
BRIT. MUS. (N.H.)
ENTOMOLOGY

Colony of Seychelles.

ANNUAL REPORT

ON

AGRICULTURE AND CROWN LANDS

FOR THE

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AGRICULTURE AND CROWN LANDS

ANNUAL REPORT FOR 1917.

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CHAPTER I.

EXPENDITURE, RECEIPT, SALE OF PRODUCE &c.

	Rs	c.
Sale of produce	1,586	82
Royalty on guano	2,485	34
Export duty on guano	2,019	78
Rent of Crown Lands	20,710	09

The total expenditure under Agriculture and Crown Lands amounted to Rs 11,394.47.

The principal plants sold were the following:

Coffee robusta and allied varieties (from Java).
Palm Oil (Eleis guineensis) (from W. Africa).
Cedars (Casuarina equisetifolia).
Mangoes (Mangifera indica) (from Mauritius).
Groundnuts (Arachis hypogea) do.
Sweet patatoes (Ipomea batatas) from Brazil, Mauritius and W. Indies.
Jerusalem artichoke (Helianthus tuberosus).
Cowpeas (Vigna catjang) non-trailing varieties from Washington U. S. A.

Among the plants successfully introduced during the year the following may be mentioned:

15 varieties of sweet potatoes from Mauritius.
3 varieties of Groundnuts from Mauritius.
7 varities of Coffee robusta from Java.
Nephelium lappaceum (fruit) „
Cordia myxa (ornamental) from Egypt.
Feijoa sellowiana (fruit) „
Galphimia brasiliensis (ornamental) from Egypt.
Zizyphus spinachristi (ornamental) „
Date palm (Phœnix dactylifera) 4 varieties from Egypt.
Cocos romanoffiana (ornamental) „
Solanum warsewiezci „
Lansium domesticum (fruit) from Java.
Terminalia arjuna (dye) „
Durian (Durio zybethinus) „
Eugenia maltia „
Uvaria rufa „

CHAPTER II.

STRIKING SPECIES WHICH FLOWERED OR FRUITED FOR THE FIRST TIME.

Sandoricum radiatum.—This very handsome and still insufficiently known fruit tree from Java produced ripe fruits at Barbirons and at the Botanic Station. Seeds were introduced from Java in 1912. It is beside an excellent shade tree with a dense head and is very ornamental owing to the old leaves turning red before falling. The fruit is large attaining a diameter of nearly 3 inches and the sweet pulp inside is arranged like that of the mangosteen. The thick rind is, it appears, turned into jams in the Philippines.

2. Mangosteen (Garcinia mangostana) (from Malaya).—One of the few trees introduced in 1903 flowered or fruited abundantly at Capucin Crown Land this year (1917). The flowers appeared at the beginning of the year and the fruits ripened gradually from May to June. Trees of the same age planted at Victoria have not yet flowered although they are of the same height. For this and other reasons it seems that this unique fruit tree is more at home on the hills than in the low country. It does best in sheltered and damp ravines. At an elevation of 1200 feet the fruits produced this year were much larger than the fruits produced now and then at Bel Ombre (low country), where there is a tree growing in the yard of the Convent. It is believed that this tree was introduced by the late Sultan of Perak when he was a political prisoner in Seychelles more than 30 years ago.

3. Durian (Durio zibethinus) (from Malaya).—The 6 fruits mentioned last year matured in April and were not fully developed. My impression is that this tree like the mangosteen is more at home on the hills or on the alluvial flats of the low country than on the rocky grounds such as those of the Botanic Station. It is exacting in its requirements as regards soil. The fruits however produced fully ripe seeds and were found excellent by many persons although some declined to eat them. Several trees flowered again this year in October but the flowers did not set.

4. As usual economic palms other than Palm oil and Palmyrah palm dealt with in preceding reports have received the attention of this department during the year. Mention is made of two palms: 1. date palms from Egypt, 2. Cohune nut palm of which unfortunately only a few seeds have hitherto been received from British Honduras.

Regarding date palms it has been found impossible to introduce plants (suckers) owing to the present shipping difficulties. Seeds received from Egypt have germinated well; they belong to the following types:—

Data Palm "Zaglool"
„ "Ambat"
„ "Hayani"

and have been selected by the Director, Horticultural Section, Ministry of Agriculture, Egypt. Data palms are said not to do well in wet countries like Seychelles but there are several islands of the archipelago which are low lying and uncommonly dry during a large part of the year. It may be worth while experimenting with date palm in those districts.

The Cohune nut palm (Attalea cohune) from Honduras produces large nuts containing several kernels (3 to 5). Although these nuts are hard to crack they furnish an oil quite comparable to palm kernel and coconut oils, for which the demand is so great at present in Europe.

5. Palm oil (Eleis Guinensis) (from Nigeria).—Soft-shelled varieties of this palm received from the Cameroons in 1914 through the instrumentality of His Excellency the Governor of Nigeria fruited for the first time this year at the Botanic Station and at the "Palms" at Mont Fleuri (Victoria). The plants had been set out early in 1914 and were 3 years old. On other Crown Lands and at Government House, rows of the same varieties and also widely seperated rows of other types introduced from Lagos and Mauritius were more recently set out at various elevations. The first soft shelled trees which fruited at the Botanic Station were placed in a row of 8 in laterite soil of very poor composition.

No. 1 produced whorls of male and female flowers and 6 bunches of fruit during the year out of which 5 reached maturity but were in all cases very partially developed. In 2 cases the pericarp was dry and not fleshy. The shell was very thick (5 mm) in all cases; the percentage of the different parts of the devoloped fruits being on an average:

Weight of one fruit	10·5 grs	o/o.	
„ „ depericarped nut after drying ...	8·3 grs.		
„ „ „ „ „ „ ...	8·3 grs	100	o/o.
„ „ shell	6·0 grs	72	o/o.
„ „ kernel	1·7 grs	20	o/o.

No. 2 produced male flowers only; No. 3 produced 3 bunches of female flowers one of which came to maturity and gave the following results:—

	grams	o/o		grams	o/o
Weight of one fruit ...	2·50	...	weight of shell ...	0·96	56
„ „ depericarped nut	1·70	100	„ „ kernel ...	0·70	41·3

the shell was thin measuring only 2 m/m as compared with 5 m/m in No. 1.

Nos. 4, 5, 6, 7, 8 have borne male flowers only as yet.

At the "Palms" there are 14 trees in a row set out in damp alluvial soil. All the odd numbered palms, 1, 3, 5, 7, 9, 11, 13 are local strains, i.e., plants obtained from seeds of the original palm introduced in 1901 from Mauritius, and all the even numbered palms, 2, 4, 6, 8, 10, 12 are strains from the so-called soft shelled variety introduced from Nigeria. The latter plants are not yet 3 years old and the former are 1 year older.

No. 1. Local strains:—

First 2 whorls male flowers; next 2 whorls female flowers; next 2 whorls male flowers; no developed bunch as yet.

No. 2. Soft shelled strain:—

First whorl female flowers; second whorl male; third whorl male; fourth whorl male; fifth whorl 3 female flowers; the first female flower from whorl 3 developed into a partially matured bunch of dried fruits without pericarp.

Weight of one fruit ... 14.5 grams...100o/o | weight of one shell ... 10·3 grams...71o/o
weight of one kernel ... 3·7 grams...25o/o.

The large size of the nuts of this variety is notewhorthy but the shell is very thick measuring 7 m/m.

The second bunch from whorl 5 developed into a small head weighing 3000 grams and consisting of 43 fully developed fruits and 8 small ones.

	grams	o/o		grams	o/o
Weight of one fruit ...	18·3	...	weight of shell ...	6·8	80
„ „ pericarp ...	9·4	51·3	„ „ kernel ...	1·5	18
„ „ depericarped nut	8·4	100			

The shell is still very thick measuring 5 m/m.

The third bunch from whorl 5 was also undeveloped and contained only 22 full size fruits.

	grams	o/o		grams	o/o
Weight of one fruit ...	21·8	...	weight of shell ...	6·3	80
„ „ pericarp ...	9·5	43·5	„ „ kernel ...	1·3	17
„ „ depericarped nut	7·8	100			

The characters of the nuts still remain the same. They are all very large but thick shelled.

No. 3. Local strain :—

First whorl 2 male flowers ; second whorl 8 female flowers ; third whorl 3 female flowers ; fourth whorl 7 female flowers ; fifth whorl 5 male flowers.

2 flowers of the third whorl developed into a small head giving 17 ripe fruits.

	grams	o/o		grams	o/o
Weight of one fruit ...	11·7	...	weight of shell ...	4·4	83·0
„ „ pericarp ...	6·3	53·9	„ „ kernel ...	0·9	16·9
„ „ depericarped nut	5·3	100			

Note the large percentage of shell which measured 5 m/m.

One flower of the fourth whorl also developed into a head containing 8 full grown nuts which yielded.

	grams	o/o		grams	o/o
Weight of one fruit ...	26·8	...	weight of shell ...	11·2	78
„ „ pericarp ...	11·2	42·7	„ „ kernel ...	2·5	17.4
„ „ depericarped nut	14·3	100			

No. 4 soft-shelled strain :—

First whorl 5 male flowers ; second whorl 5 male flowers.

No. 5 Local strain :—

First whorl 4 female flowers ; second whorl 3 female flowers ; third whorl 3 female flowers ; fourth whorl 5 female flowers ; fifth whorl 5 male flowers.

No. 6 soft-shelled strain :—

First whorl 3 male flowers ; second whorl 3 female flowers.

One of the female flowers of the second whorl developed into a small head of 17 ripe fruits.

Weight of one fruit ...	10.5 grams	o/o	weight of shell ...	1·6 grams	...	45·5 o/o
„ depericarped nut	3·3 „	100	„ „ kernel	1·6 „	...	45·5 „
„ pericarp ...	4·2 „	22.7				

Note the high percentage of kernel. The shell measured only 2 m/m.

No. 7. (Local strain) first whorl 3 male flowers ; second whorl 3 female flowers.

No. 8. (Soft-shelled strain) first whorl 3 male flowers ; second whorl 3 male flowers.

No. 9. (Local strain) first whorl 3 male flowers ; second whorl 5 female flowers ; third whorl 3 male flowers ; fourth whorl 6 female flowers.

One female flower of the second whorl developed into a small head of 50 fruits.

Weight of one fruit ...	11·5 grams	o/o	weight of shell ...	4·0 grams	...	76 o/o
„ depericarped nut	5·2 „	100	„ kernel ...	1·0 „	...	19 „
„ pericarp ...	5·3 „					

The shell was thick and measured 5 m/m.

No. 10. Soft shelled strain :—

First whorl 10 female flowers ; second whorl 8 female flowers ; third whorl 2 female flowers.

No. 11. Local strain :—

First whorl 7 male flowers ; second whorl 2 female flowers ; third whorl 3 female flowers ; fourth whorl 4 male flowers.

No. 12. Soft shelled strain :—

First whorl 12 male flowers ; second whorl 9 male flowers ; third whorl 4 male flowers ; fourth whorl 2 female flowers.

One of the flowers of the fourth whorl developed into a very small head with only 8 fruits.

