrounding the fields or to hold the same if there be too little. For this purpose a large drain has been made round each plot surrounded by a bund. Cross drains have been placed at one chain apart.

Parts of the land have been changkolled and over a good deal lime has been spread i· varying quantities.

The soil was drained and changkolled about two months before the water was on the land; in the forthcoming years a longer period will be available as the drains are now made.

For future reference it will be of interest to describe roughly the nature of the soil on the plots which are now being used for experiment. The 13 acres at Simpang Tiga are covered with a surface layer of peat varying from 1 inch to 1 foot in depth. There is a clay subsoil. On the 2½ acres between Simpang Tiga and Simpang Lima there is a surface layer of peat in parts several feet deep. In other places there are out crops of clay. There is a clay subsoil.

At Sungei Bogak the land is wholly peat and it is unlikely that any success will attend the experiments there.

The largest stretch of this poor land that I know of in the irrigation area lies between Simpang Tiga and Bagan Serai. It is a stretch of about 8 miles and averages at least ½ in width. How much of this land can be brought into proper cultivation and how much will have to be excluded from the irrigation area is one of the points which the experiments will help to decide.

DEPT: OF AGRICUL: F. M. S.

DIFFERENCE BETWEEN AMAZONS AND PLANTATION RUBBER.

In the Bulletin Mensuel de la Chambre d'Agriculture de la Cochin-Chine, July 1911, p.479, M. Vernet commences a series of articles on the preparation and commercial value of the different sorts of Crude Rubber, that is the crude rubber of *Hevea braziliensis*. After a general introduction he proceeds to point out that wild Para rubber is actually valued more highly than Plantation Para. This he shows to be the case by giving the values of the two forms at the date March, 1911, as being 17 francs 50 for wild smoked Para and 10 francs 25 for very pale crepe, and, as the wild Para when treated gives 82 per cent. of commercial washed rubber and the pale crepes 99 per cent., the value of the Wild Para when washed gives 21 francs 34, as against 18 francs 43 of crepe.

The reasons for this difference in value he attempts to investigate.

The principal factors which are of importance to manufacturers in dealing with rubbers of different kinds are (1) their output in commercial rubber washed and dried, and (2) the actual value of this washed rubber.

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To obtain the output of commercial washed rubber, the crude rubber is first weighed and then washed in a flow of pure water as it passes between a series of rollers moving at different rates of speed. The result is "washed rubber" and the difference in weight between it and the crude rubber represents the loss in washing.

M. Vernet proceeds then to give the loss by washing of the various forms of cultivated and wild rubbers.

Cultivated Para, No. 1 Crepe, biscuit, sheet or block, as made in the factory. This varies, pale crepe giving a loss by washing of ½ to 1½ per cent. while biscuits give a loss of 3 to 4 per cent.

No. 2, Clot or as he calls it Lump—the rubber which has coagulated in the cups—which is always he says, more or less stained with organic debris (it should not be) gives a loss of 5 to 30 per cent. but when made up as crepe, only 2 to 3 per cent.

No. 3 Scrap gives 6 to 15 per cent., Scrap-crepe 4 per cent.,

No. 4 Bark-scrap in the form of crepe, 4 to 8 per cent. Wild Para loss on washing given by Dr. W. Esch in Fabrication de Caoutchouc.

	Maximum.	Average.	Minimum.
Para Bolivia and Peru	16	14	12
„ Amazon Hard Cure	17	15	13
„ Island Soft Cure	20	18	15
Nanaos No. 1	28	26	23
Entrefin	25	22	18
Sernamby: Niggerhead	40	30	26

(Here we see that with the exception of Clot, giving a loss of 30 per cent., even the scrap is cleaner than the best wild Para. Clot giving anything like this loss must be very unusual and is a disgrace to any estate.)

I have shown elsewhere sufficiently clearly, he says, that in Hevea Braziliensis caoutchouc and the substances which combine to form it play a direct alimentary part, so that every system of too strong or unsufficient milking only induces a loss of Caoutchouc. If the tapping has a direct action on the amount obtained, can it not equally affect the quality of the rubber? We do not know in what form the rubber occurs in the laticiferous vessel, but we know it is not in the same state as it is in the latex when it exudes from the cut.

If we heat Hevea latex in some vessel, we obtain a clot. If we heat a living branch of a tree, we, can see that when afterwards we break the bast bark the laticiferous tubes do not contain threads of rubber, though this occurs under the same circumstances in the stalks of rubber producing *Apocynaceae*. The different substances which combine in the formation of Caoutchouc in the latex of Hevea cannot be produced with equal rapidity, it follows then that the methods of tapping of different intensities may exercise direct and variable influences on the value of the Caoutchouc.

It appears that during the past few years the difference in value between the washed wild para washed Plantation rubber has increased from 1 franc to 1.50 per kilo in 1906, to 2.91 and 7 francs a kilo in about a year.

It has been suggested that this diminution in value has been caused by the great over tapping due to the demand for rubber on account of the high price it reached during the past few years. Other people attribute it to the age of the trees tapped, and those who incline to this opinion seem to have chiefly studied the amount of resins soluble in Acetone which may make the difference in value.

H. Wright in his "Hevea braziliensis" p. 205, says the resins or oils vary from 1 to 4 per cent according to the age of the trees.

M. Kelway Bamber in the report of the Committee of Agricultural Experiments in Ceylon gives :—

	2 years	4	6	8	10-12	30
Moisture	.70	.65	.55	.85	.20	.50
Ash	.50	.30	.40	.14	.22	.25
Resin soluble in acetones.	3.60	2.72	2.75	2.66	2.26	2.32
Proteins	4.00	1.75	1.51	1.75	2.97	3.69
Rubber	91.20	94.58	94.79	94.60	94.35	93.24.

In other rubbers something of the same kind has been shown. C. O. Weber showed that in Castilloa passing upward from the trunk to the leaves the amount of resin in the latex rose gradually from 2.61 to 750 per cent. And M. Vernet has shown that the younger the branches of Ficus elastica are, the more sticky is the rubber, and that in *Landolphia* and other *Apocynaceae* the young parts of the plant give only a sticky substance while the adult parts of the same part give a latex containing a strong rubber.

Many planters whom M. Vernet had consulted affirmed that they never found that the age of the trees made any difference to the sale price of the rubber on the market, but this is no criterion as prices were given for appearance as much as for real commercial value. Caoutchouc from trees of various ages were sent from the Botanic Gardens, Singapore, to America and England for analysis and the verdict was that there was no difference. M. Vernet sent to the firm of Michelin, in France, latex from trees of different ages in the Botanic Gardens of Singapore and the result of analysis he gives as below.

	5 years	10 years	20-30 years.
Ash	0.03 per cent	2 per cent	.25 per cent.
Resin from the dry rubber.	1.47 „ „	1.44 „ „	1.47 „ „

The resistance to heat at 80° all well preserved, the 5 year old trees rather better than the others. Messrs. Michelin consider that there is practically no difference between these samples. However they were not large enough for exhaustive experiments.

A third suggestion has been that the dfferences in soil and climate between South America and Tropical Asia is the cause of the difference between the two rubbers. M. Petit (Encyclopedie Roret Caoutchouc et Gutta Percha) compares the position of linseed, as produced in Russia, India and the Argentine, the oil of which has different properties and qualities in these different countries, and suggests a parallel in rubbers.

M. Gerber states that the rubbers of different regions of Amazonas have different values and puts it thus: there are "crus de caoutchouc comme il y a des crus de vin" (*i.e.*—there are vintages of rubber as there are vintages of wine). However, he says it is possible and probable that these differences are due to various causes, local methods of preparation, skill and care on the part of the operator, etc. Besides the balls of rubber are marked with the name of the maker and those that bear certain marks are the ones most valued and sought for. May not, says M. Vernet, each tree produce rubber possessing its own individual properties? This occurs in other trees and probably also in Para Rubber.

Another suggestion not made by M. Vernet, but which he will doubtless refer to in the continuation of the series of articles is that the rubber tree that we cultivate in Asia is a different strain or variety from that now supplying the bulk of the Amazonas rubber.

Practically all the Asiatic trees sprung from one lot of seed collected at Tapajos, but nowadays the bulk of the South American rubber comes from a much more remote district and it is certainly probable that the tree would vary in different districts and its produce would equally vary. Specimens of the plants from the areas at present worked have been received at Kew and they appear identical. It does not follow, however, from this that the rubber would be identical. An expert in rubber from Brazil visiting the Botanic Gardens at once identified the tree and rubber as what was formerly known as Tapajos, or low river rubber, and stated that it was not considered as good as Bolivian.

With respect to the analysis showing that rubber from young trees is not richer in resins than that from old trees, and to the statements sometimes made that for commercial purposes young is as good as old, if the preparation is equally good, one would receive this with caution in view of the great difference in strength and pull of the two. Evidently much more chemical research is wanted in the matter.—Ed.

FERTILIZING PINE-APPLES.

In the "Hawaiian Forester and Agriculturist" for May, 1911, is an important article on fertilizing pineapples. A large series of experiments were made by Carlton C. James, and the results are given. The paper is too long to quote in full, but the deductions from the experiments are that superphosphate, reverted phosphate, and steamed bone meal, showed good results when applied. Superphosphate better when applied together with lime nitrogen is not the dominant element in pineapple fertilizing. Of the three forms studied nitrate of soda was the least productive of good results. There was not much choice between sulphate of Ammonia and steamed hoof-meal as nitrogen carriers. Of the potash salts the sulphates of potash magnesia gave the best results, followed by sulphates of potash and chloride of potash respectively. Fertilized soil lends to bring the fruit to maturity from 2 to 4 weeks earlier than the unfertilized.

It appears too, that the weight of the fruit is also increased by the action of fertilizers.

The Hawaiian Canneries accept pineapples weighing more than three pounds at a general rate of 20 dollars a ton. The pines which do not reach this minimum are left on the field or disposed of for juice at half price. In the first check plot 11.25 per cent of the pines weighed ever three pounds, while all in the fertilized plots were over the limit weight.

In the Straits Settlements the pines are not fertilized, as they grow so readily and are usually so cheap that it is unnecessary. A few years ago the output was so great that there were many thousands of pines more than the canners could use, and prices went down so that the cultivation dropped and the result was a shortage this year.—ED.

THE QUALITY OF PLANTATION RUBBER.

In recent numbers of The India Rubber Journal, Mr. L. Wray contributes some interesting notes on the comparison of Fine Hard Para with Malayan plantation smoked and unsmoked Rubber, and the result of some tests furnished by the Continental Rubber Company of New York which we reproduce.

As will be seen Brazilian Fine Para possesses little, if any superiority over cultivated rubber cured in the same way at the Botanic Gardens, Singapore.

Mr. Wray also pointed out that a sample of unsmoked plantation rubber gave better results than either of the smoked samples (the particular unsmoked sample came from Glenealy Estate, Perak) this however, should be qualified by Mr. Wray's note in the India Rubber

Journal for Aug. 12th, that nine samples were tested in the series of experimental tests and only Glenealy sheet and smoked rubber from the Singapore Botanic Gardens were comparable with Fine Para.

The smoked rubber from Singapore cured by the Brazilian method was part of the same experiment referred to in the Agricultural Bulletin of the Straits, July 1910 (Vol. IX) p. 277-284, which was the first successful attempt, I believe, made in the East in coagulating latex by smoke and consequently could not be regarded as an example of up to-date smoked rubber, although furnishing highly satisfactory results.

The tests furnished Mr. Wray by the Continental Rubber Company of New York are interesting as supplementing the analysis published in the Agricultural Bulletin last July.

July 22nd, 1911.

Mr. WRAY writes:—

At the recent Conference, held during the International Rubber Exhibition, doubts were cast by Dr. J. Huber, Commissioner for the State of Para, on the quality of the Para Rubber seed obtained by Mr. H. A. Wickham, it being contended that in the locality from which the seed came, practically all the trees yield what is known as weak Rubber. The inference was that the vast area of land which has been brought under cultivation in the Mid-East, at a cost of many millions sterling, has been planted up with the seed of an inferior variety of Hevea, incapable of yielding anything but a low-grade rubber.

If true this is a most serious matter, not only for the numerous shareholders, but also for the Governments of British Malaya, Ceylon, India, and the Dutch Indies. It may be a fact, that at the present time the locality contains only an inferior species of tree, yet all else may be erroneous, for it is 35 years ago since Mr. Wickham collected the seed, and during that period it is quite possible that the better variety may have been exterminated by the ruthless methods of tapping in vogue up to the last few years, while the inferior trees may have survived through being neglected by the rubber collectors until recently. This view was, however, unsupported by direct evidence, except for the assertion of Mr. Wickham that he obtained the seed from trees which were yielding the best quality rubber, until some tests, made at the Exhibition, were completed. The results appear so important that I take this early opportunity of communicating them to all interested in plantation rubber.

There was an exhibit sent from the Botanic Gardens, Singapore, of a piece of plantation rubber prepared by Mr. R. Derry, in the Brazilian method; that is coagulated on a revolving stick by means smoke. A portion of this sample was most kindly vulcanized and tested by the Continental Rubber Company of New York, together with a sample of fine Para. Both samples were subjected to the same treatment, and as will be seen by the following figures, the results, obtained were practically identical.

Name of Sample.	Breaking Strain Weight.	Extension.	Pull.	Elasticity and Recovery. Pull after 5 minutes.	Permanent set after 5 minutes rest.
Malayan	58 lb.	$9\frac{1}{2}$ ins.	21 lb.	$17\frac{1}{2}$ lb.	10
Fine Para	58 lb.	$9\frac{1}{2}$ ins.	$19\frac{1}{2}$ lb.	17 lb.	8

The only point in favour of Fine Para is in permanent set after five minutes extension and five minutes rest. The figures given represent set of 7.81 and 6.25 per cent., so that in this respect there is 1.56 per cent. advantage to Fine Para. Against this must be put $1\frac{1}{2}$ lb. in the third column and $\frac{1}{2}$ lb. in the fourth column. These represent 7.1 and 2.8 per cent. resistance to pull in favour of Malayan rubber. All these differences are, however, so slight that were a number of tests instituted they would doubtless practically disappear. We may, I submit, conclude as the result of these most interesting experiments, that when Malayan plantation rubber is prepared in the same way as Brazilian rubber, the two substances are indistinguishable in quality, and that there is the strongest probability that they are the product of one and the same species of Hevea.

As people may hastily jump to the conclusion, from the above-stated facts, that the only way to prepare Para rubber so as to retain its best characteristics is the Brazilian method, I may add that at the same time and under the same conditions a sample of Malayan unsmoked sheet plantation rubber, coagulated by the acetic acid method, was also vulcanized and tested, and the results obtained were much higher than those of either of the two rubbers already mentioned. I cannot give the name of the producing company, nor the details of the tests and manufacture, until the consent of the company has been obtained.

The conclusion which these and other tests so generously made by the Continental Rubber Company of New York, during the Exhibition, forces upon me is the urgent necessity of the Mid-Eastern rubber planters having a properly equipped vulcanizing and testing laboratory of their own, where the many problems connected with the growing and preparation of rubber could be worked out, and the quality of their product the by raised and standardised. I had the opportunity of meeting and talking to many manufacturers at the Exhibition, and what they all seem to require is a rubber of a definite character, so that before they buy, say, a hundred ton lot, they will know exactly how to treat it without wasting time and money in bulking it and in experimental work. This points to the necessity of concerted action on the part of the planters.

L. Wray.

August 12th, 1911.

Since writing on this subject on July 19th (Page 5), I have received permission to publish the details of the tests, made on the sample of plantation sheet rubber then mentioned.

The rubber came from the Glenealy Plantations, Ltd., Perak, Federated Malay States, was exhibited on the British Malayan Stand and numbered 71. It was medium coloured, unsmoked sheet, approximately one-eighth inch in thickness and measuring about 24 ins. by 12 ins. It was even in texture, translucent, of a warm brown colour and outwardly of good quality, though some of the sheets were slightly spotted with mould. It was kindly tested by the Continental Rubber Company, of New York, in the Exhibition; at the same time and under the same conditions as the samples mentioned in my previous letter; the figures being:—

	Breaking Strain.		Elasticity and Recovery.		
Name of Sample.	Break.	Extension.	Pull.	Pull after 5 Minutes.	Permanent set after 5 Minutes' rest
Glenealy	64 lb.	8¾ ins.	25 lb.	21½ lb.	10
Fine Para	58 lb.	9½ ins.	19½ lb.	17 lb.	8

It will be seen that the breaking strain is 6 lb. more than for fine Para; this equals 10.35 per cent. greater strength. The resistance to pull is more by 5½ lb. and by 4½ lb. after five minutes extension; equal respectively to 28.20 per cent. and 26.47 per cent. greater resistance to pull. As in the former case, fine Para has the slight advantage of 1.56 per cent. in permanent set after five minutes extension and five minutes rest.

Mr. E. T. C. Garland has kindly supplied me with the following details respecting the growing and preparation of this rubber. The Glenealy Estate is situated near the Perak River at Parit, six miles from Seputeh. Parit is about twenty miles, as the crow flies, from the sea coast, and eighty-five, following the course of the Perak river. The trees are twelve years old and under, planted experimentally by the Government in avenues on sloping ground of gentle undulation; the avenues had Merbau (*Afzelia palembanica*) trees planted between them; which Mr. Garland had cut out in 1906-7, at the same time as the lalang was eradicated, and young rubber planted in place of them. The field is forty acres in extent and only about 2,500 trees are now being tapped, giving an estimated yield this year of 10 lb. per tree.

Acetic acid is used for coagulating, diluted with water to make a 10 per cent. solution. The general basis of mixture being one fluid drachm of dilute solution to one quart of latex; equal to .031 per cent. of acid. It is added gradually to a large jar of latex, whilst the contents are being stirred with a stick. The latex coagulates in porcelain pans within two hours, and is finished off by a hand mangle the same day. Absolute cleanliness is essential, and the only metal the latex touches is the galvanised spouts on the trees, the rollers of the mangle being of wood. The sheets are dried in the factory for forty-eight hours before being moved to the drying shed, which is about fifty yards distant. To the above description, which is given nearly his own words, Mr. Garland adds: "There are certain special points about quality of material used for the factory, which are my own ideas, not generally shared by planters."

It is difficult to say wherein lies the secret of the high quality of this rubber, for in essentials the process of preparation, as far as can be made out from the description given, does not seem to differ materially from that generally adopted on other estates.

