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The Tropical Agriculturist

[Founded in 1881 by the late MR. JOHN FERGUSON, C.M.G., F.R.A.S., F.R.C.I.]

MARCH, 1923.

Peradeniya, Ceylon.

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THE following stocks of plants are available for sale.

Applications should be made to the Curator, Royal Botanic Gardens, Peradeniya; the Curator, Hakgala Gardens, Nuwara Eliya; or the Assistant Curator, Botanic Gardens, Heneratgoda, respectively.

Payment in advance is desired.

F. A. STOCKDALE,
Director of Agriculture.

May 25th, 1922.

Stocks at Royal Botanic Gardens, Peradeniya.

1,000 fruit-tree plants in bamboo pots, including Mangos, Rambutan, Durian, Oranges, Custard-apple, Avocado-pear, Loquat, Guava, Pomegranate, Sapodilla, Lime, Grape fruit, &c., 25 cts. to 50 cts. each.

1,500 fruit-tree plants in nursery beds, including Mangos, Durian, Oranges, Rambutan, Guava, Sandoricum, Aberia, Averrhoa, Loquat, Rose-apple, &c., 10 cts. each.

1,000 plants of various shade and timber trees in nursery beds, including Rain-tree (Inga saman), Filicium (Pehimbiya), Heritiera, Berrya, Mesua &c., price 10 cents each.

500 plants of ornamental trees in bamboo pots, including Parkia, Cassia (different species), Poinciana (Flamboyante), Peltophorum, Spathadea, Lysidice, Jacaranda Enterolobium, &c., price 25 cents each.

1,000 plants of ornamental trees in nursery beds, price 10 cents each.

1,000 plants of Spices and Herbaceous Perennials in nursery beds, including Cinnamon, Cardamom, Vanilla (cuttings), &c., price 5 to 10 cents each.

5,000 plants of miscellaneous economic plants, including Sisal-hemp (Agava), Sansevieria (bowstring-hemp), Cuscus grass, Lemon grass, Citronella, &c., prices on application.

5,000 plants of miscellaneous ornamental flowering and foliage shrubs in nursery beds, including Hibiscus, Acalypha, Brunfelsia, Dracaena, Barleria, Beloperona, Clerodendron, Crotons, Russelia, Salvia, Heliconia, Panax, Sanchezia, &c. 1,000 plants of various ornamental climbers in nursery beds, including Allamanda, Petrea, Bignonia, Ipomoea, Camoensia, Congea, Aristolochia, Passiflora, &c., 20 cents. each.

450 palms in bamboo pots, including Livistonia (Fan palms), Ptychosperma, Sabal, Licuala, Stevensonia, Howea Areca, Oreodoxa, &c., price 25 cts. each.

1,500 palms in nursery beds, price 10 cents each.

5,000 miscellaneous ornamental bulbous or tuberous plants, including Cannas, Hippeastrums, Caladiums, Tuberose, Eurycles, Gloxinia, Hymenocallis, Zephyranthes &c., 2,000 miscellaneous ornamental water plants, or plants suited for water cultivation, including Papyrus, Cyperus, (different species), Limnocharis, Ludovia, Monocharia, Acorns, Aponogeton, Pistia, &c. 2,500 miscellaneous ornamental plants for a fernery or rockery under shade, including Selaginella (different species), Rhœa, Philodendron, Curculigo, Maranta (different species) Gymnostachyum, Dieffenbachia (different species), Fittonia, Heliconia, Ophiopogon, Ruellia, &c., price from 10 cents each.

Stocks at Botanic Gardens, Hakgala.

400 plants of fruit trees in baskets, including Plum, China guava, Tree-tomato, Loquat; price 25 cts. each.

1,000 plants of fruit trees in nursery beds, including Tree tomato, Peaches, Plums, Pears, Figs, Passion-fruit, Cape Gooseberry, Blackberry, &c., price 15 cts. to 25 cts. each

800 plants of Shade and Windbelt trees in nursery beds, price 10 to 20 cts. each.

1,500 plants of ornamental trees in baskets, including Cupressus Knightiana, C. macrocarpa, Acacia pruinosa, Hakea saligna, Juniperus bermudiana, Casuarina (4 kinds), Melaleuca armillaris, Pinus longifolia, Eucalyptus (2 kinds), Pinus longifolia, Acacia elata, price 25 cts. to 50 cts. each.

1,000 plants of ornamental trees in nursery beds, including Cupressus Knightiana, C. macrocarpa, Frenela rhomboidea, Photinia notaniana, Acacia decurrens, Salix babylonica (Weeping willow), Casuarina montana, &c., price 15 to 25 cents. each.

8,000 plants of ornamental shrubs in beds, including Abelia, Abutilon, Azalea, Begonia, Brunfelsia Camellia, Cestrum Choisya, Calliandra, Cuphea, Fuchsia (3 kinds), Geranium (different kinds) Impatiens, Iresine, Magnolia (2 kinds), Montanoa, Pleroma, Streptosolen, Strobilanthes, Tecoma, Veronica, &c., price 15 to 50 cents each.

1,000 plants of ornamental bulbous kinds in beds, price 15 cents to 50 cents each.

500 plants of ornamental climbers and creepers in nursery beds, including Begonia, fuchsioides, Ipomoea Learii, Solanum jasminoides, Lonicera, Tacsonia, &c., price 15 cents to 25 cts. each.

Botanic Gardens, Henaratgoda.

1,700 palms in nursery beds, including Dypsis, Livistona, Chrysalidocarpus, Ptychosperma, Sabal, Cocos sabal, &c., price from 10 cents each.

1,500 plants of ornamental and shade trees, including Jacaranda, Swietenia, Macrophylla, Peltophorum, Adenathera, Cola acuminata, &c., price 10 cents each.

600 plants of ornamental shrubs, including Crotons, Gardenia, Hibiscus, Duranta, Ixora, Angelonia, Phyllanthus, Allamanada, Panax (3 kinds).

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SEED STORE AT PERADENIYA

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COTTON SEED			
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GROUNDNUTS (from Mauritius)	...	per lb. ...	0·40
,, local	...	,, ...	0·15

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MANAGER,
Central Seed Store,
Department of Agriculture,
PERADENIYA.

to whom all payments should be made payable.

THE
TROPICAL AGRICULTURIST

VOL. LX. PERADENIYA, MARCH, 1923. **No. 3.**

THE CULTIVATION OF JAK.

Within recent years endeavours have been made to encourage the cultivation of Jak. This has been done with the object of increasing the production of food as well as for the provision of timber.

The Jak (*Artocarpus integrifolia*) is one of the standard timbers of Ceylon and is being planted by the Forest Department, by lessees on re-afforestation leases and by private individuals. The demand for this timber for building purposes and for furniture is however great and there is little doubt that the villagers who are owners of jak are gradually selling off the timber and allowing their properties to be depleted.

In our present number is included an article relating to the destruction of jak in a section of the Kegalle district. The figures contained therein clearly demonstrate the destruction that is taking place and unless steps are taken to plant up new areas there is little doubt that the increasing scarcity of good jak for timber will become more marked within the next few years.

Nor is this the worst feature of the destruction. The jak in certain parts of the Colony is a most important food of the rural population. With the destruction that is taking place for the purpose of supplying timber, an important food producing asset is being considerably reduced. In years of stress, the jak is often an all-important asset to the rural population, and one cannot view this destruction of a valuable asset without concern.

It has been suggested that the destruction of jak should be controlled by legislation but seeing that most of the trees

are to be found on private lands, it would appear that such a suggestion would be impossible of adoption. It remains therefore to see that the planting of jak shall be at a rate equal to, if not in excess of, the destruction. Encouragements to attain this end must be given.

In the Kalutara district, areas of village forest lands have been leased out for chena cultivation on the understanding that such areas shall be reafforested in jak and other useful timbers. Many of these areas have been successful and there are now a fair number of blocks of good young jak that are making good progress. What can be accomplished in one district might be attempted in others, and there is a possibility that increased quantities of jak could be established fairly easily in those districts of the Island in which jak grows readily.

The encouragement of the cultivation of jak in the Kegalle district of Sabaragamuwa would give satisfactory results and there are sections of the Central Province in which increased areas of jak could be established.

It is satisfactory to note that the Ratmale Colony Committee are proposing to give out to Colonists a number of jak and other food-producing trees during the next North-East Monsoon planting season. Similarly the Government Agent of the Eastern Province is proposing to distribute jak plants for cultivation in the Bintenne Pattu. For the latter division, it is probable that the Department of Agriculture will establish a small nursery at Mahaoya for the provision of these plants in quantities.

The attention of Food Production Committees is drawn to the desirability of encouraging the growth of jak. Such a policy would tend to re-establish an important food-producing tree that is being gradually reduced in number by reason of the increasing demand for its timber.

The experience of large capitalistic food-producing schemes has during the past few years demonstrated that paddy cultivation by capitalists is not likely to be a profitable undertaking at the present prices. Paddy growing in Ceylon is essentially the work of the small holder, be he owner or tenant. The opening up of new areas must necessarily be somewhat slow and if the position of the colony's food supplies is to be improved, one of the matters which must receive attention is the cultivation of jak.

FOOD SUPPLIES.

THE PLANTAIN INDUSTRY OF KEGALLE DISTRICT.

G. G. AUCHINLECK, M.Sc., A.I.C.,
Divisional Officer, Central,
and
C. P. CRISPEYN,
Agricultural Instructor, Kegalle.

There are in Ceylon several agricultural industries which are partly or exclusively in the hands of the peasantry, and in connection with which there have grown up simple but stable methods of handling and marketing. They are for the most part of purely local importance, and do not figure in annual statistics of exports : they are therefore apt to be overshadowed by the great capitalist and export industries of the Colony, such as tea, rubber and copra. The magnitude of some of these industries entitles them to attention, and in addition the methods of cultivation are usually defective, so that they offer good opportunities for the instructional work by the Department of Agriculture.

Village tea, rubber, cacao, cinnamon, citronella and to a certain extent coconuts, depend for their stability on foreign markets. Industries of purely local importance are paddy, the production of sugar, toddy and arrack from coconut or kitul or palmyrah palms, the cultivation of 'wrapper-leaf' tobacco in the Central Province and the 'filler-leaf' in the northern districts, the market-gardens of Nuwara Eliya, the raising of 'black' cattle in the North-Central Province, and the cultivation of plantains, areca-nuts and pine-apples in Kegalle and other districts. In addition to these there are numerous smaller industries such as chillies, betel, dry grains, beans and other vegetables, the sum total of the values of which is considerable.

The diversity of these crops and of the methods of production is surprising. As cases in point we may mention that varieties of paddy number several hundred, and that in a couple of months over 60 named varieties of sweet potatos were collected in Matara and Galle Districts alone in 1920. Very little accurate information is available as to the yields of these crops or as to the methods of cultivation and marketing used, and it is precisely for this class of work that the instructional staff of the Department of Agriculture exists. A critical and descriptive study of the most important ones is called for, and following on this a systematic campaign directed towards organising and improving each industry in turn is necessary.

PLANTAINS AND BANANAS.

The distinction between a plantain and a banana is not recognised in Ceylon ; all are called plantains. In other countries the banana is a variety which can be eaten without cooking—in other words a table-fruit, while the plantain is a vegetable which must be cooked before it is palatable. The purple cone at the end of the fruit-bunch is usually persistent in the case of the banana, while in the plantain it is shed before the fruit ripens.

The varieties grown in Kegalle may be summed up as follows :—

Kolikuttu. Edible without cooking : sweet, mealy taste : bunches arge.

Suwandel. Edible without cooking ; sweet : fruits smaller.

Honderawala. Edible without cooking ; sub-acid in flavour. Fruits small and straight.

Anamalu. Sometimes cooked as vegetable when green, but also edible uncooked ; long, stout fruits, subcaid in flavour. Bunches large.

Ash plantain. (Alukehel). Cooked before eating : fruits short, covered with powdery, white wax.

Maralhamalu. Cooked before eating. Taste resembles that of Anamalu. Fruits thick and stout.

Rathkehel. Sometimes cooked, usually eaten uncooked. Fruits short. round, sub-acid, red-skinned.

Puwalu. Sometimes cooked, usually eaten uncooked. Fruits thin, sub-acid.

Bingkehel. A dwarf variety of plant; fruits thick. Resembles Anamalu in flavour.

Cananoor. Cooked before eating: Fruits short and stout. This variety is not much relished.

The classification of varieties of plantains and bananas has not yet been satisfactorily carried out in any country, so that it is not possible at this stage to identify the Ceylon types with those of other countries.

PRODUCTION AND PRICES.

The magnitude of the plantain industry in Kegalle can be realised from the figures in the following table, which of course do not include a certain number of fruits consumed in the villages :—

Town.	Annual Shipment by Rail.
Rambukkana	4,524 tons
Kadugannawa	107 ,,
Aranayake	107 ,,
Morontota	85 ,,
Alawwa	2,124 ,,
	6,947 tons

The average weight of a bunch is 20 pounds, so that the weights given in the table above are equivalent to about 778,000 bunches of fruit.

The prices paid for the different types vary considerably, shewing that the differences are not merely in name but that quality and taste are important factors.

Variety.	District of origin.	Prices paid (per 100 bunches) Colombo Market.	Kandy Market.
Honderawala 1st ...		... Rs. 200	
,, 2nd ...	Rs. 50 to Rs. 100	... ,, 150	Rs. 100 to Rs. 175
,, 3rd ..		... ,, 75	
Kolikuttu and Suwandel ...	Rs. 150 to Rs. 200	... Rs. 20·30 p. 1,000 fruits.	Rs. 250 to Rs. 275
Cooking varieties	Rs. 75 to Rs. 150	Rs. 100 to Rs. 150	Rs. 100 to Rs. 150

It is not possible to give figures shewing the distribution of varieties in the markets, and the prices fluctuate with supply and demand, and to some extent are dependent on quality. If we assume an average price of Rs. 100 per 100 bunches, the total value cannot be far short of three-quarters of a million rupees, or £50,000 annually.

VILLAGE FAIRS.

For the most part, agricultural industries which lie in the hands of the peasantry are scattered over large areas of country and are difficult to centralise. The Kegalle plantain industry for example affects the following number of villages in the northern part of the district.

Centre.	Contributory Villages.
Rambukkana	153
Aranayake	100
Morontota	89
Alawwa	123
Kadugannawa	140
Total of Villages ...	605

In the smaller centres where Government or Municipal markets are not available, the whole of the village produce is brought into some convenient centre on definite days, and a brisk barter is carried on. The villagers sell their little lots of garden-produce and buy the foodstuffs they need, and traders purchase the products needed in the larger towns and cart them to the nearest railway station for shipment.

Village fairs of this kind are becoming increasingly numerous, and they fill a greater part in the life of the peasantry than is realized by the inattentive onlooker. The Rambukkana fair is restricted entirely to plantains and takes place on Mondays and Thursdays each week; the other fairs in Kegalle deal in all kinds of village produce: at Aranayake, Morontota and Kadugannawa on Sundays and at Alawwa on Tuesdays and Fridays each week.

The control of these village fairs is usually leased out by the Government to influential villagers, a fee varying in amount with the importance of the trade being paid to the lessee, who in turn collects space-fees from each villager wishing to expose and sell produce. The lease appears to be usually a profitable one as may be judged from the following list of fees paid for the chief fairs of Kegalle.

Centre.	Annual Lease fee.
Rambukkana	Rs. 1,500 00
Alawwa	,, 1,800 00
Kadugannawa	Free
Morontota	,,
Aranayake	,, 700 00

In return for the profits derived from his lease, the lessee is responsible to the headman of the division for the order and cleanliness of the fair-ground.

BUNCHY TOP DISEASE.

This disease has been described in the TROPICAL AGRICULTURIST for December, 1921. It has appeared within recent years on every plantation in Kegalle District, and has caused considerable loss in addition to preventing a further extension of the industry.

The cause of the disease is not yet known. An observation plot of one acre is being established by the Department of Agriculture near Rambukkana, on which six of the chief varieties are being planted. Half of the plot is being dressed heavily with lime, and the suckers before being planted are (a) untreated, (b) treated with Bordeaux mixture or (c) treated with Brunolinum. In addition, the effect of dressings of potash is being tried.

The Kolikuttu and Suwandel varieties are believed by the villagers to be more susceptible than others to the disease. These two varieties are ranked as the best, and the highest prices are paid for the fruit.

DEFECTS OF VILLAGE AGRICULTURE.

The outstanding characteristic of village agriculture in Ceylon is mixture of crops. The 'mixed gardens' of the villager have always attracted attention and have been defended on the grounds that they best serve the needs of the villager, who wants small quantities of several kinds of vegetables

and also that if one crop fails through disease there will still be some of the others remaining. These arguments may be sound, but the correct method would be to separate the crops into distinct plots : mixed crops mean low yields. The truth appears to be that usually, where the profits on a particular crop are low, the villager will interplant others in the hope of increasing his out-turn per acre. The market-gardens of Nuwara Eliya, and the sugar-cane plots of Galle, in both of which cases profits are usually high, are in their way models of neatness and order, and there is no confusion and mixture of crops.

Plantains should yield high enough profits to induce greater efficiency of cultivation than is the case in Kegalle. An acre yields 300 bunches of fruit annually which at the lowest market-price should be worth Rs 150. Before the fruit reaches the final markets of Kandy or Colombo it has passed through the hands of two, and sometimes three, middlemen. It seems probable that in this way the profits of the villager are reduced considerably, and he therefore is reluctant to rely on this crop alone for his support.

COMPETITION AND CO-OPERATION.

The production of plantains for the local market can be considerably increased without much lowering of prices. Two methods of inducing an increase may be adopted. If the villagers can be persuaded to unite and form a union of growers, it would be possible to eliminate a certain number of middlemen, and so increase the profits of the growers. Co-operative unions of this kind have not yet been tried in Ceylon, but they appear to be a legitimate extension of the functions of existing co-operative credit societies.

Agricultural competitions for substantial prizes have had excellent results in other countries. An annual prize of Rs. 150 for the best small holding of plantains would, if the judging were efficiently carried out and increased in stringency each year, result in a steady extension and improvement of the crop in the district. The problem of increasing the areas under plantains, and at the same time improving the methods of cultivation, by means of the direct stimulus of a substantial money prize is worth the attention of the District Agricultural Committee.

CUTTING DOWN OF JAK TREES (*ARTOCARPUS INTEGRIFOLIA*) AND ITS RELATION TO THE FOOD SUPPLY OF THE PEOPLE.

P. C. DEDIGAMA,

Ratemahatmaya, Beligal Korale.

The fruit of the Jak tree (*Artocarpus integrifolia*) as a source of food is recognised throughout the Island. It is well known that during certain portions of the year the jak fruit takes the place of rice and whole families depend on this fruit for their sustenance. It is therefore necessary that steps should be taken to prevent the wholesale cutting down of this tree for use as timber. The following statement shows the number of trees that have been cut down in the Beligal Korale during the last ten years and the probable number of fruits that those trees would have yielded during the period.

It would not be uninteresting to trace the past history of this tree as it shows the importance attached to it at the time as a yielder of food. Mention is made of this tree in a great many old books and old documents "Lekammitiyas" and from them and the fact that this timber is not found in ancient buildings it is apparent that in ancient times the timber of this tree was never used for building purposes and that its yield was utilised as food. From a record which is in my possession of a "Lekammitiya" of Dedigama compiled about 300 years ago I find that the statistics collected are the following,

viz :—Names of each family, extent of mud land possessed by each, number of jak trees and number of buffalos. This clearly indicates the paramount importance placed then on the jak tree as a yielder of food. I have besides heard on good authority that it is on record that during the Dutch period Jak trees were prohibited from being cut down without the sanction of Government. It is a proved fact that the Jak fruit stands only second in importance to rice as the staple food of the people, but this is not so recognised by the Government at present as there is no control or record of the cutting down of jak trees. In point of food value Jak gives more nourishment than rice as it possesses more health-giving properties than the latter. Another advantage is that the produce of the jak tree can be preserved to last throughout the year or even longer. The jak trees standing now have been planted by past generations and those of the present day make no effort to plant new ones to replace those that are being cut down. The trees of spontaneous growth are not looked after by the people and are being destroyed by stray cattle. Under these circumstances this food-producing tree is menaced with reduction to a very great extent in some districts and the remaining trees being those that are not fit to be utilised for timber which will be about 10%.

There are whole families living solely on this food so long as the season lasts. The preservation of the jak tree is more incumbent on the people now than it was 5 or 10 years ago owing to the fact that consequent on the sale of high land to estates by villagers there is very little land for producing other food grains to supplement the staple food of the people. This want will be even greater in the future when with the increase of the population and the available land is planted up with permanent products a very much larger number than at present will have to be dependent on the produce of the jak tree. The timber of the jak tree is both strong and good and there is a large demand for it for building purposes and for making household furniture, etc. This has given rise to an influx of traders from outside who with a very small sum of money purchase this valuable food-producing tree and there are instances where trees have been sold at only a few cents a cubic foot, the villager being forced to accept it by his poverty as such traders come in large numbers during the lean months, i.e., from middle of September, to middle of February every year.