Weight of one fruit	...	11·5 grams	o/o	Weight of shell	...	3.7 grams	... 78·7 o/o.
,, depericarped nut		4·7 ,,	100	,, kernel		11·3 ,,	... 27·0 ,,
,, one pericarp	...	4.0 ,,	34.8				

The kernel measured 3 m/m.

The results obtained hitherto with these two sets of soft kernelled palms indicate that one tree at the Botanic Station in hard laterite soil and one tree at the "Palms" in damp alluvial soil out of 2 trees which fruited in each case came true to type. The very small head of No. 12 of the Palm series is to be discarded as being too much undeveloped although the shell is thin, being 3 m/m. The experiment will be continued as it would be most interesting to ascertain if 50 o/o of the tree will in all cases continue to breed true. The experiment, as already stated, is being duplicated at various altitudes and a comparison will also be made with trees derived from seeds obtained from Lagos in 1912. The undeveloped bunches in so many cases is accounted for from want of sufficient pollination owing to small number and young age of trees grown. For the sake of comparison a small head obtained from a tree 8 years old of local strain was examined and gave the following results :—

Weight of bunch	... ...	3,628 Grams		
Number of fruits	... ...	127 ,,		
Weight of fruits	... ...	1,676 ,,		
,, of stalk	... ...	1,950 ,,	... ...	o/o of fruits.
,, of pericarp (fresh)	...	660 ,,	... ...	39·3
,, of depericarped nut (dry)		986 ,,	... ...	58·3
				o/o of nut
,, of shell ...	... ...	755 ,,	... ...	76·5
,, of kernel	... ...	210 ,,	... ...	21·3
,, of oil ...	... ...	246 ,,	... ...	14·6 o/o of fruit.

The oil was extracted by the native process after fermentation. Some time ago when I asked an Ashanti political prisoner to extract some oil from a few bunches, I was surprised to see that he took away with him all residues including the sediment of the hard oil and the water in which the oil was boiled and skimmed off. This shows that no material from the fruits of the palm is lost and that such a precious palm is to the native of W. Africa what a coconut or Palmyrah palm is to an Indian.

It is no wonder that enquiries are being held in Europe at present as to the future of this wonderful palm. According to a report recently published by the Colonial Office it appears that the oil obtained from the pericarp of fresh fruits contains only 2 o/o of fatty acids and is fit for edible purposes. New machines have been invented for depericarping the fruits in which the nuts are thrown off clean by contrifugal power. It appears that the melting point of palm oil is exactly the melting point required for making margarine. The nuts are cracked by special machinery which must be power driven. The pieces of shell which remain among the kernels can be separated by immersion into brine or by using big jig tables as they use in mines. The kernels are either pressed after being ground small and heated or after grinding they are placed in a special cylinder and mixed with a fat solvent generally benzine or trichlorethylene. The solvent which carries the oil with it into another receptacle is recovered by distillation and the oil remains. The resulting cake (obtained by pressing) or meal (obtained by chemical extraction) is used for feeding pigs and other live stock. According to experiments, mostly German, milk fat is increased by 10 o/o by feeding cows with palm kernel cake. The cake does not turn rancid when it is heated to 70° c. The palm cake oil is refined and manufactured into edible fats. It is very similar to refined coconut oil and interchangeable with it. These two nut oils are replacing animal fats in the manufacture of margarine, lard and cocoa butter substitutes. The future of nut oil is thus very great and if fish and other cheap liquid oil can be transformed into edible fats by the hydrogenation process, the competition for many years to come is not to be dreaded as the demand for nut oils greatly exceeds the supply, they being used as well for manufacture of non edible products (soap). There is no plant which grows more easily than the palm oil. In West Africa the rule of the native for centuries past has been to throw the seeds broadcast on the land cultivated for one year or two in ground provisions and then abandoned for pastures new. The varieties of palms growing at present are not found present in the wild state in virgin jungle. There is no doubt however that the native method of planting them can be much improved.

The plants hitherto introduced have done well even in comparatively very poor soil but they have not yet emerged from the experimental stage and it is very likely that the yield of the trees will be much affected by the nature of the land. Trees grown in alluvial flats are much more developed than those grown on stiff laterite soil. The former will probably produce more and larger heads. Unfortunately this palm is attacked in Seychelles by a scale insect which is very destructive (Ischnaspis filiformis) and which owing to its small size and uncommon appearance is likely to be overlooked for a long time to come. This scale insect is also found on coffee, ixora, coconut, and such gardens plants as calathea. I do not think however that these parasites are worse than those of the coconut tree but in both cases they levy a heavy tax on these cultivated plants. The palm oil tree (like the coconut tree) seems to grow as well on coral land as on granitic land but no experiment have as yet been made on a large scale to show that it thrives on purely coral islands. A few plants set out in 1913 on coral land have however flowered as early as on granitic land. Coconut palm are so much handicapped by beetle diseases that another palm of the same hardy type would be a useful adjunct in Seychelles plantations even if it gives an inferior crop. There is no comparison hitherto made between the two crops side by side but as palm oil trees are produced so easily by seeds it is likely to become spontaneous on abandoned or waste land and in that condition it is well known that coconut trees will not bear at all. It is important to have in this undeveloped Colony plants which can grow wild or which can grow well without much trouble. As an example I can quote cinnamon introduced by Monsieur Poivre in the middle of the 18th century which has spontaneously established itself in the jungle, before it began to be known and exploited. It has produced at least a million Rupees worth of bark and essential oil from leaves in the last decade.

Already three different strains of the palm oil have been introduced into the Colony. The soft shelled variety is not common in Africa except perhaps in some parts of Nigeria and the Cameroon. It is considered by many as a freak of nature. The question of varietal difference between palms of various origin is however receiving the attention of the authorities in England and a most liberal sum have been placed by the Right Honourable the Secretary of State for the Colonies at the disposal of the Director of Agriculture S. Nigeria to carry out the necessary botanical investigations in connection with the breeding of palm oil. There is no doubt that this and other Colonies will soon be in a position to take advantage of the result of the investigation in question which will be followed with great interest.

6. Algaroba (Prosopis juliflora) is another tree of great economic importance which was introduced during the year through the instrumentality of Professor Piper of United States Department of Agriculture. The tree is a native of Texas and it is grown extensively in Hawaii for its fruits (beans) which are used as food for cattle, pigs and poultry. Seychelles, owing to the steepness of the land, is more suitable for trees than for herbaceous plants and folder grasses. Cattle food is very scarce since coconut cake (poonac) is no longer made in the Colony. For this double reason trees like Algaroba are a welcome addition to our economic plants. The trees introduced are about one year old, they are already 8 feet high. It is likely that they will flower and fruit in the second year as they do in their country of origin.

CHAPTER III.

DISTRIBUTION OF INFORMATION ON AGRICULTURAL MATTERS.

A series of leaflets were published during the year and distributed free to planters.

In the first the coconut beetle disease caused by Melitomma insulare was described and measures were suggested to combat it. Much stress has been laid on the control of this pest of the coconut trees which attacks them at the base of the stem and gradually kills them. As the palms remain sometimes several years before succumbing it was pointed out that other beetle and scale insect diseases find an easy prey on these weakened trees and as the melitomma beetle breed in coconut stems only and nowhere else, it was not only easier to combat the disease caused by them than the others but also by combatting the small beetle first the other diseases would find little ground to establish themselves. It would be of little use to check the ravages of the scale and other insects if the beetle is left boring into the stem of the coconut stems near the ground. Many planters have taken up the treatment of attaked trees which consists in scooping out by means of a gouge and burning all affected tissues containing the larvæ and tarring over the wounds. In many districts this simple treatment is however not adopted and the trees succumb yearly in great numbers. As a coconut tree in full bearing is worth at least Rs 20, a planter can well afford to spend 20 cents to combat the melitomma. But the nature and cause of the disease is not very apparent unless one cuts into the stem of the tree. This means that each tree in bearing has to be examined at least every year. This simple task is unfortunately still beyond the ordinary routine work of most estates in the Colony.

In the second leaflet the symptoms and nature of the stem bleeding disease of the coconut palm were described and the means of control, as adopted in Ceylon, explained. The disease is caused by a fungus (Thievalopsis ethaceticus) which decomposes the tissues of the trunk in one or several places. A black liquid oozes out from the decomposed tissues and runs down the stem. The treatment is the same as the one recommended against the melitomma. One and the same treatment is sometimes sufficient for both diseases in a given case although the bleeding disease generally affects higher portions of the stems. At any rate when the treatment against the melitomma is carried out the bleeding can be attended to at the same time with the same instrument. It is mostly the two diseases above mentioned that have induced the Seychelles planters to adopt the system of interplanting young trees in all plantations of the Colony whether or not attacked by diseases and whether old or young. The idea was to set out young trees in advance in order to supply the vacancies left by the premature death of the old

ones caused by the two diseases, each old tree being supplemented by a young palm growing under it. This method is of course bad as it is possible to cure the beetle disease and so keep the old trees living for over 50 years; while the young palms growing under shade develop soft stems and so become sooner the prey to these and other diseases. The old trees, which are also killed out by the beetles, themselves suffer from the young palms which take nourishment from the same ground and the consequence is that the crop of the tall trees is reduced considerably. The crop of the two sets of palms are not cumulative; the crop of one set is followed by that of the other but as a rule only after the death or removal of the first set. The crop on the land is reduced by half because about 50o/o of the trees succumb to the disease before the young palms, which have been handicapped themselves by the old palms whose place they have to take, have come into bearing. This means that with proper treatment the crop per acre would be doubled and there would be no necessity of interplanting young trees which are bound to become, by reason of shade and of root bound soil, an easy prey and a breeding ground for most coconut diseases in the future. Certain vacancies have of course to be filled in but each tree has to occupy a space of about 25 feet diameter at least by itself and a new supply should be made only in plantations where there are gaps larger than the above space.

The third leaflet refers also to a coconut leaf disease caused by a small weevil whose larvæ bore into the mid-rib of the leaves with the consequence that a great number of leaves are broken and torn off from each tree exposed to the heavy gales prevailing here generally in April. During the same gales I have noticed that by the twisting motion of the leaves many mid-ribs get split for a distance of several feet and along several lines between the base of the leaf and the leaflets. The small weevil has been identified under the name of Diocalandra frumenti by the Director of the Imperial Bureau of Entomology who reported that it appears to be considered as an insect of no special importance in the other areas where it occurs (Madagascar, Mauritius, Ceylon and Java). In boring into the mid-ribs a resinous substance oozes out which gives an indication to any one standing under the tree that the insect is at work. As the insect is common all over the archipelago on indigenous palms it has been recommended to cut the attacked leaves and to burn them on the spot. Another weevil of the same group was found in 1902 attacking coconut mid-ribs at Port Glaud. It was then identified as Eugnoristus Braueri. This insect is endemic in Seychelles and lives generally between the leaf bases of Verschaffeltia splendida (palmier latte) where humus accumulates. Some importance was attached to this question of weevils found attacking the mid-rib of coconut leaves as they are often mistaken for the red palm weevil or the banana weevil by those who have little knowledge of Entomology. Fortunately the red weevil does not exist in the Colony. It is 1 inch long or twice as long as the Eugnoristus which is itself double the size of Diocalandra. Our sugar cane weevil which bores into the under ground stems is Trochorropalus strangulatus and is half the size of Eugnoristus (i.e. about 5 m/m long). The last mentioned insect has been recorded in Mauritius. It does not attack coconut leaves. The bananas weevil (Cosmopolites sordidus) also does no harm to coconut trees.