It should be mentioned that nine samples were tested in this series and that only Glenealy sheet and Mr. Derry's "spindle rubber," previously noticed, were comparable with fine Para. Some of the others, although excellent from a broker's point of view, proved to be very inferior in quality. With variations in the vulcanization, some samples showed improved results, while in the case of others, it was clear that no alteration in the vulcanization would render them anything but weak and short. Two of the samples were "smoked sheet from 20-year old trees," and "smoked biscuit," both prepared in the Botanic Gardens, Singapore. It is curious and instructive to note that these two samples gave quite dissimilar results.

Name of sample and time of Vulcanization.	Breaking Strain			Elasticity and Recovery.		
	Break.	Un-broken.	Ex-tension.	Pull.	Pull after 5 mins.	Permanent set after 5 mins. rest.
	lb.	lb.	ins.	lb.	lb.	
Smoked sheet 50 mins.	—	39	9½	13	10½	11
" 55 "	47	—	10	15½	13	24
" 45 "	—	41	10¼	13	10½	15
Smoked Bisct. 50 mins.	—	41	10	12½	10½	14
" 55 "	40	—	9½	13½	12¼	12
" 60 "	75	—	9¾	19	17	8

Although these experiments are necessarily incomplete, still it may, I think, be inferred that the smoked sheet is incapable of giving good results with any vulcanization period, while the smoked biscuit, when the right period is found, gives very good results. Interest naturally centres round the cause, or causes, of the difference in quality of these two samples. Presumably they were coagulated and treated in much the same way, and outwardly the only difference in them is one of form, due to the shape of the vessels in which they were coagulated. This is an admirable example, showing clearly the absolute necessity of instituting experimental work to discover the factors which determine the quality of rubber.

There are now, I believe, in British Malaya some 400,000 acres planted with rubber, and over twenty-four million pounds invested in the industry, so that there should be no difficulty in raising sufficient funds to carry out these investigations. A levy of, say, one penny per acre, would give ample money to equip a laboratory, and from three farthings to one penny per annum should cover all working expenses.

L. Wray.

EXPERIMENTS IN THE TREATMENT OF PREPARATION & PACKING SMOKED RUBBER FOR TRANSPORT & THE MARKET.

The following correspondence and analyses refer to a series of experiments conducted at the Botanic Gardens Singapore, for the purpose of determining how smoked rubber would travel best, such correspondence must therefore be read in the light of purely experimental work and it will be noted that in all instances the criticisms suggest and refer to methods of treatment, as the inherent quality of the rubber as revealed by the analyses supplied is generally satisfactory, and in some instances very little improvement could be expected; indeed, it is doubtful if some of the samples have ever been surpassed.

The latex was coagulated by the smoke process in long ribbons and some samples were despatched a few days after coagulation to London, after being wound in balls and the rubber considerably stretched. Other samples were kept longer and were naturally much drier but also wound in balls and stretched in winding, and, as will be seen, such stretching had a deteriorating effect on the rubber.

The biscuit and sheet referred to in the following correspondence was merely a small lot of ordinary rubber for sale.

London, 12th January, 1911.

H. N. Ridley, Esq.,
Botanic Gardens, Singapore.

DEAR SIR,

In further reply to your three favours dated 27th October, 17th November and 1st December, respectively, we have held back our detailed report on the various samples enumerated by you until now, as those referred to in your letter of the 17th November have only just come to hand.

We have carefully selected average samples of each kind and requested Professor Wyndham Dunstan to have analyses carried out, and the results of these will be forwarded to you in due course.

We have now examined the various samples and have pleasure in reporting as follows:—

Rubber Described by you as Smoked Brazilian Method. Very dark thin irregular shaped sheets. These appear to be composed of thin films of rubber pressed together. They have arrived in excellent condition, in that they are quite free from mould, etc. They have the appearance of very thorough smoking, and the surfaces on arrival had a peculiar greasiness similar to, but more pronounced than that characteristic of Hard Fine Para. The curing seems thorough and satisfactory in most respects, but the rubber is somewhat soft in character and not as strong as would be expected. Value about that of F. A. Q. Smoked Sheet, viz. 5/8. per lb.

Sample Described by you as Biscuits, Light Smoked and Second Quality. The former are amber coloured small sheet and biscuits, very similar to a previous consignment received from you. Although the rubber has been carefully prepared, is in excellent condition and of good strength, the smoking is rather too slight for the market. Very thorough smoking is at present looked for and most appreciated, The smoke smell on many of the above samples has almost disappeared at the time of writing. Value 1d. to 2d. per lb. below F. A. Q. Smoked Sheet. The second quality is rough rejected sheets, partly cured, part mouldy and in unsatisfactory condition.

Samples Referred to in your Letter of 17th November just to hand, viz., about 67 lbs.—The landing weight of this parcel is about 60 lbs., showing apparently about 7 lbs. loss in transit owing to moisture.

Case No. 2. Light yellowish roll, consisting of sheet tightly wound up. On being unwound the rubber is very wet and of a very light grey colour. It has a nice smell of smoking, but this is hardly pronounced enough. The rubber seems to be very strong, but the winding appears to have had a stretching effect on the sheet, and it somewhat resembles thin Balata sheet in appearance and character. This stretching seems to have an effect on the physical properties of the rubber, and it lacks some of the nervousness and resilience found in ordinary sheet, the effect of the winding would appear to be different from that obtained in the Hard Fine Para method, this may be due to temperature.

Case No. 2. This is narrower sheet than the above, the outsides of the roll darker in colour, otherwise very similar in appearance, there being hardly any difference between the colours of the surfaces of the sheets when unwound. The rubber in this roll, however, does seem a little drier, and the sheet is more even in texture and thinner. Both this roll and the above are very hard. The strength of the rubber in this case also is excellent and seems to compare with that of Hard Fine Para; on the whole we are inclined to give this the preference as the curing seems more thorough, in the first case we would describe the rubber as distinctly under-cured. Value about that of Soft Fine Para, viz., 4/6.

Sample Referred to in your Letter of 17th November described as about 3 lbs. sent by mail via Brindisi. Wound sheet,—this is somewhat similar to the above, rather rougher and not so carefully rolled out or so attractive in appearance. There seems to be more interstitial moisture; the rubber also has free water on the surfaces when the sheet is unwound. Smoking does not seem to be nearly thorough enough. Value about 1d. to 2d. per lb. less than the above.

Samples Referred to in your Letter of 1st December, Dark amber sheet in rolls. The rolls have arrived in excellent condition ; there is, however a very marked difference between these and the other rolls, in that these are quite free from moisture, not nearly so tightly wound, and the sheet does not adhere in the same way as in each of the other rolls. The rubber more closely resembles the medium smoked sheet on the market. It is clean and very strong. In the present market this would probably be more valuable than any of the others, as it could be passed as F. A. Q. Smoked sheet. At present buyers look for even darker colour than this, that is to say, more thoroughly smoked. Value about 5/8. per lb.

Comparing all the various samples in the most important respect, viz. strength, the two cases (your letter 17/10/10) and the three pounds post sample (your letter 1/12/10) seem to be about equal. None of the other samples are as good.

I may mention that the question of the excessive percentage of "resin" present in some of the specimens of smoked Para rubber from Singapore has been carefully investigated here. The high figures obtained in certain cases have been found to be due to the presence in the rubber of a sugar-like constituent, derived from the latex which is removed by hot acetone and is therefore included with the resin as usually determined. In the three other specimens of smoked Para Rubber forwarded with your letter of the 11th January the percentage of this constituent has been determined and the amount of resin corrected. A report on these specimens will be forwarded to you in a few days.

I am, Dear Sirs,

Yours faithfully,

(Signed) WYNDHAM R. DUNSTAN.

London, 2nd February, 1911,

DEAR SIR,

In further reply to your letter of the 29th December.

The samples referred to therein have now come to hand and we have had them unpacked for the last week or two carefully examining their condition, etc.

The samples are as follows:—Dark brown, thin, ribbon in the form of rolls. The rubber has arrived in excellent condition, there being only the slightest trace, here and there, of any mouldiness between the layers.

The rubber seems to have been thoroughly dried and the curing is very even and appears thorough and satisfactory. The rolls in the portion marked 5-lbs. 7½ ozs. are rather duller looking and greyer than those marked 6-lbs. 12-ozs. which are a richer brown in colour.

When unrolled the rubber has the same sort of stretched character referred to in the previous lots and it is very difficult to estimate at all accurately the strength of the rubber in this condition.

We are of opinion that the strength in each of the samples is very good and fully up to any of the samples previously reported on.

Though the sides of the ribbons show slight traces of the greasiness referred to before this is not nearly so pronounced as in the wet samples.

We are in communication with manufacturers in the hope of getting an expression of their opinion as to the quality of this rubber.

Meanwhile,

We are, Dear Sir,

Yours faithfully

GOW, WILSON & STANTON, LTD.

London, 17th, February, 1911.

COPY.

(From Imperial Institute, London, S. W.)

15th February, 1911.

Messrs Gow, Wilson and Stanton Ltd.
13 Rood Lane, E. C.

DEAR SIRS,

The three specimens of smoked rubber from the Botanic Gardens at Singapore, which were forwarded with your letter of the 21st December, have now been examined with the following results:—

No. 1. A this sheet of dark brown rubber, slightly sticky on the surface, and having a strong odour of creosote. The rubber was fairly strong but appeared to be rather deficient in elasticity, as strips when stretched elongated very considerably and showed little power of recovery.

The rubber had the following composition:—

	Rubber as received.	Composition of dry rubber.
	Per cent.	Per cent.
Moisture	2.0	—
Caoutchouc	80.7	82.3
Resin	5.5	5.6
Proteid	4.1	4.2
Insoluble matter	7.7	7.9
	100.0	100.0
Ash	1.0	1.0

The results of the analysis show that this specimen is abnormal in containing a large proportion (7.7 per cent) of matter insoluble in chloroform, and a very high percentage of ash. The insoluble portion consisted ef dark brown flocculent matter which differed in appearance from the so called "insoluble caoutchouc" frequently present in Para Rubber. The amount of resin is very high for Para-rubber and in this respect the sample resembles those previously examined. The percentage of proteid is also high.

No. 2. The sample consisted of pieces of light brown smoked sheet and biscuit which were free from all traces of stickiness. The rubber appeared to be a little stronger than No. 1., but like the latter was easily extended permanently on being stretched.

The rubber had the following composition,

	Per cent.
Moisture	0.5
Caoutchouc	94.1*
Resin	3.2
Proteid	2.1
Ash	0.1

* Including 1.1% of insoluble caoutchouc."

The percentage of resin, proteid and ash are all much lower in this specimen than in No. 1, and the amount insoluble in chloroform is only 1.1 per cent compared with 7.7 per cent in the preceding sample.

14/224

No. 3. Two pieces of smoked biscuit rubber, one light brown and the other dark brown; the specimens showed no trace of stickiness. The physical properties of the rubber resembled those of No. 2.

The results of the chemical examination were as follows :—

	Per cent.
Moisture	0.4
Caoutchouc	95.1*
Resin	2.2
Proteid	2.1
Ash	0.2

* Including 1.3 per cent. of "insoluble Caoutchouc."

This sample is the best of the three specimens so far as chemical composition is concerned.

I shall be glad to learn the age of the trees from which these rubbers came and to have some information as to how they were prepared. It may then be possible to discuss further their peculiarities.

COPY.

Imperial Institute.

23rd. February, 1911.

DEAR SIRS,

In continuation of my letter of the 15th instant, I now send you the following report on the three further specimens of smoked Para rubber from Singapore which were forwarded with your letter of the 11th January.

No. 4. Two small pieces of thin sheet rubber of light brown colour. The rubber was strong, but easily elongated when stretched and exhibited little power of recovery.

The analysis gave the following results :—

	Per cent.
Moisture	3.5
Caoutchouc	89.9*
Resin	2.6
Saccharoid substance	1.1
Proteids	2 5
Ash	0.4

* Including 4.8 per cent. "insoluble caoutchouc."

No. 5. Two small pieces of thin sheet rubber of dark brown colour. The rubber was strong and exhibited greater elasticity than No. 4. Its composition was found to be as follows :—

	Per cent.
Moisture	0.9
Caoutchouc	91.9*
Resin	2.7
Saccharoid substance	1.3
Proteid	2.8
Ash	0.4

* Including 5.7 per cent. "insoluble caoutchouc."

No. 6. Two pieces of thin sheet rubber, dark brown in colour and rather moist. The rubber resembled No. 4 in physical properties.

The results of the analysis were as follows:—

	Per cent
Moisture	5.6
Caoutchouc	88.0*
Resin	2.8
Saccharoid substancc	1.0
Proteids	2.3
Ash	0.3

* Including 1.6 per cent. "insoluble caoutchouc."

It will be seen from these analysis that the percentage of resin in the three samples, when corrected by the determination of the amount of the saccharoid substance which was previously included as "resin," are practically identical, viz., 2.6, 2.7 and 2.8 per cent, and within the usual limits for Para rubber. The amount of moisture present is rather variable, 3.5, 0.9 and 5.6 per cent, and also the percentages of "insoluble caoutchouc" 4.8, 5.7 and 1.6 per cent.

In the absence of full information respecting the origin and preparation of these samples it is not possible to discuss the results fully. I shall be glad to know whether Mr. Ridley has furnished you with such information.

I am,

Yours faithfully,

(Signed) WYNDHAM R. DUNSTAN.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State of Selangor for the month of August, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur ...	29.876	142.7	80.1	89.7	71.3	18.4	75 0	0.785	72.9	77	Calm.	6.05	1.08
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	5.43	6.90
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4.50	1.85
,, Klang	...	...	...	91.4	69.9	21.5	...	...	...	...	...	6.17	1.59
,, Kuala Langat ...	...	...	...	87.9	73.5	14.4	...	...	...	...	...	6.49	2.55
,, Kajang	...	...	...	86.2	74.8	11.4	...	...	...	...	...	6.69	1.43
,, Kuala Selangor ...	...	...	...	88.0	74.3	13 7	...	...	...	...	...	3.68	0.75
,, Kuala Kubu	...	...	...	91.8	68.2	23.6	...	...	...	...	...	8.84	2.95
,, Serendah	...	...	...	92.7	70.8	21.9	...	...	...	...	...	8.27	2.05
,, Rawang	...	...	...	91.6	71.2	20 4	...	...	...	...	...	7.25	2 15
Sabak Bernam	...	...	...	...	...	...	...	...	...	...	...	4.39	2.90

OFFICE OF THE SENIOR MEDICAL OFFICER,
Kuala Lumpur, 26th Sept., 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the Month of August, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
		° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%		Ins.	Ins.
Kota Bharu	..	...	81.8	87.30	73.77	13.53	78.7	.897	76.0	84.8	...	9.83	1 56
Kuala Lebir	...	...	78.4	89.9	72.0	17.9	76.1	.854	74.5	87.8	...	7.05	1.37
Kuala Kelantan	...	...	...	86.51	74.00	12.51	...	...	...	...	...	11.24	2.74
Kuala Val Rubber Estate	...	...	...	87.51	73.19	14.32	...	...	...	...	...	7 44	1.58
Kuala Pahi	...	...	...	86.45	72.03	14.42	...	...	...	...	...	4.54	2.00
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	7.65	2.50
Pasir Besar Estate ...	...	...	...	...	...	...	...	...	...	...	...	8.49	1.20
Pulau Laiat	...	...	...	...	...	...	...	...	...	...	...	11 53	2 35
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	13.26	1.95
Passir Gajah Estate	...	...	...	...	...	...		...	...	...	...	7 75	1.53
Pasir Jinggi Estate	...	...	...	...	...	...		...	...	...	...	5.63	1.26
Chaning Estate	...	...	...	...	...	...	..	...	...	...	...	4.32	1.73

Residency Surgeon's Office,
Kota Bharu, *26th September*, 1911.

T. L. Devota,
for Residency Surgeon, Kelantan.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of August, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban		149.2	79.8	87.9	71.4	16.5	75.3	.800	72.5	.79	N. W.	3.54	0.80
... ... Kuala Pilah		135.6	80.7	90 6	71.0	19.6	75.3	.777	71.5	.75	—	2 16	9.54
... ... Mantin												6.58	1.44
... ... Tampin												7.64	2.30
... ... Jelebu												2.79	0.94
... ... Port Dickson												10.62	2.89
Beri-Beri Hospital, Port Dickson												9.98	2.67

Office of the Senior Medical Officer,
Kuala Lumpur. 20th Sept., 1911.

A. J. McClosky,
Ag: Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

PERAK.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of August, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point.	Humidity.			
Taiping	...	108	81.98	96	70	26	75.96	816	...	74	...	6.67	1.43
Kuala Kangsar	...	...	81.53	95	70	25	75.43	800	...	74	...	1.90	.67
Batu Gajah	...	101	82.18	95	70	25	76.33	831	...	77	...	5.44	2.40
Gopeng	...	...	80.96	92	65	27	73.93	746	...	70	...	7.31	2.20
Ipoh	...	...	82.73	94	69	25	75.54	789	...	71	...	4.20	.59
Kampar	...	...	81.78	95	68	27	75.77	810	...	73	...	5.82	1.65
Teluk Anson	...	...	81.35	93	68	25	76.46	847	...	80	...	5.10	1.75
Tapah	...	...	81.86	93	69	24	75.52	801	...	74	...	8.58	3.64
Parit Buntar	...	...	81.76	92	71	21	76.37	837	...	78	...	6.53	1.40
Bagan Serai	...	...	82.05	92	72	20	76.56	840	...	77	...	9.70	2.78
Selama	...	...	80.18	93	70	23	74.99	800	...	78	...	6.79	1.09
Lenggong	...	...	79.89	93	70	23	74.92	803	...	80	...	3.79	.76
Tanjong Malim	...	...	80.46	93	65	28	75.93	836	...	80	...	11.80	3.61
Grit	...	...	78.15	92	67	25	74.47	805	...	84	...	9.13	1.96
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	4.11	1.00
P.P. Laut	...	...	...	...	...	...	...	...	...	...	...	4.55	1.25
Kuala Kura	...	...	...	...	...	...	...	...	...	...	...	9.40	2.78
The Cottage	...	...	...	...	...	...	...	...	...	...	...	20.95	4.70
Maxwell's Hill	...	...	...	...	...	...	...	...	...	...	...	13.30	2.50

OFFICE OF SENIOR MEDICAL OFFICER,
Taiping, 13th Sept., 1911

S. C. G. FOX,
Senior Medical Officer.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of July, 1911.

District.			Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	...	...	82.8	91.5	67.3	24.2	76.2	...	...	...	...	3.28	1.32
,, ,, Raub ...	...	...	...	...	84.3	93.2	68.4	24.8	73.7	...	...	...	...	0.50	0.31
,, ,, Bentong	...	...	...	...	82.5	92.5	70.6	21.9	75.1	...	...	...	...	1.20	0.52
,, ,, Pekan...	...	...	...	...	82.6	91.2	72.4	18.8	78.0	...	...	...	...	5.88	1.41
,, ,, Kuantan	...	...	..	...	80.5	91.5	71.0	20.5	77 2	...	...	...	...	4.72	2.26
Dispensary, Temerloh	...	...	...	...	...	93.1	70.2	22.9	...	...	...	...	...	2.80	1.14
Sungei Lembing ...	...	...	...	...	...	87.6	68.8	18.8	...	...	...	...	...	10.06	1.34
Pahang Rubber Estate ...	...	...	...	...	...	...	...	...	...	...	...	...	...	3.18	1.08

OFFICE OF THE SENIOR MEDICAL OFFICER,
KUALA LUMPUR, *26th Sept.*, 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan, & Pahang.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of August, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE. Mean Dry Bulb.	TEMPERATURE. Maximum.	TEMPERATURE. Minimum.	TEMPERATURE. Range.	HYGROMETER. Mean Wet Bulb.	HYGROMETER. Vapour Tension.	HYGROMETER. Dew Point.	HYGROMETER. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	79.3	90.0	66.9	23.1	74 7	...	...	...	...	2.65	0.85
... ... Raub	...	...	82.3	93 5	67.6	25.9	73.1	...	...	...	..	3.90	1.02
... ... Bentong	...	...	81.3	91.5	70.8	20.7	75.4	...	...	...	...	6.03	2.30
... ... Pekan	...	...	82.3	89.9	71.1	18.8	77.6	...	...	...	...	6.99	2.10
... ... Kuantan	...	...	81.1	89.1	70.8	18.3	77.2	...	...	...	...	6.26	0.96
Dispensary Temerloh	...	...	...	92.1	75.3	16.8	...	...	...	...	...	4.96	1.26
Sungei Lembing	...	...	...	86.1	68.5	17.6	...	...	...	...	...	11.26	4.32
Pahang Rubber Estate	...	...	...	...	...	...	...	...	...	...	...	4.57	1.47
Kuala Tembling	...	...	...	...	...	...	...	...	...	...	...	3.92	1.17

A. J. McClosky,
Ag: Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

Office of Senior Medical Officer,
Kuala Lumpur, 26th Sept., 1911.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 11.] NOVEMBER, 1911. [VOL. X

THE GROWING OF VEGETABLES IN MALAYA.