There is legislation to prevent the removal of buffalos outside a District and this was provided to increase the number required for agricultural purposes. I am strongly of opinion that the necessity for prevention of jak trees being cut down is greater inasmuch as manual labour for agricultural purposes can supplant the work got out of buffalos. If the buffalos in a village like Dedigama, by some mishap, is totally destroyed and their labour is not available the paddy fields are not going to be abandoned because out of a population of 2283 in this village a thousand five hundred or more men, women and children can turn out and cultivate the fields. Taking for granted that all the jak trees are cut down in this village there is no possibility by any means of replacing the food lost thereby for at least ten or more years to come. Another point of vital importance which has to be taken into consideration is the fact that the area available for paddy cultivation is limited as almost all irrigable lands have been asweddumised while on the other hand the population is increasing and creates a demand for an enhanced supply of the staple food.

On the above grounds I would suggest that immediate steps be taken to protect the jak tree by law. No jak trees may be cut down without due enquiry by a Government officer and authority obtained from Government after proving to its satisfaction that the owner has one or more plants growing in his garden, free from cattle, to replace the trees that are sold or cut down for his own purposes.

A complete list of jak trees in each *Wasama* should be made and a register should be kept by each aracci for periodical inspection by an authority. Experiments should also be carried out by the Agricultural Department to find out means to make the existing trees more productive and villagers, through Agricultural Societies, should be made to improve their own trees. By experimenting on a few trees I find that those that are kept free from shade yield more than those that are neglected. Very old trees do not usually yield many fruits but by pollarding a certain number of the branches and roots and also by digging round them and spreading a certain amount of common manure the trees get a new lease of life and begin to yield as any good tree.

It is several years since the statistics in the following statement were collected and since then a very large number of jak trees have been cut and removed. Having visited such localities as the borders of the Gurugoda Oya, Alauwa Ferry and Ambepussa Railway Station I have found large numbers of jak trees lying in those places awaiting removal. The majority of these trees were young ones of about 20 to 30 years of growth and this is evidence of the fact that trees of older growth have almost been utilised. The eagerness to sell even young trees is accounted for by the fact that the price of jak timber has doubled or even trebled itself recently.

In this Division there are Crown lands leased for food production and as a further measure if extensions of the lease of these lands be applied for a condition might with advantage be added that a given number of jak trees should be planted in them before they are delivered over to Government. As regards the existing Crown lands small portions of them ranging from even half an acre to one or more in a village may be given out for planting jak trees. It is inadvisable to give out one large acreage in one locality for this purpose as it is necessary to plant this food-producing tree in small areas in every village so that all may be benefited.

Number of Jak Trees cut down in Beligal Korale within the last Ten Years.

Name of Pattu	No. of Trees cut down	Probable number of fruits that would have been produced
Kandupita Pattu South	643	32,150
Kandupita Pattu North	524	26,200
Gandolaha Pattu	832	41,600
Otara Pattu	1,034	51,700
Koraweli Pattu East	1,342	67,100
Koraweli Pattu West	826	41,300
Total ...	5,201	260,050

Note:—A single jak fruit or a measure of rice is sufficient for one meal of a family consisting of 3 or 4 members. Therefore 260,050 fruits represent an equal number of measures of rice. This quantity of rice can only be obtained from the paddy crops of 209 *amunams* of sowing extent. Every 25 trees cut down amounts to the abandoning of one *amunam* of paddy land annually and thus the 5201 trees already cut down during the last ten years is tantamount to the abandonment of 209 *amunams* extent of paddy land.

If each family has 5 jak trees, two bread-fruit trees and a very small extent of paddy land this Division can be self-supporting as regards its food supply.

COCONUTS.

SELECTION OF COCONUTS.

H. W. JACK, B.Sc., B.A.,

Economic Botanist, Department of Agriculture, F.M.S. & S.S.

The days when rubber estates paid big dividends being now in the past, the thoughts of Agriculturists have turned to crops other than rubber, and coconuts, already well established in the country, are gaining more attention than heretofore. Coconut oil and vegetable oils in general, have sprung to a position of considerable importance in the world's economy during the last decade and the position has been decidedly enhanced since the war which, more than any other factor, proved the utility of vegetable oils.

The following figures clearly indicate the growth of the coconut industry in the Federated Malay States and similar increases occur in the Straits Settlements :—

COPRA EXPORTS IN THE FEDERATED MALAY STATES.

			Total Value in dollars.
1904	...	16,404 piculs	—
1905	...	30,172 ,,	—
1906	...	38,772 ,,	—
1907	...	49,326 ,,	452,270
1908	...	71,981 ,,	462,870
1909	...	106,469 ,,	726,884
1910	...	125,770 ,,	1,194,226
1911	...	135,064 ,,	1,294,301
1912	...	129,531 ,,	1,303,169
1913	...	156,033 ,,	1,808,913
1914	...	243,754 ,,	2,474,990
1915	...	234,150 ,,	1,838,508
1916	...	249,038 ,,	2,141,739
1917	...	353,722 ,,	2,505,129
1918	...	428,226 ,,	3,053,325
1919	...	447,717 ,,	5,146,575
1920	...	419,988 ,,	9,216,586

The Officers of the Department of Agriculture have for many years recognised the importance of this crop which has always maintained a foremost place on their programme of work, more especially from the point of view of control of pests. The first enactment in any country which was passed to enforce coconut pests destruction was that of 1890 when the Government of the Straits Settlements gave powers to various authorised persons to order the destruction of pests and their breeding places. This enactment was followed in 1898 by a similar one in the Federated Malay States, and a special staff was organised to carry on a systematic campaign against the various pests of coconut trees. The campaign was eminently successful and saved the industry at a critical time when pests were very much in evidence. The present Inspection Staff continues this good work and has also been instrumental in instructing all classes of cultivators how to deal most effectively with the various injurious insects.

The problem of the selection of seed coconuts has not been entirely neglected but no scientific breeding experiments have been carried on long enough yet to give definite results, but, experiments have been started in South India, the Philippines, Java and more recently in the Federated Malay States. In Java and the Philippines, selection has been restricted, as far as the writer is aware, to the identification, description and propagation of the best local varieties for special needs. Thus, in the Philippines some twenty-four types of coconuts are described, though only four of them are of considerable commercial importance as copra, toddy, or fibre producers and individual trees showing a notable development of one or other of these characters are selected as seed-bearers for propagating the desired features. In the absence of prolonged scientific breeding work, this method of selection if carefully performed should produce good results, but the choice of parent trees is largely speculative for although the characters of the female parent can usually be ascertained yet, because its constitution is unknown, variation in the offspring is likely to occur to some degree in such a method of selection.

In South India work has been in operation for some years for the purpose of producing pure strains of various approved types of coconut for comparative trial as copra producers, etc., but this work is still in its infancy as the first generation of trees from known parentage has not yet reached maturity, as far as the writer is aware.

Some years ago the problem of coconut selection engaged the attention of the Botanical Division of the Federated Malay States' Department of Agriculture, and work of a preliminary nature, was immediately initiated. Owing to the shortage of staff, scientific breeding experiments had to be postponed until very recently.

The purchase by the Government of Sapintas Estate gave the Department an opportunity to begin experimental work on coconuts, and some 470 acres on this estate were assigned to spacing, covercrop, manurial and varietal experiments and for selection work. The seed-nuts for all the areas under spacing, covercrop, and manurial tests were obtained from one of the oldest and most uniform estates in the country. The collection of seednuts from such a realiable source constitutes the simplest form of selection and is one which should be adopted by every agriculturist in laying out any plantation.

Unfortunately, seednuts so collected are most frequently merely gathered from the piles of nuts accumulated at the store from an ordinary harvest, and nuts thus selected merely provide for the production of trees of average utility. A superficial examination of the individual trees on plantations grown from nuts selected in this manner reveals considerable variation in any character, girth, foliage, height, colour, size and shape of fruits, number of nuts per bunch and per tree, length of spathes, etc., so that this method of selection cannot be called satisfactory. Should the selection of seednuts be done in the field by marking as parents individual trees which show desirable characters or which closely approximate to an approved type, a much more uniform plantation would be the result. This practice of picking out suitable parent trees does not insure uniformity in a plantation for not only do trees which look very much alike differ constitutionally but seedlings from the same parent tree will be found to vary to an extent, as yet undetermined, on account of cross-pollination which undoubtedly takes place, though not to the exclusion of self-pollination as contemporaries maintain elsewhere; indeed, "selfing" appears to be the chief natural mode of pollination in Malaya. This has already been proved experimentally in the case of "dwarfs" (Vol. X, No. 1 of the MALAYAN AGRIC. JOURN.)

Coconut trees like all other plants grown as mixed populations show variation in many characters, but the only character of economic importance is that of copra production. The number of nuts which a tree can produce is not a reliable index of its ability as a copra producer because consideration must be given to the size of the nuts, their shape, thickness of meat, etc., which are characters that vary greatly in different trees, but a study of the variation in the number of nuts produced by individual trees affords a glimpse of the extent to which variation occurs. A study of this nature, which has been in progress for a period of twenty-four months with 453 trees, shows a variation in the number of nuts produced per tree per annum of from 7 to 180. All these trees are about 12 years old and were taken consecutively in blocks of good average coconuts, that is, blocks which averaged upwards of 60 nuts per tree per annum, and the crops produced by each tree were recorded monthly. This study was taken up for the dual purpose of estimating individual tree variation and for selecting good trees as parents of seednuts for planting half-acre test plots, in order eventually to ascertain what percentage of the seednuts will prove true to the parent type and to compare copra yields of the progeny of different parent trees. Preliminary observations seem to indicate that at least 10% of the daughter trees will not come true to type. Similar variation in the amount of copra per nut occurs in comparing nuts from a mixed population, although in choosing nuts from trees of the same variety the variation is greatly reduced. The amount of copra contained in a nut is apparently a distinguishing character between different varieties of coconuts within limits but young mature trees will yield slightly more copra per nut than old trees of the same variety.

It is a matter of concern with some owners and managers of long established estates that they find that a larger number of nuts is required to produce one pikul of copra than was required several years previously. This is the natural course provided that ordinary cultural methods are maintained and is no cause for alarm, unless the difference becomes extremely great. Mention is made of this matter, because some planters are inclined to select seed-nuts on the basis of the number of nuts required to produce one pikul of copra. This method of selection is erroneous because the essential concern on every coconut plantation is the amount of copra which each acre can produce, it matters little whether 200 or 220 nuts are required for the preparation of one pikul of copra as long as the total output per acre is high. Of course the question of cost of handling nuts must be considered but when difference of only 20 or 30 nuts per pikul are involved the costs are not materially affected, Sound selection can only be based on the amount of copra produced per tree under estate conditions. For this method of selection it is necessary to study the producing qualities of individual trees and by a process of elimination to ascertain which are the best trees on the estate. This cannot be done in a short time nor can it be done economically over large areas, but the best producing field of each estate should be chosen for selection of seednuts, and a block of, say, 40 acres in that field should have every tree numbered and a record compiled of its yield of nuts per picking. Three one-monthly pickings will be sufficient to indicate the poorest trees which can then be dropped out of the experiment, thus reducing the task of record taking by

one-third. Records of the number of nuts per picking from the remaining trees should be kept for a further twelve months and then calculations should be made to show which trees produce the most nuts per annum. Having ascertained the best trees from the point of view of number of nuts produced, the next step is to compare the amounts of dry copra produced by the nuts of each tree. For this purpose as many ripe nuts as possible should be taken from each of the best trees, taking care that the nuts from all the trees in the comparison are, as far as can be discerned, equally ripe. The nuts from each tree should be carefully converted into dry copra in separate lots and weighed and then a calculation made of the amount of copra produced per nut from each tree. The best trees having been determined, it is now necessary to examine their individual environments for should any of them occupy especially favourable positions with regard to light, drainage, etc., they should be discarded, because their high productivity, which may, with certainty, be partially ascribed to their favoured situations, might fall very low under normal estate conditions. Finally, only trees which appear healthy in every respect and as nearly the same type as possible should be chosen, and the number selected should depend on the size of nursery required. In a block of 40 acres, say, 1,900 trees, it should be possible, under average estate conditions, to find 100 trees capable of producing over 110 nuts per tree per annum, which would be sufficient to supply 900 nuts per month for the nurseries. As already stated, many seednuts so selected will not produce trees true to the parent type, but this method of selection is the only practical one for the planter to adopt.

The production of pure strains of coconuts, which is the only certain method of producing uniform and high yielding estates, lies beyond the power of the planter, because it necessitates initial work stretching over at least three generations of trees, but this work has recently been inaugurated by the Department of Agriculture and will, it is hoped, be continued to a successful issue.

The type of coconut to select for future plantations would appear to be a medium sized rounded nut. Large nuts are generally produced in small numbers and oblong nuts on the average contain less copra per nut than round ones. At the same time, it is quite possible that exceptional trees, which bear large numbers of large nuts, may be found and, if so, they should of course, be selected as parent trees for some of their offspring are sure to inherit the parental heavy yielding characters. The above remarks refer entirely to tall coconut trees (as opposed to dwarf) but a few words about dwarfs will not be out of place. So far, none of the types of dwarf trees has been encouraged in India, Ceylon or Java, where coconut cultivation has been so long in vogue. In Java the orange type of dwarf is said to be the only one which produces nuts in anything like sufficient numbers to enable it to compare with tall trees as copra producers per acre, taking working costs into consideration, but this assertion needs investigation. The manager of a local estate contends that a certain type of dwarf (niyor gading) is capable ot producing far more copra per acre than is produced by average tall trees. He has planted large areas with this type of nut and the development and output of the areas will be watched with considerable interest. Also shipments of these nuts have been sent to Ceylon, Burma

Java, and India for comparative trials in those countries, in which the "niyor gading" may not have been known authoritatively, previously. With regard to dwarfs, COPELAND, in the Philippines, says "the difference in economy in handling large nuts and small nuts is so great that even though one of the dwarf nuts which, in general, mature several years sooner than the large nuts do, were approximately equally productive with one of the very large varieties it would still in the long run, not be economical to select the dwarf nut for the manufacture of copra." Apparently he has had no experience of dwarf trees which yield more copra than tall trees, but apart from his reason for the discouragement of planting dwarf trees, there are grounds for believing that their life period is limited as compared with tall trees and that their particular advantage lies in the fact that they give a more rapid return on capital expenditure. Of course, as our knowledge of dwarf trees increases, it may be found economical to plant them and when they begin to decline, to cut them out and replant but this largely depends on the yields obtainable from mature trees.

Observations regarding types, growth, pollination, production, etc., of dwarf palms are being recorded and will be communicated in the pages of the MALAYAN AGRICULTURAL JOURNAL from time to time.

With regard to the possibility of selecting types of nuts by the quality of oil they contain, experiments by the Chemical Division seem to indicate that the oils contained in different types and varieties of nuts do not vary to any appreciable degree and certainly not to an extent likely to affect the market price of oil derived from different varieties.

Over seventy parent trees have been selected as probable heavy yielders by the Botanical Division, the selection in some cases being based on yield data extending over more than a year, but most of the trees were selected by field examination. A sufficient number of seed-nuts has already been collected from most of these trees to plant up half an acre of each for comparative yield trials of blocks and of individuals on attaining maturity as a basis for seed selection. Many of these lots have already been planted out in the field and care is being taken to give them good average cultural conditions.

In addition to work regarding the selection of heavy yielding strains of coconuts, a study of the different types of coconut grown in Malaya and elsewhere is essential, in order that the experimenter may become expert in picking out and describing the different characters of importance for the accumulation of data which may give clues to correlation and variation factors, and to throw light on the capabilities of different varieties, etc. For a comparative study of this nature, the Botanical Division has collected seed-nuts of eighteen distinct types of coconuts representing local varieties and has imported seednuts from most coconut producing countries and planted them in blocks on Sapintas Estate. These importations which should prove interesting in about five years' time include types from Borneo, Java, Ceylon, Seychelles, South India, Cocos Islands, Panama, Burma, Madagascar, etc. The scope of coconut work is wide and the many problems it presents other than those connected with selection work, are interesting. It is hoped that the gradual development of the Government Experimental Coconut Estate will do much in the next decade to clear up some of the more pressing problems connected with this useful and profitable crop.—MALAYAN AGRIC. JOURN., VOL. X., NO. 5.

RUBBER.

IMPROVEMENTS IN THE PREPARATION OF RUBBER.

For the information of members of the Rubber Growers' Association and others the following complete specification, filed at the Patent Office (United Kingdom), is published :—

The policy of the Rubber Growers' Association is to secure for the industry the benefit of any discoveries made by the Scientific Staff during the course of their research activities. In view of difficulty experienced in obtaining acceptance of the specification in the Malay States, and with the object of preventing any other party stepping in and claiming protection for the invention, the Association, acting on the advice of Counsel, is taking steps to give full publicity to the specification.

Experiments are still being carried out with the new coagulant. The Consulting Chemist's latest vulcanisation results with litharge mixings are favourable. A supply of rubber prepared by the process is being despatched for trial by a manufacturer. MR. EDWARDES claims that from a planter's point of view the chemical covered by the specification has many advantages over acetic acid, the chief of which are (1) ease of manipulation (all that is necessary is to weigh out the correct amount for each tank, throw the powder into the tank and stir). MR. EDWARDES has coagulated several tanks, using stirrers of the type described in the September Bulletin, and no trouble whatever has been experienced through lumps, or in any other way) : and (2) it is cheaper to use and more easily shipped than acetic acid, or any similar liquid.

Until the final results of experiments are available the Association is not in a position to make any recommendation as to the use of the process for coagulating rubber latex. The information is merely published for the reasons stated above.

PATENTS AND DESIGNS ACTS, 1907 AND 1909.

COMPLETE SPECIFICATION,

Improvements in the Preparation of Rubber.

We, Rubber Growers' Association (Incorporated), of 38, Eastcheap in the City of London, incorporated under the laws of Great Britain, do hereby declare the nature of this invention (as communicated to us from abroad, by JOHN EDWARDES, of the Research Laboratory, Petaling, Selangor, Federated Malay States, Chemist to Rubber Growers' Association (Incorporated) a British subject), and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement :—

This invention relates to an improved process for coagulating latex in the preparation of rubber, and consists in mixing the latex with hydrofluosilicic acid or a suitable salt thereof, particularly sodium silico-fluoride. Suitable salts are such as are soluble in water and have no deleterious action on latex or on the rubber produced therefrom ; sodium silico-fluoride

is particularly suitable, but the salts of metals like copper, which are harmful to the rubber, are not suitable. These compounds have the property of coagulating very many times their weight of latex, and possess the advantage over the commonly used coagulants, such as acetic acid, that they are sufficiently antiseptic or fungicidal to restrain the "oxidation" of the latex and to diminish the tendency of the rubber prepared in sheet form to go mouldy.

Hydrofluosilicic acid or a suitable silico-fluoride also forms a useful addition to acetic acid or other known coagulant.

As an example of the use of sodium silico-fluoride, one pound of the powdered material is introduced into a tank of 150 gallons capacity, which is then filled with latex, previously standardised, if necessary, by addition of water to bring it to dry rubber content of 2·5 lb. per gallon. The whole is vigorously stirred until coagulation is complete.

Generally speaking, with a latex of the aforesaid strength, a smaller proportion than 0·75 lb. per 150 gallons of latex is not of sufficient effect, while a larger proportion than 1 lb. per 150 gallons is wasteful of the silico-fluoride.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is :—

A process for coagulating rubber latex which consists in mixing the latex with hydrofluosilicic acid or a suitable salt thereof, particularly sodium silico-fluoride.

Dated this 21st day of October, 1922.

(Signed) ABEL & IMRAY,
30, Southampton Buildings, London, W. C. 2.,
Agents for the Applicants.

RUBBER FROM YOUNG TREES.

It is well known that trees below the ordinary tapping age give rise to an inferior rubber. DR. DE VRIES (*Arch. v. de Rubb. Ned.—Indie*, August 6, 1922, p. 308) gives an account of experiments on four groups of trees from 3 to 4½ years old. He found the amount of rubber in the latex was low, 20-30 per cent. The rubber, especially in sheet form, was brittle or "short." The tensile strength of the vulcanised rubber was 1·20 against 1·49 for ordinary vulcanised rubber. The time of vulcanisation was remarkably short, being very similar to that of "matured" rubber from older trees. The viscosity of the rubber solution was very low, especially for crêpe. DR. DE VRIES remarks that, after the trees have reached the usual tapping age, the age of the tree has less influence on the rubber than is generally supposed. The older trees give rise to a somewhat slower curing rubber than the young trees, but there is no improvement in the tensile strength.—BULL. OF THE IMPERIAL INSTITUTE, Vol. XX, No. 4.

COFFEE.

COFFEE CULTURE.*

J. HAGEN

(Translated from the Dutch by H. L. Ludowyk, Department of Agriculture.)

[Continued from January issue.]

CHAPTER V.

DISEASES AND PESTS.

Coffee has a host of enemies ; and one can hardly expect it to be otherwise as it is a crop that is raised on a very large scale here.