In the fourth leaflet the question of planting Robusta coffee in Seychelles was discussed. This prolific variety was introduced from Java with its numerous subvarieties and they all seem to grow remarkably well at high elevations where the green scale disease is kept in check by the Cephalosporium fungus. Experimental plantations have come into bearing within 2 years and the crop was good. Unfortunately this coffee seems to be exacting in its soil requirements and planters have been advised not to take up planting it except in those red soils of special composition which are not baked and hardened by the sun like all other laterite soils of the Colony. The special soil occurs in dykes all over Mahé, Praslin, Felicité etc., where I have traced it and seems to originate from those blue stones called here "roches Maurice" which are so much like dolerites, basalts, etc. These rocks are of more easy decomposition than the granites and for that reason coffee like most other plants with a tap root and numerous surface feeders are more at home in the soil derived from them, since roots can penetrate deeper even when the rock is not entirely decomposed. The numerous streams of this Colony have cut their courses in these rocks of special texture and it often happens that deep precipices are formed and even flight of steps by the more rapid erosion of these rocks when they occur in dykes or veins between granitic boulders which are of much slower decomposition.

Much time was spent by the Head of this Department together with other members of the Community in Committee meetings for the purpose of protecting and developing the food resources of this Colony during the war.

An Ordinance was passed for the protection of breadfruit and Jack trees both of which yield such a large crop of edible fruits. Under Ordinance No. 24 of 1917 no one is allowed to destroy the trees in question without having received the written permission of the Curator of the Botanic Station.

As another outcome of the work of the Committee in question an Ordinance (Ordinance No. 1 of 1918) was passed to control the sale of foodstuffs (January 1918). The controlled foodstuffs are at present rice, sugar and flour.

The establishment of a Labour Bureau has also been provided for under Ordinance No. 2 of 1918 (January). Employers of labour and landowners are thus enabled to get reliable information as to would-be cultivators who are prepared to accept short leases of land or enter into contracts in respect of land.

An Ordinance was also passed (No. 3 of 1918) to provide for the increased cultivation of ground crops. The Labour Bureau is also empowered to apply this Ordinance by which any proprietor may elect to surrender any land to the Labour Bureau for its cultivation by any other person whether by contract or tenancy or otherwise provided such land shall not be cleared by fire except by or with the permission of the owner. Under the same Ordinance every proprietor is bound to plant, cultivate himself, or cause to be maintained in cultivation by his labourers, any part of his estate not exceeding 1/20th to the satisfaction of the Labour Bureau.

Many of the above Ordinances were discussed and amended by the Planters' Association which came into being during 1917 and was incorporated under Ordinance No. 4 of 1918 (January.) During 1917 the Agricultural body then known as the Agricultural Board consisting of members selected by His Excellency the Governor was several times requested by the latter to visit in company with him several estates and at these meetings it soon became evident that a Planters' Association would be of more benefit to the community than an official Committee. Under the auspices of the Government a committee was appointed to draw up the regulations and the members of the council of the Association were elected at a general meeting of planters in October 1917. Although the planters of this Colony are at present working under very depressed conditions caused by the shortage of freight it is generally believed that agriculture in this colony will progress more rapidly when the planters manage their own business.

As an outcome of discussions at the Food Committee meeting and at meetings of the Planters' Association the growing of the following plants which are already well known in the Colony has been recommended :—

1. Maize (Zea Mais). Owing to the exacting requirements of this plant in respect of humus its culture can only be developed in the outlying islands rich in guano deposits and on a smaller scale alongside the so-called marshes of the Seychelles group. It is estimated that about 500 tons of maize can easily be grown in this Colony, the yield in the outlying islands reaching and even exceeding 1 ton per acre. Measures will however have to be adopted against the weevil (Calandra Oryzae) which destroys the crop very soon after it is stored. Drying kills have been recommended.

2. Rice (Oryza sativa). The culture of this plant is well understood by the few planters who have taken it up in marshy ground. Some 50 years ago or more this cereal was extensively grown in this Colony. A few plants of the mountain rice had still survived and it is mostly this strain together with a variety from India that the rice planters have adopted. Unfortunately the handsome cardinal bird of Madagascar was introduced at about the same time and rice culture is now handicapped owing to the ravages of this paddy bird. The only measure of destruction which seem advisable but hardly workable owing to the financial depression of the colony is the payment of a bounty per each bird destroyed.

3. Manioc or Cassava (Manibot Utilissima) Is a plant more suited to the hills than to the marshes owing to the well known requirements of the plant in respect of dry land. Unfortunately the hill sides are very steep in this colony and much erosion is to be feared if wide areas are planted out. Every body knows that tons of surface soil sometimes exceeding several hundreds of tons in one year are washed down to the sea when manioc is set out on steep sides. The granitic rocks of this group of islands are of extremely slow decomposition and it is questionable whether the community has the right to ruin by erosion in a year the land accumulated during centuries which has been handed over to them by their forefathers and which they should preserve in at least as good as possible a state of fertility for their descendants.

It is not perhaps known that the labourers here eat manioc leaves. The young shoots are pounded and squeezed to get the juice out then cooked with salt fish and greatly relished.

4. Sweet potatoes (Ipomea batatas). This culture is very well understood by the inhabitant who prefer to plant sweet potatoes during the dry season (May to October) owing to the vines being inclined to develop more leaves than tubers in the rainy season.

Many outlying islands where the soil is flat are far more suitable to ground provisions than the islands of the Mahé group where the soil has been already worn out by erosion. A crop 20 to 100 times larger is obtained in the outlying islands and this means in many cases 50 acres being planted and looked after instead of 1.

5. Pumpkins (Cucurbita maxima) are everywhere grown especially in the outlying islands where they produce crops so abundant in good seasons that I have seen whaleboats being pointed out to me as units of measurement for the crop per acre. At the Agricultural Exhibition held in September 1918, at the request of the Committee of the Horticultural War Relief Fund, as many as 25 varieties of pumpkins were exhibited.

6. Bananas (Musa paradisiaca) are extensively grown and set out in the rainy season during which they make stupendous growth even in soils which are by no means rich. It is often not well understood that the roots of the bananas are very large and easily made to branch by cutting their ends and that for this reason friable soils are more suitable than the others. At the time when they are set out it is for this reason that the holes should be very large and filled in with good loam. There are no less than 18 varieties of bananas growing in this Colony. They were described in Kew Bulletin No. 6 of 1913. The most valuable crops are obtained from bananas St Jacques and Malagache which are plantains of the Congo type producing bunches worth R. 1 each. Among the newly introduced varieties the Gros Michel from Jamaica has been found to produce a large bunch after 6 months i.e, about 4 months earlier than the other tall plantains.

7. Beans. A good many beans are grown here extensively as an intercalary crop between manioc or maize. The numerous cow peas (Vigna Catjang) are the most commonly grown including several varieties of Chinese origin which produce cord like beans more than one foot in length. The pods are also used as string beans when they are young. Cow peas are also sometimes set out as a green manuring plant. The dry beans fetch about 10 cents a lb. in the local market. Being very rich in protein they make a good ration when used with rice, cassava, or sweet potatoes. The plants take only 2 months to mature their pods from date of sowing.

Sword bean (Canavalia ensiformis) is seldom grown although it is by far the hardiest plant of all the beans group producing in poor soil a stupendous amount of leaf and pods. The green pods are used as a vegetable and make excellent curries with meat or fish. The nearly mature beans make good soups. They are wrongly considered as being poisonous.

Kidney or French bean (Phaseolus vulgaris) only one variety producing black seeds is grown in gardens. The Rodrigues varieties however do equally well. It is noteworthy that leguminous plants black seeds are more used than those producing white or yellowish seeds. They are said to do better.

Lima bean (Phaseolus lunatus) is always found growing near the hut of all labourers. This is the pois d'Achery of Mauritius. The strains producing white or mottled seeds are preferred and are never considered as being poisonous. The Madagascar improved types (Pois du Cap) have never succeeded here the climate being two warm and damp and the soil not fertile enough. It could be tried in the outlying islands more successfully.

Ground nuts (Arachis hypogea) are seldom grown, many pods contain no seeds and a fungus disease on the leaves and stems soon develop owing to the wet climate.

Bambara groundnut (Voandzeia subterranea) is more hardy and much more cultivated than the ordinary ground nut. It belongs to a different tribe of leguminosæ. It can be grown in the wet season without damping off like the other ground nut. The seeds are excellent eating and their composition approaches that of an ordinary complete food ration. When ground the meal is used in the same way as the ordinary ground nut in soups, etc.

Amberique (Phaseolus aureus) 3 varieties of this plant are cultivated in this Colony. One producing yellow, the second black and the third green seeds. They are all relished by labourers. In Japan and India whence these plants originated the seeds are ground and used as a meal second to none as infant or invalid food. The yield is however small, and in harmony with the small size of the plant as compared with other leguminosæ. For this reason they do better during the dry season, heavy showers being detrimental to such small plants.

8. Arouilles (Alocasia and Colocasia). Alongside streams and marshes these aroids which belong to the W. Indian Taro and Indian dasheen types are extensively grown for their stout cylindrical rootstocks and tubers which are eaten boiled as a substitute for rice. The yautias (Xanthosoma sagittifolium) have lately been introduced from W. Africa. Besides the rootstocks the yautias produce smooth and round tubers borne on stalks a few inches long. For this reason the tubers can be snapped off without removing the plant which will continue to produce new tubers for a long time. The young leaves of the dasheens are however seldom or never used as vegetables as in Mauritius and elsewhere.

9. Brèdes (Amaranthus oleraceus) brède parietaire; Solanum nigrum (Brède martin) are often found cultivated in native gardens. The mynah (acridotheres tristis) is fond of the seeds of the latter which are spread by them undigested all over the Colony. The seeds of the former are also greedily eaten by the small Indian turtle dove (Geopelia striata).

10. Brinjal (Solanum melongena). This bushy herbaceous annual is grown in sandy soil near the beach where it gives better results than on the hills although in both cases the introduced plants from seeds have a tendency to degenerate rapidly. Very fine specimens were exhibited at the Show in September.

11. Bottle gourd or calebasse (Lageneria vulgaris) is exacting in its soil requirements and for this reason one comes across it more often in the outlying islands rich in guano deposits. Ripe fruits are used as flasks for carrying toddy or bacca.

12. Cabbage (Brassica olaracea) does not do well here owing to caterpillars which eat the head as soon as it begins to form. In places where the caterpillars are absent fairly good results are obtained.

13. Chocho (Sechium edule). This little "cucumber" which is so good eating is sparsely grown at high elavations. For the last few years it is even becoming scarcer owing to the ravages of scale insects which attack the growing vines and prevent them from fruiting.

14. Granadilla (Passiflora gnadrangularis) is often grown from seeds or cuttings. The large fruits are eaten boiled in the unripe state as a vegetable.

15. Horse radish tree (Moringa ptsrygosperma). This small tree is often cultivated for the sake of its leaves which are eaten as spinach. The long pods are also used in curries. The roots are never used as a substitute for horse radish as they are elsewhere. The flowers are also used as a vegetable.