One of the essentials of a healthy diet in any country is a supply of fresh vegetables. In the tropics this is perhaps more essential than in temperate regions. The Tamil coolie realizes this and wherever he can be grows his little patch of native vegetables, which doubtless form a wholesome addition to his food supply.

The European in Malaya is not so fortunately situated, as a rule his tastes do not incline to the sweet potato (kledek) egg-fruit, yam, ochro, green pepper, etc., which residents in earlier settled parts of the tropics find so excellent. He is therefore dependent either upon tins or on the Chinaman for what vegetables outside potatos and rice he can get. The Chinaman's idea of what constitutes a palatable vegetable and of sanitary precautions in the garden are not usually in accord with those of the European.

There is no doubt, however, that a large number of European vegetables can be grown even in the low lands of Malaya; for the expenditure of a little time and less money, there is no reason why every bungalow would not grown its own supply of vegetables all the year round.

With the idea of proving the possibilty or otherwise of vegetable growing under unfavourable conditions, some experiments were carried out this year at Kuala Lumpur experimental plantation. The soil here is a heavy clay and therefore not well suited to many vegetables, moreover the dry weather experienced during the early part of the year had a bad effect particularly upon the root crops. It was not intended to attempt any proof of the profitability of growing vegetables—but merely to show what could or could not be grown.

The tropical vegetables mentioned above were not tried as it was not necessary to prove their capacities. They would give less trouble than the others.

The experiments were grown under the superintendence of Mr. F. G. Spring by whom the following notes have been prepared:—

"All the seeds referred to in the following list were obtained from Messrs. Moonisawmy and Sons, Bangalore.

"Reference to the tables will show that some varieties of seed did not germinate but as the soil was neither water-logged, nor too dry it is probably the seeds were not in good condition when planted.

"The Malayan soils as a whole are not very suitable for the growing of vegetables but deep cultivation, bringing the soil to a fine tilth, and manuring will greatly help to rectify this. In some cases the surface soil is apt to be more or less baked by the heat of the sun, consequently it is necessary to apply sand for the purpose of keeping the soil open, particularly so where root crops are grown.

"The climatic conditions are good for the production of growth but the wet seasons should always be taken advantage of for the sowing of seed. The plants during the early stages of growth must be protected from the heat of the sun by shading.

"As far as experience goes Tamil Gardeners are not familiar with the cultivation of English vegetables the two most common mistakes being:—not having sufficient space between the plants, and the growing of them in the hollows between ridges, instead of on the ridges themselves

"The following list shows the varieties grown and the yields obtained on a given area. I have taken the vegetables separately and given a few notes on the growing of each kind.

Turnip.

VARIETY.	AREA,	CROP.
All the year round	91 sq. ft.	22 lbs
Extra purple top, Milon	91 ,, ,,	no germination.
Jersey Lily	91 ,, ,,	19 lbs.

Sowing.

If the soil is light the seed may be sown broadcast but when the soil is more tenacious it is better to make shallow drills about 15 inches apart, sow the seed evenly on the top of the drills and cover with a thin layer of fine soil. The plants should be thinned out as soon as rough leaves appear, leaving them about 8 inches apart.

Soil and Climate.

The Turnip succeeds in light sandy soils, and loams containing a large proportion of sand. Stiff clays are unsuitable.

Dry weather retarded the growth of the plants and the roots were not so succulent as they would have been had growth taken place at a uniform rate. It is therefore necesssry to water the plants during dry weather.

Cabbages.

Variety	Area	Crop.
Jersey Wakefield	448 sq. ft.	70 lbs.
London Market	448 ,, ,,	56 ,,
Blood Red	448 ,, ,,	28 ,,
Landreths	448 ,, ,,	109 ,,
York Early	448 ,, ,,	90 ,,
Carters White Prize taker	448 ,, ,,	88 ,,

Sowing.

The seed is sown broadcast or drilled in well prepared seed beds. When the plants are 5 or 6 inches high they can be transplanted out in rows 20 to 30 inches apart each way depending on the variety grown.

Soil.

Cabbages are suited to the very stiffest soils and will stand heavy manuring. Well manured soils produce tender and succulent plants.

Beet Root.

Variety.	Area.	Crop.
Carter's Perfection	81 Square feet	10 lbs.
Blood Red	81 ,, ,,	8 ,,
Turnip-rooted	81 ,, ,,	3 ,,
Egyptian, Early	81 ,, ,,	Nil
Sutton's Red	81 ,, ,,	,,

Sowing.

Previous to sowing the seed should be steeped in water. The seed is sown in drills 20 to 26 inches apart and must not be more than ¾ of an inch below the surface, as the true seed is small and does not contain a large enough supply of reserve food to enable the young shoot to reach the ground if planted at a greater depth.

When the plants are two to three inches high they should be thinned in such a manner as to leave the plants 10 to 12 inches apart.

Soil.

Suitable soils are sandy, and rich open loams.

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Radish.

VARIETY.	AREA.	CROP.
Long red	54 Square feet	19 lbs.
Olive-shaped deep scarlet	54 ,, ,,	no germination.
Turnip, Earliest white	54 ,, ,,	7 lbs.
Turnip, Earliest large red	54 ,, ,,	3 ,,
Turnip, Catter's Holborn Crimson Marble	54 ,, ,,	26 ,,

Sowing.

The seeds is generally sown broadcast in well prepared beds which should be from 5 to 6 feet broad with shallow trenches between each bed. The soil from the trenches may be used to cover the seed but only lightly. Radishes can also be grown on drills, the distance between the drills being from 6 to 9 inches. The plant should be thinned out so as to leave them 6 to 8 inches apart in the row.

Soil.

Radishes do well in any soil which is not too heavy or wet.

Lettuce.

VARIETY.	AREA.	CROP.
Drumhead or Malta	35 Square feet	3½ lbs.
Cabbage Favourite	35 ,, ,,	1½ ,,
Cabbage Victoria	35 ,, ,,	no germination.
Hardy White, Dutch Beck's	35 ,, ,,	do.

Sowing.

The seeds should be sown in well prepared raised beds. When the plants are from two to three inches high they may be planted out in rows 10 inches each way or on the top of 7 inch drills. The surface soil should be lightly stirred to encourage the growth of the plant.

Soils.

Light soils not too heavily manured.

Kohl Rabi.

VARIETY.	AREA.	CROP.
Large green	91 Square feet	19½ lbs.
Early White Vienna, short leaved	91 ,, ,,	14½ ,,
Early Purple, Vienna short leaved	91 ,, ,,	no germination.

Sowing.

These are cultivated in much the same manner as turnips but the distance between the rows should be 12 inches and the plants 8 inches apart on the rows.

Soils.

Suits medium to heavy loams. Stands heavy manuring.

Endive.

Variety.	Area.	Crop.
Green Curled	49 Square feet	14 lbs.
White Curled Imperial	49 " "	6½ "

Sowing.

Sow the seed on a well prepared bed of rich soil. When the plants have four leaves they may be transplanted in rows 1 foot apart each way.

Soil.

Light rich soils.

Beans.

Variety.	Area.	Crop.
(a) French or Dwarf Varieties		
Canadian Wonder	120 Square feet	7 lbs.
American Wonder	120 " "	6 "
(b) Runner		
Double Runner	20 " "	4 "

Sowing.

The seeds are sown four inches apart and two inches deep in drills 2½ feet as under. The young plants when about 8 inches high should be slightly earthed up. Topping the plants when the lower pods are ready stops the upward growth of the plant and encourages the pods to swell.

Soil.

Clays and strong loams.

Peas.

Variety.	Area.	Crop.
Acclimatized	120 Square feet	1½ lbs.
Champion of England	120 " "	2½ "

Sowing.

The distance of a planting depends on the variety, tall varieties should be planted further apart. The rows are from 3 to 6 feet apart but some of the taller varieties require to be planted even wider than this.

Soils.

Calcareous or sandy loams.

Onions.

Variety.	Area.	Crop.
Acclimatized	40 sq. ft.	no germination.
Giant Spanish	40 " "	do.
White Queen	40 " "	do.

(4/23)

Indian Corn.

Variety.	Area.	Crop.
Yellow	105 sq. ft.	6 lbs. (green wt.)
Red	105 „ „	No germination.
Snake Gourd	30 „ „	9½ lbs.
Bottle Gourd	132 „ „	57 „

Cress.

Carter's Curled gave an excellent crop but the yield was not noted.

Mustard.

Several varieties were grown and would have given good results had the plants not been attacked by white ants.

Cucumber.

Green Long English Prickly and Early White did not germinate but Green Long Fournier and the Princes did fairly well.

Leeks.

None of the varieties tried did well. This was most likely due to the condition of the soil. Probably no crop requires so much forcing with nitrogenous manures as this.

"It is important that Vegetable seeds should be obtained from a reliable source as old seed lose their power of germination. On receipt of same they should be planted as soon as weather permits.

PESTS AND DISEASES.

"The pests noted below were identified by the Government Entomologist and Assistant Mycologist:—"

Eelworm.

Carrots, Tomatoes, Spinach, Pumpkin and Water Melon were badly attacked by this pest. The Water Melons dried off, and the Tomatoes began to appear unhealthy about the time of the production of fruit. The Carrots in an adjacent bed were also found to be attacked. The roots of all those species showed the characteristic nodules made by the Eelworms and on examination were found to contain them. In the case of the Carrots the stems and leaves appeared quite healthy but no tap-roots were developed. All the roots were fibrous. On the identification of this pest the plants were taken up and burnt, care being taken, as far as possible, to remove all the roots from the soil, The soil was then treated with Carbon Bisulphide. It is too early yet to say whether this remedy will be effective or not.

Fruit Flies.

The fruits of the Capsicum, Peking Koy, Peking Ghi and Pav Koy were totally destroyed by a fly. The first appearance of the disease was a discolouration of the fruits which was confined to a small area. In a few days from the first symptoms of the disease the whole fruit assumed a dark brown unhealthy appearance and quickly rotted and fell to the ground. Several remedies were tried but were not satisfactory; probably the best was the protecting of the young fruits by small bags. As soon as the attack was noted the diseased fruits were collected and burnt.

Phytophthora Blight. The Potato Disease.

The leaves of the potatos began to die off but did not show the characteristic brown spots of this fungus. The tubers, however, on examination were found to contain the mycelium of *Phytophthora infestans*. In all probably this fungus had been brought from India in the seed tubers.

Kuala Lumpur,
11th October, 1911.

L. Lewton-Brain,
Director of Agriculture,
F.M.S.

ABNORMAL RUBBER TREE.

A planter sends from Johore, a very curious specimen of an abnormal growth of a Para-Rubber tree. The trunk, of which the lower postion is sent, is 11 to 12 inches through at the lower end and the tree appears to be five years old. It has been tapped, and from the tappings run down swellings, thickening downwards between each tapping mark. At each cut the swelling ends in a thickened rounded lump, commencing again below the next tapping. The back covering these swellings contains no latex, a cross section of the tree shows bark covered by a peculiar woody out growth as much as 2 inches thick in the centre and thinning out to the edges forming a semi-circle or semi-cylinder of corky looking wood.

This mass of out growth is apparently composed of roots which have grown in great abundance from the cuts and pushed their way through the bark and over the cambium layer, and in part apparently over the bark. The covered up bark contains latex, but the bark over the root out growth does not. We are accustomed to out growths of dormant buds on cuts made in the bark of a Para rubber tree especially where the wood has been exposed are cut into, but I have never met with an example of the effusion of roots from tapping in such a way as this.

Trees which root easily from the branches like Ficus often emit from the upper edge of a wound a number of roots which may push under the bark below, but in this case they generally push off the bark altogether, and leave a mass of ordinary and normal roots.

In the old tapping marks (half-herring-bone), there seem to be a mass of abnormal roots developed, and some of these have run down beneath the wood not cut by the tapping. These roots still contain latex even where covered with an inch of wood. No sign of any fungus appears on cutting into the wood even from the point at which this out growth started, which is in one of the upper tapping marks. The wood and even the abnormal roots seem free from disease, but a portion of the bark sent previously with a mass of these abnormal roots beneath it has produced the typical fructification and spores of *Diplodia*. It is possible that this fungus has invaded one of the tapping cuts and set up an irritation in the stem which has caused the extrusion of roots, though there is no signs of discoloration or death at the point at which this accident has taken place.

The tree, though spoilt for tapping purposes on the side where the abnormal growth has taken place—as there is no latex in the bark, is by no means dead and produces plenty of latex on the other untapped side.

The planter who sends it says he has several trees resembling it. They are quite valueless, as they practically produce no latex.

The monstrosity is a very curious and interesting one.—ED.

UTILIZATION OF PARA RUBBER SEED.

From the time of the introduction of the plantation rubber, suggestions have been put forward for the possible utilization of the seeds as a by-product of the rubber industry. Up to the present these suggestions have possessed mainly an academic interest, owing to the demand for seed for planting purposes and the consequent high prices obtained for it. This has rendered it distinctly unprofitable to attempt to utilize the seeds for industrial purposes. With the large acreages now coming to maturity it is evident that the demand for seeds for planting will not supply a sufficient outlet for the quantity that will be produced. Some other outlet will have to be found, unless a product with possibilities of value in it is to be wasted. At present practically the only use made of the rubber seed is as a fuel in smoke houses.

An article in the *Bulletin of the Imperial Institute** deals with the possibilities of utilizing rubber seed as a source of oil. It is pointed out that the kernels contain about 42 per cent. of a liquid drying oil very similar in its properties to linseed oil and capable of being used in the manufacture of paints and varnishes, oil cloth, soft soap and many other important industrial products. There can be no doubt therefore of the existence of a large and steady market for the product, the only question being whether the product can be placed on the market at a profit.

It is just on this point that available figures are so contradictory that it is distinctly difficult for any one interested to come to any definite conclusion. It was decided therefore during the present season to make a sufficient number of tests, weighing and measurements on a sufficiently large scale to leave no room for any large

* Vol. ix No. 1, p. 35

margin of error. The weighings were made at the Kuala Lumpur Experimental Plantation. I am indebted to Mr. F. G. Spring, Superintendent of Government Plantations, for the recording of them.

Cost of Collection.

In the Annual report of the Department of Agriculture, Federated Malay States, for 1908, the late Mr, Carruthers estimated that the seeds could be collected here for 4 cents (1-1d) per 1,000. In Ceylon it was estimated by Messrs. Macmillan and Petch that the cost of collecting 1,000 seeds was 4d.

Accordingly on three separate occasions this year the seeds were left to accumulate under our 12 years old trees for a week. Children earning 18 cents per day were put on to collecting them with the following results:—

i.	4,200 seeds were gathered at the rate of cts.	3.21 per 1,000.
ii.	5,000 ,, ,, ,,	3.15 ,, ,,
iii.	4,500 ,, ,, ,,	3.18 ,, ,,

On a larger plantation, if the children could be put on piece work, I have little doubt that it would be easy to collect the seeds at 3 cts. (0.84d.) per 1,000. An estimate of one penny per thousand would therefore be on the safe side. Why the cost should be so much higher in Ceylon is difficult to say, the abundance of the seed harvest and the frequency of collection would make large differences.

Weight of Seeds and Kernels.

Another difierence of opinion existed as to the number of seeds that would be required to produce one ton of kernels. Mr. Carruthers estimated 414,000 seeds to the ton while Messrs. Macmillan and Petch* placed the number at 700,000 at least. Their figures, however, refers to dried seeds while Mr. Carruthers' were for fresh ones. As Mr. Carruthers' figures were based on the weighings of only 12 seeds, his results were open to criticism on that score.

Three separate lots of two thousand seeds were decorticated and the weights of the kernels and shells taken separately :—

No. of seeds.	Weight of kernels.	Weight of shells.	Total Wt.
2,000	10 lbs. 10¾ ozs.	6 lbs. 3¾ ozs.	16 lbs. 14½ ozs.
2,000	10 ,, 2½ ,,	6 ,, 4½ ,,	16 lbs. 7 ozs.
2,000	10 ,, 11 ,,	6 ,, 4¾ ,,	16 lbs. 15¾ ozs.

Average weight of 1,000 kernels 5 lbs. 4 ozs.
,, ,, 1,000 shells 3 ,, 2 ,,

These were all from tapped trees, 12 years old.