In treating of the diseases and pests we differentiate here between insect and cryptogamic enemies.

Among the insect enemies we class first the Cockchafer (*Melolontha vulgaris*), the May Bug and lice first, and next deal with caterpillars, borers and mole crickets.

Among the Fungus enemies are the fungi causing the Coffee Leaf Disease, the Pink Disease (*Corticium salmonicolor*) and Canker.

The list of the enemies of coffee is very long ; but, in consideration of the limits of this booklet, there is no scope for dealing with more of them than is to be done. For detailed study of the diseases and pests I would refer my readers to the different communications of the Buitenzorg Botanic Garden that successively appeared.

COCKCHAFERS.

These, as is generally known, are the larvæ of the May Bug. In West Java they are known as Koeoeks and in East Java as Oerets. The female lays its eggs from February to April, a few inches below the surface of the ground, especially in places which have had no mechanical cultivation and which are dusty. The larvæ arising from these remain in the soil for over two years, feeding on the roots it comes across and doing considerable damage. Emerging as beetles, they fly about for some days, especially at twilight : when the sun is powerful, they retire to take cover in the ground, or in dark and dingy places. The method of overcoming these insects is given here. The ground should be tilled as little as possible in order to facilitate the capturing of the beetles. In old plantations searching for and capturing the beetles is rather difficult for the insects come near the surface and settle by the stems of the trees and digging them out would injure the tree too much. With a little effort and searching the sleeping insects can be easily got at, at day time. These should be taken out and burnt. As far as I know, the May Bug has no natural enemies, except the pigs, which seem to like them. Like all pests in general, this pest too appears suddenly and disappears in a short time sometimes.

EELWORMS.

Eelworms are among the most deadly enemies of our Coffee industry. When we sometimes notice in our gardens certain plots gradually deteriorating, and dying in spite of our efforts to resuscitate them, then we can

*Onze Koloniale Landbouw VII, Die Koffiecultuur, Door J. Hagen, and Planter Tweed Druk. Haarlem, 1917, H. D. Theime en Zoon, Prijs f. 2·25

almost be sure that the depredators are eelworms. They are microscopic insects that belong to the class of worms and, in this case, to the family (*Tylenchus*) of which there are two species harmful to coffee which we have to guard against. They are (*Tylenchus coffea*) and (*T. antocaudatus.*) The first species occurs only in Arabian Coffee but can also pass over to Robusta; and the second attacks the Arabian, Liberian and Robusta types. Eelworms attack the taproot and other main roots. As the bark at any spot which is attacked dies, the wounds caused by it are made noticeable. If the outer layer of tissue is cut off, the section would show a brown or gray colour instead of the white of the healthy tissue. Around about these spots the bark thickens and forms a surrounding ring: underneath this, the root forms a layer of corky tissue which, when dry, can easily be reduced to a brown powder.

What can be done to counteract this pest? But little. As soon as we are certain that eelworms have been the cause of the decay of any trees, the plot wherein the pest occurs should be placed under quarantine, and cultivation should not be carried on. The best course to adopt will be to give such a plot a sowing of some papilionaceous plant, and leave it to its fate. If *Tylenchus coffea* is the pest, then the infested plot can be replanted with Liberian plants and these grafted with Robusta scions, but if we have the other (*Tylenchus antocandatus*) to deal with, then grafting is of no use at all and the only thing to be done will be to let the land lie fallow for a long time.

It is easy to differentiate between the two species of Tylenchus. *T. coffea* has a thicker hinder part than *T. antocandatus.* Both have a sharp, protruding mouth part with which they bore into the root. That of T. coffea is more easily perceptible than that of *T. antocandatus.*

PLANT LICE.

Under these come the Scale Bug or Scale Insect, Coccidæ, and the Aphides. Of the Coccidæ, the most harmful is the Green Bug (*Lecanium viride*). Here, in a nutshell, is an account of the development of the bug. Out of the eggs which are developed under the scale of the mother, the larvæ come into being. They immediately scatter in order to find food for themselves. They spread over the young green parts of the plant and nourish themselves on the young twigs, attacking also the leaves on the reverse side, near the veins. After the shedding of the skin for a second time, the female is capable of genital activity. Impregnation through the intervention of the male is not necessary, for the eggs have the power of parthenogenetic development. The male bug is unknown at any stage. The number of eggs laid by one bug is very great and can be estimated at least 150; and this being so, the fact that the pest can assume most enormous and dreadful proportions is not astonishing. The damage inflicted by the Scale Bug is principally this. They wound the tender parts of the plant, and through the wound suck up the sap for their own sustenance. Besides this, it sheds on the leaves a sweet secretion which causes them to be covered with a soot-like unhealthy film which arrests their functions of transpiration, and respiration, and brings on disease.

Where Scale insects occur generally, one finds their usual concomitants: ants which are attracted by the sweet secretion alluded to.

Whether the ants are in any way instrumental in increasing the numbers of the bugs, or whether they transfer them to the young leaves is not known. After research, MR. P. VAN DER GOOT has established the following facts regarding the influence of the ant (*Plagiolepis longipes*) on the developing of the Green Bug pest :

(1) That the death rate of the Green Bug is very considerably reduced by the presence of the (grammang) ant ;

(2) That the Green Bug falls less frequently a prey to the Chalcid Wasp ;

(3) That the Green Bug develops faster and more luxuriously ;

(4) That the Green Bug brings forth, on an average, twenty times as many descendants.

Of the Aphidæ I shall, for the sake of brevity, take only one species, namely, *Aphis coffeæ*. When this comes on, it does not assert itself in such a severe epidemic as to create very great damage. To the natural enemies of the Scale Bug belong, first, the "Ladybird Beetle" (Coccinellidæ) and their larvæ. Larvæ of the Hover-Fly which are found in the colonies of Scale insects as well as the Lacewinged-Fly and the Hover-Fly are known to be enemies of the Scale Bug ; numerous minute Chalcid wasp breed inside the body of the bug and the parasites draw on their foster mother for their sustenance, praying heavily upon her, till after some time, not more than the mere scale is left of her.

Nor is the Scale Bug spared enemies from among destructive fungi. PROFESSOR ZIMMERMANN discovered five varieties of fungi which play a by no mean unimportant part in the extirpation of the pest. Finally, the Scale Bug can also be killed by a number of chemical solutions—lime water, soap suds, etc., which, if well applied, give good results. There is no need pointing out that this method of control is only possible to be adopted in young plantations and in nurseries : as for adopting it in our older estates in the case of wide-spread epidemic, it is hardly feasible.

4. BUTTERFLIES.

To the order of butterflies belong some injurious caterpillars. I take only the Black Grub, the *Agrotis segetum*, the *Agrotis suffusa*, and the *Orela extensa*.

The first feeds on the bark of the tree, at a height generally not of not more than a foot above the ground. During the day it conceals itself in the ground, and ventures out in the evening twilight and remains out all night seeking food, to the detriment of the plants. These are met with all the year through, but do most damage during the rainy season.

The 'Oelar Djaran' or 'tjilleng' the caterpillar of (*Orela extensa*) lives on coffee leaves which it eats up from the margin inwards. It attacks the intervening places and leaves the veins and upper epidermis. These insects appear sometimes in such great numbers that in a few days they devastate a whole plantation.

The caterpillars are from 4 to 5 c. m. long and are of a colour varying from light to dark brown, their bodies not being hairy. They have very small heads with two blunt, horny feelers which are curled backwards. The chief characteristic of the caterpillar is the protruding part (about 1 centimeter long) of its last body segment. It bears this appendage (according to DR. KONINGSBERGER) bent a little outwards.

Any measures against this pest should be taken at the very outset and vigorously carried out in order to exterminate it. If the pest proceeds and is in its advanced stages, hardly anything, except its natural enemies, can successfully combat against it to any extent. These enemies are a kind of

chalcid wasps and some smaller wasps. The caterpillar of *Orela extensa* appears to confine itself to attacking Arabian coffee exclusively.

The well known Coffee Borer (*Zeuzera coffeæ*) makes its appearance in the branches. Its eggs are laid under the bark of the stem or branches which it perforates for the purpose. The young caterpillar, shortly after its birth, bores and makes its way to the very pith of the stem and branches, causing the tissue around about the holes to decay. The branches thus attacked should at once be cut off and burnt.

THE ROBUSTA BEETLE (*XYLEBORUS COMPACTUS*).

This is about the only disease Robusta is attacked by. The beetle bores into the woody branches of the tree. If one of the branches that are attacked be carefully examined, a hole bored about 1 m. m. in diameter would be found. The hole is generally not easy to discover ; but the wood dust issuing from the holes, and later the withering of the leaves and the decay of the branches easily reveal the concealed insect. If a branch be cut through, a cavity is discovered in the pith, full of a number of those insects at different stages of development—eggs, larvæ, pupæ and fully developed beetles, all existing side by side, simultaneously. The developed female is from 1'5 to 1'8 m.m. long and its body is of a brown colour. The undeveloped beetles appear yellowish outside, while growing older they turn into a dark brown colour. On each sheath a dark spot is noticeable. Seen from above, the long thoracical part and the hinder parts only are noticeable; the head is completely hidden by the insect's boring appendage. On its head too are a number of small warts. Its head is covered with fine hairs. There are so many striking characteristics to differentiate the male from the female, that one would be inclined to think that the male belonged to a different species. The male is small and of a bright brown colour. Its body is oval and not oblong or round like the female's. They lack wings altogether and are unable to fly.

In a fairly large cavity made in the pith of a branch the female lays several heaps of colourless eggs, sometimes so many as 70 of these heaps. From these emerge the larvæ which measure easily 2 m.m. in length and 1 m. m. in breadth. Their bodies are white and their heads yellowish. They are devoid of legs or any such members and are thus unable to move from place to place. The hollow in which the development of the larvæ takes place is almost $2\frac{1}{2}$ c. m. long and its breadth is not greater than that of the pith canal. The hollow is lined with a layer of white mould. Here then we have to deal with a symbiotic existence of the beetle and the fungus. The beetle provides for the spreading of the fungus, and by boring other passages connected with the main gallery, gives ample scope for the mould to increase. The larvæ and beetles live in these hollows which are well lined with a thick layer of the mould.

There is often very serious damage caused by this pest. At first the measures taken against the pest were to cut down and burn, as soon as possible, all the infested branches; but now these measures are never resorted to, as the control measures entail more loss than the pest itself does. In that drastic method of treatment branches which, in spite of the ravages of the bores would continue to live and produce, are cut off. Besides, cutting

and burning never wholly stamps out the disease, and the extent of damage, too, does not call for such measures. The fact that the damage caused is not as great as might be is due to the fact that as the pest spreads the enemies of the beetles also increase and redouble their activities and act as powerful controllers that limit the damage the pest might occasion. The chief of these enemies is a small chalcid wasp which is often discovered even in the nests of the beetle.

We have here to stop the account of the natural enemies of the beetle, as, they being so numerous, we would, if they were fully to be described, have to overstep the limitations of space. For a study of these insects, I would refer my readers to the 'Mededeeling v.h.'s Lands Plantentium, No. XX, deel ii by DR. KONINGSBERGER and No. XLIV, deel ii by DR. KONINGSBERGER and PROF. ZIMMERMANN. Now we shall pass over to the principal fungus diseases.

6. THE COFFEE LEAF DISEASE.

This disease which is caused by the fungus known as (*Hemileia vastatrix*) is the most dangerous one coffee is attacked by. The disease is nearly always prevalent and avail itself of every advantage, arising from the unhealthy condition or general weakness of the trees, to spread and cause more damage on a plantation. The Coffee Leaf Disease appears to have been first discovered in Sumatra in the year 1876, though long before this, it was known in Ceylon. DR. BUCK has clearly described it, so that the whole life history of the fungus is widely known. Its life history is briefly given below :

On the underside of the leaf are visible at first certain spots which shed orange-yellow spores. These spores are scattered all over by the wind and by other agencies, and when they alight on leaves that are moistened by rain or dew, they begin to develop very quickly—even in less than three hours. The conditions favourable to the development of the spores are darkness or bad light. Strong sunlight kills the spores very fast. After some hours when the tube has grown fairly long, it finds an entrance through one of the breathing spores (stoma) of the leaf, and it is then that infection sets in. Since in the case of coffee the stoma are found only in the under side, and as the germ tube cannot pierce the leaf skin, it is apparent that infection can start only on the underside of a leaf.

The Mycelium threads develop very fast at the expense of the leaf cells which change colour and quickly die. After about four weeks have elapsed, the conidia begin to emerge through the breathing spores of the leaf. The parasite, now, its life cycle completed, again gives rise to a second infection.

Arabian coffee especially, which ripens all its berries in comparatively short time, is, during that short period, the sore victim of the Leaf Disease. The leaves fall off at last, the young twigs die and the trees often fail to ripen part of its berries. As a result of this, even in a plentiful harvest, a large percentage of inferior coffee occurs. After the harvest, the tree is completely stripped of all leaves, so as to resemble the real wintering of trees in Europe. The trees do not die ; but they take fully two years to bring forth another good crop.

The Liberian coffee plant too, is slowly but surely, becoming a victim of the leaf disease. Once Robusta plantations used to show not a trace of the Leaf Disease. At present it is otherwise. It is either that in the course of time the Leaf Disease is becoming more virulent, or that it adapts itself more early to every species of coffee. Whatever it be, it is certain that the leaf disease is the most dangerous of the diseases that occur in our cultivations.

What can be done to counteract this disease? Really very little. DR. BURK has recommended certain preventive and repressive measures; but on a plantation with 100,000 trees, the measures for both purposes become impracticable. As a preventive we can use the following:— a solution of copper sulphate which should be sprayed on the, leaves. These kill the spores. The whole estate can be sprayed regularly, say, once a week. This will make the disease, if it occurs, less virulent and less widespread. If this preventive method be used in nurseries, I can guarantee the raising of good plant material. The repressive method whereby primary infection is removed by destroying the orange patches under the leaves by means of strong sulphuric acid or by tearing them away with a pair of tweezers or forceps is also adopted only in nurseries. What now remains to be done is to bring the trees up to a condition as favourable and healthy as possible by means of manuring and cultivation. A rational thinning of the berries at the very outset (when they have just appeared, and later, if necessary, during the period of ripening when the youngest unripe berries may be plucked) will be very favourable in promoting the health of the tree. By this means a weight is taken off the already heavily laden branches of the tree. After this the sooner the harvest is gathered the sooner will the tree be able to rally, and the better will be the product obtained from the lower branches. My experience shows that the above mentioned measures are really useful..

I have already briefly dealt with the fact that shade trees on a coffee estate tend to regulate and keep down the productivity of the trees. The denser the shade, the less profuse is the output of buds on coffee trees. It will therefore be advantageous if planters do not prune their shade trees too heavily at the beginning of the monsoon.

In 1887, noticing that Arabian Coffee suffered badly from the attacks of the Disease, it occurred to me to perform an experiment for rendering the Arabian plant even just a little more resistant than it was to the Leaf Disease. The Arabian I grafted on the Liberian stock so that the advantage of the latter's vigorous root system might be gained. But this was of no avail: the Arabian tops suffered as much as they did before. Yet, in spite of my failure, the fact remains that what advantage there is to be gained in the resistance to disease should be by grafting. I know that already there exists here and there hybrids between Arabian and Liberian coffee which, unhampered by the Leaf Disease, produce a big harvest.

These hybrids can be propagated only by means of grafting, for, as is admitted here, propagation from seed gives rise to great variation in the offspring.

Formerly Robusta suffered but little from the Leaf Disease. We wish it always remained so. It is necessary, however, to proceed on the beaten track, and work regularly in pursuit of a variety that is immune to the disease. Once this has been attained, all other species and varieties should be made to give way to it, and the cultivation of that species alone should be encouraged. The fact that not long ago an inquiry was made as to whether Robusta showed signs of deterioration or not is enough to convince one of the importance of constantly having the fact before us and see to it that Robusta is always kept up to the standard of what it was as a plant immune to the Leaf Disease. Those who discussed the question above referred to were in no way unanimous in their verdict, but the fact remains that a number of planters were of opinion that Robusta was visited by the Leaf Disease oftener than it used to be. This fact gives us food for thought.

The American Leaf Disease (Cercospora) is different from the one just dealt with. It is not dangerous either to Arabian or Liberian coffee. It was formerly the only fungus disease to which Robusta was more susceptible than the other two. In nurseries one often sees the leaves of plants strongly marked with peculiar brown spots with a light yellow or white centre, often surrounded also by a light zone. Owing to the absence of the yellowish or whitish spores this disease is easily distinguished from the real Leaf Disease. When Robusta plants are severely attacked by Cercospora, their growth is greatly retarded. The plants that are most susceptible to the disease should be destroyed, and the plants in the nurseries as well as those in the gardens should be sprayed with Bordeaux Mixture in order to prevent a somewhat serious infection. (According to DR. VAN HALL.)

7. THE PINK DISEASE (CORTICIUM JAVANICUM).

This is not exclusively a coffee disease, but appears on other plants such as Cacao, Cinchona, Tea and Pepper. This disease first affects the twigs and young branches which die off. At first light grey threads are noticed which at last assume a rose tint. The ideal conditions for the development and spread of the fungus are dampness and bad light. In Coffee the fungus first kills the thin tertiary and secondary branches. The infection then reaches the older branches and the stem. The upper part of the tree withers away gradually and death follows. Djamoer oepas too, like the Leaf Disease, works more damage during the period wherein the berries ripen. The only measure of control is to cut down and burn the infected portions. The burning should be done in an open place in the immediate vicinity of the infected area, in order to prevent conveying the branches and infection with them to healthy portions of the plantation. Liberian coffee seems more easily susceptible to this disease than Arabian. coffee.

8. CANKER.

The disease known as canker (*Rostrella coffea*) is relatively less important than those previously dealt with; and since Robusta is for us the most important, I shall deal with another disease known as Robusta stem canker, caused by *Acospora coffea*. The fungus causing this disease is a wound parasite. The leaves of the tree when infected turn yellow, hang flaccidly on for some time and fall off. The bark then, to a great extent, turns brown, the part affected reaching sometimes even so far as the collar. If the tissue affected be rather closely examined, it will be noticed that the dark colour penetrates further than the outward appearances lead us to think it would.

The disease is as prevalent among full grown trees as it is in nurseries. Infection seems to start beneath at the stem and then spread to the roots. To avoid the spread of this disease one should see to it that no wounds are inflicted on any of the trees, and the trees affected should be destroyed as soon as possible.

The shade trees too have their enemies. Albizzia has a bad borer enemy (Cerampycidæ) whose larvæ live between the bark and the wood. They bore into the wood and remain there in their pupal stage.

The dadap varieties have also a number of insect and cryptogamic enemies of which, next to the dadap caterpillars, the dadap root disease is the most important. Attacks of this last named disease always kill the trees.

SOILS AND MANURES.

FERTILISERS ORDINANCE, 1901.

A CRITICISM AND SOME SUGGESTIONS.

ALEXANDER BRUCE, B.Sc.,

Assistant Analytical Chemist, Ceylon.

The above Ordinance was drawn up by the authorities to give protection to purchasers of fertilisers. Ceylon being an agricultural country it is only just that such an Ordinance should be in existence to protect agriculturists who are improving their lands by intensive cultivation, by the application of artificial manures, which are purchased from dealers in that commodity. The Ordinance is now twenty years old and may have been all that was necessary at that time, but it is evident from the wording of the Ordinance that the authorities were not in touch with the local trade —buyers and sellers—but merely drew the Ordinance up on extracts from the Fertilisers Act of Great Britain. The local Fertilisers Ordinance should not have similar wording for Ceylon and Great Britain as the requirements are not the same and trade is carried on differently in these countries. In Ceylon tropical perennials are cultivated, in Great Britain temperate annuals. The manures required for tropical perennials, tea, coconuts, etc., are graded in availability and are applied usually once in two years. In Great Britain manuring is annual and top dressings are applied. Compound manures prepared in Great Britain are made up in large quantities such as potato, turnip, cereal, etc. mixtures. Invoices do not state the ingredients of these mixtures, but simply state so many tons of such and such a manure, at so much per ton containing so much nitrogen, phosphoric acid (water soluble and insoluble), and potash, per cent. Compound manures prepared in Ceylon are made up in small quantities—a few tons a time—to definite specifications to suit the requirements of the estate and the cultivated product. The invoices quote the proportions and weights of the ingredients, the percentage guarantee of each essential constituent, from which the percentage composition of the mixture may be calculated, and the price per ton.

It will be readily acknowledged from the above facts that it is wrong to base the Ceylon Fertilisers Ordinance on the Fertilisers Act of the U.K.

Taking the Ordinance in pars.

"Warranty on sale of Fertiliser par. 3 (1). Every person who sells .....shall give to the purchaser an invoice stating the name of the article and whether it is an artificially compounded article or not, and what is at least the percentage of the nitrogen, soluble and insoluble phosphate, and potash, if any, contained in the article, and this invoice shall have effect as a warranty by the seller of the statements contained therein."