16. Jerusalem artichoke, Topinambour, (Helianthus tuberosus). Does not occupy the position it deserves. Only a few planters care to cultivate it. This excellent vegetable should be better known. It produces edible tubers 4 or 5 months after planting and in good sandy soil each plant set out a feet from one another produces to 2 or 3 pounds of tubers. As potatoes do not succeed here there is not reason for not growing this substitute which possosses the delicate flavour of french artichoke.

17. Ladies fingers (Lalo) Hibiscus asculentus. This annual does not do well owing to the ravages of mealy bugs and caterpillars. The young pods are much appreciated as a vegetable.

18. Luffa acutangula & Egyptiaca (Papangaye) These two strong growing gourds are used as vegetables and are much in demand by the creole population.

19. Trichosanthas anguina (Patole) Three varieties of this curcubitaceous vegetable are grown as vegetables. They are all very prolific and one small garden bed 10 feet by 4 will often produce 50 or 60 long fruits in a couple of months. A variety which short and stout fruits was found at Aldabra in 1916 and introduced into Mahé. It is supposed that seeds of this variety came from China.

20. Sesbania Grandiflora (gros mourroungue). This plant is sometimes cultivated for the sake of its large flowers which are eaten boiled by the Indian residents. A variety with pink flowers (instead of white) was recently introduced from Ceylon.

21. Yam Beans (Pachyrrhzus tuberosus). This leguminous climbing plant produces a tuberous root like a turnip which is edible.

22. Yams Dioscoreas (Cambares). There are several yams grown in the colony: two of the greater yams (Dioscorea alata) and 1 white lessor yam (Dioscorea aculeata) which is named cambare betty. The tubers of one of the greater yam reaches enormous dimensions being more than a foot broad and 6 inches thick. A reddish sap exudes on skinning the tubers whose flesh is slightly of the same colour. This variety is now becoming scarce. Many other varieties should be introduced from the far East especially the long yams measuring several feet long whoch do not send their tubers deep into the soil. In the W. Indies yams as well as bananas and dasheens are converted into meal. They make an excellent bread. The good keeping qualities of yams render these plants very useful when food is scarce.

Amorphophallus Campanulatus (Tulipier de Java). This aroid produces a huge corm or tuber which is used as food in the Philippines. It is generally known as a curiosity the enormous foul smelling flower smerging from the ground before the development of the huge umbrella like leaf. These tubers in the Far East are harvested in the dry season, cut in thin slices are dried in the sun. The dried slices are pounded in a mortar and this meal is then boiled and fed to pigs. The tubers cannot be used in the row state owing to the presence in the flesh of crystals of calcium oxalate which render them unpalatable. It is said that the top of the young petiole deprived of its outer cuticle and boiled to get rid of the burning sap makes a good salad.

Tacca Pinnatifida (Arrowroot de l'Inde). It is not generally known that this plant produces a very white starnch used as food in Madagascar. The leaves are also used for making straw hats.

Papaya Carica (Papaw). The green fruit of this tree is also used as vegetable and for feeding pigs. There are many large varieties which instead of being dioecious (male and female plants) are bisexual. Some of these latter varieties have a tendency to produce female flowers only and when a male plant occurs it is topped and the new branches which make their appearance have a tendency to produce female flowers instead of male. This tendency is however absent in the local strains which are dioecious and it is in vain that many planters take to topping them.

There are many other garden plants which except the tomato are grown from European seeds.

As a rule gardening is well understood in the colony and all planters take sometimes great trouble in having their own garden. They unfortunately neglect surface cultivation and red laterite soils are as a rule allowed to become baked with the result that the development of the plant is checked and that maximum evaporation takes places.

I am often asked how best to apply lime to garden soil. In the form in which this article is sold in Seychelles (Chaux éteinte, chaux de maçon) it is caustic and should be employed in small quantity at a time. Huge quantities of 2 tons per acre are to be avoided as harm to the soil will result from a too rapid dissipation of its humus, nitrogen, potash. It is safer to use ground limestones (coral) which have not the empoverishing effect of lime. Only acid soils full of organic matters can be treated with lime especially when legumes (beans) are grown because lime favours the development of these plants which fix atmospheric nitrogen by means of bacteria in their roots. These bacteria cannot live in acid soils.

CHAPTER IV.

METEOROLOGICAL OBSERVATIONS

The subjoined tabulated return shows the rainfall during 1917 and also the rainfall from June 1916 to May 1917 which governed the crops of the year under review 1917. Another return is also appended to show the variation of the rainfall from June to June during the last 20 years. The latter table gives a more correct idea of the variations in the annual rainfall because the greatest monthly rainfall occurring either in December or January, it often happens that one year is drier or wetter than another owing to the heavy rains beginning in December instead of January. The season which governed the crops for 1917 was unfavourable to coconuts but favourable to vanilla. The latter plant which is an orchid was benfitted by the dry weather which occurred in August, September and October 1916 while coconut trees in the shallow soils of this Colony suffer when the spell of dry weather exceeds 2 months. For the same season the rainfall for July, August and September 1917 have far exceeded the requirements of vanilla and the crop of this orchid for 1918 will be considerably reduced as compared for the crop for 1917. As vanilla cultivation is at present restricted owing to disease, over-production and competition with vanillin (which is mostly prepared from oil of cinnamon and clove) and the culture of coconut palms more developed, it is important for the colony to have a spell of dry weather of the shortest duration possible.

Meteorological Observations

Temperature			Hygrometer			Rainfall		Rainfall from June to June.			
Daily average per mensem	Maximum	Minimum	Wet Bulb	Dry Bulb	Humidity	Total monthly	No. of rainy dys	Months	1914–15	1915–16	1916–17
January	86.1	72.2	82.2	77.8	83	22.93	1[illegible]	June	2.42	4.29	1.04
February	87.0	72.6	82.3	77.0	82	20.14	1	July	1.40	5.63	4.29
March	88.6	73.0	82.9	74.1	65	3.51	[illegible]	August	3.55	0.50	2.23
April	87.4	71.0	79.0	77.7	95	12.76	4	September	22.27	0.50	0.10
May	92.8	74.4	81.0	74.0	71	0.10	1	October	10.82	1.13	6.89
June	86.9	73.6	78.3	72.0	77	1.04	1	November	10.98	4.40	12.77
July	86.6	73.2	78.0	72.8	77	4.29	4	December	7.07	10.18	
August	85.6	73.8	77.0	72.6	79	6.97	7	January	9.31	22 93	
September	86.7	74.4	80.2	75.9	81	2.23	2	February	7.17	20.04	
October	86.5	72.8	78.0	72.8	78	0.10	1	March	6.96	3.61	
November	86.5	75.0	78.8	74.5	81	6.89	[illegible]	April	9.28	12.76	
December	86.3	73.8	78.4	76.1	89	12.77	[illegible]	May	8.06	0.10	
	87.2	73.3	79.6	74.7	79	93.53	63		99.29	85.97	

Rainfall from June to June

Months	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916
June	11.57	3.80	3.53	2.08	4.52	0.76	20.01	0.12	0.89	4.42	0.55	4.52	1.13	1.28	1.94	7.13	8.24	3.50	2.72	4.29
July	4.95	0.72	3.39	2.30	4.01	0.92	3.79	0.32	0.62	2.69	3.61	2.54	1.13	1.66	1.01	4.53	7.72	1.11	1.40	5.53
August	1.28	3.12	3.41	1.12	1.33	4.11	0.70	4.75	6.25	0.88	1.35	1.06	0.53	1.51	0.81	0.76	3.80	1.24	2.55	0.56
September	2.20	6.71	11.31	3.76	12.12	2.51	3.90	7.13	12.92	0.96	5.99	6.25	1.52	2.66	7.00	5.08	6.71	12.25	22.27	0.50
October	5.20	3.37	7.92	6.33	4.88	8.60	1.89	2.82	0.48	4.72	4.19	4.06	5.03	0.03	7.00	4.37	2.10	13.70	10.82	1.13
November	5.26	3.62	6.12	19.94	8.22	10.88	11.89	24.03	5.58	7.63	3.56	4.73	10.46	9.00	14.15	4.28	9.79	10.93	10.98	4.40
December	18.49	10.70	14.43	19.17	9.72	14.63	8.52	18.94	25.51	13.49	14.11	10.88	9.61	18.67	5.94	13.51	20.26	12.68	7.07	10.18
January	24.01	17.81	18.73	12.53	15.44	17.84	29.56	13.40	20.61	20.13	3.06	18.70	13.[illegible]	11.15	29.69	3.89	13.77	18.54	9.31	22.93
February	18.21	0.35	13.20	6.00	14.72	15.12	14.45	6.03	8.85	16.98	19.75	16.65	6.[illegible]	15.27	18.70	8.11	6.61	30.38	7.17	12.93
March	14.11	11.61	9.42	14.00	9.87	14.61	0.56	3.47	12.72	1.99	7.52	1.39	10.[illegible]	4.93	3.17	9.43	19.26	7.75	6.96	10.04
April	1.21	3.35	9.47	9.66	1.76	16.70	3.97	4.22	14.10	5.05	10.52	10.33	10.[illegible]	3.83	5.56	8.12	12.01	13.12	9.28	3.51
May	6.60	5.19	4.20	5.27	3.96	16.85	0.19	9.54	5.05	4.9[illegible]	6.37	2.97	7.[illegible]	4.18	9.18	2.77	9.53	14.36	8.06	12.76
Total	94.09	70.35	105.23	102.16	90.55	123.53	100.46	94.97	113.58	83.36	80.58	84.08	78.[illegible]	74.17	104.17	71.98	118.77	129.93	99.29	88.80

CHAPTER V.

THE COCONUT INDUSTRY.

	Crop for 1915	1916	1917
Nuts exported in nature...	200,673	93,959	106,775
„ converted into coprah	20,439,356	18,573,844	14,795,550
„ „ „ oil	674,568	575,179	561,192
„ „ „ soap	445,445	437,983	195,650
„ consumed locally	4,000,000	4,000,000	4,000,000
Total ...	25,759,942	23,679,955	19,659,167

Owing to the war the Messageries Maritimes steamers calling at Mahé were requisitioned for the transport of troops. For that reason it has not been found possible to export the coprah made during the year except in small packages and by parcel posts. The bulk of the quantity exported was shipped by two cargo boats which were chartered for that purpose during the year in March and December. A very large quantity still remains in the warehouses or stored on private estates. With such irregular exportations of coprah the local market for nuts has fallen from Rs 50 to Rs 25 and Rs 30 per thousand. It is calculated that the coprah from at least 6 million nuts is still lying unsold. The loss sustained by the coconut planters in 1917 can therefore be reckoned at about 1000 tons worth at least Rs 300 a ton nett, or Rs 300,000. This is the more disappointing in that top prices are paid in Marseilles for coprah and coconut oil at the present moment. Part of this loss will be recouped in 1918 or 1919.

The coconut diseases are still very numerous and hardly combated except by a few planters. In another chapter an account has been given of the small beetle disease, of the stem bleeding disease and of the leaf disease caused by a weevil (Diocalandra).