It will be noticed that the weight of the shells is fairly uniform, while that of the kernels varies somewhat. In calculating the weights of kernels from the total weights, it will be safer therefore to deduct 3⅛ lbs. for every 1,000 shells, than to assume a propor-

* Circulars of the Royal Botanic Garden, Ceylon, Vol. iv. No. 11, May 1908.

tionate weight of about 60 per cent. A separate set of weighings of 300 seeds per day from tapped trees for 16 days gave an average total weight per 1,000 seeds of 8 lbs. 6 ozs.—exactly the average given in the other set of weighings.

Taking the average weight of 1,000 kernels at 5 lbs. 4 ozs. we arrive at a total of 426,700 seeds required to produce 1 ton of fresh kernels. This figure is in fairly close agreement with that given by the late Mr. Carruthers.

Allowing a loss of 20 per cent. on drying, the weight of 1,000 kernels will be 4 lbs. 3 ozs. This will give a total of 533,000 seeds to the ton of dried kernels.

The results may therefore be summarized as follows:—

i. Mr. Carruthers in 1908 found the total weight of 1,000 seeds to be 9 lbs.; of 1,000 kernels, 5 lbs. 6½ ozs. These were taken from untapped trees and no allowance made for drying.

ii. Messrs. Macmillan and Petch in 1908 give the total weight of 1,000 seeds at 7 lbs. 13 ozs.; of 1,000 kernels fresh, 4 lbs. 8 ozs.; of 1,000 kernels dried, 3 lbs. 10 ozs. These were from tapped trees. From untapped they state the results to be closely in accordance with those of Mr. Carruthers.

iii. The actual figures arrived at here in 1911 on a large scale give the total weight of 1,000 seeds, 8 lbs. 6 ozs.; weight of 1,000 kernels, fresh, 5 lbs. 4 ozs.; weight of 1,000 kernels, dry, 4 lbs. 3 ozs.; these are from tapped trees and are intermediate between those above.

Cost per Ton.—Worked out on this basis the cost of collecting 1 ton of fresh kernels will be $15.25 (£1 15s. 7d.) For dried kernels it works out at $19.04 (£2 4s. 5d.). Owing to the low cost of collection, even the last figure is but little in excess of that calculated by Mr. Carruthers for fresh kernels, which was $18.64.

Attention should be called to an error in Mr, Carruthers' estimate of the cost of putting rubber seeds on the market. The freight is given at 40 shillings per ton. This is now 40 shillings ($17.14) per scale ton of 50 cubic feet, which works out to about 64 shillings ($28.00) per ton weight of husked rubber seed packed in bags.

There remain to be considered the cost of decorating, packing, and freight to port of shipment. There is at any rate room for a decided margin of profit even with husked seeds selling at £10 per ton in England.

Decorticating would have to be carried out in Malaya. The article in the *Bulletin of the Imperial Institute*, above referred to, states that "trials with Miller's nut cracking machine at the Imperial Institute have shown that this can be used for the purpose; but it is necessary that trials on a comparatively large scale with the various machines available should be made before definite recommendations in favour of anyone are made." The essential point if the kernels are to be exported is that these should not be injured in the husking.

It remains to be considered whether it would be financially more advantageous to ship the dried kernels or to express the oil here and export this only. If the latter course were to be adopted, there would of course be less danger of losses through fermentation of the husks. On the other hand there would probably be less difficulty in marketing the kernels than the oil.

Agriculturally, it would be preferable to retain the oil cake in the country where it could be directly or indirectly returned to the soil. Whether the cake can be used as a cattle food remains to be proved. It might be found to possess deleterious or even poisonous effects on cattle. In any case it could be used as a manure, containing as it does a fair percentage of nitrogen.

Weight of Seeds from Tapped or Untapped Trees.

As mentioned above Messrs. Macmillan and Petch state that they find a large difference between the weight of seed from tapped and untapped trees, the latter being considerably heavier. The figures they give are 9.1 lbs. against 7.8 lbs. per 1,000 seeds, a difference of 1.3 lbs. or 16⅔ per cent. on the weight of seeds from tapped trees.

To see whether the difference were an actual one and if so what would it would amount to here, and extensive series of weighings was carried out by Mr. Spring. Trees of the same age in the Experimental Plantation and the Public Gardens, Kuala Lumpur, gave an excellent opportunity for comparison. The following are the actual results:—

Tapped.			Untapped.		
300	seeds equals	2.65 lbs.	300	seeds equals	2.93 lbs.
300	,,	2.69 ,,	300	,,	2.90 ,,
300	,,	2.48 ,,	300	,,	2.88 ,,
300	,,	2.81 ,,	300	,,	2.76 ,,
300	,,	2.56 ,,	300	,,	2.80 ,,
300	,,	2.42 ,,	300	,,	2.71 ,,
300	,,	2.70 ,,	300	,,	2.70 ,,
300	,,	2.60 ,,	300	,,	2.71 ,,
300	,,	2.47 ,,	300	,,	2.72 ,,
300	,,	2.55 ,,	300	,,	2.81 ,,
300	,,	2.34 ,,	300	,,	2.84 ,,
300	,,	2.41 ,,	300	,,	2.73 ,,
300	,,	2.50 ,,	300	,,	2.74 ,,
300	,,	2.31 ,,	300	,,	2.77 ,,
300	,,	2.39 ,,	300	,,	2.80 ,,
300	,,	2.53 ,,	300	,,	2.81 ,,
4800	,,	40.39 lbs.	4800	,,	44.61 lbs.

Average equals 8.4 lbs. per 1000. Average equals 9.3 lbs. per 1000.

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It will be noted that not only is the average weight per 1000 seeds distinctly higher from the untapped trees, but that only one weighing of seeds from tapped trees gave a higher total than the lowest weighing of the untapped trees. The seeds were collected fresh every morning and weighed immediately. The difference is 0.9 lb. per 1000 seeds or 10.7 per cent, not quite so great as the Ceylon figures. That this difference is entirely due to the extra weight of the kernels, the husks remaining nearly constant, is shown by the following test:—

	No. of seeds.	Wt. of kernels.	Wt. of shells.	Total.
Tapped Trees	2000	10 lbs. 11 ozs.	6 lbs. 4¾ ozs.	16 lbs. 15¾ ozs.
Untapped ,,	2000	12 ,, 1½ ,,	6 ,, 4¾ ,,	18 lbs. 6¼ ozs.

It will be interesting to see what the difference in germination between the two sets of seeds will be, after different periods of storage. A series of experiments is in progress to test this point and will be reported on later, when complete.

Kuala Lumpur,
13th October, 1911.

L. Lewton-Brain,
Director of Agriculture,
F.M.S.

RUBBER IN JAMAICA.

The Agricultural experts of Jamaica, to judge by tne Annual Report of the Department of Agriculture in Jamaica, for 1910 just received, have not yet given up hopes of starting a rubber industry in the island, as yet. Of Para rubber it is reported that some of the trees planted five years ago are now beginning to thicken and some fairly good trees are to be found in favourable localities. Castilloa, however, seems more promising. The results of tapping the Castilloa trees in various parts of the island during the past year have been on the whole encouraging and in some cases remarkably good yields of rubber have been obtained. "I have estimated" says the Director of Agriculture "the cost of 100 acres of Castilloa Rubber up to the tapping age at ten years as £2,500 to £3,000 with rubber selling at 2/6 per lb, the profits should then be £500 to £700 per annum under favourable conditions of yield on the 100 acres, with a tendency to rise under good management to £1,200 per annum at the 20th year where suitable lands of proved capacity for the cultivation of Castilloa rubber are available. It would appear that the financial prospects of a rubber plantation are fairly safe, and though we already possess other staples such as bananas, cocoa and coconuts that offer greater inducements, there appear to be stretches of second grade rubber lands in Portland and elsewhere that offer sound inducement for plantations of Castilloa rubber. Three years ago on the basis of facts then available I stated that I could not honestly advise any planter to invest money in the cultivation of any species of rubber yet tested in Jamaica. To-day in the light of further facts as to the growth and rubber yield of Castilloa trees in certain soils and climates I am able to modify this opinion and to state that there is evidence that Castilloa rubber can be grown with some reasonable security of a profitable outcome when planted in certain suitable soils and the districts in Jamaica. It is satisfactory to be able to report that so far as the best indications at present show the original variety from Kew seems to the best yielder of rubber yet tested in Jamaica."—Ed.

SOME CAMPHOR INSECTS.

The following insects have been noted as attacking Camphor plants in the Government Experimental Gardens at Batu Tiga in such abundance as to deserve the term " pest :—

i. A beetle identified as *Hypomeces* near "*rustica*". It is a blackish, greyish or bronzy weevil about ⅝ of an inch long without the characteristic proboscis of the weevils. The wing cases are longitudinally striated or rather coarsely punctured in rows and end in a blunt point behind. The thorax is narrower than the paired wing cases and decreases in width towards the head. The head has prominent eyes set well back on either side and is furrowed throughout its length to the blunt lip covering two powerful jaws. In front of the eyes are the antennae or horns which are elbowed and end in a club.

Under a microscope or even a good lens, the whole insect is seen to be covered with disc-like scales interspersed with white hairs. In fresh specimens the hairs are covered with yellowish felty masses which appear to be of waxy nature. This gives the beetle on the trees the look of being powdered thickly with yellow.

The legs are covered with white hairs and are divided into three movable parts, the femora or thighs, the tibiae or shanks and tarsi or feet, of apparently four joints. The thighs and shanks are about equal in length about $\frac{3}{16}$ inch each and the last joint but one of the feet is divided into two flattish discs between which is inserted the last joint of the foot ending in two curved claws growing side by side.

This insect, when disturbed, flies heavily and not very readily and can easily be shaken or beaten into some receptacle and then destroyed. They eat camphor and other leaves voraciously in the adult stage. I have not yet traced their life history.

ii. The second insect found on the camphor plants in abundance is the Atlas moth the life history of which is as follows :—

The brown eggs, rather over ⅛ inch in diameter through the shorter axis, for they are somewhat oval in shape, are laid singly or in small clusters on the underside of the leaves. They hatch out into greyish white spined larvae which feed on the leaves and when they come to maturity are over three inches in length, green in colour with humps on the first three segments behind the head (caterpillars of moth and butterflies always consist of 14 segments including the head but the 14th is difficult to see). On segments five to twelve there are transverse rows of bluish grey processes (like the arms of a small sea anemone but stiff) pointing backwards. On the outer side of the hind leg is a blue spot with a red ring round it.

All the damage done by this insect is during this stage.

From a caterpillar it turns into a pupa encased in golden brown silk.

The moth spans over 8 inches across the wing and is coloured with various shades of red, yellow, blue and black and has a large triangular window-like spot in the centre of the fore and hind wings ; a number of specimens have a further glassy streak over and beyond the marks on the fore wings.

The pest can easily be dealt with by collecting the cocoons spun up generally in the fold of one leaf or pulling off the caterpillars. Shaking is not of much use as they have a firm grip.

Spraying with tobacco water or soap emulsion should be tried where the pest is bad.

The moths are very conspicuous and may be destroyed, especially the fat bodied females which lay over two hundred eggs.

Camphor appears to be one of the coming products of the Federated Malay States and of late a number of inquiries have been received as to its cultivation, so I hope that the above hints will be of use to those who wish to grow it.

The beetle in question has also been found feeding on rubber but the height and stability of the trees will prevent of the possibility of getting rid of it by shaking. If it becomes a pest on that plant spraying will be the best remedy.

Kuala Lumpur,

16th October, 1911.

C. B. Holman-Hunt,

Assistant Entomologist,

F.M.S.

ROOT-SHOOTS IN CASUARINA GLAVCA.

The are a considerable number of species of the genus *Casuarina*, chiefly natives of Australia, of which many have been introduced into the Botanic Gardens, but except in the cases of the indigenous Ru tree, *Casuarina equisetifolia* and *C. sumatrana* of the Malay islands none have as yet adapted themselves to our flora, with the sole exception of *Casuarina glauca* Sieb, a native of Queensland which was introduced here a few years ago and has grown vigorously, forming a valuable addition to our ornamental and curious trees. This plant has been planted out on the grass plots and as it roots high, the roots have here and there got cut or wounded by the grass cutters. In these cases the *Casuarina* has thrown up shoots from the wounded root, from which it will be probably easy to propagate it. The emission of shoots from roots of trees is by no means uncommon in in this country. The *Spathodea* is commonly so propagated in this country and most, at least of the trees of this plant in Singapore, at least have been so obtained, as it seldom fruits here (I have indeed only seen it fruiting in Kuala Lumpur). *Albizzia Moluccana* is another plant which produces strong plants from the roots, and the Tembusu, *Fagraea fragrans,* also produces shoots on wounded roots, but these never seem to develop into trees. The most curious instance which I have met with was in the case of a *Garcinia* (*G. globulosa* Ridl) which threw up from its root a stem about a foot tall which bore not only leaves but flowers.

I have, however, never seen a case of the production of shoots from roots in any of the Casuarinas and our species here are at least very difficult to reproduce from cuttings. It is usual to find that the trees which throw up shoots from the roots are those with soft wood and plenty of suppressed buds so that they are easily reproduced from cuttings. The Casuarinas, however, have hard wood, are difficult or almost impossible to reproduce from cuttings, and indeed suffer badly and often die if pruned at all, so that it was not to be expected that they would produce root-shoots, and I think this action in *Casuarina glauca* to be worth recording.—ED.

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LORANTHUS AS A PARASITE ON HEVEA BRASILIENSIS.

A short time ago the Acting Conservator of Forests wrote to the Director of Agriculture stating that on a recent visit to Pahang he noticed many Para Rubber trees at Pekan affected by a parasitic growth of some kind, similar to mistletoe. The parasite was not confined to Para rubber, but other trees, among which Casuarinas and Mangosteens were noticed, were very badly attacked, Specimens were obtained and it was found that the parasite was a species of *Loranthus.* The particular species could not be determined owing to the condition of the material. It is quite possible that the parasite may be found on rubber trees in other districts, and a short account of it may therefore be interesting to planters.

Loranthus is closely related to the European mistletoe. There are many species, and they are all parasitic on trees, mostly in the tropics. The plants attach themselves to the branches of trees and form shrubby growths, often of a considerable size. The leaves are green, and usually of a leathery texture. Like all plants with green leaves, *Loranthus* can manufacture its own carbonaceous food, and it probably draws little more from the host-plant than supplies of water with the salts dissolved in it. It is therefore not a true parasite, for these derive all their nutriment from the plants on which they live, and on accounts of its partial independence it is called a semi-parasite.

The mode of distribution is peculiar and interesting. Each fruit contains a large seed, around which is a layer of a very viscid substance. The fruits are eaten by birds, which are fond of the pulpy fruit-coat. The seeds, however, are not eaten, ether because the sticky substance makes them difficult to swallow, or because they are distasteful on account of the large amount of tannin they contain. The bird gets rid of the seed by rubbing its bill against some convenient object, usually the branch of a tree. Here the seed adheres and germinates. The seedling puts out a root-like organ, and if the tree happens to be a suitable host it penetrates the bark and bores its way down to the wood. After a time lateral "roots" are put off from this primary "root" and grow along the branch between the wood and the bark. Buds arise from the upper side of those lateral "roots," push their way outwards, emerge and from new branches. A shrub-like growth ultimately results.

As a rule a species of *Loranthus* will not grow on any and every kind of tree, but has a preference for certain kinds. Some species are more indiscriminate than others, and it is not at all surprising that one of them should have taken a liking to Hevea. In other tropical countries *Loranthus* attacks various plants of economic importance. For many years it has been a troublesome parasite on tea in India Burma and Ceylon.

There is not much danger of a semi-parasite like *Loranthus* killing its host-tree, but it can do extensive local damage by enfeebling the branch on which it grows, crowding out some of the smaller branches and causing the death of others owing to the heavy shade depriving them of light. It may also be indirectly injurious by allowing the entrance of fungi and bacteria at the swollen, cankered place which is sometimes produced where it attaches itself. If the parasite is not removed, the seeds will be distributed in the manner in the manner described above, and besides being spread to other trees they may give rise to numerous additional plants on the tree originally attacked.

Treatment. To cut off the stem of the parasite is only a temporary remedy, as the "roots" left inside the branch possess the power of putting out fresh stems. If it is taken while still young, the whole plant can easily be removed. The lateral "roots" are not well developed and can be got at by cutting into the bark. Where the parasite is strongly established nothing but sawing off the branch will completely eradicate it. All exposed surfaces should of course be made smooth and given a coating of coal tar. A search should be made on other kinds of trees near the estate. and any branches bearing the parasite should be cut off. Further attacks would thus be prevented.

Kuala Lumpur,
11th October, 1911,

E. BATESON,
Assistant Mycologist,
F.M.S.

A BLEEDING RUBBER TREE.

A planter in Johore sent some time ago an account of a rubber tree which continued for a long time to exude latex without any apparent reason. Possibly other of our readers have come across similar instances.

The tree is, he says, a well grown tree, originally a seed planted at stake in October 1908, growing on a very old grey clay flat on the edge of a drain. The girth of the tree on August 17 was 12 inches at three feet from the base, on three occasions I have dug out large lumps of rubber from the base of the tree. "The first time was a year previously and the last at the date of his letter, when he obtained 2 pounds of rubber. The roots of the tree are quite healthy and the tree by no means top-heavy, the branches not too large for the tree to support and there is no reason to suppose that the tree has had a wrench from a high wind. The latex oozes from the point where the large roots proceed from the collar of the tree. The latex also gushes out at a point where one of the branches joins the main trunk and runs down the stem.

This bleeding has been going on for a whole year, and yet the crown of the tree looks perfectly healthy and has put out fine new shoots. There is not a dead branch on the tree nor an unhealthy looking leaf. He remarks that at the rate of rubber production in this way, it would be satisfactory to have a number of such trees as it only took him two minutes to dig out 2 pounds of wet rubber, and a cooly could collect 150 pounds a day at a cost of 50 cents, i.e., a third of a cent a pound, and even cheaper on contract rates.

I have not seen the tree and can give no suggestion as to the cause in this case, but the amount of latex produced by so small a tree is rather remarkable, as it seems to be a good deal more than one could obtain from so small and young a tree by ordinary tapping.—ED.

MANURING FOR RUBBER.

The Department of Agriculture has recently been asked by a number of planters to advise as to what manures to apply to rubber trees and in what quantities they should be used.

On the majority of plantations it is doubtful whether any manuring is required. There are a number of places, however, where the growth or the general vigour of the trees is not equal to that on others. In these places, provided it is not the cultivation or the drainage that is at fault, manuring may prove of advantage.