Better protection would be given to the purchaser if this par. read as follows :—

"Every person who sells artificial manures shall give to the purchaser an invoice stating the name and weight of the manure ; if a single ingredient, the percentage or percentages of the essential constituent or constituents and the price per ton ; if a compound mixture, the names of the

ingredients, the weights of the ingredients, the percentage or percentages of the essential constituent or constituents of every ingredient and the least percentage of total nitrogen, organic nitrogen, soluble nitrogen, nitric nitrogen, ammonium nitrogen, nitrolim nitrogen, water soluble or insoluble phosphoric acid, and potash, if any, contained in the mixture, and the price per ton....."

Nitrogen is the most expensive unit of the three essential constituents, —nitrogen, phosphoric acid, and potash,—in the ratio of 15-30 : 5 : 5 (approximately), yet there is no legislation as to the availability of the nitrogen, although phosphoric acid, a much cheaper unit, is protected as regards availability in the wording soluble and insoluble phosphoric acid (phosphates).

Phosphates are not guaranteed in the local price lists but phosphoric acid is. Total phosphoric acid only is quoted in the price lists, not soluble and insoluble phosphoric acid. Recent correspondence with DR. DYER (the deviser of the citric soluble test) states that the citric soluble test is being modified for the Fertilisers Act U.K. At present it is revoked but the method of analyses is retained under the Act U.K.

Soluble and insoluble phosphoric acid refers more to superphosphates, little of which is used in Ceylon, but it is as well to keep the terms (water and citric) soluble and insoluble phosphoric acid (phosphates) in the Ordinance as disputes may arise on these points when dealing with compound or phosphatic manures.

PENALTY FOR BREACH OF DUTY BY SELLER PAR. 4 (b).

"Causes or permits any invoice or description of the article sold by him to be false in any material particular to the prejudice of the purchaser."

This is the saving clause of the Ordinance and gives ample protection to the buyer provided that the nitrogen content is properly defined as in the proposed modification of par. 3 (1). Compound mixtures can be made up containing the desired percentage of nitrogen, phosphoric acid, and potash and analyses would show the percentages guaranteed, but on detailed analyses of the nitrogen, although the total nitrogen might be found correct the availability might be found wrong and might not coincide with the proportion or weights of ingredients specified, or ingredients not specified added. Mixtures can be made up, the same in appearance, with the same percentage of plant food, total nitrogen, phosphoric acid and potash, yet differing Rs. 30 per ton in price, due to the different availabilities of the nitrogen, and yet the seller could take refuge under par. 3 (1) as the analyses of the plant food would be up to the guarantee.

Par. 6 (2)....."cause each sample to be marked, s e a l e d, and shall deliver or send by post one sample with the invoice or copy thereof to an agricultural analyst."

Invoice, should read invoice, circular, and advertisement. The seller's name need not be disclosed to the analyst on the invoice circular advertisement, and on returning these with certificate of analyses, invoice, circular and advertisement should be initialled by the analyst for purposes of identification.

Par. 10 (1) 2% Citric Acid should be substituted for ammonium citrate as laid down under the Fertilisers Act U.K.

LIMITS OF ERROR.

There are no limits of error in the local Fertilisers Ordinance such as are given in the Fertilisers Act U.K. Under the present reading a single or compound manure which is not up to the minimum as found by analysis can be claimed against under par. 4 (6), this is hardly fair to the seller. The Fertilisers Act U.K. views analyses more generously due to the difficulties of intimate mixing and sampling errors.

It is suggested that the limits of error given in the Fertilisers Act U.K., be embodied *en bloc* in the local Ordinance or at least the par. referring to compound mixtures, as many of the fertilisers mentioned in the Fertilisers Act U.K. are unknown on the local market.

The wording of the pars. mentioned is as follows :--

4. "Compound manures (other than Bone Compounds, but including Dissolved or Equalised Guano):—(a) If the respective percentages of nitrogen, and potash do not exceed 4. Limits of Error. Soluble phosphate 1 %, Insoluble Phosphate 1 %, nitrogen 0·3 %. potash 0·3 % (b). If such percentages exceed 4. Limits of Error: soluble phosphate 1 %, Insoluble phosphate 1 %, nitrogen 0·5 %, Potash 0·5 %—1910 Regulations par. 3. The Phosphate might be changed to the equivalent phosphoric acid as phosphoric acid is used throughout the local price lists, so 1 % phosphate should read 0·45 % phosphoric acid.

SAMPLING.

There is no provision for sampling in the Local Ordinance. Distinct rules are laid down in the U.K. ordinance which might well be followed locally. Under the 1906 U.K. regulations par. 6 (b) might be modified to 5 % of the bags. The weights of the bags in Ceylon vary according to the estate requirements, 5 % of the bags up to a maximum of 10 bags should give a representative sample.

Turned out on a clean floor, mixed lumps broken up, the heap quartered, opposite quarters taken, mixed again, treat as before until about 15 lb. are left, when three samples of 5 lb. each can be obtained. If the heap is large, portions may be taken from different parts of the heap, floor level, top, middle, after mixing and breaking down lumps ; the miniature heap can then be treated as above until 15 lb. are obtained, when the samples can be taken.

(a) Might well be deleted considering the distances in Ceylon and delay in applying the manure.

This refers to 3 days' notice being given to the seller in case he should wish to attend the sampling.

The Fertilisers Ordinance U.K. has gone through several modifications since it first became law, showing the necessity for change according to conditions. Ceylon Fertilisers Ordinance has remained the same for over 20 years although conditions have changed.

The sampler on forwarding samples to be tested should state that samples were drawn according to the Ordinance.

FALSE OR MISLEADING DESCRIPTION.

A heavy penalty should be imposed on sellers giving a wrong or misleading description, in any invoice, pamphlet, or advertisement, to any of their manures, single or compound.

INCOMPATIBILITY.

Any seller showing incompatibility of any of the ingredients in a mixture may refuse guaranty under the Fertilisers Ordinance.

THE LIMESTONES OF CEYLON.

J. SPENCER COATES,

Principal Mineral Surveyor.

Limestones in general belong to two main types. (1) Massive or non-crystalline, (2) Crystalline. The massive limestones are of organic or chemical origin. They may consist of an agglomeration of the remains of calcareous organisms (e.g. the Mountain limestone of Derbyshire and Chalk of the South of England) or be formed by the precipitation of carbonate of lime in an enclosed sea or lake-basin (e.g. the Oolite). Crystalline limestone is usually the result of alteration of the massive variety in regions where the rocks have been crushed and folded by earth-movements on a large scale with the resultant recrystallisation of the constituent minerals (metamorphism). It may however possibly be produced in some cases by crystallisation of the calcium carbonate from solution, in cavities in older rocks.

Limestone consists essentially of calcium carbonate, $CaCO_3$, sometimes practically pure. Most limestones however contain other minerals, such as magnesium carbonate as a chemical impurity, or clay, sand, etc., as mechanical admixtures.

Massive limestones are frequently altered structurally by solution and re-deposition of the lime carbonate until all trace of the original organic structure has been obliterated and the rock appears as a hard, compact mass with a splintery fracture. The action of the magnesium salts in sea-water also alters the rock chemically, replacing part of the lime by magnesia, with the formation of a magnesian limestone or dolomite. Such rocks when subsequently metamorphosed give rise to crystalline dolomites. In the metamorphism of impure clayey or sandy limestones the impurities of the original rock are crystallised in the form of complex silicates of lime, alumina and magnesia such as mica, pyroxene, scapolite, etc. Such accessory minerals are very conspicuous in the crystalline limestones of Ceylon.

Ceylon Limestones.

Both massive and crystalline limestones are common in Ceylon.

1. *Massive limestones* are well developed in the Jaffna peninsula, where they cover an area of over 300 sq. miles, though partially obscured by blown sand and mud. At the west end of the peninsula a gradual transition may be observed from loose coral rubble to massive limestone containing occasional well-preserved marine shells, but with no trace of coralline structure. The rock may therefore be regarded as an altered and compacted coral reef.

An extension of the Jaffna limestone may be traced southward along the west coast, eventually giving place to an alternation of sandy and clayey beds with impure limestones, the whole series dying out in the neighbourhood of Puttalam.

The Jaffna limestone is remarkable for its purity. Occasional thin sandy bands are intercalated in the mass, but on the whole the rock is almost free from silica and magnesia, as shown by the following analyses made at the Imperial Institute of (1) the purest of several samples, (2) the least pure, (3) an average sample.

	(1)	(2)	(3)
CaO	55·12	51·10	54·60
MgO	0·50	0·58	0·51
Fe_2O_3	0·08	0·34	0·54
Al_2O_3	0·62	1·72	0·28
SO_3	0·11	0·08	0·05
SiO_2	0·68	4·29	1·02
Loss on ignition	43·40	41·60	43·26

Besides the compact coral limestones of the northern extremity of the Island, there are extensive deposits of loose coral debris (1) in an almost unbroken belt along the south west coast from Ambalangoda to Matara and (2) as raised beaches at various points between Kalcudah and Trincomalie. A sample of coral debris from a raised beach, washed free from sand, gave the following analysis, showing that it consists of nearly pure lime carbonate.

Lime	CaO	-	54·04
Magnesia	MgO	-	0·29
Sulphate	SO_3	-	0·70
Silica, iron and alumina		-	0·56
Loss on ignition (CO_2)		-	44·07

(Analysis by Govt. Analyst.)

2. *Crystalline Limestones.*

Isolated outcrops of crystalline limestone are found throughout the Island. Exposures are most numerous however in the northern part of the hill country and on its south-eastern flank.

The main limestone district extends from Kandy eastwards to Hanguranketa and north of this line, through Matale and Nalande, as far as Habarane. At the southern end of the belt the limestone bands are comparatively narrow, but they appear to coalesce towards the north, till at Sigiriya there is a single band, with a width of over a mile across the outcrop.

Another prominent group of limestone bands extends from near Koslande through Ella to Badulla and north of the town, and a less important one is found near Timbolketiya in S.E., Sabaragamuwa.

The limestone bands are intercalated in the great series of crystalline rocks, which may for convenience be called gneisses, of which the island is built up. Those of the Kandy-Matale districts are evidently of great extent and their outcrops may be traced for miles along the flanks of the deeply cut valleys. As a rule, however, the beds are lenticular in form, and though several feet wide in one outcrop, taper away rapidly in either direction along the strike.

The boundary between limestone and gneiss is often clearly defined. In many cases, on the contrary, the transition from one rock to another is gradual, a wide zone of rocks of intermediate composition intervening. These intermediate rocks consist of calcite with a number of silicates of lime and magnesia, chiefly pyroxenes and such as diopside. Phlogepite mica often occurs in these zones, sometimes in large crystals.

The mode of origin of the limestones is doubtful. If as is not impossible, the crystalline rocks are the result or metamorphism of a very ancient series of sandstones, clays, etc., the limestones may originally have been

organic limestones deposited at the same epoch as the sediments. The intermediate rocks of the transition zone would then represent metamorphosed sandy or clayey limestones.

In some respects, however, the limestones have the appearance of intrusive rocks, forced in between the bands of gneiss: in a fluid form, either as solutions or softened by heat under a pressure high enough to prevent dissociation of the calcium carbonate. Thus the limestone frequently contains blocks of the gneiss, which might have been torn off the walls during the process of injection, and occasionally tongues of limestone break across the bedding planes and fill irregularly shaped fissures in the wall-rock.

Composition.

The following are analyses made at the Imperial Institute, London, of crystalline limestones from various localities :—

		1	2	3	4
Lime	CaO	45·61	33·98	30·41	27·44
Magnesia	MgO	8·50	18·08	20·98	23·90
Iron Oxide Alumina	Fe_2O_3 Al_2O_3	1·56	2·10	0·70	1·68
Silica	SiO_2	0·17	3·12	3·20	10·24
Loss on ignition (Water & CO_2)		44·70	43·10	43·54	31·87
CaO: MgO 100 to		18·6	53·2	69·	87.

The following are analyses made by the Agricultural Chemist, Colombo, of further crystalline limestones from other localities :—

		5	6	7	8
Lime	CaO	39·0	51·0	34·0	36·0
Magnesia	MgO	0·3	5·8	20·5	26·3
Oxide of iron and alumina	Fe_2O_3 Al_2O_3	4·0	1·0	tr	2·0
Insoluble (mainly Silica)		26·1	0·2	2·7	4·1
Carbon dioxide	CO_2	30·6	40·0	42·8	31·6
CaO: MgO 100 to		0·75	11·4	60·3	73·6

1. Kadikawa, South of Anuradhapura. 2. Habarane—Minneriya road. 3. Diyaluma—Koslande. 4. Below Hakgala. 5. Matale district. 6. Kurunegala district. 7. Badulla—Passara district. 8. Kandapola.

The proportion of lime to Magnesia is normal dolomite $CaCO_3$. $MgCO_3$ is 100; 71·3. The Ceylon limestones, therefore, though in rare cases consisting of nearly pure calcite (calcium carbonate), are usually to be regarded as inter-growths of calcite and dolomite in varying proportions. This is borne out by microscopic examination which shows that crystals apparently homogeneous are often composed of an intimate inter-growth of the two minerals in alternating thin plates.

PESTS AND DISEASES.

THE COTTON LEAF CATERPILLAR:

COSMOPHILA EROSA.

J. C. HUTSON, B.A. Ph. D.,

Government Entomologist.

About the 20th of November the cotton plots at Ambalantota belonging to the Department of Agriculture and the adjoining cotton area being grown by the Ceylon Spinning and Weaving Company were reported to be attacked by a caterpillar pest, which to all appearances had suddenly invaded the fields in large numbers, since they were hardly noticed a few days previously.

The Divisional Agricultural Officer, Southern Division, immediately put in a gang of coolies to hand-pick the 50 odd acres of the Experimental plots, and a few acres were dusted with a mixture of Paris Green and wood ashes.

The Entomologist went down to Ambalantota towards the end of the month and found that the pest had spread throughout most of the 50 acres; but that comparatively few of the cotton plants were badly attacked and these mostly round the edges of the ten-acre plot. The prompt measures taken to hand-pick the area had undoubtedly checked what might have developed into a serious attack, but the situation was still sufficiently grave to warrant the immediate application of poison and a further round of hand-picking.

DESCRIPTION OF THE PEST.

The caterpillars are rather slender and when full grown are about 1¼ inches long. They are pale green in colour and are marked with faint white lines along the back and sides. There may sometimes be a slightly darker green stripe down the centre of the back. The caterpillars are very active in all stages and walk along after the manner of the "looper" caterpillars, hunching up the middle of the body and every now and then standing up on their hind legs and waving their bodies around just like leeches.

They eat large holes in the leaves and badly attacked plants may have most of their outer leaves completely stripped except the "ribs." Fortunately they seem to prefer the older leaves to the young leaves and shoots, which are hardly touched. So that vigorous and well-grown cotton plants, such as those of the Experimental Plots, can sustain a fairly bad attack without being vitally damaged. The caterpillars form their pupæ (or Cocoons) within the fold of a leaf, sometimes turning over a portion of the edge, or between two or more leaves webbed together.

An examination of the cotton plots and the adjoining waste lands revealed the presence of a malvaceous weed (related to cotton and later identified by the Botanist and Mycologist as *Abutilon graveolens*) growing

freely all along the borders of the plots and throughout the neighbouring jungle. The clean weeding of the cotton plots had kept down this weed among the cotton.

It soon became evident that the caterpillar pest had originally started on this weed, probably as soon as the weeds sprung up after the first rains of the "North-east," and that the first brood or generation of caterpillars had developed there into moths which in their turn had laid many of their eggs on the young cotton plants early in November. At the same time the cotton plants around the edges of the plots had been invaded by the caterpillars from the adjacent weeds, with the result that the plants on the outside were more seriously attacked than those in the centre of each plot

CONTROL MEASURES.

These included (1) hand-picking the caterpillars, and the cocoons in the folds of the leaves; (2) dusting the plants with a mixture of Paris Green and powdered lime or wood-ashes (1-40 or 1-60), (3) applying the poison in a liquid form by sprinkling it on the plants with bunches of leafy twigs. This method of application was being used by the Spinning and Weaving Company and was later tried on the Experimental Plots to supplement the dusting and hand-picking.

(1) *Hand-picking.*—The bushes must be searched very carefully and the caterpillars and cocoons picked off. The caterpillars often rest on the underside of the leaves during the heat of the day, but are also to be found on the top of the younger leaves. The cocoons are not so easy to find at first, but after a little experience the presence of these is detected by the twisted appearance of the webbed-together leaves or by the folds on the edges of the leaves. Bushes with cocoons on them have a somewhat flattened appearance on top.

The caterpillars and cocoons can be collected into small tins, which should have a little kerosene and water. In the low-country most of the coolies refuse to kill the caterpillars in this way, though they do not object to picking them off the bushes.

(2) *Dusting.*—The powdered mixture can be applied by means of small muslin or fine mosquito net bags, but this method cannot be recommended for the small cotton grower as the bags are fairly expensive. Also the method is rather wasteful if done in windy weather and by inexperienced coolies. The powder sticks on fairly well even after heavy rains, especially if lime is used, and is fairly effective in killing the caterpillars, provided that a fine enough dust is used. On the morning after applying the dust hundreds of dead caterpillars were found under the bushes.

(3) *Sprinkling.*—This seems to be the most practicable and the most effective method of applying the poison over fairly small cotton areas, such as are likely to be grown by the village cultivators.

Mix ½ oz. Paris Green in a little water first and then pour this into a kerosene tin full of water (4 gallons) to which has been added a handful of lime to neutralize any soluble arsenic. The mixture should be stirred thoroughly so as to get an even distribution of the Paris Green. Then pour out the contents of the tin (while stirring thoroughly) into wide-mouth earthenware chatties which are distributed to coolies. The mixture can then

be sprinkled on to the bushes by means of small bunches of leafy twigs, care being taken to keep the contents of the chatty agitated. The chief difficulty of this method is to obtain an adequate supply of water although this is usually available during the rains when outbursts of this particular pest (*Cosmophila-erosa*) are liable to occur. The poison is best applied in the early morning, but advantage may be taken of any fine interval of weather during the day.

NATURAL ENEMIES.

Cosmophila, in common with most other caterpillar pests, has its enemies in nature. It is normally controlled by small parasitic flies and wasps, and it is usually the temporary absence of these which enables the caterpillars to develop into a pest.

During the height of the recent outbreak large numbers of birds, including mynahs, were observed flying around over the infested plants and alighting on them. These birds appeared to be feeding on the caterpillars and probably do their bit towards controlling the pest.

Clean Cultivation etc.—All cotton areas should, as far as possible, be kept cleanly weeded, especially during the first few weeks after the cotton crop is planted. The clearing up of all weeds round the borders of a cotton field is a counsel of perfection, but should be carried out whenever practicable, as it helps to lessen the chances of a serious outbreak of this pest which breeds freely on certain weeds usually prevalent in land cleared from jungle.

The land should be well cultivated and manured before the crop is sown, since vigorous plants are much more likely to recover from the effects of a caterpillar attack than those which are weak and ill-nourished.

THE PINK BOLLWORM (*GELECHIA GOSSYPIELLA*, SAUND.).

The following is an extract from the article on "Insect Pests of the Cultivated Cotton Plant" appearing in the AGRICULTURAL GAZETTE OF NEW SOUTH WALES, VOL. XXXIV., PART 1 :—

This small moth was originally described by SAUNDERS in the *Transactions of the Entomological Society of London* in 1842, under the name of *Depressaria gossypiella*. Under this name it is listed in COLES and SWINHOE'S "Catalogue of the Moths of India" (1887). The locality given is Cawnpore; but a note is added: "It is a well known cotton pest in India, and according to LEFROY the insects are most abundant in October, when the cotton bolls are forming. He says that in Behar the larvæ live through the cold weather in the lint or seed of the cotton, emerging as moths in March or April. It ranges naturally over India, Ceylon, Burma, the Straits Settlements, Japan, and the Philippines. In Africa, besides Egypt it is found in British East Africa and in what was German East Africa."

The original home of the Pink Boll worm has been a matter of doubt among economic entomologists, but everything appears to prove that it was accidentally brought from India to Egypt in quite modern times. According to WILLOCKS it was unknown in Egypt until 1903-10, and even in 1910 it was not a common insect. Two years later, however, it had spread through Lower Egypt, and in the following season (1913) it was recorded from all the cotton fields, doing an immense amount of damage. It was most active from July to October.

The nearest country to Australia where this moth is established is the Hawaiian Islands. FULLAWAY says it was introduced from India, and it was identified as this particular moth by PERKINS in 1900. He says: "Highly injurious to cotton, Honolulu." In the "Fauna Hawaiiensis," section *Microlepidoptera*, LORD WALSINGHAM gives a detailed account of this moth, and goes into the question of its range in India and elsewhere. Its food plants are the different species of cultivated cotton plants; it also feeds upon allied species of hibiscus and other malvaceous plants. In India it feeds upon bambia or okra (*Hibiscus esculentus*), on teel or hemp (*H. cannabinus*); and on hollyhock (*Althea rosea*), and also on cultivated cotton. In Hawaii it is found upon a malvaceous plant known as milo (*Thespesia populnea*).