The scale insects are not so bad as last year owing to their being heavily parasited by fungi. The fungus Cephalosporium lecanii keeps in check Lecanium tessellatun (cinnamon scale). I have to record the presence of a red headed fungus, (Sphoerostilbe coccophila) which has been kindly identified by Miss Lorrain Smith of the British Museum.

This parasite was found this year attacking orange scale (Mytilaspis citricola) at the Botanic Station. I also came across, on the hills a Mt. Sebert, a red fungus which looked the same and which I found attacking the same scale. I noticed on an avenue of areca nut palms at Government House (which for the last 10 years had been prevented from fruiting owing to the attack of Chionaspis and Aspidiotus scales) that the palms suddenly recovered about the middle of 1917 putting forth several clusters of nuts each, without having been sprayed with insecticides. No parasitic fly was found as yet in a breeding cage to account for the sudden diappearance of the scale insects. This fortunate result is very likely due to some chalcidid parasite which has not yet been identified.

If the fungus parasites are beneficial as an adjunct to combat scale insects there is no doubt that on the other hand the wet climate of Seychelles is beneficial to other fungi which themselves attack our palms. I have found this year that the fungus Pestolazzia palmarum was attacking coconut leaves. This disease is not however to be feared. The fungus has been attacking coconut palms here for a very long time but I know no trees as yet which has succumbed to this disease. The fungus kills out the tissue of the leaf and leaves reddish spots which are easily mistaken for the traces left by scale insects. At first the spots caused by the fungus are whitish and microscopic but they soon assume the characteristic colour of a leaf tissue attacked by a fungus. The small central part of the spot is dead and ash coloured and the surrounding tissue shows the reddish yellow colouration of dying leaves. The spots are small (like shot holes) but they vary in size and often coalesce forming irregular markings on the leaf which at once takes a yellowish appearance. The young leaves are seldom attacked although I have seen a few trees with all the leaves infested at Port Glaud. This tree recovered after some time without treatment and from this I conclude that the Pestalozzia fungus is not as virulent here as in some parts of the East. Sugar cane leaves are attacked also in much the same way and also without the same evil consequences.

Several diseases probably of fungoid origin have increased lately in Seychelles. One is the disease known in Trinidad under the name of little leaf disease owing to a certain number of leaves of the crown and sometimes all of them getting reduced in size and shrivelled. Another very similar disease is very common on the hills on native palms as well such as Verschaffeltia splendida (palmier latte) Stevensonia grandiflora (latanier feuille) and Deckenia nobilis (chou palmiste) etc. The causative organisms of these diseases have not yet been identified. Sometimes only one whorl of leaves is affected and the tree recovers but sometimes the whole crown of the tree is involved showing many symptoms of the bud rod disease.

The Rhinoceros beetle disease is increasing on many localities where the refuse from essential oil distilleries is heaped alongside coconut plantations. As 1 ton of cinnamon leaves is distilled every day in a factory of ordinary size one can imagine the quantity of refuse accumulated in the year; one ton of cinnamon leaves measuring about 4 cubic metres. Measures have been taken on many estates to get rid of the refuse by digging it in trenches or spreading it on the surface of the ground in coconut plantations. Most estates are however so much handicapped from want of capital and consequently of labour that the work of digging in the refuse is not carried out properly. As the Rhinoceros beetle is gaining ground it is advisable that before compulsory measures for their destruction are adopted that another system of furnace for burning the leaves used as fuel in the distillery itself should be invented. In Mauritius the same question was solved when the refuse from the sugar cane factories was found to contain too much water to be used directly as fuel by adopting specially constructed wide sloping furnances with a large admission of air.

Fortunately Mr. D'Emmerez de Charmoy, the well known Entomologist of Mauritius, has discovered in Madagascar scoliid wasps that are parasitic on the grubs of the Rhinoceros beetle such as Scolia Orictophaga and several species of Elis. We have three allied representatives of this latter genus of insects at Aldabra but none in Mahé and before long we shall have to introduce the beneficial parasites in question from Madagascar. The introduction of other insects of the same family would have to be considered at the same time as it has been found by Mr. d'Emmerez de Charmoy that Elis thoracica from Madagascar is parasitic on the larvae of the rose beetle (Adoretus) and other beetles which are swarming in Seychelles.

CHAPTER VI.

Experiment on the manuring of coconut at Long Island.

No. of Plot.	Manure used.	No. of trees per plot.
No. 1	no manure or control plot	12
„ 2	green manuring	17
„ 3	„ „ plus guano (800 lbs per acre)	20
„ 4	„ „ „ plus potash (ashes 800 lbs per acre	14
„ 5	„ „ „ „ plus lime 1270 lbs per acre	12
„ 6	fish guano (600 lbs) fresh sea weeds (2¾ tons per acre)	16
„ 7	no manure or control plot	11
„ 8	same as 2	17
„ 9	„ 3	17
„ 10	„ 4	10
„ 11	„ 5 lime being used in the form of coral sand	16
„ 12	„ 6	21
„ 13	no manure or control plot	12

Potash has had to be used in the form of coconut ashes as was used also last year owing to the difficulty of importing Sulphate of Potash. The manuring took place in December 1917 just a year after the 1st manuring in December 1916 and therefore only 15 months have elapsed since the commencement of the experiment. The authority on coconut culture (Professor Copeland) states that the influence of manures cannot show itself before a period of at least 2 years after their application. This is due to embryo leaves being formed much in advance in the growing shoot, long before they are developed externally, and the influence of manures is exercised on the embryo leaves before they are formed and not on those already formed. The land, as stated last year, slopes considerably and although it had been decided to make the length of the plots parallel to the slope and not at right angles to it surface erosion has been considerable. For that reason early this year (1918) permission was obtained from His Excellency the Governor to terrace the experimental field by using Prison labour. The showers experienced in February 1918 served to illustrate the amount of wash. Walls were built along a contour line 6 inches above the surface in most places. After one shower the 6 inches of empty space above the surface was silted up to the rim. If we take the specific gravity of an ordinary soil as being 1.5, 6 inches of soil would weigh 600 tons per acre. In assuming that only one inch of soil was washed away during the rain of February (20 inches) the above figures go to show that 100 tons of soil per acre were swept down into the sea in all unturfed sloping fields of the colony. This means as corollary that the manures spread on the surface or gently hoed in are carried off in the same way and that on sloping land the only method of manuring coconut palms should consist in terracing the land or putting the manure deeply in semi circular trenches round the tree. With full grown trees 40 years old it was found impossibe to build level trenches a few yards distance from one another to counteract erosion as the trees themslves stand in the way of trenches if they are to be made level. As the foot of the drains or trenches should not be sloping, if erosion is to be avoided, these drains have to be dug before plantation is made. To get out of the difficulty of stopping erosion walls are being built but it will take about a year to complete this work of terracing the whole field. I do not think reliable figures can be obtained with regard to the results of manuring if the erosion is not stopped.

The Natural Yield of the Plots.

No. of plot	No. of trees per plot	Total number of nuts		nuts per tree per annum	
		1916	1917	1916	1917
1	12	336	285	28	20
2	17	350	269	30	16
3	20	507	289	25	14
4	14	349	233	24	17
5	17	334	171	28	10
6	16	330	228	21	15
7	11	253	195	23	18
8	17	291	262	17	15
9	17	218	242	13	14
10	10	103	91	10	9
11	16	220	157	14	10
12	21	176	190	8	9
13	13	136	135	10	10

The yield for 1917 is also considered as the natural yield of the plots. The year under review was more unfavourable to coconut yield than in 1916. At Long Island which is used as a quarantine station and where several hundreds of labourers were encamped during 1917 much pilfering invariably takes place. In ordinary and normal years the number of persons sent to this quarantine station is small and there is little or no pilfering. The system of plucking the nuts on the tree 4 times a year was carried out in anticipation of the pilfering in question.

Owing to the empoverishment of the land in the past, it has been found impossible to establish the ordinary members of the leguminous family as green manures in order to enrich the soil in nitrogen and prevent erosion. These plants (cow peas, velvet peas, wild indigo) made no growth except on plot 5 where these leguminous plants come out in striking contrast with the results in the other plots. The small seedlings of indigo and velvet beans dried out everywhere when 2 to 6 inches high except on plot 5 where they actually covered the ground. As plot 5 received lime the well known beneficial effect of this amendment on leguminous plants was well illustrated. On plot 10 which received coral sand instead of lime the effect was very slight and almost negligible. When coral sand is used it has to be ground very fine to produce an immediate effect. As the question of preventing erosion appeared important the attempt to grow leguminous plants was given up and the ordinary vigorous Asystasia coromandeliana was adopted as a green manure plant although it is not so beneficial as regards improvement of the chemical constituents of the soil.

CHAPTER VII.

THE VANILLA INDUSTRY.

The vanilla crop was exported to the amount of 6½ tons in 1917. A large part of the crop still remains unexported. Rs 50,000 represent the declared value of the amount exported. 20 years ago the value of the vanilla crop exceeded 1 million Rupees when 50 tons used to be exported annually. Four reasons were urged in the report of last year to account for the present crops which have been very low for the last 10 years.

Viz 1. Reduction of area planted owing to the 7 years of drought which lasted from 1904 to 1911, the orchid being unable to stand dry weather for long.

2. More money has been invested in coconut planting which has become a more paying industre than vanilla.

3. Disease caused by the Calospora fungus.

4. Improper conditions of soil occuring through exhaustion by repeated culture of the orchid on the same piece of land.

The influence of these factors have remained the same and owing to the abnormally wet weather at the end of 1916 and beginning of 1917 the fungus disease has become even more acute.

Another factor which is a corollary of the above is that owing to over-production and competition with vanillan the price of vanilla is still going down and there is no signs of any improvement. Vanillin is not, properly speaking, a substitute ; it is a vegetable substance of the same composition as that which gives to vanilla its aroma.

It is manufacted mostly from oil of cinnamon leaves and clove which, curiously enough, this colony is exporting on a greater scale every year. There is therefore little likelihood that vanilla will ever regain its former position on the market.

The planters who still continue to grow vanilla are principally those who devote little attention and money (some Rs. 300 to Rs. 400 a year) to the orchid in the hope that at some time or other a good flowering will take place and recoup them at one stroke for the expenses incurred during the bad years.

I do not think this is a wise policy except for those planters who still have a good virgin soil rich in humus most favourable to vanilla, and a site properly sheltered from the wind. Owing to diseases vanilla vines die out almost everywhere in the Colony and if the disease is not put under control the above system of indolent cultivation will lead to no results. The more vanilla becomes affected by diseases the more it should be carefully tended. It is an orchid which has to be sheltered and properly shaded, and the slightest touch of fungus disease and physiological weakness causes it to remain unproductive for several years.

MANURING EXPERIMENTS.

Part of the experimental plots Nos. 1 to 13 has been under treatment for 3 years. Little flowering took place this year owing to the prolonged period of drought which prevailed in August, September and October. The dry weather lasted a month too long.