Cultivation in most places will be found of greater advantage than manuring. If every rubber field could be changkolled twice a year or receive an equivalent cultivation with ploughs, disc harrows. etc., it is certain that both the immediate and permanent benefits would be great. Of course with old trees which have formed a interlacing root system near the surface of the soil such cultivation would be dangerous, but with young plantings cultivation is strongly recommended. On fairly flat lands which have been thoroughly cleared of timber and stumps, probably mechanical cultivation by ploughs or disc harrows will be found more economical and more effective.

The following recommendations for manurial treatment have been drawn up by Mr. B. J. Eaton, Agricultural Chemist, Federated Malay States. It must be borne in mind that they are based on general principles and are not the result of experiments. Manurial experiments have been started by the Department of Agriculture, but reliable results will not be obtainable from them for some years. It is proposed to publish similar notes for other types of soils.

Manuria Treatment for Para Rubber on Heavy Clay Soils.

The following treatment is to be recommended for clay soils :—

Slaked lime	...	½ to 1 ton per acre
Basic Slag (phosphate manure)		350 lbs. „ „
Ammonium Sulphate	...	150 „ „ „
Potassium Sulphate	...	100 „ „ „

The lime and basic slag should be applied about a month or two months before the other manures as they decompose Ammonium Sulphate.

The Ammonium Sulphate and Potassium Sulphate should be mixed together and then mixed with earth and subsequently spread.

If concentrated manures are used they frequently injure the roots with which they come in contact, and the earth is added as a diluent.

With trees one or two years old it is preferable to dig a shallow trench (4 to 6 inches deep) at a radius of 2-3 feet round the tree, sprinkle the manure round and subsequently cover with earth again.

With older trees, where the roots interlace, the manures may be broadcast and the whole surface forked over.

The following can be used in place of Ammonium Sulphate :—

Castor seed cake, or
Linseed cake, or
Cotton seed cake, or
Para seed cake, or
Ground-nut cake.

These should be applied at the rate of about 600 lbs. per acre. If it is found that the cost of the quantity recommended is cheaper than the Ammonium Sulphate, I would recommend their use. Instead of Potassium Sulphate may be employed.

Kainit (12 per cent Potash) 400 lbs. per acre, or
Potassium Chloride 100 lbs. per acre.

The cost of the above quantities should be compared with that of 100 lbs. of Potassium Sulphate.

Instead of Basic Slag, Perlis Guano or other Phosphatic Guano may be substituted.

Perlis Guano (containing 15 per cent. Phosphoric Acid) at the rate of 500 lb. per acre, should be very economical, as its price is is only $25/- per ton.

In the first instance as a trial I would suggest the use of the most economical fertilizers, until more is known of the different

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effects on the Para rubber tree on different soils of the various nitrogenous, phosphatic or potash fertilizers.

The average cost per acre of the above formula excluding lime, will amount to $20 to $25 per acre. This does not include transport, freight or labour.

Lime can be purchased at 80 cents to $1 per picul.

L. LEWTON BRAIN.

INTERNATIONAL RUBBER EXHIBITION 1911.

The following reports by Sir William Taylor, K.C.M.G., and Mr. L. Wray on the Malayan section of the Exhibition contains much that should be carefully considered by planters in Malaya.

It will I think be conceded that so far as the Botanic Gardens, Singapore, Forest Department and the Department of Agriculture, Federated Malay States, were concerned on this side and the Malay States Information Agency, with the assistance of Mr. Wray in England, were concerned everything that possibly could be thought of and done was done to make the Malayan Exhibit a success. The part of the exhibit they were able to look after themselves has been favourably commented on and the accessories of the exhibit compared favourably with those of any other country.

In fact the only thing required to make the Malayan exhibit a really notable success was the rubber. It ought to be evident that a rubber exhibit cannot be made out of accessories, however necessary these may be to the proper framing of the central exhibit.

The Department mentioned above could not supply the rubber —this much must come from the plantations. All that they were asked to do was to forward their samples to the Department of Agriculture in Kuala Lumpur, where they were sorted and packed. The Planters Association of Malaya forwarded the rubber to England where it was taken charge of by the Malay States Information Agency.

Yet only 34 estates out of over 700 could take this small amount of trouble over a matter which affected the prosperity of the rubber industry of Malaya and it was left to the thirty-four estates, and among them special credit must be given to Bukit Rajah, Chersonese, Highlands and Lowlands, Linggi, Vallambrosa and Lanadron, to prevent the Malayan exhibit being a total failure.

This lack of the spirit of co-operation between the plantations among themselves and between them and the departments concerned is I venture to think the most important point broughtout by the Rubber

Exhibition. If this same principle or rather lack of it is carried into other matters, into dealing with labour, in the matter of manufacture and of marketing for examples, then I am afraid that the future of the rubber industry of Malaya is likely to be beset with many difficulties which are absolutely avoidable. An agricultural community, in these days of bargaining competition and combines, that does not combine is liable to became a 'backnumber'. The agricultural individualist in competition with and in bargaining with a combine is not likely to come off best.

L. LEWTON-BRAIN,
Director of Agriculture,
F. M. S.

Kuala Lumpur.
18th October, 1911.

Sir William Taylor's Report.

It was originally proposed that the Exhibition should open on June 12th and remain open till June 28th. These dates were subsequently altered, and the period extended, to June 24th to July 14th.

On Saturday June 24th there was a private view for the Press and for persons specially invited, and the formal official opening of the Exhibition by the Earl of Selborne K. C. took place on the afternoon of the 26th of June.

The Exhibition was held in the Agricultural Hall, Islington, where the space allotted to the British Malaya Section occupied a very good position in the Main Hall of the Building. The area occupied was 122 feet by 23 feet, giving a total floor space of 2,806 square feet. Counters were arranged on this space for the display of the Exhibits, the counter space available being 460 square feet. The rubber was arranged on these counters in the best manner possible, and the screens at the ends of the section as well as the walls of the small building in the middle of the section were utilised for the display of maps, of diagrams regarding the growth and extent of the rubber industry, * and for large photographs, of a uniform size of 24 inches by 20 inches, illustrating the conditions of rubber cultivation and preparation. Some additional photographs of scenery in the Malay States were added, as were two large frames containing photographs of places of interest on the Federated Malay States Railways, contributed by the Federated Malay States Railway management.

The Exhibits of rubber were collected in the Federated Malay States and forwarded by the Planters Association of Malaya to the address of the Malay States Development Agency. The Exhibits were in the first instance delivered at the offices of the Agency where they were unpacked, cleaned and otherwise prepared for Exhibition and were taken from there to the Agricultural Hall where they were placed in position on the stands or counters prepared for them.

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* The diagrams were prepared in England from figures collected by the Department of Agriculture, Federated Malay States.

An exceedingly interesting collection of historical exhibits was sent from the Singapore Botanic Gardens by Mr. H. N. Ridley, F.R.S., C. M. G. and proved one of the great attractions of the Exhibition. From the Singapore Gardens came stems of Hevea trees, 25 and 35 years old, showing the method of tapping employed. The Kuala Lumpur Experimental Plantation provided also two large rubber stumps showing tapping as it should be and splendid recovery of back. Another interesting collection was contributed by the Forest Department of the Federated Malay States made up of samples of Gutta percha, of wild rubbers and of creepers from which wild rubber is extracted; this collection too, attracted much attention.

From Linggi Estate came samples of Para Rubber Oil and of Rubber Seed Oil Cake; and from the Singapore Botanic Gardens some lots of Para rubber seed showing the method of packing employed in the Singapore Gardens.

Perhaps the most attractive exhibit of the section was a Pyramid of 25 blocks of Lanadron Rubber, kindly lent to the Agency for the purpose of the Exhibition by the London Office of the Lanadron Company.

In all thirty-four estates were represented in the section by exhibits of plantation rubber, not a large representation when it is remembered that the number of rubber estates in Malaya is now reckoned by hundreds. Of the thirty-four estates in question 17 are in Selangor, 3 in Negri Sembilan, 8 in Perak, 4 in Johore, 1 in Province Wellesley and 1 in Malacca.

The quality of the samples exhibited was excellent and while the quantity was no doubt sufficient to allow of manufacturers and experts forming opinions thereon there is no doubt the public would have liked to see larger samples from the various estates.

In addition to the exhibits sent to the Agency and displayed on the British Malayan Section a number of samples were sent direct from estates to the Exhibition Authorities to compete for the Medals offered by the Rubber Growers) Association and for the other prizes. A large proportion of these awards fell to the Malayan estates. The special Gold Medal for the best all round sample of rubber in the Exhibition was awarded to the Associacao Commercial do Amazonas, of Manaos, Brazil, for their exhibit of 20 tons of fine Para rubber. Of the other twelve medals presented by the Rubber Grower' Association the Malayan estates took seven, viz. two Gold Medals, three Silver Medals and two Bronze Medals in other words the Malayan estates took two-thirds of the Gold Medals all the Silver Medals, and two-thirds of the Bronze Medals awarded in the Hevea classes.

The successful competing companies were:—

Highlands and Lowlands Para Rubber Company. Gold Medal and diploma in class 1, Gold Medal diploma in class 2 and a diploma in class 3.

The Selangor Rubber Company Limited. Silver Medal and diploma in class 1.

The Tremelbye Rubber Company Limited. Silver medal and diploma in class 2.

The Seafield Rubber Company Limited. Silver Medal and diploma in class 3.

The Bukit Rajah Rubber Company Limited. Bronze Medal and diploma in class 2.

The Batu Caves Rubber Company Limited. Bronze Medal and diploma in class 3.

The Federated Malay States Rubber Company Limited, were "Highly Commended" for their exhibit in class 1, and the Rembia Rubber Estates Limited were "Commended" for their exhibit in class 2.

The classes in respect of which the competition took place were:—

1. Hevea Crepe, Sheets, Biscuits or Block (unsmoked)
2. Smoked Sheet from Hevea latex
3. Smoked Crepe (any thickness) from Hevea latex
4. Any form made from Species other than Hevea. The other prizes for which Malayan planters entered were the India Rubber Journal's Silver Shield, and Grenier's Rubber News Silver Trohpy, the awards in respect of which are not yet announced.*

It was the wish of the Planters Association of Malaya, expressed through their Exhibition Sub-Committee that the model Malay house, which figured so prominently in the exhibition of 1908, should be again utilized on this occasion. Unfortunately space could not be found for the house on the Section in the Main Hall but, by the courtesy of the Management of the exhibition, space was given for its erection in King George's Hall where it proved a source of attraction.

The exhibits of coconut produce sent home by the Director of Agriculture were arranged in connection with this house.

In a building opening off the King George's Hall a Cinematograph display was arranged four times daily showing all the operations connected with rubber production and manufacture in the Malay States from the burning jungle to the despatch to Europe of the rubber on board the exporting ships. The film was prepared by Messrs. Pathé Freres, of Singapore, at the instance of Mr. H. N. Ridley, F. R. S., and the display never ceased to attract large numbers of the visitors most of whom understood then for the first time what rubber planting really means.

* Both the Shield and Trophy have since been awarded te Sungei Kapar State, Selangor.

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In order further to illustrate planting matters there were shown on the British Malaya Section in the Main Hall models of a planter's bungalow, coolie lines, a smoke house and a factory such as would be found on a well arranged rubber estate.*

The very interesting and excellent collection of photographs used for the decoration of the section were enlargements by Messrs. Rains of Ealing, from negatives provided, for the most part, by the Director of Agriculture, Federated Malay States.

The Director forwarded to Kew a supply of Hevea seeds but they failed to germinate so that the hope that there might be a supply of seedlings for the decoration of the section was frustrated.

This Agency prepared for distribution at the Exhibition four illustrated pamphlets, one a compilation by Mr. T. H. Reid, entitled "Trade and Travel" (in the Federated Malay States), and another a reprint from the Illustrated Guide to the Federated Malay States of Mr. J. H. H. Robson's chapter on "Motoring in Malaya." "The Story of the Rubber Industry" by Mr. Ridley F. R. S. with statistics by Mr. Lewton-Brain, Director of Agriculture, Federated Malay States, and a reprint of Mr. L. C. Brown's pamphlet on "Coconut Cultivation." As showing how much these were appreciated it may be mentioned that 11,800 copies of "Trade and Travel" were disposed of, some 3,500 copies of "Motoring in Malaya," 5,300 copies of "The Story of the Rubber Industry" and 3,400 copies of "Coconut Cultivation." Between 500 and 600 copies of Mr. R. G. Watson's brochure on the Land Laws of the Federated Malay States were also taken.

In the Mail Hall of the Exhibition were numerous fine exhibits of machinery connected with the Rubber Industry. Among them were the stands of two firms connected with the Malay Peninsula, Howarth Erskine Limited, and Riley Hargreaves and Campany Limited. The exhibit of Howarth Erskine Limited, was particularly interesting to visitors as they were able to see for themselves the process of converting the coagulated latex into sheets of rubber.

In preparing for the exhibition I invited the co-operation and assistance of Mr. Leonard Wray, I.S.O., who with Mr. R. Derry, was responsible for the Malayan exhibits at the Exhibition of 1908. Mr. Wray very kindly gave his time and his experience, and the success, which I hope may be claimed to have been attained, is perhaps more largely due to Mr. Wray than to any other source.

While the Exhibition was open the Conference of Rubber Producers, manufacturers and others interested in the industry had frequent sittings at which British Malaya was represented by Mr. Leonard Wray and Mr. J. Mitchell. The latter read a paper at one of the meetings.

W. T. TAYLOR.

18th August, 1911.

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* Also prepared under the supervision of the Department of Agriculture, Federated Malay States.

Mr. Leonard Wray's Report.

Thirty-four estates exhibited, showing a total of 71 specimens of Para rubber, made up of 24 samples of crepe, 8 of smoked crepe, 5 of block, 8 of sheet, 17 of smoked sheet, 4 of scrap crepe and five of bark crepe. There were also 6 samples of Rambong, 2 of sheet and 4 of crepe. Of the estates which exhibited, 8 are in Perak, 17 in Selangor, 3 in Negri Sembilan, 4 in Johore and 2 in Malacca.

Considering the number of estates in existence, it cannot be contended that they were adequately represented or that with the exception of Buket Rajah, Chersonese, Highlands and Lowlands, Linggi and Vallambrosa any serious attempt was made to send a full suite of exhibits.

The quality of the exhibits was excellent and compared favourably with anything else in the exhibition. Undoubtedly this exhibition was shown that vulcanization tests and not appearance will be the determining factors in the valuation of rubber in the near future. It is satisfactory to be able to report that a sample of Malayan plantation rubber (unsmoked sheet) tested in the exhibition and subjected to the same treatment as a sample of Fine Para, excelled it in strength. This result indicates, that with proper preparation, Malayan rubber can take the place of the best Brazilian rubber; but before this can happen the bulk of it must be brought up to this high standard. There is little advantage in isolated estates turning out first quality rubber when the remainder of the output is of a much inferior grade. Uniformity is the great desideratum from the manufacturer's point of view, and uniformity, I submit, can only be attained by co-operation on the part of the planters.

The quantity of the rubber shown was distinctly inadequate. In Ceylon section the samples averaged 100 lbs., whilst those in the Malayan section were only about 25 lbs. Size, in an exhibition of this character, is an important consideration. It is quite true that a small sample shows all the qualities of any given grade as well as a large one, but it does not impress visitors in anything like the same degree. It may be noted, in this connection, that the Judges awarded the Special Gold Medal to a pile of 20 tons of fine hard Para rubber, and it is perhaps hardly necessary to add that a single ball of this rubber would have had no chance of winning the prize.

The contributions of the Botanic Gardens, Singapore, and of the Forest Department of the Federated Malay States, were decidedly good and interested many visitors. They might have been larger and more comprehensive with advantage.

The attendance at the exhibition, although not very numerous. was satisfactory and the visitors consisted largely of those having direct interests in the rubber industries. There were amongst them many shareholders in rubber estates; all wishing to see samples of

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the produce of the estates in which they had holdings and many, I am sorry to add, were sadly disappointed at finding their particular estate, either not represented at all, or represented by one insignificant and unconvincing sample. It would have been enlightening to Estate Managers, Directors and Secretaries had they heard the freely expressed comments of some of their shareholders. This is not an agreeable subject to dwell upon, but it is one, which in the interests of the Companies concerned, cannot be passed over in silence.

There were many manufacturers amongst the visitors, both English and foreign, and it was a favourable sign that they appeared to be much interested in the subject of plantation rubber and were seriously considering the feasibility of using or extending the use of it, in their various businesses.

Should the Exhibition just closed lead Malayan Planters to combine and carry out a thorough scientific investigation of the whole subject of rubber growing and preparation ; with the object of turning out standard grades of Malayan rubber of high and unvarying qualities, then all the money and work which has been expended on it will not have been spent in vain.

L. WRAY.

July 24th, 1911.

SELANGOR.

Abstract of Meteorological Readings in the various Districts of the State for the month of September, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur ...	29.879	141.4	80.6	89.1	72.1	17.0	75 9	0.808	72.7	77	Calm.	7.05	2.44
Pudoh Gaol ,, ,, ...	...	...	...	...	...	...	...	...	...	...	...	8.85	3 42
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	6.29	1.85
,, Klang	...	...	...	90.9	70.4	20.5	...	...	...	...	...	9.43	3.26
,, Kuala Langat ...	...	...	...	86.9	73.3	13.6	...	...	...	...	...	12.33	2.10
,, Kajang	...	...	...	85.9	76.0	9.9	...	...	...	...	...	5.67	0.77
,, Kuala Selangor ...	...	...	...	87.7	73.2	14 5	...	...	...	...	...	6.70	1.40
,, Kuala Kubu	...	...	...	90.5	70.2	20.3	...	...	...	...	...	7.43	1.25
,, Serendah	...	...	...	92.6	70.7	21.9	...	...	...	...	...	6.21	1.12
,, Rawang	...	...	...	91.6	71.6	20 0	...	...	...	...	...	6.16	1 33
Sabak Bernan	...	...	...	...	...	...	...	...	...	...	...	8.84	2.10

A. J. McClosky.
Ag. Senior Medical Officer,
Selangor, Negri Sembilan and Pahang.

Office of The Senior Medical Officer,
Kuala Lumpur, 24th Oct., 1911.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the Month of September, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE. Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	HYGROMETER. Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
		° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	%		Ins.	Ins.
Kota Bharu	..	...	81.0	87.13	74.18	12.95	78.1	.897	76.0	84.8	...	10.74	2.06
Kuala Kelantan	...	...	...	86.46	74.63	11.83	...	...	...	...	...	8.76	1.97
Kuala Lebir	...	...	79.2	89.6	72.2	17.4	76.8	.874	75.2	87.5	...	14.85	2.46
Kuala Nal Estate	...	...	...	86.40	73.33	13.06	...	...	...	...	...	11.33	2.81
Taku Estate	...	...	...	...	...	...	...	...	...	...	...	15.24	2.62
Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	9.44	1.50
Kenneth Estate ...	...	...	...	...	...	...	...	...	...	...	...	14.97	2.14
Passir Gajah Estate ...	...	...	...	...	...	...	...	...	...	...	...	14.41	2.95
Pasir Jinggi	...	...	...	...	...	...	...	...	...	...	...	14.40	2.98
Chaning Es'ate	...	...	...	...	...	...	...	...	...	...	...	12.09	2.77

RESIDENCY SURGEON'S OFFICE,
KOTA BHARU, *19th October*, 1911.