The small greyish-brown moth is under half an inch across the outspread wings; the fore-wings are marked with darker blotches, and the hind-wings are fringed. It has no very distinctive characteristics as a moth. It lays its eggs on the underside of the leaves, as well as upon the bolls. The small yellowish caterpillar bores into the sides of the closed boll, and as it increases in size becomes white, subsequently, however, when full grown, becoming pink or red. The caterpillar remains feeding in the boll for two or three weeks, by this time being about half an inch in length, and pink or reddish in colour. The caterpillars of the first brood then emerge. Gnawing a hole through the side of the bolls, they make their way down to the ground, and pupate under the shelter of any rubbish. Under ordinary conditions, they remain in the pupal state from ten days to a fortnight. The latter broods in September (says WILLOCKS, speaking of Egypt) do not leave the bolls, but, remaining inside, spin their cocoons in the interior of the seeds or between two seeds webbed together. Most of them remain in the larval state in this manner from September till the following April; others carry on until November or December before they finally change into pupæ. Shortly after pupation the moths emerge. Thus a large number remain in the cotton seed, and this seed may be used for sowing the cotton fields.

This remarkable fact in its life history shows that these boll worms can remain quiescent, in the larval or caterpillar state, and also after they are fully fed, for over a year, and this fact renders them a difficult pest to control. It can also be readily understood how easily this pest can be distributed and introduced into any country in infested cotton seed. It is not a great distance from Honolulu to Sydney, and it is from this direction that we should in particular prohibit all cotton seed or unginned cotton.

CEYLON AGRICULTURE.

BOARD OF AGRICULTURE.

MINUTES OF MEETING OF ESTATE PRODUCTS COMMITTEE.

Minutes of the twelfth meeting of the Estate Products Committee of the Board of Agriculture held at the School of Tropical Agriculture, Peradeniya, at 2·30 p.m. on Thursday, 8th February, 1923.

Present :—The Director of Agriculture (Chairman), the Government Botanist and Mycologist, the Government Entomologist, the Government Agricultural Chemist, the Assistant Botanist and Mycologist, Lieut.-Col. T. Y. Wright, Sir Solomon Dias Bandaranaike, C.M.G., the Hon. Mr. O. C. Tillekeratne, Lieut.-Col. T. G. Jayawardene, Gate Mudaliyar A. E. Rajapakse, Messrs. R. G. Coombe, John Horsfall, A. S. Long Price, J. S. Patterson, A. M. Clement Dias, E. C. Villiers, Graham Pandittasekera, Dr. C. A. Hewavitarne, Messrs. E. W. Keith, A. J. Austin Dickson, A. W. Beven, A. P. Waldock, F. R. Senanayake, J. B. Coles, R. Garnier, M. L. Wilkins, W. R. Matthew, Geo. Brown, Major J. W. Oldfield, O.B.E., M.C., Messrs. N. G. Campbell, N. D. S. Silva, C. E. A. Dias, H. D. Garrick, D. S. Cameron and H. A. Deutrom (Acting Secretary).

As visitors :—Messrs. F. R. Dakeyne, R. W. Campbell, John A. Coombe, B. A. Campbell, Allen Coombe, A. W. L. Turner, J. Fergusson, C. H. Gadd, T. H. Holland, M.C., and J. Mitchell.

Letters and telegrams regretting inability to attend were received from the Hon. Mr. H. L. De Mel, C.B.E., Lieut.-Col. L. Bayly, Mr. Thos. A. de Mel, the Government Agent, C.P., Kandy, the Hon. the Government Agent, W.P., Colombo, the Hon. the Controller of Revenue and Mr. A. P. Goonatilleke.

The minutes of the previous meeting having been circulated to members were taken as read and confirmed.

Before proceeding with the business on the Agenda, the Chairman informed the meeting that according to rule 6 members absenting themselves from half the number of meetings vacated their seats on the Committee. In accordance with this rule the names of following members had to be placed before the meeting :—Sir Solomon Dias Bandaranaike, Mr. R. Garnier, the Hon. Mr. H. L. De Mel and Lieut.-Col. L. Bayly.

The Committee approved the re-appointment of SIR SOLOMON DIAS BANDARANAIKE and MR. R. GARNIER after considering the reasons for their absence from meetings during the past year.

The CHAIRMAN said he had received a letter from LIEUT.-COL. L. BAYLY expressing his inability to attend the present meeting. If COL. BAYLY found it impossible to attend meetings he proposed the name of MR. JOHN HORSFALL in his stead. MR. HORSFALL had been acting for MR. COOMBE during his absence in England. Every member of the Committee would welcome MR. COOMBE to the Colony again.

The HON. MR. H. L. DE MEL would be approached in regard to his place on the Committee.

The CHAIRMAN mentioned that he had received a letter from MR. A. C. MATTHEW in which he says that he would be glad to resign in favour of MR. W. R. MATTHEW. The Committee agreed to this proposal.

Agenda Item 1. Progress Report, Experiment Station, Peradeniya.

The CHAIRMAN in commenting upon this report referred to the rubber budding experiments carried out on the station, the methods employed and the percentages of success obtained. He also briefly reviewed the experiment in planting coconuts in different positions.

He said Job's tears was a dry-grain crop being developed in the Philippines. It produced a crop of 33 bushels per acre on the Station. It is proposed to continue the trials at Peradeniya and Anuradhapura.

Maize did not do well as the weather was not favourable.

Kikuyu grass had not been successful and had to be replanted.

MR. CAMERON enquired as to the age of the plants budded.

MR. HOLLAND stated that they were 14 months at the time of budding.

Referring to tea MR. GEO. BROWN asked in which plot Grey Blight had been found.

MR. DEUTROM replied that it was on plot 145.

Agenda Item 2. Results of Experiments on Tea Manuring, Rubber Tapping, Manioc, Sweet Potato, etc.

The CHAIRMAN stated that the results of experiments on Tea manuring, Rubber tapping, Sweet potatos, Manioc, etc., will have to be postponed as it was impossible to get these prepared in time for circulation. They were now tabled. He said that with the approval of the Committee he would postpone the discussion until the next meeting.

Agenda Item 3. Tea Termites.

The Entomologist gave a summary of the investigations on Termites connected with tea which are in progress at the present time. He grouped these termites under two divisions :—A, Termites which form their colonies inside living tea bushes and eat into the heart-wood. These are primary pests and include *Calotermes militaris*. B. Termites which have their nests outside the tea bushes usually underground and which generally attack the dead or dying bark and wood. This group includes the common round building termites and are mainly scavengers.

He also mentioned the chief control methods for each group of termites. A discussion on the suggested control measures took place and several members gave details of their experiences in the control of termites.

Agenda Item 4. Black Bug on Tea.

MR. R. G. COOMBE, who introduced this subject said that he had brought up this question on Black Bug on tea for discussion about two years ago and had left for England before it could have been brought up in the Committee. He said he had, however, expected to see an account of the proceedings on the subject reported in the Overland issues of the newspapers but had been disappointed. Since his return, however, he had got all the information he needed from DR. HUTSON.

The CHAIRMAN said that this was a question of scale insects in the Haputale district which MR. COOMBE had raised before his departure for England. A full account of the investigations carried out in this connection had appeared in the TROPICAL AGRICULTURIST for June, 1921. MR. COOMBE now stated that he had obtained all the information he needed and there was no need to go into the question again.

MR. COOMBE said that it was a matter for regret that the newspapers did not publish proceedings of the meetings of the Board of Agriculture in their Overland editions. There were a number of old planters at Home who would be deeply interested in these accounts.

The CHAIRMAN stated that he would approach the Editors of the Press with the request that they should include these items of interest in the Overseas editions of their journals.

Agenda Item 5. The Desirability of Printing Leaflets on Kapok Cultivation in the Vernaculars and Circulating them all over the Island through the Agency of the Revenue Officers.

MR. BEVEN who introduced this subject, said that this idea had been suggested to him by the instructive paper read by MR. WALDOCK at the last meeting. He said the cultivation of Kapok cost practically nothing, except for the labour of planting. On the other hand, the return goes extremely high and it seemed to him to be only fair that the villagers should be informed of the possibilities of Kapok.

The CHAIRMAN said he would be only too glad to have leaflets published in the vernaculars and distributed throughout the Island. As a matter of fact, a leaflet was at the present time in the course of preparation. This he would have duly translated and distributed in the villages.

Agenda Item 6. What is the best Treatment for Estates which have suffered from effects of drought.

The CHAIRMAN stated that the HON. MR. H. L. DE MEL who gave notice of this question was absent and therefore the discussion will have to be postponed.

Agenda Item 7. Correspondence relating to Diseases of Coconuts especially Bud-rot and the Failure of the Plant Pest Board to promptly deal with a case reported recently in the Kurunegala district.

MR. A. P. WALDOCK in introducing the subject said that the case referred to in the Agenda occurred on the 29th October last and while on a visit to an Estate in the Kurunegala district the Superintendent reported that there was on a neighbouring estate what he suspected a case of Bud-rot MR. WALDOCK explained at length the steps he had taken in the matter and commented on the delay on the part of the Plant Pest Board to take action. He said that he had only brought this matter up because it is in connection with the new Diseases and Pests Ordinance and because he considers that one of the principal things is centralization at Peradeniya instead of having these Plant Pest Boards.

MR. H. D. GARRICK enquired whether Bud-rot had been proclaimed under the Ordinance.

The CHAIRMAN answered in the negative. But he pointed out that the Government Agent had power to deal with all *dead or dying* diseases under the regulations.

The Committee finally passed the following resolution :—"This Meeting resolves that the length of time taken in dealing with the case referred to is to be deprecated and that the Government Agent, North Western Province, be communicated with on the subject."

Agenda Item 8. Brown Bast and its inducement by change-over tapping. (2) Is the half spiral not too drastic a form of tapping taking 20% more latex than the ⅓ rd or 45% more than the ½ th system ?

MR. J. S. PATTERSON asked whether change-over tapping did not induce Brown Bast. He said that he believed that Brown Bast only affects the tapping area. It seemed to him therefore that by changing over the chances of infection were rendered greater. He took it that on most of the experiments carried out at Peradeniya they did not change-over but continued to the bottom of the tree and then changed over. He asked for expert opinion as to whether in these circumstances, the change-over system was desirable.

MR. PETCH stated that, in experiments in Sumatra, it had been found that more cases of Brown Bast occurred on trees tapped daily on one-third than on trees tapped daily on one-quarter. But trees tapped on alternate days on a half gave fewer cases than either. As regards change-over tapping, trees tapped on a quarter daily gave more cases of Brown Bast than trees tapped on opposite quarters, changing over every two months, or changing over every day. It would appear from this that change-over tapping does not increase the liability to Brown Bast.

MR. PATTERSON. That is on the quarters

MR. PETCH : Yes, I don't know of any experiments on the half.

MR. PATTERSON enquired whether experiments could be carried out on the Station.

MR. PETCH said that the number of affected trees would be small and there the total number of trees that would have to be used in the experiment would be considerable.

With regard to the second part of his question MR. PATTERSON quoted certain figures obtained from estates in Java, which gave good results. He said the system there adopted was tapping one-third circumference at three feet from the ground on alternate days : with a bark consumption of one inch per month, tapping round down to the ground without changing over. Bark renewal took nine years.

MR. PETCH said that there was difficulty in expressing an opinion on these figures since nowadays there seemed to be an unaccountable tendency to omit some essential details when the reports of tapping experiments were published.

Agenda Item 9. The Establishment of a Properly equipped Chemical Laboratory for Research Work in Tea and the Submission of a Scheme for same to the Planters' Association and C.E.P.A. for their consideration and support financially.

MR. A. P. WALDOCK in introducing the subject said that it had been suggested to him that the establishment of a Chemical Laboratory was necessary, especially for the tea industry. He said that a Laboratory for research work in tea was certainly needed and subscriptions might be raised from the Planters' Association and C.E.P.A. for such a laboratory.

MR. JOHN HORSFALL in seconding the last speaker said that there were tremendous possibilities at the present time and suggested taking the matter up with the Planters' Association, the C.E.P.A. and eventually in London. He said that a lot of the present work in tea when all is said and done, was no more than guess work and what was really required was a scientific staff to guarantee the very best results for their raw material. Java and Sumatra were leaving Ceylon far behind in regard to quantity and every effort should be made to obtain scientific knowledge to improve the quality of our tea.

LIEUT.-COL. T. Y. WRIGHT enquired where the supposed site was for the laboratories.

LIEUT.-COL. T. G. JAYAWARDENE said that if the Chemical Laboratory was only confined to tea he would be rather reluctant to support the scheme.

The CHAIRMAN said that HIS EXCELLENCY THE GOVERNOR in the course of his speech in declaring the new Mycological and Entomological Laboratories open referred to the necessity of a Chemical Laboratory at Peradeniya. He said it was on the Budget last year but had to be deleted as Government was unable to afford funds for such a Laboratory. He added that every endeavour to establish a properly equipped chemical laboratory for research work for not only tea but other industries as well should be made.

COL. JAYAWARDENE—Might I ask whether it is necessary to spend large sums of money in this direction when there are research institutes in India from which the colony could benefit? He said, personally, if he had a neighbour carrying out research work and publishing his investigations he should be rather reluctant to start himself.

The CHAIRMAN said that it is not only a question for the tea industry but the agricultural industries generally. He did not think that agriculturists should be satisfied until their research work was properly provided for.

MR. R. G. COOMBE enquired whether the conditions in the tea industry are the same in Ceylon and India.

MR. M. KELWAY BAMBER said that the conditions in India were vastly different. He also said that he always found great difficulty in getting an average sample of tea to base any calculation upon. He was personally in favour of a scheme for research work in Tea and other agricultural industries

The HON'BLE MR. T. Y. WRIGHT said that tea, rubber, and coconuts constitute the main products in Ceylon and Government must pay for establishing a Chemical Laboratory.

MR. R. G. COOMBE in supporting MR. WRIGHT'S suggestion said that he had returned to Ceylon after an absence of two years. Whilst in England he had visited Exhibitions and noted how backward Ceylon was in comparison with the other Colonies. He considered that the planting community should go on agitating till Government recognised the importance of their industries.

MR. C. E. A. DIAS supported the motion.

The CHAIRMAN in closing the discussion said that he took it that the meeting desired to recommend to Government that early steps be taken to build and equip a laboratory at Peradeniya for research work in agricultural chemistry.

The resolution was put to the meeting and carried unanimously.

Agenda Item 10. Equipment of Experiment Station, Peradeniya.

The CHAIRMAN briefly reviewed the work of the Central Experiment Station at Peradeniya and urged for the better equipment of the Station for dealing with its main products, viz., Tea, rubber, cacao and coconuts. He suggested that a sub-committee should be appointed to represent to consider the matter.

The meeting approved that the following members be appointed to serve on the sub-committee:—MR. M. L. WILKINS, to represent tea, MR. R. GARNIER to represent rubber and MESSRS. E. W. KEITH and C. E. A. DIAS to represent cacao and coconuts respectively.

Agenda Item 11. Forking Old Rubber and the Value of Silt Pits.

MR. GARNIER in introducing the subject said that he had not been able to attend the meetings of the Committee recently and would like to know what data had been collected as to the injury or otherwise of forking old rubber. He gave details of the experience of the Straits, particularly in the value of silt pits.

The CHAIRMAN said that MR. PETCH had dealt with this matter before and called upon MR. PETCH for his views on the subject.

MR. PETCH said that in 1919 the question was discussed as to the probability of root disease, following forking in old rubber. It was generally agreed that forking should not be done in old rubber except perhaps in a narrow strip between the rows of trees. It had been found in Sumatra that all the old roots after forking had been broken off and in six months' time new roots had formed. There was no evidence at the present time as to the increase of root disease in forked rubber but it was not to be recommended. From the experiments carried out in Java it had been found that there was no advantage in forking and the conclusion had been arrived at that forking was of no value.

To a question asked, MR. PETCH replied that from the disease point of view he would not recommend forking in old rubber : from the cultivation point of view forking showed no advantage.

MR. GARNIER stated that in South India less leaf fall had been noticeable after forking had stopped.

MR. GARRICK referred to the reports of MR. MITCHELL of the Rubber Research Scheme in which he strongly advised against the forking of old rubber.

MR. MITCHELL said that he did not recommend forking in old rubber for the reason that it might tend to create conditions which might make the trees liable to root disease, such as Ustulina. He said he knew of one particular estate where heavy forking had actually led to an increase in leaf-fall. However it was coming to be believed that by improving the general health of the trees leaf-fall could to a great extent be minimised and that, therefore, the manuring of areas subject to leaf-fall might prove beneficial.

MR. MITCHELL supported MR. GARNIER in his remarks as to the beneficial results which have been achieved in Malaya by the practice of cutting silt pits between the rows of trees. He said in Malaya, however, the conditions were very similar throughout the whole country but in Ceylon it might be that owing to the differences in rainfall, climate and the hilly nature of the ground in some cases as opposed to flat land in others, the practice might not be equally beneficial in all estates.

MR. PATTERSON said that on an estate in Kurunegala, *Desmodium trifolium* did very well as a cover crop.

The CHAIRMAN stated that silt pits were advisable between drains and that if it was the wish of the members experiments could be carried out on the Hill top rubber plot.

Agenda Item 12. Plant Pests and Diseases Legislation.

The CHAIRMAN said that he wished to report the progress made in regard to this matter. He said that it came up before the Committee who recommended a draft for consideration to Government and also suggested that it should be sent to the Planters' Association, Low Country Products Association and Ceylon Estates Proprietary Association which was done. The Low Country Products Association members on the sub-committee had made certain suggestions which it was decided should be added to the original draft.

The CHAIRMAN quoted the recommendations made by the Low Country Products Association. He said that the Draft Ordinance was laid before the general committee of the Planters' Association and approved. With regard to the C. E. P. A. they decided to wait till the draft went before the Attorney-General and was published in the Gazette before they considered the matter.

The L. C. P. A. he said preferred that the existing ordinance should remain in regard to Plant Pest Boards.

The CHAIRMAN said there could be no two opinions. He had placed before this committee the work of the Plant Pest Board and the manner in which they had been able to perform the duties imposed upon them. There was no doubt that an improvement was necessary.

He called upon MR. SENANAYAKE the CHAIRMAN of the Low Country Products Association for his views on the subject.

MR. F. R. SENANAYAKE said that the views of the L. C. P. A., as far as he understood, were not opposed to the alterations in the Ordinance but they felt that the suggested ordinance would necessitate the creation of a new Department and would entail a large expenditure. He said that they supported the ordinance but they desired that additional expenditure should be avoided.

The CHAIRMAN in reply said that he could not understand the argument as there would be no necessity for any extra expenditure. He assured the Low Country Products Association that the assumption that there will be a huge expense to Government in the appointment of Inspectors, peons, etc., for every village was incorrect. There was no desire on the part of the Department to increase expenses on this Head. The Provincial administration would be utilized wherever possible.

MR. C. E. A. DIAS said that at the Committee meeting of the Low Country Products Association some of the members were for and others against the Draft Ordinance. Indeed he was at a loss to understand what was decided at the end of the meeting. Personally he was in favour of it, and recommended that the draft be submitted to the Attorney-General and to Government.

LIEUT.-COL. T. G. JAYAWARDENE criticised one of the Regulations under the proposed Ordinance and was of opinion that villagers could not be expected to communicate direct with the Director of Agriculture. He thought it was desirable to retain the connection with the Revenue Officers.

The CHAIRMAN in conclusion proposed that the Draft Ordinance be sent to the Attorney-General together with the observations of the Low Country Products Association. This was agreed to.

The meeting then terminated.

H. A. DEUTROM,

Acting Secretary, Estate Products Committee.

MINUTES OF MEETING OF FOOD PRODUCTION COMMITTEES.

ANURADHAPURA.

Minutes of a meeting of the Anuradhapura Food Production Committee held at the Kachcheri on January 6, 1923, at 10 a.m.

Present.—Mr. G. F. R. Browning, Government Agent, N.C.P. (in the Chair): Mr. H. R. Freeman, Mr. L. B. Bulankulame Dissawe, Mr. B. W. G. Tennekoon, Kachcheri Mudaliyar; Mr. T. H. Holland, Acting Divisional Agricultural Officer, Northern Division, and Mr. C. C. Woolley, Secretary.

1. The minutes of the previous meeting held on the 21st October 1922 were read and confirmed.

2. The members were informed that normally the meetings of this Committee will be held quarterly in future on the first Saturday in March, June, September, and December at 10 a.m.

3. The HON. THE TREASURER'S letter No. 4381 of 3-11-22 stating that an endeavour should be made to utilise during 1922-23 the sum of Rs. 3,500 allowed out of the profits on local Food Control was read.

4. The HON. THE COLONIAL SECRETARY'S letter No. 131 of 28-11-22 sanctioning Rs. 1,800 for improvements to wells was read. It was decided that the construction of all the wells proposed (vide list given in Government Agent's letter No. 219 of 27-10-22 to Government) be undertaken this financial year, utilising the balance of Rs. 2,325 out of the sum allowed from profits on Food Control together with the above Rs. 1,800—should funds be insufficient for all these wells, the repairs to Unduruwa well to be postponed.

