The Journal

OF THE

BOARD OF AGRICULTURE

OF

BRITISH GUIANA.

ISSUED QUARTERLY.

VOLUME XII./32-6

JANUARY, 1919.—OCTOBER, 1919.

EDITED BY :

G. E. BODKIN B.A. Dip. Agric. (Cantab), F.Z.S., F.E.S.

Demerara :

PRINTED BY "THE DAILY CHRONICLE," LTD., GEORGETOWN.

1920

INDEX TO VOL. XII.

1919.

A

A.—(Contd.)

A.—(Contd.)

B

B.—(Contd.)

C

C.—(Contd.)

C.—(Contd.)

C.—(Contd.)

D

D.—(Contd.)

D.—(Contd.)

E

E.—(Contd.)

F

G

G.—(Contd.)

H

H.—(Contd.)

I

J

K

L

L.—(Contd.)

M

M.—(Contd.)

N

O.

O.—(Contd.)

P.

P.—(Contd.)

P.—(Contd.)

Q

R

R.—(Contd.)

S.

S.—(Contd.)

S.—(Contd.)

T.

T.—(Contd.)

T.—(Contd.)

U.

V

W.

W.—(Contd.)

X

Y

BOARD OF AGRICULTURE.

MEMBERS :

President.—His Excellency the Governor.
Chairman.—The Director of Science and Agriculture.
Deputy Chairman.—The Assistant Director of Science and Agriculture.

The Honourable C. Clementi, C.M.G., M.A., F.R.G.S., Colonial Secretary.
The Honorary Secretary, Royal Agricultural and Commercial Society (the Honourable Dr. J. J. Nunan.)
The Honourable R. E. Brassington.
The Director of Public Works.
The Commissioner of Lands and Mines.
The Inspector General of Police.
His Worship the Mayor of Georgetown.
J. Junor, Esquire.
B. Gainfort, Esquire.
S. H. Bayley, Esquire.
T. Earle, Esquire.
Oscar Webber, Esquire.
H. L. Humphrys, Esquire.
W. M. B. Shields, Esquire.
A. E. Bratt, Esquire.
H. E. Murray, Esquire.
Edgar Beckett, Esquire.
The Secretary, Co-operative Societies, (C. Shankland, Esquire.)
The Honorary Secretary, British Guiana Farmers' Conference, (Reverend E. R. O. Robertson.)
The Economic Biologist.
R. Ward, Esquire, Superintendent, Botanic Gardens and Agricultural Stations.
The Government Veterinary Surgeon.

Honorary Members.—Sir Daniel Morris, K.C.M.G., D.Sc., Sir Frederic M. Hodgson, K.C.M.G., J. J. Quelch, Esquire, B.Sc., Sir Francis Watts, K.C.M.G., D.Sc., Sir Walter Egerton, K.C.M.G., Sir Alexander Swettenham, K.C.M.G.

Secretary.—E. M. Peterkin.

COMMITTEES.

The Chairman and Deputy Chairman of the Board are members of the following Committees of the Board.

THE EXECUTIVE COMMITTEE.

The Honourable C. Clementi, C.M.G., M.A., F.R.G.S., Colonial Secretary.
The Commissioner of Lands and Mines.
H. L. Humphrys, Esquire.

THE EXHIBITIONS COMMITTEE.

His Worship the Mayor of George town.
J. Junor, Esquire.
S. H. Bayley, Esquire.
T. Earle, Esquire.
Oscar Webber, Esquire.
H. L. Humphrys, Esquire.
John F. Waby, Esquire.
Edgar Beckett, Esquire.
H. E. Murray, Esquire.
The Secretary, Co-operative Societies, C. Shankland, Esquire.

THE SUGAR-CANE COMMITTEE.

The Honourable R. E. Brassington.
J. Junor, Esquire.
W. M. B. Shields, Esquire.
H. L. Humphrys, Esquire.
A. E. Bratt, Esquire.
R. Strang, Esquire (co-operative.)

THE WILD BIRDS COMMITTEE.

The Inspector General of Police.
The Commissioner of Lands and Mines.
The Economic Biologist.
The Honorary Curator, British Guiana Museum (co-optative.)

THE GOVERNMENT FARMS COMMITTEE.

H. E. Murray, Esquire.
The Government Veterinary Surgeon.
The Auditor General (co-optative.)
The Inspector of Prisons

THE ORNAMENTAL GARDENS COMMITTEE.