T. J. DEVOTA,
for Residency Surgeon, Kelantan.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of September, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Seremban	...	149.4	79.9	87.4	72.0	15.4	76.2	.833	73.7	.81	...	8.90	2 55
Do. Kuala Pilah	...	135 7	80.5	90.0	71.8	18.2	75.4	.781	72.0	.70	...	7.83	1.59
Do. Mantin	...	...	...	...	...	...	...	...	...	...	...	7.82	1.90
Do. Jelebu	...	...	...	...	...	...	...	...	...	...	...	5.18	0.64
Do. Tampin	...	...	...	...	...	...	...	...	...	...	...	6.72	2.27
Do. Port Dickson	...	...	...	...	...	...	...	...	...	...	...	13.76	2.75
Beri Beri Hospital, Port Dickson	...	...	...	...	...	...	...	...	...	...	...	14.49	2.67

OFFICE OF THE SENIOR MEDICAL OFFICER,
Kuala Lumpur, 31st October, 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

PERAK.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of September, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension	Dew Point	Humidity.			
Taiping	...	108	81.03	92	71	21	76 45	850	...	80	...	9.59	1.55
Kuala Kangsar	...	...	81.03	94	71	23	75.53	810	...	76	...	8.14	4.81
Batu Gajah	...	101	81.45	93	71	22	76.72	857	...	80	...	11.46	3.15
Gopeng	...	...	80.68	92	68	24	74.79	7[illegible]5	...	76	...	17.20	3.90
Ipoh	...	...	81.80	92	71	21	7 .02	823	...	77	...	11.18	2 48
Kampar	...	...	81.23	93	69	24	76.23	837	...	78	...	7.94	2 06
Teluk Anson	...	...	81.04	93	70	23	76.49	850	...	80	...	4.85	1 35
Tapah	...	...	81.34	92	69	23	75.95	826	...	78	...	14.76	3 25
Parit Buntar	...	...	81.79	91	71	20	76.62	848	...	78	...	6.12	.93
Bagan Serai	...	...	82.00	91	72	19	77.09	864	...	81	...	6.09	2.76
Selama	...	...	80.18	92	71	21	75.49	820	...	80	...	6.07	1.12
Lenggong	...	...	79.68	91	71	20	75.45	826	...	82	...	4 85	2.22
Tanjong Malim...	...	...	80.49	92	68	24	76.74	871	...	85	...	8.49	1.48
Grit	...	...	77.95	92	65	27	74.34	802	...	84	...	9.60	1.36
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	9.82	2.42
P.P. Laut	...	...	...	...	...	...	...	...	...	...	...	18.15	4.64
Kuala Kura	...	...	...	...	...	...	...	...	...	...	...	9.22	2.30
The Cottage	...	...	...	...	...	...	...	...	...	...	...	20.11	3.30
Maxwell's Hi l	...	...	...	...	...	...	...	...	...	...	...	19.28	1.80

Office of Senior Medical Officer,
Taiping, 13th Oct., 1911.

S. C. G. Fox,
Senior Medical Officer.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of September, 1911

District.	Mean Barometrical Pressure at 32° Fah	Maximum in Sun.	Temperature. Mean Dry Bulb	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	80.0	91.1	67.6	23.5	74 9	...	...	...	...	8.58	1.34
... ... Raub	...	...	82.3	93 0	67.5	25.5	72.7	...	...	...	..	6.73	3.54
... ... Bentong	...	...	80.2	90.6	71.0	19.5	75.1	...	...	...	...	6.93	2.50
... ... Pekan	...	...	82.0	90.2	71.4	18.8	77.3	...	...	...	...	2.77	1.38
... ... Kuantan	...	...	80.9	89.2	70.5	18.7	77.4	...	...	...	...	4.16	1 32
Dispensary Temerloh	...	...	...	90.2	69.8	20.4	...	...	...	...	...	6.12	1.88
Sungei Lembing	...	...	...	85.6	69.5	16.1	...	...	...	...	...	11.17	1.94
Kuala Tembling	...	...	...	...	...	...	...	...	...	...	...	11.59	4.51
Pahang Rubber Estate	...	...	...	...	...	...	...	...	...	...	...	8 51	3.20

Office of Senior Medical Officer.
Kuala Lumpur, 31st October, 1911.

A. J. McClosky,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

VALEDICTORY.

With the retirement of the Director of Gardens the publication of the Agricultural Bulletin of the Straits and Federated Malay States comes to an end. It was first started in its present form in 1902. Previous to that a Bulletin was issued at irregular intervals, chiefly according to facilities in printing. This, called the old series, consisted of 9 numbers and was printed and financed by the Government. The second series, though the first few numbers were printed at the Government press, was in no sense a Government publication. Small grants were given by the Government of the Straits and F.M.S. for which copies of the publication were supplied, and the Planter's Association agreed to grant 1,000 dollars annually, for which series of the Bulletin were supplied free to the Planters on their list to the value of the grant. It was hoped that a considerable number of contributors to its pages would have been forthcoming, but this was not the case, so that most of the work was written by the Editor. All that is not signed or to which no author's name is given was written by him. That there is a demand for such a Bulletin is shown by the continuous and steady increase of subscribers from all parts of the world. Most Botanical Gardens and Agricultural stations issue a monthly or quarterly Journal or Bulletin, under the auspices and with the assistance of the Government, and these, if only records of what has been done in the past is being done in the present, are extremely useful. Most of the latest facts and theories in Agriculture are published in these works, so that by them the Agriculturist is kept posted up to date. Of late years a great development in Tropical Agriculture has taken place, one has only to look at the agricultural publications of thirty years ago to see that the whole standard of this work is rising to a higher and higher level, and that the old empiric methods of planting and harvesting are long out of date now, scientific cultivation having taken its place. The planter in any country naturally wants to know the latest tips on the cultivation he is interested in, and these are generally published in such Bulletins as this one, but in all kinds of languages. There are upwards of 200 publications of this kind dealing with tropical cultivations, full series of which have been received in the Botanic Gardens, Singapore, for many years in exchange for the Bulletin. And one of the uses of a local Bulletin is to publish extractions or translations of such articles as have a bearing on local Agriculture. No planter could do this himself. He has neither the time nor the funds to obtain and read all these works. This is part of the work of a Bulletin. Another important point is to call the planter's attention to dangers appearing to his cultivation and to the best remedies for them, thus the first records and observations on *Termes gestroi, Fomes Diplodia, Hymenochoete, Eutype,* the Coffee locust, the Coffee Caterpillar, many of the sugar pests, etc., were first published in this Bulletin. Then there are the results of experiments made at the Gardens, or observations on estates to be published. New useful plants to be described, new forms of machinery, tools, or buildings to be introduced to the up-to-date planter. All this is work that cannot be done in any other way than by a monthly or quarterly Bulletin.

The Straits and F.M.S. Bulletin has never been a large sized publication owing to the fact that printing is expensive here and the funds available by the Editor very small, and had it not been for the advertisements obtained it would have been necessary for the Bulletin to cease to exist some years ago.

However, it has served its purpose small as it has been, and it now only remains to bid our readers farewell.—ED.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 12.] DECEMBER, 1911. [VOL. X

TOMATOES.

Probably one of the greatest hardships of a prolonged stay in the Tropics is the want of well-grown vegetables. True, the Chinese put before us something which are called vegetables but usually Europeans treat them with some reserve as their method of cultivation leaves much to be desired.

It is practically impossible for us, at such a low level, to succeed with most of the vegetables usually obtained in England, but at any rate a fair amount of success is usually obtained with parsley, celery and tomatoes, provided sufficient care and perseverance is exercised.

Usually everyone makes an attempt to grow tomatoes and probably for the first few times splendid crops are obtained, but after one or two successful attempts one is greatly discouraged by the sudden dying off of the plant, apparently through no fault of the grower. This dying off frequently takes place just when a splended crop is seemingly assured, *i.e.*, just before the fruit is ripe. This is invariably due to fungus pests and those will be dealt with under Tomato diseases.

The Tomato (*Lycopersicum esculentum*) is a native of South America. Its uses are many and varied, the fruit being cooked as a vegetable, mixed in salads, prepared as a sauce, and used for many other culinary purposes. Like the Durian, one has to acquire the taste of the tomato and it is rarely the case that one likes the flavour of a tomato at a first trial. The fruit is credited with being a mild aperient and it also has a cooling effect on the blood, and these qualities in themselves provide sufficient encouragement for repeated and whole-hearted attempts to attain its successful culture.

Tomatoes may be increased in any quantity from seed which ripen freely in most of the fruits which reach maturity. As the seed retain their vitality for some considerable time, it is better to obtain a fresh supply from Europe when required. They may also be propagated by cuttings, often with better results, as they reach the fruiting stage quicker than the seedlings and also escape a few of the diseases which attack the plant in the seedling stage.

Seeds may be sown at any time in pots or shallow pans filled with a light porous soil and placed in a shady position. The method to be followed in preparing the pots or pans is as follows:—

Place broken pots or crocks as they are called, to the depth of one inch in the bottom of the pot or pan, cover these with some fairly rough material such as the residue of soil which is unable to pass through the ½" sieve, removing all pieces of wood; take equal proportions of loam and leaf-mould and add to it some sand; mix all well together, pass as much as possible through the ½" sieve. Fill the pot or pan to ¾" of an inch from the rim, do not press the soil firmly, obtain a level surface using the base of another pot, or better still a piece of wood cut to the size and shape of the pot or pan. Water thoroughly and allow the soil to settle. About an hour after watering the soil will have settled sufficiently to allow the sowing of the seed to take place. The seed does not require a heavy covering of soil, a slight sprinkling being sufficient. As soon as the seedlings appear, remove the pans to a light, airy position and avoid heavy waterings, it being better to steep the pan in a bucket of water rather than water the tender seedlings overhead. In a few days the second leaf will appear and now is the time to commence thinning out or *pricking off*. An old yet trite saying aptly comes in here and that is *sow thinly and thin quickly*.

Prick off into pans leaving about an inch between each plant and place in a sunny, airy spot. They may be covered with a sheet of glass with advantage.

As is probably well known tomatoes may be either grown in pots or planted out in the open in prepared ground. It must now be decided what method is to be adopted. If they are to be planted out, then pot off singly into 3 inch pots when the seedlings are 2 inches in height, using a slightly coarser compost.

If it is intended that they are to fruit in pots then I would advise the placing of three seedlings, equal distances apart, in a 5 or 6 inch pot.

When those intended for planting out are about 6 inches to 1 foot in height they will require to be removed to their permanent quarters, the ground having been well prepared beforehand, a liberal supply of well-decayed cowmanure and where possible a little lime being added to the soil, those will require similar treatment to the ones grown in pots as far as regards staking, thinning, and perhaps watering. When the roots of those placed in 5 inch pots are appearing round the sides of the pots in fair numbers remove the three plants into a 10 or 12 inch pot or even an empty kerosine tin taking care to disturb the roots as little as possible. A much coarser compost can be used in this the final potting, and also the soil can be made rather firm.

It is not advisable to add too much organic material in the shape of decayed cowmanure or artificial manures to the soil at present as this induces too rank growth and very little blossom.

Place a stout stake to each plant sloping the stake slightly outwards to allow free acess of air to the centre of the pot, tying each stem loosely to its stake when necessary. If at any time the plant suffers from lack of water then poor results will be obtained, so that it is essential to see that they are thoroughly watered when necessary.

Opinions differ as to whether the side shoots ought to be removed or not, and as far as I have seen it is immaterial which method is adopted in this country, but in many cases it has been a decided advantage to leave as many of the side shoots as possible, provided sufficient light and air has access to the centre of the plant. When the fruit has *set* liberal waterings of liquid cowmanure, occasional weak solutions of guano or any other well-known manure are very beneficial. If, however, when potting into the 10 or 12 inch pots, the pots are only filled up to within 2 inches of the rim, a mulching of decayed cowmanure may now be given.

This then is a rough diary of the work in connection with the growing of Tomatoes were everything plain sailing, but it must be remembered that nearly every plant when cultivated on a large or small scale is liable to attacks of insect pests and diseases of all sorts some time or other. The tomato is no exception to this, in fact rather the reverse. From the time of sowing of the seed one has to be continually on the outlook for pests and for the benefit of those who have tried and failed to grow the Tomato I will briefly mention some of them and methods to be adopted in combating them.

The Damping off fungus *(Pythium de Baryanum*, Hesse).

When plantlets (usually in the seedling stage) fall over the die, damping off is said to have taken place. This is due to the presence of too much moisture in the soil and also keeping the seedling pans in too dark and insufficiently airy a situation.

Preventative means:—Thoroughly drain the seed pans or pots and remove them immediately the seed show signs of germination to a light, airy situation. The fungus cannot spread or be produced unless water is constantly present in the soil in excessive quantities.

Sleepy-Disease (*Fusarium Lycopersici*, Sacc.).

The first indication of a tomato plant being attacked by this disease is the drooping of the leaves and their bad colour, the older leaves being attacked first. If a badly affected plant be pulled up, the roots will be found to be decayed, but if a plant, on the first sign of being attacked, is lifted carefully to avoid breaking the smaller roots, it will be seen that many of the lateral rootlets are in a decayed condition though the main root may be quite sound. The disease is due to a fungus which enters the plant by the rootlets, gradually extending over the whole plant and eventually killing it. If such a root is split, the woody portion is seen to be of a dingy yellowish-brown colour, which becomes more marked if left open for a short time. When a plant has been attacked for about three weeks, the lower portion of the stem is usually covered with a delicate white bloom of mildew, but the disease can always be identified by a brownish ring just within the bark at the base of the stem or in the thicker portions of the root.

Treatment.

All diseased plants should be uprooted immediately the disease is noticed and should be burned.

After removing the diseased plants add liberal dressings of quick-lime to the soil or sterilise it by heat.

Use good strong sturdy plants at the commencement, avoiding weak spindly plants. Allow the plants plenty of light, air and room for growth.

Black-stripe of Tomatoes.

This disease is sometimes known as Black rot. The fruit is most frequently attacked, discoloured patches appearing, which become slightly sunken owing to collapse of the tissues. Such patches soon become covered with a delicate velvety pile of blackish-olive colour. The fungus sometimes forms long, blackish stripes on the stem, and irregular shaped blotches on the leaves.

Preventative Measures.

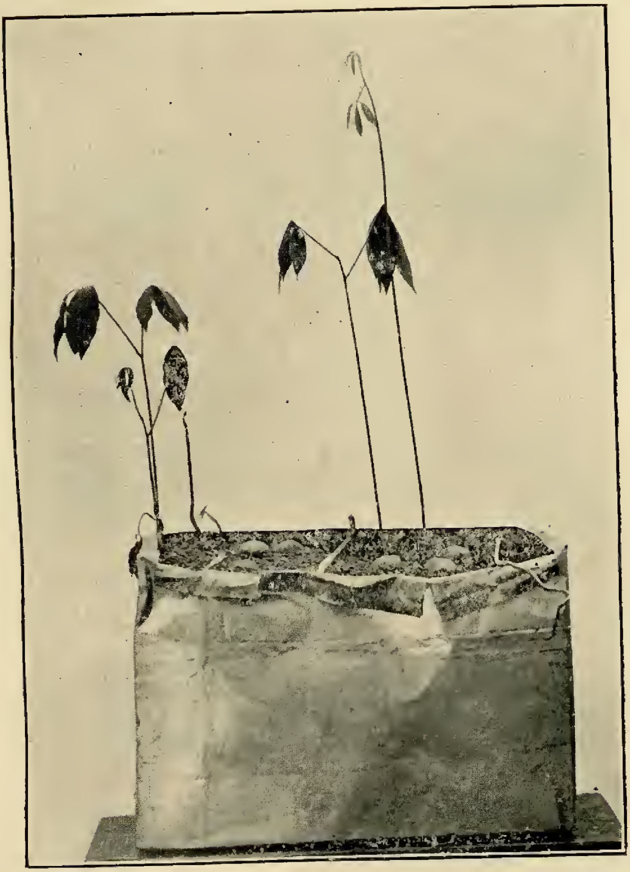
Infection can only take place through a wound. Minute cracks on the fruit expose the fruit to infection and are often the result of overfeeding more especially when green manure is used. Burn all infected fruits or plants as soon as noticed.

In many instances plants are practically destroyed by the attacks of Green Fly, Thrip, Red Spider and a White fly, the latter being perhaps the most destructive. They may be kept in check and often removed by repeatedly syringing with a weak solution of XL All Insecticide, the ultimate success depending largely on the thoroughness of the operator.

J. W. ANDERSON.

DURATION OF VITALITY OF PARA RUBBER SEEDS.

On the thirty-first of January, a box of 600 Para rubber seed was packed for a German planter to go to German New Guinea. The seeds were packed as usual in a tin box 12 inches long, 8 inches wide and 5 inches deep, in layers of burnt rice husk, and the box was covered with canvas stitched over it. The planter, however, omitted



"Germination of Rubber Seeds."

to leave any address or instructions for shipping the box, as he had intended to do. The parcel remained unopened in the office till the 13th of July, (a period of five months and thirteen days) when the lid was taken off and the box left open by a window. By the end of the month fifty-three of the seeds had germinated and thrown up strong stems.

A hundred of the others were removed and put in a pan and of these, three germinated.

No particular care was taken of these seeds and it is probable that if they had been carefully treated more would have germinated. The duration of the vitality of these seeds for nearly six months, enclosed in a box, shows that the Para rubber seed has greater lasting powers if properly packed than would be expected. I believe this is the longest record of duration for this seed.

We give a photograph of the box with a number of the seedlings germinated in it.

RUBBER IN BRITISH HONDURAS.

For some years the Botanic Gardens of Singapore have been sending Para rubber seed to British Honduras, and according to Mr. E. J. F. Campbell's Report on the Botanic Station there for 1910, the plants seem to be doing well. He writes—"All the Para rubber plants have grown and the greater number have put off branches and are taking good form. Some of these are now from 25 to 30 feet in height with a girth of from 12 to 18 inches, having nearly doubled their measurements during the year. The Castilloa plants continue their slow rate of growth but one specimen growing in the Liberian Coffee plot has made a remarkable growth, having in three years attained to a height of 20 feet and a girth of 24 inches." Experiments in clean weeding are being tried.