5. DIRECTOR OF AGRICULTURE'S letter No. 2,332 of 30-10-22 stating that it is understood that an Ordinance regarding the protection of Kabaragoyas is now under consideration was read.

6. Members were informed that, in reference to resolution No. 3 passed at the last meeting, there were 18 competitors for prizes to be awarded for the best cultivated plots under the City Tanks during the maha cultivation.

7 (a). It was resolved that the Manager, Experiment Station, Anuradhapura, the Irrigation Superintendent, City Tanks, and the Gravets Mudaliyar, be appointed judges for prizes to be given for the best cultivated plots under the City Tanks during the maha cultivation, as per resolution No. 9 (b) passed at the meeting held on 2-9-22.

(b) It was also decided that the Divisional Agricultural Officer, N.D., be asked to be the judge for prizes to be given for the best cultivated plots in the Ratmale Colony during the maha cultivation as per resolution No. 9 (a) passed at the meeting held on 2-9-22, or to nominate some one else for the purpose.

8. The CHAIRMAN explained to the members the decision arrived at at the conference of the Government Agent and the Hon. the Controller of Revenue on the question of issuing permits for the restoration of palu tanks (vide resolution No. 4 passed at the last meeting). The decision met with the approval of the members.

9. The estimate amounting to Rs. 1,150 submitted by the Irrigation Sub-Inspector, Mihintale, for improvements to Ellewe, Tamarahammillewa Urapinawa, and Ambagahawewa, was approved, the expenditure being met from Irrigation Fine Fund (Village Works).

10. The letter of 20-10-22 from the Divisional Agricultural Officer, N.D., was considered and it was decided to allot Rs. 50 as prizes to each Division, competition being restricted to paddy cultivation only, and that the present rules for competitions be referred to the Divisional Agricultural Officer, N.D. for perusal and suggestions and be submitted for approval at the next meeting. Regarding visits of cultivators to Dry Zone Experiment Station, Puliyankulam, it was decided that the Divisional Agricultural Officer, N. D., should communicate with the Government Agent later.

11. The question of supply of paddy for the Experimental Rice Mill at Anuradhapura was considered and it was decided to ask the Secretaries of Co-operative Credit Societies if they could arrange for the supply of paddy direct to the Mill.

12. MR. HOLLAND moved his resolution "that it is desirable that the name of this committee be changed to 'District Agricultural Committee," and explained that the new designation would widen the scope of the committee and bring about closer co-operation between the Director of Agriculture, Revenue Officers, and the cultivators. The Chairman seconded.

MR. FREEMAN proposed an amendment that the Committee be in future known as "Anuradhapura Food Production and Agricultural Committee," which was carried, MR. HOLLAND withdrawing his motion in favour of MR. FREEMAN'S amendment.

13. It was resolved on the motion of the CHAIRMAN that the Director of Agriculture be asked to provide an Agricultural Instructor for the North-Central Province.

MATALE.

Minutes of a meeting of the Matale Food Production Committee held at the Nalanda Rest House on the 17th January, 1923, at 3 p.m. with the Assistant Government Agent in the chair.

There were also present the Director of Agriculture, the Ratemahatmayas of Matale South and North, Messrs. H. D. Garrick, C. P. Anderson, R. A. Senior White, Agricultural Instructors M. B. Boange, V. G. Perera, G. de Silva, two visitors Messrs. R. O. Iliffe and S. W. Thambirajah and Mr. G. F. Abayakoon the Hony. Secretary.

The Minutes of the previous meeting were read and confirmed.

Eradication of Mistletoe from small holdings of cacao.—Discussed the question and resolved to endeavour to stimulate the better cultivation of cacao in the Matale District in the first instance by means of competitions with prizes; special consideration to be given to the eradication of mistletoe and other pests: The Divisional Agricultural Officer to be asked to formulate a scheme, and the Department of Agriculture to be asked to provide funds for the purpose.

Control of "Bunchy top" Disease.—Considered letter No. 5,265 of 15-12-22 from the Divisional Agricultural Officer regarding the opening of an experimental plot at Rambukkana for observing the disease. Held that at

present the incidence of the disease though widely dispersed is not sufficiently severe to be able to provide more information. Members undertake to report Divisional Agricultural Officer the results of their observations.

Agricultural Department Leaflets.—Considered Leaflet No. 19 *re* Cotton Cultivation and Leaflets Nos. 20, 21 and 22 on coconut caterpillars, etc. Further discussion postponed.

Experimental Station, Nalanda.—Tabled the Divisional Agricultural Officer's 5,267 of 15-12-22 and notes *re* different experiments that are being carried on at Nalanda. After the meeting all adjourned to the Experiment Station where the HON'BLE THE DIRECTOR OF AGRICULTURE and MR. ILIFFE explained to the members the nature and progress of the different plots.

TROPICAL AGRICULTURIST.—Read letter No. 5,309 of 18-12-22 from the Divisional Agricultural Officer *re* extending the circulation of the TROPICAL AGRICULTURIST. It was agreed to endeavour to increase the circulation in the District of the TROPICAL AGRICULTURIST and the leaflets that are periodically issued by the Agricultural Department.

Motions of Ratemahatmaya of Matale North.—Considered the questions put by RATEMAHATMAYA NORTH with regard to the sphere of action of the Food Production Committee, etc. He being satisfied with the explanation offered by the CHAIRMAN in respect of each question, withdrew the motions.

KEGALLE.

Minutes of the Meeting of the Kegalle Food Production Committee held at the Kegalle Town Hall on 31st January, 1923.

Present:—The Assistant Government Agent (in the Chair), Messrs. M. B. Mapitigama, J. H. Meedeniya, P. C. Dedigama and C. L. Ratwatte Ratemahatmayas, Messrs. R. P. Seneviratne, S. A. Molligoda, A. C. P. Canagasabai and A. F. Goonaratne (Hony. Secretary).

1. Minutes of the last meeting were read and confirmed.

2. Apportionments made for prizes for garden and paddy field competitions for 1923 were approved. It was also decided that the Village Committees of the District should be called for to contribute Rs. 80 to make up the amount required for the prizes.

3. Leaflets Nos 19 to 22 received from the Divisional Agricultural Officer were tabled.

4. Read letter No. 5312 of 18-12-22 from the Divisional Agricultural Officer *re* the TROPICAL AGRICULTURIST and Leaflets. Members who are willing to subscribe to the periodicals were requested to send in their names to the Hony. Secretary.

5. Read letter No. 5,264 of 15th December, 1922, received from the Divisional Agricultural Officer *re* "Bunchy Top Disease of Plantains."

6. Letter from Divisional Agricultural Officer *re* the transfer of Agricultural Instructor Banda to Kandy was read.

7. Messrs. Mapitigama, Ratwatte and Dedigama Ratemahatmayas gave a summary of the work done by the Agricultural Improvement Societies recently started in their divisions.

8. The working of the Co-operative Credit Societies was discussed. MR. P. C. DEDIGAMA RATEMAHATMAYA spoke at length on the benefits of these societies. It was considered that steps should be taken to popularise these societies.

9. The question of payment of huwandiram to Irrigation Headmen on the results of cultivation was discussed; Ratemahatmayas undertook to submit reports on the subject.

MATARA.

Proceedings of a Meeting of the Matara Food Production Committee held at the Kachcheri on 15th November 1922, at 2 p.m.

Present:—Mr. J. D. Brown (in the Chair) and the following gentlemen:—Messrs. O. C. Tillekeratne, E. Buultjens, G. Altendorff, F. Burnett, W. H. Schokman. Mudaliyars W. A. Ambesekera, P. F. W. de Livera, W. A. Perera, W. A. Wijesinghe and D. L Weerasinghe; Messrs. M. Joonoos, Dr. V. D. Gooneratne, J. E. Wijesinghe, B. Buultjens and Peries.

1. Read and confirmed the minutes of the meeting held on 31st July, 1922.

2. Resolved that transplanting competitions for Yala (August, 1923) be arranged in Weligam Korale and Gangaboda Pattu.

3. Resolved that with reference to Resolution 2 Rs. 100 be voted out of Government Grant for prizes to which sum Rs. 200 from Huwandirm funds should be added (the amount to be divided in 3 prizes of Rs. 75, Rs. 50 and Rs. 25 for each division).

4. Resolved that vegetable garden competitions be organised in Morawak Korale, Four Gravets and Kandaboda Pattu and that the month of July be fixed tentatively for the purpose of judging, subject to revision.

5. Resolved that with reference to Resolution 4 Rs. 300 be apportioned from the Government Grant for prizes. The amount to be divided in 3 prizes of Rs. 50, Rs. 30 and Rs. 20 for each division.

6. Resolved that the question of Vel-Vidane System be deferred for a further occasion.

PROGRESS REPORT OF THE EXPERIMENT STATION, PERADENIYA.

From 1st November, 1922 to 31st January, 1923.

TEA.

The crop has decreased since the last report. 4,693 lb. green leaf was picked for November, 3,865 lb. for December and 4,378 lb. for January, 1923.

The total output of green leaf for 1922 is 32,382 lb. from 11 acres.

The Dadaps in plot 144 were lopped after an interval of 3 months and yielded 6,800 lb. of green material per acre or 40 lb. per tree. The Gliricidia maculata in the ½ acre plot yielded 5,780 lb. per acre or 34 lb. per tree.

Specimens of diseased leaf were sent to the Botanist and Mycologist and they were reported to be attacked by Grey Blight.

Plot 150 (Albizzia) was supplied with two basket plants of Albizzia and the rest of the vacancies were planted with seed which had been soaked for 24 hours.

The manures applied annually were forked in, in the 2nd week in January, 1923, as per programme.

RUBBER.

The budding experiment started in October, 1922, resulted as given below. The Java or Deli method gave the best results, 44 out of 48 buds or 91·66% being successful. The Patch Method 29 out of 48 or 60·41% and the Diamond 24 out of 48 or 50% the average percentage on the whole being 67·36%. The buds were obtained from the 12 best yielders of the offspring of No. 2 tree Henaratgoda under individual yield experiment.

The spare acre plot in the Annual Economic area which was holed in November 20 ft. × 20 ft. on the quincunx has been planted out with budded rubber stumps on the 9th December, 1922. 30 stumps have already begun to sprout out of a total of 108. Gliricidia cuttings have been interplanted 20 ft. × 20 ft. apart.

CACAO.

5,146 lb. of cacao have been sent for sale in Colombo, the top price realised being Rs. 47·50 per cwt.

A round of canker treatment was started early in January and is still in progress.

All the old cacao plots have been deep forked, as many leaves as possible being buried in.

The cacao needs pruning and cutting back. This will be carried out as soon as labour is available.

COCONUTS.

Some of the vacancies in the Fodder grass plots have been supplied. Seed nuts have been ordered for supplying the rest of the vacancies.

The different positions of planting in nurseries have resulted as follows :—

Date of Planting.	Variety.	Method.	No. Planted.	No. Germinated.
1/ 8/22	Java	Horizontal - -	12	6
,,	,,	Vertical - -	12	10
,,	,,	Slanting at about 45° -	12	11
,,	,,	In a position assumed when dropped from a height to a level piece of ground -	12	9

COFFEE.

6 Acres of coffee field planted in October1922—Jackson's Hybrid and Kent's Arabica.

In January 1923 5% of the plants from both varieties had failed, vacancies were supplied.

The plot has been clean weeded.

SUGAR-CANE.

Specimens of canes of all the varieties are being sent fortnightly to the Government Agricultural Chemist for analyses.

FODDER GRASSES.

A new plot of Kikuyu grass (*Pennisetum Longistylum*) has been planted in January.

A nursery of Napier's grass (*Pennisetum Typhoideum*) has been planted in November in a portion of plot 17 to be transferred later to the river bank.

FOOD PRODUCTS.

Coix Jabi Lachrymæ—2 plots of ¼ acre each A4 and A6 was sown in the Annual Economic area with seed obtained from a small plot in the Show plots.

Plot A4 was given a dressing of 50 lb. of Nitrate of Soda which was lightly mamotied in a month after sowing. Both the plots ripened irregularly. The yields are as follows :—

No. of Plot.	Date of Sowing.	Date of Flowering.	Started Harvesting.	Completed Harvesting.	Calculated Yield per acre.
4	22/6/22	25/9/22	28/12/22	27/1/23	26 bushels or 936 lb. per acre
6	do	do	do	do	33 bushels or 1,188 lb. per acre

A bushel of seed weighed 36 lb.

Maize.—Variety test. Three varieties of maize from U.S.A. were grown in June for comparison and their yields are as follows :—

Variety.	Area.	Date of Planting	Date of Flowering.	Date of Harvesting.	No. of cobs per acre.	Weight of cobs per acre.	Weight of selected per acre.	Remaining seed.	Total.
Brazo's white corn	½ acre	19/6/22	17/8/22	Oct. 1922	4028	1868 lb.	54 lb.= 1 bus.	1322 lb.= 24½ bus.	1376 lb. 25½ bus.
U.S. Selection 119 corn	¼ ,,	20/6/22	do	do	3240	1116 ,,	54 lb.= 1 bus.	916 lb.= 16 bus.	970 lb. 17 bus.
Singleton Strawberry corn	¼ ,,	21/6/22	do	do	2184	820 ,,	54 lb.= 1 bus.	552 lb.= 10½ bus.	606 lb. 11½ bus

ECONOMIC COLLECTION.

Vacancies have been supplied where possible.

All vacant plots have been sown with Daincha, Tephrosia Candida and Tephrosia Hookeriana seed for purposes of raising seed for use by paddy cultivators.

TUBERS.

Sweet Potatos.—12 varieties of sweet potatos have been dug up and cuttings of 12 varieties replanted.

Dioscorea yams—20 varieties of dioscorea yams have been dug up and 20 varieties replanted.

ROADS.

A further length of road has been completed and a further length of foundation laid.

LABOUR.

A few cases of chicken-pox and measles have occurred among the coolies. Steps have been taken to isolate them.

RAINFALL.

	Inches.	Rainy days.
November	11·21	17
December	6·19	5
January, 1923	14·86	12

H. A. DEUTROM,
Manager,
Experiment Station,
Peradeniya.

AGRICULTURAL EDUCATION

AGRICULTURE AS A VOCATION.

GUNDAPPA S. KURPAD, B.A.,

Vice-Principal, Mysore Agricultural School.

One hears on all hands, complaints that the proper type of student is not attracted to the Agricultural Colleges and Schools. By the proper type is meant those that have an active interest in the cultivation of their lands, in other words, those that would take up farming as their sole business. Most of the people who come to these institutions do possess lands, and it therefore becomes all the more interesting to inquire into the reasons which make so many young men fight shy of the farmer's profession.

At the present stage of the country's development, it is natural that most of the graduates turned out by the Agricultural Institutions are absorbed into Government service in the various branches. Both research worker, and executive officers are required by the various Departments of Agriculture and these colleges are now serving as a training ground for the recruits to the Agricultural Departments. After the Government requirements are met, there is always a certain number of young men left over, and it is some of these that seek some profession which has not the slightest relation to all their training and work in the agricultural colleges. It is then pertinent to ask why these young men choose deliberately to throw away a training, got after the expenditure of so much money, energy, and time. It cannot be that they look upon farming as a degrading profession or that farming cannot give them a decent livelihood, for the essence of their training has been to show them that farming is at least quite as honourable a profession as any other and that a decent living is always assured to the industrious and intelligent farmer. There must be other causes which drive young men away from agriculture.

It must be admitted at once that a good proportion of the young men seeking admission to agricultural colleges, do so with the express intention of entering service in the Agricultural Departments, and even among those whose ultimate goal is not Government service, many cannot resist the temptation of entering Government service especially if they happen to pass high. It seems, therefore, obvious that the business of agriculture does not look to them to be attractive enough to be pursued as their life's profession. This is a deplorable state of affairs, since it reflects credit neither on the men trained and sent out into the world by the various Agricultural Institutions, nor on the Institutions themselves. If the aspect of the business of farming had been tested in the college in the proper manner and if the instruction had been intelligently followed and appreciated, such an apathy towards farming would not exist. On the other hand, the students would be so enthusiastic about farming that the existing inducements for entering Government service would be insufficient to allure them. It seems as if

much stress is not laid on the business of Agriculture, as on Agricultural Research. It should not for a moment be understood that I am decrying Research. It is on Research work that the whole advance of Agriculture rests, and without it very little progress would be possible. Research is of the highest importance and requires the attention of the most capable workers in the field. But it is only a small proportion of the agricultural graduates that can engage themselves in Research work in the various Government institutions; the bulk of them have to seek some other line of service or take up farming as their profession. Since it is the avowed intention of the agricultural colleges to turn out men who will be thoroughly equipped to conduct farming on the most up-to-date and profitable lines, a good deal more stress ought to be laid on this portion of their training than is now generally done.

It must be emphasized here that although a great many people own lands, and are getting returns from their lands, still, most of them cannot be said to be following agriculture as a profession. In most cases the land is leased out to the cultivators and the only time when the owners realize that they possess lands is when they receive their portion of the produce of the land. So that it is more or less merely a compliment to say that they are farmers or agriculturists. It is only those who attend personally to the cultivation of their lands and who depend on the produce of their lands for their living that can be really said to be following Agriculture as a vocation. It is therefore worth while discussing what attractions and what disabilities, Agriculture possesses as a man's vocation, and to see if the attractions are sufficient to lure young men away from Government service and induce them to take up Agriculture as their life's business.

Whatever the kind of farming one follows, whether it is general or mixed farming where all kinds of crops are grown and all sorts of live-stocks are kept, or whether it is specialized farming where the farmer restricts himself to the intensive cultivation of one or two special crops or breeds only one or two kinds of live-stock, a farmer does not and cannot expect to make a fortune as is sometimes done in other professions. Men who have accumulated a fortune solely through farming are very few. While some other professions might enable one to accumulate a fortune rapidly, they are also capable of ruining him completely, equally, if not more quickly. In the case of Agriculture although there is not much chance of piling up a big bank balance, there is still less chance of a man being reduced to beggary. There is very little chance for speculation in Agriculture, and when honestly and intelligently followed, it yields a steady and comfortable income. Being out in the country, a farmer is not the victim of a city's various distractions, he is out of a congested atmosphere, breathing God's air in all its freshness, and can thus lead a more healthy life than his city brother. For those who prefer an open-air life to the restricted life of the city, this fact alone is enough to turn their thoughts towards farming. It is common experience that some every day requirements like milk and curds are atrociously adulterated and extremely dear in the cities, whereas out in the country, it is not so. Further, a farmer is his own master, he has not to please some officer or other at every turn, he is not worried with the constant dread that somebody might find some fault with something that he has done, but he can do what he thinks is right and rest content without any fear of rebuke from anybody.

It is only those who occupy subordinate positions under more or less capricious officers that can realize the amount of worry that is involved in Government service. This sort of incessant worry, coupled with unhealthy surroundings, soon makes a man a stranger to robust health and happiness and makes him a discontented, half-healthy, despondent human being. The truth of this will be realized by, I dare say, all the subordinate officers in this country. This is one side of the picture.

On the other side are all the facilities which go with city life, convenient shops for all commodities, schools and colleges for the education of the children, places of amusement, the company of people of the same social status, and all the bustle that is usually associated with cities. Further there is the attraction of power—of having belted peons about the house, of being able to order people about—that is associated with superior Government service. Many of the advantages which appear to be attached to life only in the city are now also obtainable by a man out in the country, thanks to the modern means of communication that are at his disposal. The automobile, the telegraph, and the telephone have helped to annihilate distance and put the country gentlemen as much within reach of city conveniences as his city brother. The absence of residential schools and suitable boarding houses in our cities makes the problem of education of the farmer's children a really acute one. Unfortunately, the Hindu community is so busy disintegrating through internecine squabbles that it seems to have little leisure for attending to such vital matters as affording proper facilities for the education of the children of the rural parts, by organizing proper boarding houses in cities and establishing proper schools in rural centres.

It must be admitted that it is mainly a matter of personal inclination which profession one chooses. What look to be advantageous to one, may be the very thing that seem disadvantageous to another. There are certainly cases where other considerations than personal inclinations have got more weight ; but it is to those who have not got any decided predilections either way and who would be all the better for some knowledge about the profession of Agriculture in deciding their vocations, that this article is mainly addressed. In order that this profession should be entered with a full knowledge of its requirements and exactions, it should be our business next to see what it is that makes a successful farmer.