No. of plot.	Treatment.	No. of times treated during the year.	Pods obtained in 1916.	Pods obtained 1917.	Total.
1	No manure	...	...	3	3
2	Leguminous mulch ...	3	5	18	23
3	Ordinary mulch ...	3	...	12	12
4	Lime	1	...	27	27
5	Phosphate	1	...	22	22
6	Complete fertilizer ...	3	...	...	...
7	„ soluble fertilizer.	9	3	...	39
8	Potassium Sulphate ...	9	39	...	39
9	„ Chloride ...	9	16	3	18
10	Ammonium Nitrate ...	9	...	...	...
11	Sodium Nitrate ...	9	22	...	22
12	Complete fertilizer ...	3	32	...	32
13	No manure	...	19	5	24

In the following plots the vines were planted a year later, in 1915 (October) and are consequently 2 years old.

No. of plot.	Treatment.	Number of times treated.	Crop No of pods.
14	Potassium phosphate, ammonium nitrate and coral ...	8	...
15	„ „ „ nitrate	8	...
16	„ „ and coral	8	...
17	Ammonium nitrate, Potassium Chloride and coral ...	8	...
18	„ „ guano and coral	8	19
19	Sea weed	2	...
20	Fish manure	2	6
21	Coconut husk	2	8
22	Complete fertilizer	3	...
23	„ „	3	...
24	„ „	3	...
25	„ „	3	...

One half of plots Nos. 14, 15, 16, 17 was treated by Bordeaux mixture in order to combat the disease but the vines which were treated 12 times in 1916 were treated only 3 times in 1917 owing to shortage of copper sulphate which was only received from England in December 1917 after 18 months unavoidable delay. In spite of the irregular treatment, the treated vines were found to be in better condition than the untreated ones at the end of 1917. Only one treated vine had to be moved down and replanted owing to the dying out of the underground portion and of the aerial roots (a consequence of the disease) while in the untreated plot 4 times more vines have had to be lowered in the same way. The quantity of copper sulphate available at the end of 1917 was only 20 lbs and this will not be sufficient to treat the plots more than a dozen times in 1918. In view of the fact that in the other plots the disease is also prevalent and in consequence the vines have to be replanted and even replaced, the copper sulphate treatment should be adopted all over the ground occupied by vanilla at the Botanic Station. Hitherto the vines replaced are the following : one in plot 3, one in plot 5, one in plot 19, two in plot 12, one in plot 13. If the disease continues to prevail the experiment will come to an end from lack of copper sulphate.

In the following plots an experiment was made to see the effect of living grass on the growth of vanilla vines as compared with other vines of the same plant grown with a surface mulch of dry grass (Pennisetum or herbe ma tante).

No. of plot.	Treatment.	Results.
26	½ plot covered with 2 inches of macadams ½ under commelina grass (herbe cochon).	Difference in favour of macadams.
27	½ mulched with Pennisetum, ½ under Digittaria sanguinalis (gros gazon).	In favour of grass.
28	½ mulched with Pennisetum, ½ under Panicum ovalifolium (gros chien dent).	„ „
29	½ mulched with Pennisetum, ½ under Digittaria sp. (gazon).	No difference.
30	½ mulched with Pennisetum, ½ under Axonopus compressus (chien dent bourrique).	Grass better.
31	½ mulched with Pennisetum, ½ under Oplismenus compositus (chien dent).	„ „
32	½ mulched with Pennisetum, ½ under Paspalum mandiocanum (herbe Perard).	No difference.
33	This plot was set out with Bevilaqua (Hydrocotyle asiatica).	The grass was destroyed by snails.
34	½ mulched with Pennisetum, ½ under Digittaria sp. (grande herbe Perard).	Grass better.
35	½ mulched with Pennisetum, ½ under Panicum parvifolium (herbe Edwards).	„ much better.

These plots are only one year old. They are set out in poor laterite soil and the beds are not forked but simply walled in by a layer of stones. The grass seems to keep the foot of the vanilla plants in better condition as far as the experiment goes. The use of macadams instead of mulch produced excellent results. The macadam in question is simply broken pieces of granite about the size of a pigeon egg placed on the surface of the bed in a layer of 2 inches

Five beds with vanilla 1 year old are also used as follows :—

No. of plot.	Treatment.	Results.
19	Sea weed allowed to dry a little before application ...	No flower.
20	Fish manure	6 pods.
21	Coconut husk	6 „
36	Coral sand	No flower.
37	Horse manure	„

Coconut and fish manure seem to be very beneficial. In plot 19 manured with sea weed more rootlets from the shade trees are found hampering the growth of vanilla. Few rootlets from the shade trees develop in the beds manured with coral sand. Horse manure seems beneficial ; there is no killing out of the vines at all as anticipated by many persons.

The whole of the experimental plots was set out, as stated already, under the shade of Albizzia Moluccana and Parkia Roxburghii which throw out into the beds numerous rootlets thus checking the growth of vanilla. These rootlets have to be dug out every month. This work entails a considerable amount of labour as the mulch containing the manure has to be lifted out and put back again not without injury to the roots of vanilla. When funds will permit it is contemplated to separate off the beds with high walls and a cement floor so as to get rid of rootlets of which the injury cannot be properly measured in all plots. These roots were found to be more abundant in the plots where coconut husk, sea weeds and complete fertilizer Truffaut were used. At the foot of each vanilla vine nearly a basket full of rootlets has to be removed several times a year. These rootlets after being left in the sun for a couple of days are put back in their corresponding beds so as to avoid a portion of the manure, with which they are soaked, being lost. No account is taken of such a great amount of organic material containing nitrogen being put back to the vanilla beds from which it originated as the same treatment is applied to all beds.

In 1916 beds were set out with productive and non-productive vines, that is to say that vines were selected as cuttings from one estate where the vines were of uniform growth but only half of which had flowered. The other half which did not flower for 3 years in succession were supposed to be "dumb" vines. It is from these "dumb" vines that the cuttings called non-productive vines were selected. The results hitherto obtained show that the so-called non-productive vines bear as well as the others. Plots 14 to 18 were planted with productive vines and plots 19 to 23 with non-productive ones.

CHAPTER VIII.

THE RUBBER INDUSTRY.

The exportation of rubber during 1917 amounted to 3,923 kilogs valued at Rs. 5,962. The amount exported in 1916 reached 2,739 kilogs and only 285 kgs in 1915. The industry is thus progressing satisfactorily. New areas are even opened for rubber planting which is more and more gaining favour. The opposition among planters who did not believe in the future of rubber is disappearing. Rubber is taking the place which was assigned to it 15 years ago by this department i.e., that of replacing vanilla which is doomed. There are enough trees already set out to produce 100 tons of rubber in a few years worth Rs 400,000 or more than the amount realized by the exportation of vanilla.

Unlike most other plants cultivated in this Colony Para Rubber is remarkably free from disease and it thrives in those lateritic soils of Seychelles which are quite worn out. It is owing to this resistance to adverse conditions of growth that the culture of this plant has been reccommended long ago. Lateritic soils or soil derived from decomposition of granitic rocks in situ have the property of being baked or hardened by the sun. In such soils none except hardy plants like rubber can resist droughts. It is no use growing coconut, vanilla or other herbaceous plants in them. These soils which occupy 10,000 acres of land in Mahé alone are still lying waste in the Colony. Rubber depends more on the weather conditions than on soil treatment. This has been shown clearly this year. Trees which had made no growth and looked much like walking sticks 2 or 3 years ago put on new growth in the wet season and have now passed the critical period of their lives. When rubber has reached 12 inches girth in the poor soils of this Colony it increases in girth by leaps and bounds afterwards often at the rate of 5 inches per annum. Many rubber estates which were quite unpromising 2 years ago owing to the trees being spindly and small are this year in the pink of conditions. Planters who have visited Ceylon can bear testimony to this and to the immunity of Seychelles rubber from disease. This is an important proof that many hill estates of this Colony can be, as anticipated, fully converted into rubber estates.

The estates which are tapping obtain such good yields that thinning out is not carried on as it should be. The removal of trees which are so good yielders may be heart breaking but this policy is unsound as trees which are closely planted do not renew their bark properly. Mr Campbell in Ceylon has proved this point and once the renewed bark is too thin for tapping without wounding the trees the yield will decrease considerably. A planter near Victoria stated to me that he is getting 3 lbs per tree 9 to 10 years old, and that his nett produce per tree amounts to R 1 in spite of the higher cost of freight and other expenses which he puts down as being R 0 54½ for cost of production and curing and R 0.45 for cost of shipping and sale. At R 1 nett per tree and counting 150 trees to the acre this yield is more than double that of an acre of coconut in good land.

Regarding disease I saw signs of 2 fungi attacking branches of a rubber tree which had remained stunted. Mr Petch of Ceylon kindly identified them as being:

1. Hirneola hispidula; 2. Hexagonia discopoda.

Hirneola is a harmless species which grows on any dead wood. Hexagonia discopoda has a peculiar penchant, according to Mr Petch, for dead branches attached to living trees. It has also always been regarded as harmless although Mr Petch is at present ascertaining if it is really a parasite or not.

On Bel Air road I noticed lately a few dead branches of rubber on isolated trees but it soon become clear to me that rats had gnawed out the bark of these branches for a few inches even for a foot long in many places. This ringbarking was sufficient to kill the branches which were in all cases about the size of the thumb. Rats have been lately deprived of one of their favourite foods, sugar cane, which is no longer grown in the colony on the same scale as formerly owing to a tax of Rs 250 an acre having been levied by Government to protect the fisc which was losing a large part of its income from the free sale of a fermented beverage containing 6 o/o of duty free alcohol. It is said that rats are also damaging coconut crops more than formerly but this point can only be ascertained by direct experiment.

In wet countries like Seychelles where manures are still, generally speaking, an unknown factor in the production of crops it is far easier to get crops from the leaves (perfume plants) and bark (rubber) than from the fruits (coconuts, vanilla, etc.) which are handicapped in poor and unmanured soils.

Besides rats and the above 2 fungi there is no record of the other dreaded rubber diseases having yet made their appearance. It should not be forgotten however that the wet weather prevailing in this Colony makes it one of the most favourable habitats for fungi of all sorts and that all dead or drying branches of a cultivated tree like rubber should be at once burnt, no matter whether it is suffering from any sort of die back or not. This Colony is too small and too poor to adopt other sanitary measures for a long time to come.

CHAPTER IX.

ESSENTIAL OILS AND THE MINOR INDUSTRIES.

	1915.		1916.		1917.	
	Quantity in litres	Declared value Rs	Quantity	Declared value Rs	Quantity	Declared value Rs
Cinnamon bark oil	99	1,099	1,834	15,609	91	2,561
Cinnamon leaf oil	9,587	37,572	15,699	67,256	14,175	64,753
Clove leaf oil ...	465	2,325	2,137	10,557	797	4,005
Lemon grass oil ...	77	308	6	24	148	1,061
Bigarade leaves oil	...	...	12	688	...	...
Vetiver oil ...	..	...	31	666	...	...
TOTAL ...	10,228	41,304	19,080	94,200	15,169	72,380

The smaller amount exported in 1917 as compared to 1916 is due to shipping difficulties and to the consequent suspension of the work in several distilleries. That the industry is a most paying one can be judged by the fact that in spite of these difficulties so much oil has been exported. I do not think that the declared value for 1917 is a fair one, the price of cinnamon oil having increased considerably and nearly double but the exporters have declared the same price as the year before.

This minor industry which was established in 1907, after 3 years of experimental work, is gradually rising in importance, no less than 14 distilleries having been established up to 1916, one put up by a Chinaman in 1917, and 2 others at the beginning of 1918.