The Honduras station is as yet only commencing its work in improving local agriculture but it seems to be doing good work all round. It is amusing to read of the Jack fruit of which seven plants are owned by the station and which have grown 10 to 12 feet in two years, being spoken of as "a rare fruit much prized in India."—ED.

INSTRUCTIONS FOR TAKING AND COLLECTING OF SAMPLES.

SOILS.

A rough sketch of the field, paddock, or block of land from which the samples are to be taken should be prepared to accompany the samples. The spots where the samples are taken are marked on this plan, and are numbered. This sketch plan should also indicate position of roads, creeks, gullies, ridges, general fall, and aspect of land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two or more parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each section. A greater number is to be preferred, as a better average will be obtained. In order to obtain a fair average sample of the soil from a block of, land, as nearly as possible equal quantities of soil are collected from various parts of the field.

At the places chosen for the taking of the samples the surface is slightly scraped with a sharp tool, to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are dug in the ground to a depth of 3 feet. The holes are dug out like post-holes; an earth-auger facilitates the operation considerably, and the holes may be trimmed with the spade afterwards, and the holes cleaned out.

Careful note of the appearance of the freshly cut soil of any intermediate layer and of the subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is also measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the sub-soil, as is the case in some places where the soil is of very great depth, this line of division can only be guessed approximately, and it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil, from 3 to 4 inches thick, down to the beginning of the subsoil or to a depth of 12 inches, is now cut off and put on to a clean bag. The same is done with the sub-soil, and the slice is taken from where the soil ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples. Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Take careful note and give description of soils in each hole, as numbered and marked on plan. The samples of soil collected on the one bag are thoroughly mixed by breaking up any large clods, and about 10 lb. of the mixed soil are put into a clean canvas bag, which is securely tied up and labelled. The same is done with the samples of subsoil collected separately on the other bag.

All the samples collected are afterwards placed in a wooden box.

It is important to use clean bags and clean boxes, and also that the samples should not be left in the neighbourhood of stables or manure heaps.

A short description of the land must accompany the samples and the sketch plan. In the case of cultivated land, state how long the land has been under cultivation, what crops were chiefly grown, result of such crops, was any manure applied, when, and what sort, and in what quantities per acre. In the case of virgin soil, state if the land was heavily timbered or not, ringbarked, if scrub or forest land, what sort of timber was chiefly growing on the land. In all cases a description of the neighbouring land, outcropping rocks, &c., are of great value. Also state if the land is naturally or artificially drained or not; describe the land as regards its position to hills, roads, creeks, ridges, &c.

Only by adhering strictly to these instructions, and by giving minute details can benefit be derived from the soil analysis.

Special forms of application for advice as to manurial treatment of soil have been prepared, and may be obtained from the Under Secretary, Department of Agriculture and Stock.

It is strongly advised to fill up one of these forms in each case when a sample of soil is submitted for analysis.

(Queensland Agricultural Journal Vol. XXVII, No. 3.)

EXPERIMENTS IN THE EXTRACTION OF MANIHOT GLAZIOVII LATEX.

Two experiments of this kind have been made recently at Kalamu, near Boma, in the Lower Congo, with trees, in the first case, growing in a sandy hollow. The results, which are given in the *Bulletin Agricole du Congo Blege*, for June 1911, p. 359, show that in the first experiment made in the dry season, employing 129 trees, the yield of latex was 12.9 gallons, equivalent to 32.7 lb. of dry rubber; the renewals of the tapping were made during twenty-nine days. It was noticed that, during this trial, the latex was much thicker and richer in rubber than in the one to be described. A circumstance rarely observed in regard to Manihot was noticed, namely a decided increase in the yield of latex after the first four renewals of the tapping; towards the end of the trial a gradual diminution occurred in the quantity collected daily. A former experiment, made on the same trees during the rainy season, gave a yield of 14.6 gallons of latex, or 28.3 lbs. of dry rubber,

The second trial was made in the dry season, employing 242 trees, situated on a plateau possessing a clay soil with pebbles. The tapping, repeated for ten days, gave 27.6 lbs. of dry rubber.

In the two experiments, the latex was coagulated to form sheet rubber by the employment of 3 per cent. of its volume of 'formol'. The rubber was kept for a quarter of an hour in water at 80°C., then passed through the press and well washed with water. The report of the experts to which the samples were submitted showed that the rubber had exactly the same appearance as that shown by Hevea rubber from the Far East. It was valued at 2*s*. 5*d*. per lb., with Para at 5*s*. 10*d*.

The wounds from tapping healed normally in the case of most of the trees. With some, however, the bark dried up, and cracks were produced in it, the wounds thus formed being attacked by insects.

FUNGUS NOTES.

Recent Work on Bordeaux Mixture.

In considering the poisonous action of copper salts on plant organisms when they are used in the form of sprays, it must be borne in mind that no substance in the solid form is capable of penetrating the walls by which the living protoplasm of practically all plants is protected, and that, consequently, in order to bring about the death of the organism, the copper salt must be soluble in water. Such a soluble salt is copper sulphate, or blue stone, and it might at first seem that the application of a solution of this substance to diseased plants would be all that is required to kill the fungi causing the disease. This course has several drawbacks. In the first place, it is often found that such a solution, when strong enough to kill the fungi, damages the host plant as well; secondly, it is easily washed off by rain.

In order, therefore, to diminish its harmful effect on the host plant, and at the same time to increase its adhesiveness, it is mixed, in the preparation of Bordeaux mixture, with lime-water, or water containing slaked lime partly in solution and partly in suspension. As a result of this mixing, an insoluble compound of copper is formed, which may often be mixed with excess of lime. The Bordeaux mixture must contain no copper in the form of the soluble sulphate, if injury to the leaves of the sprayed plant is to be avoided. Consequently, enough lime is always added to turn all the copper into the solid form. The liquid containing the insoluble copper precipitate suspended in the form of fine particles is then sprayed on the plant, and covers the parts to be protected with a fine film of insoluble copper compounds. The question now naturally arises as to how this insoluble substance is again rendered soluble, as it must be, if it is to bring about the death of germinating fungus spores, which would otherwise infect the sprayed plant.

There are three theories which have been put forward to account for the manner in which the insoluble copper compounds are rendered soluble; these are: (1) that the copper is brought into solution by the action of the atmosphere, more especially owing to the presence of the carbon dioxide in it; (2) that the insoluble compounds are dissolved by some substance or substances secreted by the sprayed leaves; (3) that the copper is rendered soluble by some substance secreted by the fungus itself, which consequently brings about its own destruction.

The first of these theories was supported by Pickering (see *Eleventh Report on the Woburn Experimentnl Fruit Farm*, 1910); but recently, further work carried out by Gimingham, and by Barker and Gimingham, discredits this theory and lends support to the last, namely that of the action of the fungus itself. (*Journal of Agricultural Science*, Vol. IV, pp. 69 and 76.

Pickering found that the insoluble substances containing copper formed in the preparation of Bordeaux mixture were partly dissolved in water containing a large amount of carbon dioxide and that copper sulphate was formed in the solution. This naturally led to the idea that the fungicidal action of the mixture was due to the effect of atmospheric carbon dioxide on the insoluble copper precipitate. Furthermore. he observed that when the mixture contained excess of lime, no copper appeared in the solution until all the lime had been converted into chalk by the action of the carbon dioxide. Consequently, he recommended that care should be taken to prepare Bordeaux mixture without excess of lime, since this substance would only delay the action of the mixture as a fungicide.

Gimingham, however, found that if the excess of carbon dioxide was removed from the liquid, the copper was again precipitated in an insoluble form; while as the result of several experiments he finally concluded that it was unlikely that the copper was rendered soluble by the action of the atmosphere.

The possibility that the copper is rendered soluble by secretions from the sprayed leaves was examined by Barker and Gimingham. They found that a certain amount of soluble copper sulphate was produced by the substances secreted through minute punctures or abrasions on the surfaces of the leaves. This quantity, however, was not sufficient to account for the fungicidal action of the Bordeaux mixture; on the other hand, it was enough to cause scorching of the leaves in spots, and explains why older leaves which have been longer subject to possible damage are more liable to scorching than younger foliage, since undamaged leaves do not appear to secret the necessary substances.

The same workers then turned their attention to the possibility that the copper is rendered soluble by substances secreted by the spores or germ tubes of the fungi themselves. They found that spores possessing thin walls, and also the tips of young germ tubes, do actually appear to secret small quantities of substances sufficient in amount to dissolve enough copper to cause their death. The amount of copper dissolved depended, however, on the distance of the spore or germ tube from the particle of copper compound nearest to it; while the fungicidal action of the particle only took place when this distance was very small. Another point determined was that there was no secretion from spores, provided with a special, thick protective wall, and that these could only be killed after the formation of a germ tube. This makes it still more improbable that the epidermal cells of the sprayed leaves can give rise to the necessary secretion, as these also are furnished with a special thick cuticle in almost all cases.

These results have an important practical bearing on the application of Bordeaux mixture. In the first place, they indicate that the mixture is of more service as a preventive than as a remedy; this is supported by actual results. In cases where fungi have already gained a hold on the leaves before spraying, the hyphae in the plant tissues will not come into intimate contact with the particles of copper compound on the sprayed surfaces, and will, therefore, not be affected.

In the second place, the film of copper compounds deposited must be even and universal, for, if small untreated areas are left, fungus spores will be able to germinate on them unharmed, and the resulting hyphae will penetrate the internal tissues underlying the fungicidal film, without coming into close contact with this, and, therefore, without receiving any check. It is because of the advantage gaind by uniformity in the film deposited that a second spraying is particularly beneficial. Excess of lime in the mixture would appear to have but little effect on its action, except in so far as it increases the distances between individual particles of the copper compounds in the film.

A final point not considered by these workers is of importance in the tropics. Frequently, extra adhesives must be added to Bordeaux mixture when it is used in places where the rainfall is high. The choice of such adhesives requires care, since they might conceivably form a film over the particles of copper compounds, such as would prevent the secretions of the fungi from exerting their solvent action on those particles.

(West Indian Agricultural News Vol. X, No. 245.)

THE PROBLEM OF MANURING IN CONNECTION WITH THE CULTIVATION OF THE PARA RUBBER TREE.

The question of the application of artificial fertilizers in the cultivation of the Para rubber tree is closely connected with the value of plantation Para rubber and the yield.

Manurial treatment which would be profitable with a product yielding a profit of $1.50 per pound might not be so with rubber at a profit of 50 cents or less per pound.

It can be safely asserted that no agricultural product either in temperate or tropical countries at present yields such a handsome return on expenditure.

This state of affairs is not without its attendant disadvantages, as with such a handsome profit as say $1.50 to $2 per pound of rubber, there is a tendency in many cases to underrate the value of obtaining an extra profit, either by preparing better rubber or by increasing the yield, which may one day represent the difference between success and failure on an estate. In connection with the question of increased yields by cultivation or the application of manures the same remarks apply.

Manurial treatment costing say $30 per acre would be justified by any increase of yield of rubber per acre over and above an increase of 20 lbs. per acre with rubber yielding a profit of $1.50 per pound, *i.e.*, an increase of 10 per cent. on a yield of 200 lbs. per acre, whereas with rubber yielding only half this profit an increase of more than 40 lbs. of rubber per acre, *i.e.*, an increase of over 20 per cent. would have to be obtained to justify a similar expenditure under such circumstances. This applies to the output for one year only—a smaller increase extended over two or more years would equally justify the application of manures at the above cost.

The value of various agricultural products in most cases may be stated to have reached a level, with only occasional fluctuations due to shortage or other causes, so that the profits are more or less fixed.

It is extremely probable however—one might almost say certain—that the normal level of price has not yet been reached in the case of rubber, and till this is so, the question of extra expenditure on cultivation and manuring is by no means an easy problem except in special cases.

An illustration of how not to conduct such manurial treatment was recently brought to my notice by seeing an advertisement in this country of a certain fertilizer of which a planter had applied 20 lbs. per tree. Assuming even only 100 trees per acre this would mean about 2000 lbs. per acre or say 1 ton per acre, costing in this particular instance $25 per ton exclusive of transport and labour. This particular fertilizer supplied only one of the essential constituents necessary to plant growth and this may or may not have been that most needed in the soil in question. The increased yield of latex or rubber was unfortunately not stated for any period whatever — this might have been interesting! Some figures of increase of girth were given, but these were too small to be of value, being probably within the limits of experimental error, and no statement made as to how many trees were used on the manured plot or the control.

There are one or two points, which it may be advisable to emphasize, as they may not be generally known, in connection with the use of fertilizers.

(1). The first application of any fertilizer usually produces the greatest increase in yield, subsequent treatments producing a gradually diminishing increase till a level is reached.

(2). Double the increase is not necessarily obtained by doubling the amount of manure applied.

These points explain why excessive expenditure on fertilizers in connection with crops of low price are not justified. The more valuable the crop, the greater the amount—to a certain limit—which can be profitably expended on fertilizers, and this principle particularly applies in the case of Para rubber cultivation at the present time.

The problem of manuring as applied to Para rubber trees is somewhat different to that of an annual crop such as roots, cereals, vegetables, etc., and resembles the cultivation of fruit trees.

Para rubber trees, like fruit trees, require a prolonged preliminary period of growth before any crop is obtained and growth still continues while the tree is fruiting and being tapped, whereas with an annual crop, growth ceases when the plant ripens.

We are dealing also with a continuous cropping of one kind, thus removing the same proportion of plant food every year. Nothing except the constituents in the fallen leaves is returned to the soil.

General principles still apply, however, in this cultivation, since it is essential to replace constituents removed from the soil and to maintain the general health and vigour of the plant; any treatment which increases the girth of the tree also enables it to be tapped at an earlier age.

Manurial Requirements.

Of the principal contituents which need replenishing in the soil viz.—Nitrogen, Phosphoric acid and Potash, each to a certain extent exercises a definite function, and if one is deficient, the application of the others has no beneficial effect.

Both the nature of the soil and the requirement of the crop has to be considered in applying fertilizers.

Nitrogen is essential to the production of a good leaf growth. Phosphates are essential to seed production. Potash is necessary in the production of woody growth and in the elaboration of carbo-hydrates (sugar, starch, etc.,) and since it is believed that the caoutchouc substance is built up from carbohydrate material, the application of Potash should be beneficial. Lime is the essential constituent of the wood, but is of more value indirectly in rendering available other dormant plant foods in the soil.

In the Federated Malay States, the soils are usually rich in Nitrogen, although this constituent may not be in a readily available form—owing to the sourness of many of the soils when first brought into cultivation from virgin jungle, this being especially so in the lowlying coast districts.

Lime, Potash and Phosphate are generally very deficient. In spite of the richness of the soil of many rubber estates, there are marked exceptions where the soil may be described as very poor and where the growth of the trees is very slow.

Method of Application.

Fertilizers should not merely be spread on the surface of the soil, which on most estates is hard, as with a heavy rainfall they would be rapidly washed into the drains. On all estates where the trees are two years old or more, it will be found more economical and effective to broadcast the manures and lightly fork over the surface soil. Artificial fertilizers are best applied after mixing with fine earth—to ensure better distribution.

Fertilizers applicable to Certain Soils.

Another important point in connection with the application of manures is that certain manures must not be used on certain soils, thus, Superphosphates as a source of Phosphoric acid and Ammonium Sulphate as a source of Nitrogen should not be used on peaty soils, as they increase the acidity of such soils. Superphosphates should not be used on clay soils, and Sodium or Potassium nitrate should not be used on clay soils as it deflocculates the clay, and renders it more heavy.

Organic nitrogenous manures, as a source of nitrogen, Potash fertilizers and lime are specially suitable on light sandy soils.

The application of lime to improve the physical texture and Bacis slag as a source of phosphates is especially applicable to clay soils which usually contain potash in excess.

Manurial Treatment Recommended on Different Soils.

LOAM SOILS:—On loam soils of average quality the following formula is recommended:—

Ammonium Sulphate	...	150 lbs. per acre.	
Potassium ,,	...	150	Do.
Double Superposphate	...	150	Do.
Lime	...	500	Do.

N.B.—The Lime should be applied about one month before the other manures. The other manures may be mixed together and mixed with earth and spread. In subsequent years half the Ammonium Sulphate can be replaced by organic nitrogenous manures, oil cake, blood meal, etc. and the Superphosphate by Bone meal or Phosphatic Guano.

CLAY SOILS:—One half of the Ammonium Sulphate might suitably be replaced by oil cake—using quantities containing an amount of Nitrogen equivalent to that in the Ammonium Sulphate replaced. The Superphosphate should be replaced by Basic slag or Guano—preferably the former. Potash salts may frequently be omitted. Lime should be applied at the rate of 1500—2000 lbs. per acre.

SANDY SOILS:—At least half of the Ammonium Sulphate should be replaced by organic nitrogenous manures *i.e.*, oil cake, etc., using a quantity of cake containing Nitrogen equivalent to the 150 lbs. of Ammonium Sulphate—as sandy soils are often very deficient in Nitrogen.

Potash salts (Chloride or Sulphate of Potash) should be applied at the rate of 200—250 lbs. per acre. Basic slag is preferable to Superphosphate, as a source of Phosphates. Lime should be applied at the rate of 1000 lbs, per acre.

PEATY SOILS:—Nitrogenous manures may be generally omitted; if used, a small quantity of Sodium or Potash Nitrate—say 100 lbs. per acre might be applied, as Ammonium Sulphate tends to produce acidity.

Phosphate should be applied preferably as Basic slag or Guano. Potash salts may be applied as in the case of loam soils. Lime is especially important and should be applied at the rate of 2000—3000 lbs. per acre.

The following table will indicate the quantities to be supplied of any particular manure when substituted for either Ammonium Sulphate, Superphosphate or Potassium Sulphate. The above quantities should be increased by at least one half on poor soils

Average composition of Fertilizers.

The following table gives the average percentage composition of the various artificial fertilizers in common use. From this table it will be easy to see what quantity of any particular fertilizer can replace any other in order to supply equivalent quantities of the same constituent.