First and foremost, a farmer should not be afraid of any kind of work and must be ready to put his hand to any work that comes across his way. This need not scare anybody away from farming, for it does not mean that the farmer should engage himself in strenuous manual labour day in and day out. All that is implied is, that when circumstances are such that he has to do strenuous work, he must be prepared to do it and not shirk it. Farming conditions are so fluctuating that no specific time-table can be followed as in factories. The farmer must be able to decide what he should do under certain conditions which he may not have encountered previously. This requires a fund of common sense and a little of intuition, neither of which are taught in any college. The farmer must possess the ability to control labour properly. Hard words and rough treatment drive labour away, and especially at the present time when on every hand we

hear the cry of scarcity of labour, everything should be done to attract labour on to farms. Kind words, sympathetic treatment and an attempt to understand the view-point of the workmen attract men to farms even when the wages obtainable there are no more than what is available elsewhere. Patience is doubly a virtue in a farmer. Any money and trouble spent on efforts to mitigate the lot of labourers will all be paid manifold in that the farmer will have a contented lot of labourers which means that he can get more and better work out of them. Perhaps the most important of all is self-confidence. A feeling that he is going to succeed in his business whatever happens ; and this is only born of accurate knowledge of what he means to do, and what difficulties are likely to crop up. It goes without saying that the kind of farming that one takes up must be such as appeals to him, for unless that is the case he is not likely to be interested in his work, and this interest is essential if he has to seriously think about the work he has to do, and plan out everything carefully. Above all the farmer must have plenty of grit in him. He must have the faculty of looking adverse circumstances in the face, and to smile whatever happens. Farming is not a soft *job*, and it is only he who takes things as they come, be they good or bad, serenely and with a determination to succeed, that will be successful. All this may look very formidable on paper, especially to one who is looking about him for a suitable vocation, but he need not be scared. Converted into practice it merely means that one must have his wits about him and must not be discouraged by things which may seem terrifying but may after all be trifling.

The foundation of farming is land, and a man must possess land, and a certain amount of capital to work the land, before he can become a farmer. A few words must therefore be said about the availability of land and capital for the prospective farmer, As has already been mentioned, most of the students who come to the Agricultural School at Hebbal do possess lands, as this is one condition of admission to the School. But in many cases this land is not held by them, but by their relatives, very few of whom seemed inclined to put the boys on the land. This can only mean one of two things, either they think that the boys have not got the stuff in them for a farmer's life or they have no confidence in the training obtained by their boys at the Agricultural school. It follows that either the parents and guardians of these boys sent them to the Agricultural School without any thought of what they were going to do with them after their training was over, or that they sent them there with the hope that they would somehow be taken into Government service. This is not a desirable state of affairs, and there must be a way of improving matters.

Arguing in this way, it is obvious that the elders of the community must give the lead if we are ever going to realize the ambition of seeing all the students of the Agricultural School turning their faces resolutely away from Government service and taking up farming as their life's work. The elders interested in the advancement of Agriculture which incidently also includes the well-being of the community should send to the school only such boys as take an interest in farming and are likely to become good farmers after coming out of the Agricultural School. The boys must have both the mental and physical equipment necessary in the making of a successful farmer. The elders, on the other hand, must have prepared matters, against

the boy's return, in such a way that they can start off on their careers without losing any time. It must not be a case of sending a boy somewhere especially to a place where he can get a scholarship for two or three years, put off every consideration of the boy's future till he returns, and shove him into any odd place that comes handy at the time. It may be that, under these conditions, the number of students in the school will be few, but that need not discourage anybody. We will be conscious that really good solid work is being done, and if progress is slow, it is none the less certain. A beginning in this direction might, I think, be made if a personal interview with the parents or guardians of boys entering the school, be insisted on, in every case, by the authorities concerned.

The question of capital need present no difficulty. It is incorrect to believe that, like other kinds of business, farming also requires a large amount of initial capital. On the other hand, one can suit himself to the amount of capital one can raise. It is, of course, evident that the greater the capital, the greater is the work that can be done always remembering the evils of over-capitalization. Farming can in most cases be begun with a capital of about a thousand rupees and as a man goes on, he can save or raise more capital as he wants. This small amount of capital can, without difficulty, be obtained by any student of the Agricultural School, from Government, on application to the Director of Agriculture. A modest beginning and a cautious advance are the secrets of success in farming on a small scale. If the young men who go out of the school can get over their diffidence about the future, and start work with a will to succeed, I have no doubt that they will meet with success.—JOURN OF THE MYSORE AGRIC. & EXPT. UNION, VOL. IV, NO. 4.

EXTENSION WORK.

Persons otherwise well informed often have little or no personal knowledge of the Schools of Agriculture in their area and the facilities they offer. Probably one of the most effective ways of keeping the farming public informed of the best methods to be followed and bringing them into touch with the local agricultural education and research institution and organizing them, is by means of the country agent. At any rate it is maintained in the United States that the country agents have been the most effective means of establishing a contact between the scientific workshop and the farm. In South Africa country agents have not yet been appointed, and other means have to be employed for making known the facilities offered in the way of education, research, and advice by the various Schools of Agriculture. At Glen every opportunity has recently been taken of making visitors to Bloemfontein acquainted with the work and function of the school. In May last a party of 70 members of the Dutch Reformed Synod were invited to Glen, and in September 150 members of the Presbyterian Church Congress were shown the various sections with their stock and equipment. Towards the end of the month 70 delegates of the Associated Chambers of Commerce visited Glen and left it equipped with some of the properties of a country agent; it is hoped that they will make full use of their exceptional opportunities of making known the school and the facilities it offers. Commerce and agriculture are mutually interdependent, and any progress in Agriculture is reflected to an equal extent in the commerce of the land.—JOURN. OF THE DEPT. OF AGRIC. U.S. AFRICA, VOL. V. No. 5.

POULTRY.

INTENSIVE POULTRY KEEPING FOR TOWN DWELLERS.

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(Abstracted.)

Town dwellers experience much difficulty in securing a supply of fresh eggs. The space available in many back-yards of town dwellings is too small for the erection of even a moderate sized poultry run. Much poultry food is on the other hand thrown away in the form of kitchen scraps, such as cabbage leaves, onion tops, potato peels, etc.

In the November issue (1922) of the Journal of the Department of Agriculture, Union of South Africa, is given the results of an experiment carried out at the School of Agriculture, Glen, for the purpose of ascertaining whether the town house-wife could by utilising all scraps of food from the table and kitchen secure in her own yard a supply of fresh eggs.

A house was made 4 ft. 6 in. wide by 6 ft. long by 4 ft. 6 in. high, framework of 1½ in. by 3 in. deal, except the corner uprights, which were 3 in. by 3 in. The framework was covered with 1 in. netting but opened at the top. Half the length of the house (the back half) was covered from top to bottom, on the sides and back, and along the bottom front and at the sides of the front half 2 ft. high from the ground, with malthoid, so as to serve at the same time as a house for sleeping and to keep in the scratching material, and also act as a windbreak for the birds. In the back part of the house on the cross pieces, 2 ft 3 in. from the ground, a platform was fixed, and on this a tin tray fitted to hold sand ; above this on either side a support of 1½ in. by 3 in. about 4 in. high, supported a perch 3 in. by 1½ in. on the flat, in the two corners at the back nests were made in a box 9 in. by 9 in. by 4 in. high. Across the top, 3 in. under the lid at the two ends, a piece of wood 1½ in. by 3 in. is fastened ; on this rests a wire-netting frame to act as a cover when the two lids are open for purposes of airing the house. There are two lids 4 ft. 6 in. by 3 ft. over the run and the other over the sleeping part ; these lids are also made of 1½ in. by 3 in. and are covered with malthoid. On the outside of the house at the front end, raised 4 in. from the ground on some bricks or such like material are three or four paraffin tins as the case may be. Through the end of the house 12 in. up a horizontal

slit, the length of the width of the house, is cut 3 in. wide ; in the tins and 2 in from their top a horizontal slit 3 in. wide is cut ; this is put against the trough and opening in the end of the house, and thus the birds can get their heads into the tins for their contents, but are unable to upset or foul them. One tin contains grit, shell, and charcoal mixed, another such mash food as may be given, the third water, and the fourth tin may be provided for table scraps boiled and dried off with bran.

Suspended to the centre cross piece of the frame inside the run is a wire-netting basket 9 in. by 3 in. by 6 in. into which all green food or table scraps are thrown. This prevents the floor being soiled or littered unnecessarily.

The floor of the house is used for scratching purposes by being kept dry and littered with straw, etc. All grain food was also thrown into this.

The tins were always kept full of mash, water, grit, etc. The dropping board under the perch was cleaned from the top once a week and the sand in it was renewed three times during the year. Feeding was done once a week and clean drinking water given.

The birds used in the experiment were six South African Utility White Leghorn pullets between six to seven months. These were taken at random from among 50 odd birds bred at the school. The birds were never allowed out of the house during the period of the experiment, viz., one year. The foods supplied consisted of bran, pollards, oats. wheat screenings, mealies, kaffir corn, grit and shell, charcoal, mealie bran, crushed oats and green food. 1470 eggs were laid and the experiment resulted in a nett profit of £3-5-8 or *sh*10-11$\frac{1}{3}$*d* per bird. The cost of production of a dozen eggs was a fraction more than 7*d* per doz.

Essentials. The birds must be of a laying strain. Food must not be allowed to turn sour. The floor must be kept dry. Insects must not be allowed to get into the house or on the bird's body.

WORLD'S POULTRY CONGRESS AND EXHIBITION.

A Circular from the Secretary of State for the Colonies has been received by the Ceylon Government intimating that the Spanish Government have extended an invitation to all Dominions and Colonies to participate in the Worlds' Poultry Congress and Exhibition to be held at Barcelona in Spain during the year 1924.

Full particulars of the Congress can be obtained from MR. BROWN, F.L.S., the President of the International Association of Poultry Instructors and Investigators.

APICULTURE.

THE CAUSE OF SWARMING.

GEO. S. DEMUTH,

(Continued from page 50 of Vol. LX, No 1.)

HOW FIELD BEES CONTRIBUTE TO SWARMING.

In 1916 I had several normal prime swarms from colonies that were made up entirely of bees old enough to work in the fields. This, of course, was unusual. Instead of there being an excess of larval food in these cases there should have been a deficiency, for old bees are supposed to elaborate larval food with difficulty. While a large proportion of young bees, no doubt, contribute to bringing on swarming, they alone evidently are not always the cause.

During the honey flow from clover in 1916 the plants apparently did not begin to yield nectar during the forenoons, since the bees did not go to the fields until about 11 o'clock. During these hot forenoons the field bees remained in the hives, crowded into the space below the frames and pushing upward among the combs, apparently waiting for the signal to rush to the fields. But few, if any, field bees could be found in the supers during the forenoons, but the brood-chambers, especially the lower portion, were literally jammed with these old workers. Just previous to the honey flow the field bees had been confined to their hives by several weeks of almost continuous rain, and when the honey flow finally came they stayed at home during the sultry forenoons waiting for the nectar to come. The season was the worst for swarming I have ever seen.

Since that time I have carefully gone over the back volumes of the bee journals for reports of seasons of excessive swarming; and thus far I find that, in every case, excessive swarming was attended by some factor which caused the field bees to stay in the hives during the heat of the day, such as rain or the flowers yielding only a part of the day.

While a large proportion of bees too young for field work is apparently conducive to swarming, if to these is added the great horde of field bees all trying to stay within the already crowded brood-chamber, the congestion and discomfort are too much for even the best-bred bees, which at such times often forget their manners and swarm most unreasonably.

ONE FACTOR ALWAYS PRESENT IN SWARMING.

Is it not now time to announce that the cause of swarming has at last been discovered? Fifty years of accumulated experience of bee-keepers waging a bitter fight against swarming indicates that one thing is always present in normal swarming, so far as the prime swarm is concerned, whether the hive is large or small, whether the colony is weak or strong, whether the queen is two years old or two weeks old. This one thing that is always present is a congestion of bees within the brood-nest, bringing to the colony a feeling of strength or a need for expansion.

If this congestion is brought about in weak and medium colonies by the colony's confining its work to the brood-chamber, leaving the supers and remote brood-combs vacant and crowding the queen by surrounding the brood-nest with honey, the congestion within this little brood-nest is as real and as potent in bringing on the swarming impulse as though the colony were 20 times as strong. The remedy is stronger colonies or a strain of bees less inclined to crowd the queen in this manner. If the congestion and discomfort are brought about by a lack of ventilation or shade, the remedy is obvious. If the congestion is brought about by a preponderance of young bees which are inclined to stay in the brood-nest too long, the remedy is to invite these youngsters upstairs by giving a set of attractive empty combs immediately above the brood-combs. If the congestion is brought about by field bees staying at home as they often do, even when nectar is plentiful, because the hive is already crowded and uncomfortable, the remedy is to invite more bees upstairs and give more ventilation if needed. How foolish for field bees to stay at home because the hive is not comfortable, when by doing so they only add to their discomfort!

Congestion of the brood-nest is a matter of distribution of the bees rather than numbers, for the hive can be expanded to accommodate all; but the bees must be induced to expand also as the hive is expanded. If most of the bees can be induced to leave the brood-nest, going either into the supers or to the fields, all is well. If the congestion in the brood-nest is caused by field bees staying at home during the heat of the day waiting for the flowers to begin to yield, the problem becomes more difficult; but here again anything that adds to the comfort of the colony should help. Anyway, it is some comfort to know the cause of swarming even though we have not yet learned how to remove it in every case.—GLEANINGS IN BEE CULTURE, Vol. L., No. 6.

BEE-KEEPING NOTES.

The much lauded Hubam, or "Annual Sweet Clover" as it is called, is not a clover in the strict sense of the term, just as Amaryllids, though generally spoken of as lilies, are not true lilies. Hubam belongs to the Genus *Melilotus*, and is not a *Trifolium*, the Genus to which ordinary clover belongs. The name Hubam commemorates PROFESSOR HUGHES of Alabama, who "evolved" it, and is made up of the first syllable of the Professor's name, and the third syllable of its native State.

A hive of bees kept by the Secretary at Lindula was last October found to be badly attacked by mites. The weather during the time was excessively wet. Specimens were sent to the Government Entomologist who reported that the mites appeared to be similar to those found on flies, beetles, etc. "These," he said, "are purely external and may possibly feed to some extent on their hosts. They belong to a different family from *Tarsonemus Woodi*." This is good news, as it was apprehended that the mites might have been the same as the dreaded *Tarsonemus*, associated with Isle of Wight disease.

The Secretary is forwarding specimens to Dr. RENNIE, the well-known Parasitologist of Aberdeen.

MR. SHANKS writes :—I have now two strong colonies of bees on twelve frames, each 13½ by 7 inches. One lot has brood in ten frames, the other in eight frames. Had I continued regular feeding I feel sure the queen would have filled the twelve frames of first lot. Two of the frames have only drone larvæ. Strange to say there have been no queen cells constructed in this hive, in which the queen is dark coloured ; while the other which has a yellow queen and not so many bees are continually building queen-cells.

I see from the bee Journals you send me that the tendency in America as well as England, is towards large hives and frames. I cannot but help thinking that the Ceylon Bee-Keepers' Association's temporary standard is too small. It may be that it follows the natural inclination of bees, but if Nature is to be copied there will be no advance made. To ascertain capacity of a colony, I would suggest that the best available queen should be selected, and kept fed if there is no honey coming in, and the standard size of frames and hive made even larger than that required under these conditions. In my experience a queen under favourable conditions, can deal with 43,200 cells, which is nearly double that reckoned for brood rearing under natural conditions. If the accommodations were limited it would just induce swarming."

DR. RENNIE, the eminent Parasitologist, in his presidential address to the *Apis Club* (Oxford) remarked : "There is little need on this occasion for me to emphasise, apart from the natural interest and charm connected with the study of bees, the growing importance of bee-keeping as a practical industry. Not only is the industry of some significance in Britain, but it is undesirable that there is within it the possibility of great development. But being an industry which depends primarily on an understanding and utilisation of natural processes, assured scientific knowledge is indispensable, and must be readily available for its successful pursuit."

Referring to *A. dorsata* bees, the late MR. SLADEN, writing about his visit to India, mentions that though these bees migrate, they do not (so he was informed) ascend the hills higher than 2000 ft. as the cold at higher altitudes is too great for them. But he states that in the Khasia Hills there is a dark variety of this bee, known as *A. zonata*.

MR. E. F. EDIRISINGHE, of St. Winifred's Farm, Newara Eliya, has kindly furnished the following information to the Secretary: "Bambaras are plentiful at this elevation, as well as the Danduwel (*A. florea*.) Me-messas (*A. indica*) also are found, but bambaras are more plentiful."

The point to be solved is whether the bambara is the same as the Low country species, or whether it is SLADEN'S black *A. zonata*.

Of *A. indica*, SLADEN writes : "It is common in the plains, but in the hills it disappears, and its place is taken by a larger, black bee, possibly a variety of it This black bee occurs throughout the Himalayas to a considerable elevation, and can evidently stand a good deal of cold. It is extensively kept in hives. At Darjeeling, 7,000 ft., I found a large apiary of these bees kept in modern bar-framed hives. No smoke or veil was used in manipulating them..... ..they do not sting. A remarkable feature about these bees is that the plates on the underside of the abdomen are soft and almost membranous.....In Ceylon I saw a similar bee to the one at Darjeeling, colonising in the stems of palms.....In Kashmir the bees differ from those in having dense, whitish hair on their underside,"

Apparently, it would be an advantage for bee-keepers in Ceylon to choose the dark variety.

MR. SHANKS writes that he has both varieties at Hanwella (K. V.)

Hubam clover is reported to be doing well at Kuruwita (Ratnapura District), elevation 866 feet and rainfall 200 inches.

C. D.

GENERAL.

EXPERIMENTS WITH KURAKKAN.

The following extract is taken from the Progress Report of the Acting Divisional Agricultural Officer, Northern Division, for the month of December, 1922.

The Variety test.—Yield statement is appended. The varieties will have to be compared very carefully in the next season for conclusive results.

Cultivation Experiment.—In this experiment 2 plots each 1/8 of an acre in extent were laid out. One plot was ploughed with the country plough and the other with the improved plough and the yields were 624 and 720 lb. respectively. As it is the first year of the experiment it is too short a time to draw definite conclusions.

Variety Test.

Name of Variety	Date of Sowing	Date of Germination	Date of Transplanting	Date of Flowering	Date of Harvest	No. of tillers	Height of plants	Quality of straw
1. Local B	9'8'22	12'8'22	1'9'22	10'10'22	20'11'22	2	2 ft. 6 in.	Coarse
2. Local W	,,	,,	,,	,,	,,	,,	,,	,,
3. H 41 Violet Mutant	,,	,,	,,	22 10'22	22'11'22	3	3 ft. 6 in	Fine
4. H. 2 Green open	,,	,,	,,	22'10'22	22'11'22	3	3 ,, 5 ,,	Fine
5. Bellary Ragi	,,	,,	,,	24'10'22	22'11'22	3	3 ,, 6 ,,	Fine
6. H. 13 Green open	,,	,,	,,	22'10'22	22'11'22	3	3 ,, 6 ,,	Very fine
7. H. 22 Violet open	,,	,,	,,	25'10'22	22'11'22	3	3 ,, 5 ,,	Fine
8. H. 3 Green open	,,	,,	,,	22'10'22	22'11'22	3	3 ,, 5 ,,	Fine
9. Jedesanga Ragi	,,	,,	,,	24'10'22	22'11'22	3	4 ,, 0 ,,	Fine
10. H. 42 Green Mutant	,,	,,	,,	22'10'22	22'11'22	3	3 ,, 5 ,,	Fine
11. H. 7 Green open	,,	,,	,,	22'10'22	22'11'22	2	3 ,, 6 ,,	Fine

YIELD PER ACRE.

Variety	Source	Age from date of transplanting to harvest	Yield per acre 1st series			Yield per acre 2nd series			Yield per acre 3rd series			Yield per acre Average for 1922			Yield per acre Average for 1921		
			Grain		Straw	Grain		Straw	Grain		Straw	Grain		Straw	Grain		Straw
			M.	lbs.	lbs.	M.	lbs.	lbs.	M.	lbs.	lbs.	M.	lbs.	lbs	M.	lbs.	lbs.
1. Local B. -	Jaffna	81 days	396	792	4,620	396	792	5,016	462	924	3,960	418	836	4,532	561	1,122	8,800
2. Local W. -	Jaffna	81 ,,	396	792	4,884	330	660	4,224	528	1,056	4,488	418	836	4,532	561	1,122	7,566
3. H. 41 Violet Mutant	Mysore	83 ,,	396	792	5,280	396	792	5,808	396	792	5,544	396	792	5,544	110	220	6,336
4. H. 2 Green open -	,,	83 ,,	396	792	5,148	528	1,056	4,488	396	792	4,752	440	880	4,796	165	330	6,072
5. Bellary Ragi -	Madras	83 ,,	528	1,056	4,488	396	792	4,620	396	792	4,356	440	880	4,821	319	638	7,436
6. H. 13 Green open -	Mysore	83 ,,	462	924	4,752	462	924	5,016	528	1,056	4,620	484	968	4,763	330	660	12,892
7. H. 22 Violet open -	,,	83 ,,	528	1,056	4,224	396	792	3,960	462	924	4,488	462	924	4,224	165	330	6,468
8. H. 3 Green open -	,,	83 ,,	528	1,056	4,224	396	792	4,356	528	1,056	3,696	484	968	4,092	242	484	7,005
9. Jadesanga Ragi -	,,	83 ,,	528	1,056	5,148	396	792	4,620	330	660	4,224	418	836	4,664	330	660	8,272
10. H. 42 Green Mutant	,,	83 ,,	396	792	4,092	462	924	3,696	330	660	3,960	396	792	3,916	99	198	6,745
11. H. 7 Green open -	,,	83 ,,	528	1,056	4,224	660	1,320	4,092	396	792	3,960	528	1,056	4,092	132	264	6,160

TANK SILT EXPERIMENT.