Owing to the large increase of population the development of this new industry is benefiting largely the poorer classes. In a distillery working 45 tons of cinnamon leaves yielding 275 kilogs of oil a month, no less than 90 persons are employed. This means that employment for about 1000 men, women (mostly children), is found in all the distilleries. The yield is very variable, according to the time of the year and age of the leaves. New flushes of young leaves and old leaves at the time of flowering yield less. The yield varies from 4 to 8 kilogs per ton. The yield is better when steam distillation is carried on with proper arrangement for good condensation and the distillation is also quicker.

Cinnamon leaf oil is distilled all the year round and there is enough cinnamon growing on the hills in Mahé to allow several more distilleries being put up. In Praslin there are not many cinnamon trees growing up to now but in the Government forests at Anse Marie Louise there are huge trees, over 100 years old, and from these plants many seeds are being scattered all over the place. These seeds, being very succulent when ripe, are propagated in Mahé by wild pigeons and mynas.

According to Professor Dunstan, cinnamon leaf oil from Seychelles is stated to contain a uniformly high percentage of eugenol (75 to 90o/o) but to possess a more clove-like and less persistant odour than the leaf oil from Ceylon.

At the beginning of 1917 the price in London was 4d per oz for African and 6d per oz for Ceylon. (Rs 8.50 to Rs 12.90 per kilog). The price has now risen. The oil is needed as a source of eugenol which is employed for the preparation of vanillin and also for soap scenting purposes.

The distillery erected by the Chinaman was a good piece of work. An evaporating basin of an old sugar cane factory served as the bottom part of the still above the furnace and the rest is a network of wooden casks and copper condensers admirably arranged to distill the same quantity of cinnamon leaves in double the necessary time and with about the same yield. As copper and other metals are unobtainable during the war the example of the Chinaman will be followed.

At the request of the Director of the Imperial Institute several samples of oil were distilled from Ocimum viride and from various specimens of ocimum which are growing wild in Seychelles. Ocimum viride plants obtained from seeds forwarded by Professor Dunstan were distilled at the Botanic Station and produced 0·4 o/o of oil which was found by the above authority to contain as much as 62 o/o of phenols (mostly thymol). At the present price of thymol the oil was valued by a firm of manufacturing chemists at 5s to 6s per lb. Larger consignments are being prepared both in the laboratory and in one factory to ascertain at what price the oil can be prepared commercially in the Colony. The plants grow well without being manured and can produce 3 or 4 crops of leaves and twigs per annum. As nearly other allied Ocimum plants are growing wild in the Colony alongside roads and in other open places it has been found necessary to distill leaves of several species which produced oils of the following composition according to a report from Professor Dunstan.

Ocimum basilicum (basilic de France). This plant which is distilled in Reunion and elsewhere produced the sweet basil oil of commerce worth at present 4s to 6s a lb. The sample from Seychelles was found to differ a little in composition from the other oils of known origin (German, Spanish, French); it contains anethol as well as methyl chavicol but the constants of the present sample agree generally with those of Reunion basil oil.

	Seychelles oil.	Reunion sweet basil oil.
Specific gravity at 15 C.	0·962	0·945 to 0·987
Optical rotation	0·82 at 28 C.	0·36
Refractive index	1·514	1·515 to 1·517
Acid value	0·2	up to 3
Ester value	2·5	up to 22
Solubility in 80 o/o alcohol ...	Nearly soluble in 4 vols. not completely even in 10 vols.	Soluble in 1 to 7 vols.

Ocimum basilicum is only grown in gardens and is not hardy enough to be set out in poor soils on a commercial scale.

Ocimum gratissimum (Basilic grandes feuilles) is the plant which grows wild in Seychelles and which can be mistaken eventually for Ocimum viride. It has the same appearance although the flower spikes are 3 times longer in Ocimum gratissimum and the odour of the leaves is quite different. This plant is also grown for distillation on the Ivory Coast.

The composition of the oil is as follows:—

	Ocimum gratissimum oil from Seychelles.	Ocimum gratissimum oil from the Ivory Coast.
Specific gravity at 15 C. ...	0·995	0·910
Optical rotation	14·1	0·58
Refractive index	1·52 at 21 C.	...
Solubility in 80 o/o alcohol ...	Sol. in 0·7 vol. at 15 C.	Soluble in 1·2 vols.
Phenols	62 o/o principally eugenol.	44 o/o almost entirely thymol.

As a source of eugenol this oil cannot compete with cinnamon and clove oil for the present. The yield of volatile oil from leaves was found to be very small, 0·1 o/o.

Another oil from Ocimum sanctum (Basilic à petites feuilles) has been also forwarded to the Imperial Institute for examination. This plant cannot however be mistaken for ocimum viride.

If the latter plant (Ocimum viride) is found to yield as much in the field as it has yielded experimentally there is no question that it will occupy a place in the Colony besides other already established perfume plants. It grows easily from seed, it occupies the field for several years without having to be replanted and it can be set out as a catch crop in young coconut and rubber plantations.

Ambrette (Hibiscus abelmoschus). This plant is being grown in good soil in many places for the production of the seeds which possess a musc odour. The present price of this article is high and is likely to remain so for some time to come. Over-production unfortunately can easily be reached; an acre of well grown plants producing as much as 250 kilogs of seeds worth Rs 500. The essential oil obtained contains an alcohol (farnesol) and an aldehyde (furfurol). It has a powerful smell. This species of Hibicus like all others is liable to be attacked by insect pests in Seychelles and it is not safe to count on the above yield except in very rich soil free from the parasites in question. Hibiscuses are generally grown in India by Entomologists in order to breed many insects such as boll worms and their parasites. This is sufficient proof that these plants are very susceptible to disease. It is impossible in Seychelles to grow properly Hibiscus rosa sinensis and most all other Malvaceæ owing to attacks of the following scale insects:—Icerya Seychellarum, Lecanium nigrum and Hemichionaspis minor.

CITRATE OF LIME.

No citrate of lime was manufactured at Silhouette during the year under review. This is due to raw materials becoming scarce and the freight difficulties which not only rendered difficult the exportation of the manufactured article but also the importation of pure chalk with which it is made. This is a home industry for the development of which there are great possibilities; the climate and soil of this colony being highly benficial to two of the citrus trees which are grown for the use of their juice in the manufacture of citrate of lime. These two citrus trees are:—

Citrus medica var acida called locally limon.

Citrus mitis called bigarade.

These two citrus trees are so much handicapped by scale insects (mostly lecanium viride) that the crop obtained is negligible except at elevations above 1000 feet where the scale insect are kept under control by natural parasites. (Cephalospo inm lecanii) Citrus mitis is a very hardy plant growing in red stiff laterite soil where no other crops are at present grown. It is said to be resistant to the canker disease while lime trees are very susceptible. A disease has broken out on both these citrus trees which look very much like canker disease and specimens have been sent to the authorities in England and in S. Africa for identification. The presence of this disease of fungus or bacterial origin goes for to strengthen the view held long ago by this Department as to the possibility of our citrus trees being suffering from pests other than scale insects.

At Mt. Sebert the planting of citrus mitis or bigarade is still going on. A visit was made during the year to the estate in question and the bigarade trees, now 4 years old, looked wonderfully free from disease as anticipated. These trees will soon come into bearing although the soil in which they grow is of the most inferior grade. Nothing like the number of trees stated to have been set out were found but only 950 trees 8 to 10 feet high instead of 5000 and over 2000 young seedlings. There are many other islands in the archipelago where one of the two citrus trees can be grown on a great scale and only capital is necessary to develop the manufacture of citrate of lime.

FIBRES.

Coir is made on a small scale at Anse Aux Pins but only 780 kilogs were exported during the year to Mauritius. This industry, like all others, is handicapped by the present shortage of freight and capital. A planter at N. East Bay started a Mauritius hemp fibre factory during the year. He purchased a fibre extracting machine (English made, and put up a water wheel to get the necessary power for driving the machine. Many parts of the new installation were made locally by the planter himself including the water wheel but the industry has not yet emerged from the experimental stage. Besides Mauritius hemp (Fourcroya gigantea) there are many plants of Agave Sisalana (Sisal fibre) already set out in Mahé. In the outlying coral islands full of guano deposits but where the land is formed of ancient reefs sisal has been also set out on a great scale. These outlying islands are far more suitable for the cultivation of sisal than Mahé owing to the mountainous nature of this latter island and the difficulties in the transport of leaves resulting therefrom. In the flat outlying islands trolleys can be made to run all over the plantations at a cheap cost. One hundred leaves weighing over 2 cwt yield only 2 lbs of fibre. The question of transport is therefore of paramount importance. Shortage of fresh water in the outlying islands will go far to handicap this new industry in Seychelles.

MEALS.

Very little starch and meals are manufactured for local use and not for export. Banana meal from plantains called locally Bananes St Jacques and Mulgache is manufactured at Silhouette on a small scale. The bananas are sliced, the cores are removed by means of a wooden knife and the dried slices ground by a special grating machine of the Maison Alexandre, Bd. Voltaire Paris. The yield in meal is 20o/o skin included. Bananas slices are also made and exported but they are found to be badly attacked by weevils.

A little starch is made from Cassava (Manihot utilissima) ; breadfruit (Astocarpus incisa) ; Arrowroot (Maranta arundinacea) ; Tavolo (Tacca pinnatifida) and Indian arrowroot (Amorpho phallus campanulatus), but most of these starches are used for laundry purposes.

Maize meal from ripe corn is also made by hand machine but degerminating machines are not used and the flours do not keep owing to the oily nature of the germs left in them. The drying of maize. as already stated, is essential if the culture of that cereal is extended to feed the population in time of war.

Tannias, eddoes, dasheens, (Arouilles) ; yams (Cambares) are not yet turned into edible meals.

CHAPTER X.

FISHERIES.

The exports from the Outlying Islands are :—

Salt fish	ks 18,445	declared value Rs	4,632.80
Calipee	„ 3,610	„ „	3,307.50
Trepang	„ 1,200	„ „	390.00
Shark fins	„ 757·500	„ „	605.90
Tortoise shell	„ 515·250	„ „	12,425.00
Green turtle shell	„ 107.000	„ „	53.00
Guano	tons 2,019·787	„ „	60,779.42
		Total	Rs 82,193.42

All the above articles, except guano, are produced in spare time by the few inhabitants of the Outlying Islands. Many islands and, the submerged reefs banks, are still awaiting development. Guano was exported to Mauritius and Reunion only, freight being unobtainable for the European market.