	Nitrogen N. per cent.	Potash K_2O. per cent.	Phosphoric acid. P_2O_5 per cent.	Lime Ca O per cent.
Ammonium Sulphate	20%	...	...	...
Potassium Nitrate	13%	46%	...	...
Sodium Nitrate	15.5%	...	...	...
Ordinary Superphosphate	...	...	20%	35%
Double or concentrated Superphosphate	...	...	44%	...
Basic Slag	...	...	17%	...
Mineral Phosphate	...	...	36.5%	...
Bone meal	...	...	21%	...
Bone dust	...	...	20%	...
Potassium Chloride	...	60%	...	...
Potassium Sulphate	...	52%	...	...
Kainit	...	12.4%	...	...
Perlis Guano (Phosphatic)	...	...	15.5%	...
Ground Nut Cake	8%	1.2%	1.2%	...
Rape Cake	6%	1.2%	2.3%	...
Para Seed Cake	5%	1.2%	1.2%	...
Castor Seed Cake	6%	1.2%	1.2%	...
Calcium Nitrate	13%	...	...	...
Calcium Cyanamide	20%	...	...	...

REMARKS ON THE PURCHASE AND USE OF FERTILIZERS:—No fertilizers should be purchased without a guarantee from the vendor of the percentage of the essential constituent in each case. In most countries the buyer is protected by a Fertilizers Act.

The purchase of mixed manures is not recommended as these are much more expensive, since the buyer has to pay for the cost of mixing and the experience of the vendor.

The following manures should not be mixed together, otherwise loss results due to volatilization or to chemical action between the constituents:—

1. Lime and Ammonium Sulphate.
2. Basic Slag and Ammonium Sulphate
3. Lime and Superphosphate
4. Superphosphate with Sodium, Potassium or Calcium Nitrate
5. Lime and Nitrogenous Guanos
6. Basic Slag and Nitrogenous Guanos

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EARLY PLANTING ENTERPRISE IN THE STRAITS.

In the great building consecrated to the official uses of India at Whitehall there are preserved several hundred volumes of records relating to the Straits Settlements, abstract and brief chronicles of the days when British Malaya was in the making. They give a wonderfully vivid picture of the life of the early settlers. The old servants of the East India Company allowed nothing to escape their vigilant observation and so we have inscribed in these time-stained documents the most intimate details affecting the interests of the Settlements. There we may see set out the price paid for labour more than a century ago, the cost of provisions and the methods of doing business side by side with other prosaic matters. We have accounts of official quarrels and (whisper it gently) official vices. Occasionally the suggestion of a duel flits across the page to add piquancy to the official story. Nor is the element of pure romance wanting. In the stories of old time piracies related in matter of fact style by the official diarist there is material for a score of thrilling novels.

The substantial interest and value of the records lie in the light they throw on the origin and infancy of the principal administrative institutions and the developments of the Colony's commercial enterprises. If, for example, we take planting as a theme we find an abundance of material illustrative of the beginnings of the wide reaching system of agricultural exploitation which gives the British Malayan region such an enviable superiority amongst countries which compete for the supply of tropical products in the world's markets. In reality British planting enterpise is very much older than any of the existing Settlements. It dates back to the period towards the end of the seventeenth century when the English East India Company was in strenuous rivalry with the Dutch East India Company for the supply of spices to the European markets. Driven out of the Eastern Islands and circumscribed in their operations at Batavia and Bantam the agents of the English Company established themselves on the West Coast of Sumatra, principally at Bencoolen, officially designated in the records, first Fort Java, and afterwards Fort Marlborough. Here they inaugurated a system which is well described in the accompanying extract:—

"We can truthfully assure your honours that our utmost diligence and endeavours have not been wanting for promoting the increase of Pepper and we hope a few years will give ample demonstration that they have not been ineffectual (we) having left no stone unturned to put them on that necessary work. * * * There are now both here and at ye North ward a great number of Pepper trees lately planted, the old plantations being generally decayed as they usually die in 14 or 15 years time and the young ones are generally three or four years before they produce any quantity, which is the reason of our crops at present being so small; but we have an unanimous assurance of very large ones in future which time must produce. To further this great work we design to assemble all the Rajas and great men to recommend to them the planting of Pepper. (Despatch to Court of Managers, Feb. 7, 1703, Vol. V Sumatra Records.)

On the Company's own plantations slave labour was employed. There are pregnant references in the reports home to the system. Here is one. "A supply of slaves we entreat your honours would send us (we) being at present reduced to a very small number occasioned through the sickness and mortality that has happened this year." (Fort York, Jan. 3, 1705. 6 Sumatra Records Vol. V.)

Planting in the modern sense of the term did not really commence until Penang was occupied. Francis Light, the builder of that particular corner of the Empire, immediately after he had taken possession of the island, set about establishing a system of cultivation with the double purpose of providing an ultimate source of reserves and of creating supplies which would be serviceable for the victualling of ships. Almost anyone who would undertake to clear land received a free grant. Under date Nov. 25, 1786, we find Light reporting to the Governor General in Calcutta as follows:—

"Captain Scott and Captain Glass and several Malays, Chinese, and Christians have applied for a portion of land; the subedars &c. and marines likewise expect an indulgence, The Tamuls, a hardy industrious people have sent a deputation for land sufficient for one hundred families." (Straits Settlements Records Vol. I.)

On Feb. 13, 1788, Light sent the following details in reference to cultivation.

"A considerable number of fruit trees, coconuts and plantains have been planted lately. The wild hogs, deer and monkeys are our greatest enemies. In one night they destroy the labour of many days." (Straits Settlements Records Vol. III.)

In a description of Penang's progress communicated in a letter to the Government in Calcutta, Light, (Jan. 14, 1790) wrote:—

At the Comporn now called Salisbury Plain resides Pornglim Dr. Hakim with 30 families. *** On the plains are Crayton's Grazing Farm, Messrs Pigou, Raban, Mylne, James, Glass and Sergt. Major Greggs Plantations. A little further on the west side of Pinang River, is James Scott's Plantation consisting of 200 oorlongs of newly cleared ground. On the East side of Pinang River is Francis Light's plantation of 200 oorlangs, newly cleared and planted with paddy. Interspersed are several Chinese Gardens that supply the bazaar with greens, brinjalls, Cucumbers, Radishes, Sweet Potatoes, Yams and Pineapples. (Straits Settlements Records, Vol. V.)

In "an account of lands cleared and cultivated from Teehouse Point to Pinang as taken by Malay measurement in 1796 appear the following European names:—Captain Lownds, 7½ Oorlongs or acres, Joan Baptiste, 6½ Oorlongs; Parkhall, 11 Oorlongs (Note: The flat land begins with this plantation—Paddy, Cocoanuts and various fruits), Captain Scott, 30 Oorlongs; Mr. Hutton, 19 Oorlongs; Mr. Light, 106, Oorlongs; Mr. Frankfort, 25; Mr. Pigou, 39; Bishop, 52½ (Coco-nuts, Betelnuts and fruit trees); Mr. Gray, 2. In all 1128½ Oorlongs were shown to be cultivated in this section. In another section "from Penang to Batu Lanchong 603½ Oorlongs were shown to be in cultivation. Most of the lands are shown to lie along the sea coasts and to be chiefly planted with Coco-nuts, Betelnuts, Pines, Plantains and various fruit trees." Others were stated to be planted with gambier and pepper. No European names figure in the list of owners (Straits Settlements Records Vol. V.)

An estimate of the cost of clearing 2,000 oorlongs of ground sent byLight to Calcutta on June 20, 1790, places to total at 22.520 Spanish dollars. How the cleared ground in the Settlement was occupied is shown in a report from Light, dated July 30, 1792:—

"I cannot inform your lordship of the exact quantity of paddy ground in present cultivation. Much land that produced paddy the first year of its being cleared is now applied to other uses and will not again be sowed with paddy. Coco-nuts, Betelnuts, Fruit Trees, Gutta, Gambier and Pepper are now upon these lands."

Bound up with a the records of this period and with a date fixed upon it of 1787 is an unsigned report upon Pinang from the pen either of Captain Kyd or of some official associated with him in the work of reporting upon Pinang. . This early account of the island contains the following which may be said to be the earliest notice in the Straits of Rubber.

"Amongst the woods there are a great variety of strong creepers that entwine themselves around all the trees and some of them of so very powerful a vegetation as to check and destroy the trees that have given them support. Amongst the number of these favourite creepers is one which yields the elastic gum said by Maj. de la Candom to be the produce of a large tree in Cayenne. This creeper at its greatest size is about six inches diameter and grows continually twisting like a corkscrew, even when it has hold of nothing. It is remarkable for having very few branches and leaves and I have traced it from the root to the top of a very high tree without discovering one. The gum is entirely in the bark, which is remarkably thick and when cut or in the least wounded emits a resinous white juice much resembling cream, which when exposed to the air, in a very few minutes takes the colour and consistency of the elastic gum and is exactly in appearance and answers the same purposes as the Kaoutchuck of South America which, it may be imagined, is also produced from a creeper of the same kind, for I can hardly suppose that nature has given two different plants grasses of so very singular qualities and so very similar as these appear to be If this gum can be put to valuable uses any quantity of it may be collected at Penang as the creeper from which it is extracted is to be found in the greatest plenty." (Straits Settlements Records, Vol. II.)

It is interesting to note that Penang Planting in its earliest as in latest phase owed much to the energy of Scotsmen. When the Government in Calcutta without reference to Light imposed new regulations relative to land tenure practically rescinding the grants in perpetuity which Light had made, there was consternation in the ranks of the settlers. In the records dated June 22, 1796, appears an indignant protest from Forbes Ross McDonald representing that he had bought his land on the faith of Light's circular that the grant would be in perpetuity and that the new conditions completely reversed the arrangement. He stated that he had become a settler in 1793 at the particular request of Mr. Light and had received the grant of a piece of land in Georgetown for a godown and a tract of uncleaned land. Having at a great expense and trouble far exceeding expectations cleared the latter, he found the soil and situation unadapted to the agricultural purpose for which he wanted, viz., the growth of pepper.

"It appears that Mr. Light, not long before his death, received the orders of the Supreme Government under date 1 August 1794, to grant no land after the 1st January 1795, for a longer term than five years. This order Mr. Light wisely suppressed well knowing that its publication would have instantly stopped all further advance and in in the full reliance that it would be rescinded on his representation. I had commenced clearing another tract of land purposely to establish an extensive agricultural commerce in pepper the ground having been selected for this purpose. This tract being cleared since the 1st January 1795, and no orders rescinding the resolutions of the Supreme Government of the 1st August 1794, appearing, I now find myself in a very unpleasant dilemma. To proceed in the expenditure of Spanish Dollars 50,000 which may become the property of the Company before it returns me one dollar is impossible. To throw up the plantation altogether involves a total loss of the money already expended, and to stop the business for the present, or wait the decision of Government, throws me so far back as to be little short of total loss."

The protest was not without effect. In a letter to the Superintendent of Police of Wellesley Island dated Aug. 22, 1796, the Government recinded the resolution of Aug. 1, 1794.

Not until Province Wellesley was settled was there any marked new development of planting enterprise. As early as 1790 a certain amount of sugar had been cultivated in Batu Kawan. But there was no real enterprise until British possession encouraged the show of capital. Even for some years after this the progress in agricultural development was slow. In this despatch from Penang to Calcutta dated Feb. 1, 1822, we find the first indication of the circumstance that the splendid possibilities of the mainland had been grasped;—

"It affords great satisfaction to us to report to your Hon'ble Court the progressive advancement of cultivation and of agricultural improvement on the island. The extensive demands which of late years have existed for Indian produce has turned the general attention to that interesting pursuit, and it is gratifying to observe the extent to which the exertions of indivduals are now carrying into practical effect. The applications which have been made for permits to clear land have been very numerous, and the general opinion seems to be in favour of clearing new and waste lands ratherthan of reclaiming the old estates from the jungle to which they had reverted through the neglect of former proprietors. The whole or the Western plains exhibit at this time an interesting spectacle of the industry of the Chinese and other inhabitants of those extensive properties and the same observation applies with equal force to the other parts of the island."

"In addition to the growth of pepper which had long been a staple article of produce, we are happy to observe a prevailing interest on the cultivation of coffee which promises to be a source of great advantage to the planters generally who are prosecuting it with the utmost spirit and preseverance." (Straits Settlements Records Vol. 182).

Owing to the onerous conditions of land tenure imposed, planting in the larger sense of the term languished until the Government altered its policy with the result that a good deal of ground was taken up. The pioneer British planter was Mr Brown who for so long was a considerable figure in Pinang life in the early half of the last century. Mr Brown's example was followed by others and notably by a number of French planters who were attracted from Mauritius by the glowing accounts circulated in regard to the Province. For a time enterprise flourished but as a writer of the period remarked the Government stopped short in this wise improvement on the antiquated systems. Instead of placing the whole cultivating population on a fair equal footing by permitting the holders of grants and leases to commute their rents and quit rents at fair rents, the commutations were fixed at unequal and in most cases excessive rates." The consequence was that after the first burst of energy the industry relapsed into a condition of somnolence, the decay being hastened by the Free Trade era in the United Kingdom which dealt a deadly blow at the sugar growing industry in the British Colonies.

ARNOLD WRIGHT.

(The Singapore Free Press, November 25th, 1911).

PERAK.

Abstract of Meteorological Readings in the various Districts of the State of Perak for the month of October, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Taiping	...	105	79.80	92	70	22	76.13	854	...	85	...	21.70	3.45
Kuala Kangsar	...	...	79.27	92	71	21	75.25	822	...	82	...	14.33	2.26
Batu Gajah	...	103	79.83	92	71	21	76.53	870	...	87	...	14.99	2.05
Gopeng	...	...	79.25	91	68	23	74.72	801	...	80	...	22.77	4.01
Ipoh	...	...	80.58	92	70	22	75.89	832	...	80	...	15.00	3.73
Kampar	...	...	79.28	92	68	24	75.28	822	...	82	...	27.08	3.28
Teluk Anson	...	...	79.63	93	68	25	76.24	861	...	87	...	13.98	1.72
Tapah	...	...	80.08	92	68	24	75.77	834	...	82	...	23.73	2.50
Parit Buntar	...	...	80.61	89	70	19	76.39	852	...	82	...	12.27	1.57
Bagan Serai	...	...	80.93	89	72	17	76.98	875	...	85	...	14.13	2.76
Selama	...	...	79.54	92	71	21	75.34	823	...	82	...	17.25	2.84
Lenggong	...	...	79.05	91	70	21	75.37	830	...	84	...	12.44	3.71
Tanjong Malim...	...	...	78.80	91	67	24	76.05	863	...	89	...	24.17	3.26
Grit	...	...	77.89	95	65	30	73.87	783	...	82	...	14.51	4.82
Klian Intan	...	...	...	...	...	...	...	...	...	...	...	15.69	2.75
P.P. Laut	...	...	...	...	...	...	...	...	...	...	...	9.63	1.85
Kuala Kurau	...	...	...	...	...	...	...	...	...	...	...	11.13	2.60
The Cottage	...	...	...	...	...	...	...	...	...	...	...	24.12	5.25
Maxwell's Hill	...	...	...	...	...	...	...	...	...	...	...	23.53	4.54

OFFICE OF SENIOR MEDICAL OFFICER,
Taiping, 13th Nov., 1911.

S. C. G. FOX,
Senior Medical Officer.

PAHANG.

Abstract of Meteorological Readings in the various Districts of the State of Pahang for the month of October, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Mean Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
District Hospital, Kuala Lipis	...	...	80.7	87.5	67.4	20.1	74.9	...	...	...	...	17.48	4.00
,, ,, Raub	...	...	81.9	92.1	67.4	24.7	72.7	...	...	...	...	14.68	2.25
,, ,, Bentong	...	...	80.3	88.9	70.7	18.2	75.0	...	...	...	...	13.55	2.44
,, ,, Pekan...	...	...	80.6	88.0	72.1	15.9	76.6	...	...	...	...	9.10	1.82
,, ,, Kuantan	..	...	78.8	87.3	70.5	16.8	76.3	...	...	...	...	8.35	2.20
Dispensary, Temerloh	...	...	...	88.5	65.6	22.9	...	...	...	...	...	15.87	2.91
Sungei Lembing	...	...	...	83.1	68.8	14.3	...	...	...	...	...	16.45	2 55
Kuala Tembeling	...	...	...	...	...	...	...	...	...	...	...	12.11	2.55

OFFICE OF THE SENIOR MEDICAL OFFICER,
KUALA LUMPUR, *25th Nov.*, 1911.

A. J. McCLOSKY,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan, & Pahang.

NEGRI SEMBILAN.

Abstract of Meteorological Readings in the various Districts of the State of Negri Sembilan for the month of October, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
District Hospital, Seremban	...	147.0	79.0	86.1	71.5	14.6	76.3	.855	74.5	86	...	12.57	1.64
... ... Kuala Pilah	...	114.7	79.3	87.9	71.9	16 0	75.7	.822	73.3	82	...	12 69	1.94
... ... Mantin	...	...	...	...	...	...	...	...	...	...	...	12.86	1 64
... ... Tampin	...	...	...	...	...	...	...	...	...	...	...	14.07	2.10
... ... Jelebu	...	...	...	...	...	...	...	...	...	...	...	13.30	1.73
... ... Port Dickson	...	...	...	...	...	...	...	...	...	...	...	17.31	2.78
Beri-Beri Hospital, Port Dickson	...	...	...	...	...	...	...	...	...	...	...	11.62	2.46

A. J. McClosky,
Ag. Senior Medical Officer,
Selangor, Negri Sembilan & Pahang.

Office of the Senior Medical Officer,
Kuala Lumpur, 20th Nov., 1911.

KELANTAN.

Abstract of Meteorological Readings in Kelantan for the month of October, 1911.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Mean Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*	%	...	Ins.	Ins.
Kota Bharu	...	147	80.1	85.06	74.19	10.87	77.1	.868	75.0	84.8	...	14.75	2.38
Kuala Lebir	...	...	77.6	87.7	72.4	15.3	75.8	.857	74.6	90.8	...	10.04	2.17
Kuala Kelantan	...	..	...	84.35	74.29	10.06	...	...	...	...	...	14.38	4.40
Kuala Val Estate	...	...	...	84.19	73.48	10.71	...	...	...	...	...	8.05	1.67
Taku Plantation	...	...	...	...	...	...	...	...	...	...	...	9.28	2.40
Pasir Besar	...	...	...	...	...	...	...	...	...	...	...	12.24	1.49
Kenneth Estate	...	...	...	...	...	...	...	...	...	...	...	13.50	3.14
Pasir Jinggi	...	...	...	...	...	...	...	...	...	...	...	10.58	2.14
Chaning Estate	...	...	...	...	...	...	...	...	...	...	...	13.07	3.11
				...									

RESIDENCY SURGEON'S OFFICE,
Kota Bharu, 20th November, 1911.

JOHN D. GIMLETTE,
For Residency Surgeon, Kelantan.