The following extract is taken from the Progress Report of the Acting Divisional Agricultural Officer, Northern Division, for the month of December, 1922.

This experiment is to ascertain the value of tank silt in improving areas newly brought under cultivation.

The land selected for this experiment is quarter of an acre in extent and received a general application of 20 cart loads of cattle manure per acre. The area was divided into 2 plots of equal size. One plot was manured with tank silt at the rate of 80 cart loads per acre and the other was not manured. The result is as follows :—

1. Plot manured with tank silt — 472 measures per acre
2. Plot manured with cattle manure alone } — 240 measures per acre

The total yield of the Kurakkan crop which occupied an area of about 1 acre is 512 measures of grain and 3080 lbs. of straw.

AGRICULTURAL COMPETITIONS IN THE SOUTHERN DIVISION.

The following competitions will take place in the Southern Division during 1923 :

GALLE DISTRICT.

Wellaboda Pattu.

(1) Best Plot of Transplanted Paddy

(2) Vegetable Garden Competition

Bentota-Walallawiti Korale.

(1) Best Weeded Plot of Paddy

(2) Vegetable Garden Competition

Talpe Pattu.

Vegetable Garden Competition

Hinidum Pattu.

Vegetable Garden Competition

Each Pattu will be awarded 3 prizes of Rs. 30·00, Rs. 20·00 and Rs. 10·00 respectively for each Competition.

MATARA DISTRICT.

Transplanted Paddy.

In Weligam Korale and Gangaboda Pattu

3 prizes each of Rs. 75·00, Rs. 50·00 and Rs. 25·00 respectively will be awarded to each Division.

Vegetable Garden Competitions.

In Morawak Korale, Kandaboda Pattu and Four Gravets.

3 prizes each of Rs. 50·00, Rs. 30·00 and Rs. 20·00 respectively will be awarded for each Division.

KALUTARA DISTRICT.

Pasdum Korale East.

Vegetable Garden Competitions.

Best Vegetable Gardens of Miscellaneous Products in the Korale.

3 prizes of Rs. 75·00, Rs. 50·00 and Rs. 20·00 will be awarded.

Best Plot of Brinjal.

2 prizes of Rs. 50·00 and Rs. 25·00 respectively will be awarded.

Best Plot of Cucumber.

2 prizes of Rs. 50·00 and Rs. 25·00 respectively will be awarded.

Best Plot of Capsicum.

2 prizes of Rs. 50·00 and Rs. 25·00 respectively will be awarded.

Transplanted Paddy.

Best transplanted plot in	Agalawatta Palata—1st Prize,	Rs. 25·00
Do	Bellana Palata	do
Do	Magura	do
Do	Meegahatenne	do
Do	Welagama	do
Do	Warakagoda	do

Entries for Competitions in Galle and Matara Districts will be closed on June 30, and in Kalutara District on March 30, 1923.

Competitors should send in their names either to the Mudaliyar of the Korale or Pattu, or to the Agricultural Instructor of the District.

Rules governing these Competitions can be had from the Divisional Agricultural Officer, Galle, or the Agricultural Instructor of the District.

THE CULTIVATION OF GINGER.

R. G. BARTLETT,

Assistant Fruit Expert.

Ginger is the dried underground stem of a plant that grows wild in South-eastern Asia and some of the islands of the Malay Archipelago, but is cultivated in South America, the West Indies (more especially in Jamaica), and in the Philippines and Ceylon.

The plant requires a rich soil, the most suitable being a heavy black loam with a clay sub-soil, possessed of plenty of moisture and well-drained. Good potato soil is highly suitable. As the crop is gathered in April or May frosts do not affect it, but it should be grown where it will get a fair amount of sun. Flats are better than ridges.

The land should be thoroughly prepared by ploughing and harrowing to bring it into condition for planting in September. Drills are opened out 4 inches deep at distances of 2 feet apart, and the fertiliser to be applied is mixed with the soil in the bottom of the furrows. A couple of hundredweight of mixture of equal parts of superphosphate and bone-dust has been found a satisfactory dressing. The sets, which should consist of two eyes (growing points), are placed flat on top of the mixed manure and soils in the drills at a distance of 8 or 9 inches apart and covered to a depth of 3 inches. A mulch of dry grass 3 or 4 inches wide is placed along the drills over the sets to minimise evaporation and prevent the surface of the ground from setting hard.

Cultivation consists of stirring the soil and keeping down the weeds.

The crop is harvested about April, when in the flowering stage; if left longer it gets too tough and too hot for use. Special care must be taken not to injure the "hands" or rhizomes in digging them. A garden fork is the tool mostly used for the purpose. Practically no preparation is given to ginger before marketing, beyond freeing the hands of soil and placing them in sacks, care being taken to reject "plant ginger." These pieces are sometimes planted a second season when eyes are still present.

From 2 to 4 tons of ginger per acre is considered a fair crop according to the nature of the soil and the season. The price obtained in Brisbane recently was 1*s*. 6*d*. per lb., jam factories being the main consumers.

As the work of harvesting is tedious, and as the local market is only limited, the trade being accustomed to getting their supplies overseas, a beginner would be well advised to plant only a small area—say a quarter of an acre.

Green ginger for plants is obtainable from Chinese importers as well as many of the leading seedsmen.—AGRIC. GAZ. OF N.S.W., Vol. XXXIII, Part II.

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MARKET RATES.

MARKET RATES FOR SOME TROPICAL PRODUCTS.

(FROM LEWIS & PEAT'S LTD., LATEST MONTHLY PRICES CURRENT) LONDON.

GOODS	QUALITY	PRICE	PER	PKGS	POSITION	MARKET
COPRA—						
" ...	Malabar ...	Nominal	ton	Bags	C.i.f. U.K.	Steady
" ...	Ceylon ...	£27	"	"	" "	"
" ...	Straits [F.M.S.] ...	£25 10/		"	" "	"
OILS—						
Coconut Oil ...	Cochin ...	45/	cwt	Casks	C.i.f. U.K.	Steady
" ...	Ceylon ...	41/	"	"	" "	"
Palm Oil ...	Lagos ...	£35	tons	"	Spot "	" but quiet
" ...	Congo ...	£32	"	"	" "	"
Palm Kernel Oil ...	Crushed ...	37/	cwt	Naked	" "	Quiet
PALM KERNELS—	West African ...	£17 15/	tons	Bags	Ex quay L'pool / Spot U.K.	Steady
SEEDS—						
Castor Seed ...	Bombay ...	£16 17/6 a £18	tons	Bags	C.i.f. U.K.	Steady
" ...	Madras ...	£15 17/6	"	"	" "	"
Sesame Seed ...	Bombay ...	£21 5/	"	"	" Continent	Quiet

ESSENTIAL OIL.

(From Perfumery and Essential Oil Record, Vol. 14 No. 1).

Camphor Oil.—Cheaper at 80s. per cwt. for white in drums on spot and at 60s. to 70s. for brown as to package.

Cinnamon Leaf Oil.—is worth 4¼*d.* per oz. with c.i.f. at 3 9-16*d.*; Mysore is quoted at 6*s.* 6*s.* per lb. spot.

Cinnamon Bark Oil.—Genuine B.P. is worth 6*s.* 6*d.* per lb., but there are factitious oils at various prices, against which seekers for pure will be on guard.

Citronella Oil.—Ceylon firmer, with business done at 2*s.* 6*d.* per lb. for ordinary quality in quantity on spot, in which position some now want 2*s.* 6*d.* There is an absence of offers from the source, but 2*s.* 6*d.* c.i.f. is quoted elsewhere. Java has been in strong demand with a good business done on spot at 3*s.* 4½*d.* to 3*s.* 6*d.* in original drums; to arrive, at 3*s.* 6*d.* c.i.f. is wanted.

Lemongrass Oil.—2 9-16*d.* per oz. still rules for quantity on spot; the quotation from primary centres is 2⅜d. c.i.f.

COLOMBO.

(From Weekly Prices Current on 12th February, 1923, published by the Chamber of Commerce).

			Rs. c.	@	Rs. c.
Cardamoms					
All round parcel well bleached	-	per lb.	2 25	,,	2 60
,, medium	-	,,	1 90	,,	2 20
Special Assortment O and 1 only	-	,,	2 60	,,	2 90
Seeds - -	-	,,	0 00	,,	2 00
Green - -	-	,,	2 05	,,	2 20
Cinnamon Quills.—(At Buyer's Stores)					
Ordinary assortment (in bales of 100 lb. nett)	-	,,	—	,,	0 53½
No. 1	-	,,	—	,,	0 55½
No. 2 - -	-	,,	—	,,	0 54½
No. 3 - -	-	,,	—	,,	0 52½
No. 4 - -	-	,,	—	,,	0 50½
Cinnamon Chips.—Maradana (At Buyer's Stores)					
(in bags of 56 lb. nett) per candy of 560 lb.	-			,,	52 00
Cacao.—(At Buyer's Stores)					
Estate—Finest -	-	per cwt.	50 00	,,	51 00
,, Medium -	-	,,	38 00	,,	45 00
,, Common (Black) -	-	,,	25 00	,,	30 00
Coconut—(Desiccated). Granulated goods					
(Delivered at Wharf or Buyers' Stores) Medium Fine					
Assortment 50% 50%	-	per lb.	0 22	,,	0 22¼

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 31st JANUARY, 1923.

Province, &c.	Disease.	No. of Cases up to date since Jan. 1st. 1923.	Fresh Cases	Recoveries.	Deaths.	Balance Ill.	No. Shot.
Western	Rinderpest	46	46	9	37	—	—
	Foot-and-mouth disease	878	78	568	2	308	—
	Anthrax	—	—	—	—	—	—
	Rabies	1	1	—	—	—	1
Colombo Municipality	Rinderpest	6	6	1	5	—	—
	Foot-and-mouth disease	65	65	65	—	—	—
	Anthrax	—	—	—	—	—	—
	Rabies	—	—	—	—	—	—
Cattle Quarantine Station	Rinderpest	28	28	3	12	13	—
	Foot-and-mouth disease	—	—	—	—	—	—
	Anthrax	13	13	—	13	—	—
Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	49	49	14	—	35	—
	Anthrax	—	—	—	—	—	—
Southern	Rinderpest	Free					
	Foot-and-mouth disease						
	Anthrax						
Northern	Rinderpest	Free					
	Foot-and-mouth disease						
	Anthrax						
Eastern	Rinderpest	Free					
	Foot-and-mouth disease						
	Anthrax						
North-Western	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	192	192	138	19	35	—
	Anthrax	—	—	—	—	—	—
North-Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	26	26	25	—	1	—
	Anthrax	—	—	—	—	—	—
	Piroplasmosis	5	5	—	5	—	—
Uva	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	4	4	4	—	—	—
	Anthrax	—	—	—	—	—	—
Sabaragamuwa	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	117	117	55	2	60	—
	Anthrax	—	—	—	—	—	—

G. W. STURGESS,
Government Veterinary Surgeon.

Colombo, 9th March, 1923.

METEOROLOGIAL NOTES.

(*Continued from next Column.*)

Mean temperatures were above average at Nuwara Eliya and in a good deal of the hill country but below average at all the coast stations except Colombo. Humidity and amount of Cloud were above average at almost all stations and mean wind velocities were on the whole about normal with a slight tendency to be above rather than below. The highest velocities recorded were at Hambantota on the 8th and Mannar on the 9th i.e. in the front quadrant of the depression.

A. J. BAMFORD,
Supdt. Observatory.

METEOROLOGICAL.

JANUARY, 1923.

Station	Temperature: Mean Daily Shade	Temperature: Difference from Average	Mean Humidity	Mean amount of cloud 0=clear, 10=overcast	Mean Wind Direction during month	Daily Mean Velocity.	Rainfall: Amount	Rainfall: No. of Rainy days	Rainfall: Difference from Average
	°	°	%			Miles.	Inches		Inches
Colombo Observatory	79·4	+ 0·4	80	6·2	N	131	6·96	17	+ 3·63
Puttalam	77·4	- ·0	82	4·8	NNE	130	9·75	15	+ 7·20
Mannar	78·4	- 0·4	82	6·8	NE	279	8·25	14	+ 5·23
Jaffna	77·2	- 0·2	84	7·4	NE	122	14·40	13	+12·09
Trincomalee	77·1	- 1·7	88	7·4	NE	210	19·56	19	+13·27
Batticaloa	77·3	- 0·5	90	7·6	NE	208	21·80	23	+11·82
Hambantota	77·8	- 0·6	84	5·3	NE	284	5·02	16	+ 1·71
Galle	77·8	- 0·4	86	6·6	W	110	6·56	17	+ 3·84
Ratnapura	80·2	+ 0·4	78	7·0	—	—	7·14	18	- 1·84
Anu'pura	76·4	- 0·1	85	7·0	—	—	21·16	19	+17·53
Kurunegala	77·5	- 0·5	82	6·0	—	—	12·77	15	+ 9·37
Kandy	74·8	+ 0·4	80	5·9	—	—	17·28	17	+12·29
Badulla	69·9	- 0·3	90	8·4	—	—	19·28	27	+ 9·76
Diyatalawa	64·8	+ 0·2	86	7·5	—	—	10·99	25	+ 5·02
Hakgala	58·1	+ 1·1	93	7·5	—	—	16·48	22	+ 7.03
N. Eliya	59·4	+ 2·0	81	7·0	—	—	11·09	18	+ 5.54

The rainfall of January was heavy throughout the Island and Kalutara, Buttala and Lahugalla were almost the only stations that failed to reach their average for the month. On the other hand stations that passed their average with over twenty inches to spare were numerous, and lay for the most part in two main groups, namely on the N. E. shoulder of the hills east of Matale from Gammaduwa to Nitre Cave, and in and around a strip running westward from Trincomalee to Madawachchiya.

In the former group the totals for the month included Hendon 63·0 inches, St. Martin's 66·3, Dooroomadella 50·4 and Gammaduwa 39·4 while further to the South East Keenakelle 42·5 inches and Ledgerwatte 33·4 may be mentioned. The second group included Puliyankulam 34·0 inches and several stations at about 30 inches i.e. not quite such high figures though as the averages are smaller, the offsets are comparable to the cases further south.

The distribution in time during the month was interesting. In the first few days rain was chiefly, though by no means exclusively, on the eastern side of the Island. From the 7th to the 12th there was an unusually well defined example of the passage of a depression across the Island which gave heavy rain all over the North and East of the Island and particularly on the North East shoulder of the hills. On the 7th Keenakelle recorded over 6 inches and on the 8th there were a number of reports of over 3 inches, but it was on the 9th that the heaviest rain occurred. On that day most of the stations in the areas referred to above as particularly wet recorded over 6 inches, including Hendon 13·4, St. Martin's 12·5, Dooroomadella 8·3, Nilloomally 8·2, Keenakelle, Kurundu Oya and Ledgerwatte between 7 and 8 inches.

The aftermath of thunderstorms that usually follow such depressions was in evidence during the next few days, particularly on the 14th when Hendon had 10·4 St. Martin's 6·07, Dooroomadella 7·6, Gammaduwa 7·3 and Kurunegala 5·4 inches. From the 17th onward the weather was comparatively fine for a few days, but on the 21st there were again signs of it becoming less settled and on the 24th and 25th there was heavy rain chiefly in the northern half of the Island though not the extreme north. On the next few days there was very little rain but on the 30th though rain did not occur over a large area, it was heavy in the neighbourhood of Deniyaya e.g. Anningkande 5·8 inches.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 28th FEBRUARY, 1923.

Province, &c.	Disease	No. of Cases up to date since Jan 1st 1923	Fresh Cases	Recoveries	Deaths	Balance Ill	No. Shot
Western	Rinderpest	49	3	9	39	—	1
	Foot-and-mouth disease	1722	844	1477	3	242	—
	Anthrax	—	—	—	—	—	—
	Rabies	1	—	—	—	—	1
Colombo Municipality	Rinderpest	8	2	1	7	—	—
	Foot-and-mouth disease	74	9	73	1	—	—
	Anthrax	—	—	—	—	—	—
	Rabies	—	—	—	—	—	—
Cattle Quarantine Station	Rinderpest	28	—	15	13	—	—
	Foot-and-mouth disease	6	6	4	—	2	—
	Anthrax	33	20	—	33		—
Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	68	19	58	—	10	—
	Anthrax	—	—	—	—	—	—
Southern	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	230	230	163	3	64	—
	Anthrax	—	—	—		—	—
Northern	Rinderpest	Free					
	Foot-and-mouth disease						
	Anthrax						
Eastern	Rinderpest	Free					
	Foot-and-mouth disease						
	Anthrax						
North Western	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	313	121	253	36	24	—
	Anthrax	—	—	—	—	—	—
North Central	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	26	—	26	—	—	—
	Anthrax	—	—	—	—	—	—
	Piroplasmosis	6	1	—	6	—	—
Uva	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	4	—	4	—	—	—
	Anthrax	—	—	—	—	—	—
Sabaragamuwa	Rinderpest	—	—	—	—	—	—
	Foot-and-mouth disease	354	237	231	2	121	—
	Anthrax	—	—	—	—	—	—

G. W. STURGESS,
Government Veterinary Surgeon.

Colombo, 9th March, 1923.

METEOROLOGICAL

FEBRUARY 1923.

Station	Temperature: Mean Daily Shade	Temperature: Difference from Average	Mean Humidity	Mean amount of Cloud 0=clear 10=overcast	Mean Wind Direction during Month	Daily Mean Velocity	Rainfall: Amount	Rainfall: No. of Rainy Days	Rainfall: Difference from Average
			%			Miles.	Inches		Inches
Colombo Observatory	78·9	- 0·9	78	3·0	VAR.	100	0·01	1	- 1·83
Puttalam	77·8	- 0·8	79	1·7	,,	118	0·00	0	- 1·28
Mannar	80·0	- 0	76	3·0	,,	185	0·00	0	- 1·30
Jaffna	79·2	+ 0·2	77	3·0	ESE	138	0·08	1	- 1·14
Trincomalee	79·3	- 1·0	78	3·4	E	145	2·22	1	+ 0·14
Batticaloa	79·0	+ 0·6	80	3·9	NE	181	0·09	1	- 3·26
Hambantota	78·8	- 0·2	78	2·2	E	271	0·38	2	- 1·09
Galle	78·9	- 0·5	80	3·6	VAR.	115	1·75	2	- 0·97
Ratnapura	82·2	+ 1·2	60	3·1	—	—	0·87	6	- 3·56
Anu'pura	78·8	+ 0·8	73	4·0	—	—	0·00	0	- 1·55
Kurunegala	79·2	- 0·8	72	3·8	—	—	0·00	0	- 1·61
Kandy	76·8	+ 0·8	72	1·3	—	—	0·02	1	- 2·25
Badulla	70·8	- 0·2	81	4·6	—	—	0·17	2	- 2·90
Diyatalawa	65·0	- 0·6	73	4·8	—	—	0·04	1	- 2·46
Hakgala	57·1	- 0·7	81	5·1	—	—	0·04	2	- 3·21
N. Eliya	55·6	- 1·9	72	3·4	—	—	0·04	2	- 2·03

February is normally the driest month of the year, but in 1923 its rainfall was far below even the low February averages, and nearly half the stations in the Island recorded no rain at all. These stations consisted of practically all those in the North-Western Province and North-Central Province, the Northern parts of the Western Province and Sabaragamuwa, a good deal of the Central Province including such centres as Matale, Pussellawa, Hatton, and Maskeliya and about half the stations in Uva and the Northern Province. In every province there were stations that failed to record any rain, though the Eastern and Southern Provinces were not quite so badly off in this respect as the rest.

At Colombo the last record of a calendar month without rain is still held by February 1876. February 1923 just failed to equal it, thanks to 0·01 inch on the 28th!

Among the few stations that reached their average for the month Kirama (6·68) and Urubokka (5·82) got most of their rain on the 4th and 28th. Sudupanawela (Uva) with 6·19 inches may also be noted, but Trincomalee which is the only station in the table above that passed its average concentrated its month's total into a single day the (21st).

The mean temperature offsets in the table above do not show a very consistent type but if maximum and minimum temperatures are considered separately it will be found that the day temperatures were consistently above and the night temperatures as consistently below their respective averages: i.e. the range from maximum to minimum was unusually great. The lowest minimum temperature in air at Nuwara Eliya was 32°·9 but the minimum on grass got below freezing point several times. At the other extreme Ratnapura recorded 96°·4 on the 24th followed by Kurunegala with (94°·2).

Humidity and amount of cloud were both below average and atmospheric pressure slightly so. The wind velocities were about normal.

A. J. BAMFORD,
Supdt., Observatory.

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