All these articles can be produced on a large scale. Tortoise shell from hawksbill turtle reared in artificial basins have failed but the failure is due to mistakes wholly unconnected with the industry itself. The life history of these turtles is not well known and they were fed artificially on fish and shell fish exclusively while they are known to feed also on sea weeds (Sargasso &c). Without a marine biological laboratory no progress can be made. The two points that require elucidation are: 1o. the food of the turtle; 2o. its natural breeding grounds. Some people say they inhabit the reefs permanently and others that they are migratory. The elucidation of this latter point would make a great difference in the successful rearing of these animals. The question of raising reptiles such as turtles is generally very easy and should be settled by a community so much interested in it. Lately much discussion took place as to how these animals get from one island to another and how for example the giant tortoises happen to be found at present only at Aldabra and Galapagos. Professor Gardiner who visited Seychelles in 1905 and 1908, is of opinion that many African species of freshwater chelonian such as (Sternothoerus sinuatus) (tortues à soupape) were transported by man and by drifting logs of wood from Africa to the Seychelles. It has not been proved as yet that Aldabra had any land connection with Madagascar where giant tortoises existed quite as recently as 50 years ago. Have they been transported attached while young to drifting wood? This is not likely. Professor Gardiner solves the difficulty in stating that the present Aldabra tortoise probably evolved from marine ancestors. Many land reptiles, crocodiles, lizards &c., are known to have originated in that way and are consequently sea borne animals.

CHAPTER XI.

INSECT NOTES.

The following is a complete list of the insects attacking coconut in Seychelles :—

1. Oryctes Rhinoceros (Rhinoceros beetle).
2. Melitomma insulare (beetle).
3. Diocalandra frumenti (weevil).
4. Eugnoristus Braueri (weevil).
5. Ischnaspis filiformis scale insect.
6. Aspidiotus ficus „ „
7. „ dictyospermi „ „
8. Aspidiotus latania scale insect.
9. „ Ansei „ „
10. Chionaspis indica „ „
11. „ dilatata „ „
12. Icerya Seychellarum „ „
13. Vinsonia stellifera. „ „
14. Lecanium tessellatum. „ „

As already stated, Oryctes Rhinoceros is doing more damage owing to the refuse from the essential oils distilleries forming new breeding places. The discovery in Madagascar, by Mr d'Emmerey de Charmoy, of natural parasites of this beetle gives an opportunity of combatting it by the introduction of these parasites into Seychelles. These parasites are scoliid wasps of which there are three species (Triscolia hyalinata, Dielis collaris var coelebs, and Scolia pilsoella) already existing at Aldabra, a Seychelles dependency, in the N. W. of Madagascar. This means that the Rhinoceros parasite (Scolia cryctophaga, and other Scoliidæ) would in all probability be easily acclimatised in Seychelles. Melitomma insulare is even worse than the Rhinoceros beetle in its ravages in coconut plantations. It is indigenous to this Colony and to Madagascar and efforts should be made in Madagascar, where the insect fauna has not been disturbed on the same scale by bush fires as in Seychelles, to find natural parasites of this dreadful nocturnal beetle. A present the larvæ (which attacks coconut stems only) are removed by means of gouges and burnt.

Diocalandra frumenti and Eugnoristus Braueri damage the leaves of the coconut trees. They have not spread to all plantations as yet but the attacked leaves should be removed from the trees, where they remain for a long time, and burnt. These insects, the latter of which is endemic are not considered as dangerous pests.

The scale insects which follow in the list show to what extent the coconut trees in Seychelles are diseased. The climate of this colony is so beneficial to these insects that they spread at a tremendous space from one place to another. I visited Cosmoledo Island in 1906 and did not find Chionaspis scales there on the coconut trees grown at that time. 10 years after in 1916 I found that this insect had been accidentally introduced and that not a single tree had escaped contamination. All fronds were white with these insects. Fortunately most of the scale insects are likely to become parasitised by fungus parasites if the weather continues to be rainy in Seychelles. A period of drought occurred from 1904 to 1911 (seven years) and from 1912 onwards not a single year of drought was experienced. If the theory of a cycle of 7 years rain to be followed by a cycle of 7 years drought is true there are not many years left to the fungus parasites to help in combating scale insect disease. Lecanium tessellatum is killed out by Cephalosporium lecanii even in the low country. Aspidiotus ficus which attacks also areca nut palms is being killed out this year by some parasite which has not yet been identified. The latter scale insect is one of the oldest species found attacking coconut in this colony. It attacks both the leaves and the husks. The excellent results obtained with these parasites show that no apprehension need be felt concerning attacks of scale insects on coconuts. This is very fortunate because any step taken by the planters to combat scale insects by spraying is outside their practical politics. Necrobia rufipes on coprah stored for a long time and silvanus surinamensis on coconut cake are still doing damage.

Vanilla is rather free from insect attack except by an Aphis (Cerataphis latania) which is bred by ants at the base of the flower stalks. This insect is however never found in considerable numbers.

Rubber. Leaves of Para Rubber are attached on a small scale by Lecanium nigrum and Hemichionaspis aspidistrae but the former scale insect is kept in check by a natural fungus parasite (Hypocrella sp.).

Limes, Oranges, Bigarades and other citrus trees are attacked by a host of scale insects. (1) Lecanium viride which is completely kept in check at high altitudes by Cephalosporium lecanii and a little at low elevations. (2) Mytilaspis citricola which has fortunately been found this year to be kept under control by the red fungus Sphoerostilbe cocophila. This parasite has been found on the hills and in the low country. (3) Aspidiotus ficus which is certainly parasitised as it disappears from plantations as suddenly as it makes its appearance. Spraying with cheap fish oil soap made locally is necessary to combat scale insects.

Roses bushes are attacked at night by Adoretus versutus and in the day time by Oxycotonia versicolor. Both these beetles are getting very common. They could be destroyed by Scoliid wasp parasites if it is decided to introduce the latter from Madagascar.

Papaws (Papaya carica) are badly attacked by Diaspis pentagona, a very common scale insect in the Colony. White washing the stem of the trees every 3 months gave excellent results as a measure of combating this pest at the Botanic Station.

Breadfruits (Artocarpus incisa), jack trees (Artocarpus integrifolia) are attacked by Aspidiotus ficus and Icerya Seychellarum.

Custard apples (Anona squamosa) Anona reticulata and soursop (Anona muricata) are attacked by Icarya Seychellarum, Asterolecanium pustulans var Seychellarum, and Saissetia hemispherica.

Coffee (Coffea liberica) is attacked by Lecanium viride, Saissetia hemispherica and Ischnaspis filiformis scale insects.

Palm oil (Eleis Guineensis). The leaves of this palm are badly infested with Ischnaspis filiformis. Scorching the palms with kerosene blast torches combined with judicious pruning is being tried. It has been found impossible to purchase blast torches but coconuts husks dipped in kerosene at the end of long poles are used instead.

Lime (Citrus aurantia) an obnoxious bush, which is spreading [illegible] is effectively destroyed by Pulvinaria antigoni and asterolecanium pustulans var.

Mangoes (Mangifera indica) are attacked by Vinsonia stellifera, Lecanium mangiferæ and Icerya Seychellarum.

Sugar cane (Saccharum officinarum) is attacked by Trochorrohopalus strangulatus, a weevil which bores into the underground portion of the stem. The ravages of this insect are not considered as being important.

Banana (Musa parasidiaca) A great many species are badly infested with Cosmopolites sordidus (a weevil) which bores into the bulbous extremity of the pseudo stem. Many species of plantain are immune while others (as one could except often the best) are attacked.

Maize (Zea mais). The stored grains are attacked by Calandra oryzae and owing to the ravages of this insect there is no grain left in the Colony 3 months after the crop has been harvested.

CHAPTER XIII.

CROWN LANDS.

The following plants were set out during the year :—

At Niol—500 feet elevation.

Gum copal (Trachylobium verrucosum)	2829	(Loquat) Eriobotrya japonica ...	4
Takamaka (Calophyllum inophyllum)	341	Citrus (various)	15
Bois de table (Heritiera littoralis) ...	492	Parkia Roxburghii	51
Cola (Cola accuminata var rubra) ...	72	Palms (various)	28
Cedars (Casuarina equisetifolia) ..	250		

At Delanos—1500 feet.

Robusta coffee	120	Cassia sp.	33
Bois maret (Risleya Griffithii) ...	70	Albizzia moluccana	173
Capucin (Northea Seychellarum) ...	310	Mangoes (Mangifera indica) ...	150
Peach (Persica vulgaris) ...	12		
Cocoplum (Chrysobolanus icaco) ...	7588		

At Perard—1500 feet.

Prosopis juliflora (Algaroba) ...	2	Nephelium longanum	9
Tonquin bean (Dipteryx odorata) ...	4	Durio Zybethinus	2
Pili nuts (Canarium Luzoniensis) ...	12	Diospyros Kaki	21
Biriba (Rollinia orthopetala) ...	6	Garcinia mangostana	2
Custard apple (Anona reticulata) ...	8	Coffea robusta	28

At Morne Blanc—1200 feet.

Coffea Robusta	28	Eleis guineensis (Palm oil) ...	41
Mango (Mangifera indica) ...	5	Citrus (various)	22
Gum copal (Trachylobium verrucosum	30	Bertholletia excelsa (Brazil nut) ...	1

At Dugand and Government House—150 to 200 feet.

Seychelles coconut (raisin type) ...	87	Prosopis juliflora	15
Ceylon coconut	20	Malpighia sp.	6
Eleis guineensis (Palm oil) ...	24	Araucaria excelsa	1
Gum copal (Trachylobium verrucosum)	152	Longan (Nephelium Longanum) ...	6
		Citrus (various)	13

Many Crown Lands Niol, Morne Blanc, Terrain Dugand, have been thrown open to small holders who work on the moitié system contract in order to try and make good the shortage of food crops. Many of these small cultivators insist on burning the land which they intend planting in ground crops and so strong is their idea that without burning the land they will obtain no crop that many of them have abandoned their lease when permission to set fire was refused owing to danger of general conflagrations.

There is no doubt that by burning a partial sterilisation of the soil takes place and this means that noxious microorganisms which prevent the growth of food fixing bateria are kept under control. By burning a portion of the potash and other elements of fertilization of the soil together with the mineral matters found in the dead leaves and roots of the weeds and grasses also assume a more available form which makes the plants, set out afterwards, grow quicker. But there is no doubt that most of this readily available plant food is lost by the action of rain because it is in a soluble state and that it is better to use it gradually without burning since it remains in the soil. The theory that burning destroys insect pests can also be held with some force but when an acre of land is burnt in the middle of square miles left unburnt the insects which are being combated very quickly return to the burnt area and in greater numbers since by destroying by fire the insects, their natural parasites are also destroyed at the same time. But the small holder wants to make use of the land which does not belong to him for a short time and to shift to pastures new when the plant food he has rendered available is exhausted. There is no question that this policy cannot be adopted on land owned by the Government whose policy is to maintain the food plants in the soil. The interest of the Government and that of the small holder is conflicting and for this reason the crown lands will not be opened to cultivation except on a very small scale. Advantage is taken of the opening which is being made this year by planting timber and fruit trees in the opened areas as an attempt towards cheap reafforestation.

Among the plants that seem to grow well in the worn out soils of the crown lands (which are all estates abondoned by their former owners) Gum Copal, (Tecoma leucoxylon) and Chrysobolanus icaco are worth mentioning. This latter bushy plant covers the ground in the most sterile places and within two years bears a crop of fruit which unfortunately is at present relished by the labourers, old and young, who even eat the stones inside as a nut. This plant will eventually be self-sown all over the Colony to the great benefit of the numerous worn out soils which are thrown out of cultivation. It will serve as an adjunct to the cinnamon trees which are at present exploited for their bark and leaves and without which the mountain slopes of Mahé would exhibit their desolate aspect from a long distance.

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