The Honourable C. Clementi, C.M.G., M.A., F.R.G.S., Colonial Secretary.
His Worship the Mayor of George-town.
The Inspector General of Police.
A. Seton Milne, Esquire, M.R.C.V.S
The City Engineer (co-optative)

THE PLANT DISEASES AND PESTS. COMMITTEE

J. Junor, Esquire.
H. E. Murray, Esquire.
The Economic Biologist.

THE RUBBER AND FORESTRY COMMITTEE.

The Commissioner of Lands and Mines.
The Director of Public Works.
Edgar Beckett, Esquire.
The Forestry Officer (co-operative.)

THE SUBSIDIARY PRODUCTS COMMITTEE.

J. Junor, Esquire.
S. H. Bayley, Esquire.
T. Earle, Esquire.
H. L. Humphrys, Esquire.
John F. Waby, Esquire.
Edgar Beckett, Esquire.
H. E. Murray, Esquire.
The Secretary, Co-operative Societies, C. Shankland, Esquire.

THE LIVE STOCK COMMITTEE.

The Inspector General of Police.
B. Gainfort, Esquire.
S. H. Bayley, Esquire.
Oscar Webber, Esquire.
H. L. Humphrys, Esquire.
A. E. Bratt, Esquire.
H. E. Murray, Esquire.
The Economic Biologist.
The Government Veterinary Surgeon.
W. Mearns, Esquire (co-operative.)

THE VETERINARY COMMITTEE.

The Inspector General of Police.
A. E. Bratt, Esquire.
H. E. Murray, Esquire.
The Government Veterinary Surgeon.
M. Nascimento, Esquire, F.R. (co-optative)
M.P. Camacho, Esquire (co-optative.)

THE BERBICE COMMITTEE.

W. M. B. Shields, Esquire.
Edgar Beckett, Esquire.
J. C. Gibson, Esquire (co-optative)
J. H. Haly, Esquire (co-optative.)

OTHER COMMITTEES.

The following Committees consist of the Chairman and

THE CONTAGIOUS DISEASES (ANIMALS COMMITTEE.
The Government Veterinary Surgeon.

DESTRUCTIVE PESTS COMMITTEE.
The Economic Biologist.

THE STALLION COMMITTEE.

The Inspector General of Police.
H. L. Humphrys, Esquire.
B. Gainfort, Esquire.
The Government Veterinary Surgeon.
The Honourable N. Cannon (co-optative).
Inspector Manning do.

JOURNAL
OF THE
BOARD OF AGRICULTURE
OF
BRITISH GUIANA.

VOL. XII. JANUARY, 1919. No. 1.

THE NEW VOLUME.

We apologize for the late appearance of this number. Circumstances over which we have no control—to wit the arranging and drawing up of a satisfactory contract for the printing of the Journal—have militated against that punctuality which was to be a feature of the new series—as opposed to the old.

We may mention here that our new contract provides for a number consisting of eighty pages ; the old contract provided for only sixty. A larger supply of copies will also be available for distribution.

We would welcome many more articles from the pens of practical agriculturists; the example of Messrs. Bratt and Haly have paved the way. A wealth of knowledge concerning the various branches of agriculture in British Guiana exists among those who obtain their livelihood therefrom and this should very certainly be recorded for the advantage of present and future generations. It is not our policy to fill these pages with technical results of scientific experiments; the views and experiences of the practical man must also be recorded. Both are equally necessary and equally valuable.

We suggest that contributions concerning mechanical tillage, coconut cultivation, management of pigs and other stock, rice cultivation, etc., would be of particular interest.

A final word. The notes on coconut cultivation which we reproduce from the Annual Report of the Madras Agricultural Department are of value and well illustrate the superior results obtainable from careful treatment. We commend the article to those of our readers who are interested parties.

NOTES ON A COLLECTION OF PRESERVED DRY FRUITS AND SEEDS.

By J. F. Waby, I.S.O.

For many years I have interested myself in collecting all the different kinds of fruits and seeds which can be preserved by ordinary means, and have obtained quite a large number in which many friends have also been interested; possibly no such collection is to be seen outside the Herbarium of the Botanic Gardens. I have been asked to give a description of these so that others may know what can be collected as natural curiosities, as many of the specimens would be welcomed by visitors to the colony to show what can be obtained in this direction, besides making them known to our own public who know little of such things. All the seeds and smaller fruits have been stored in bottles of two sizes, these being made of particularly clear glass; those fruits too large for the bottles have been kept in a glass case. The Leguminosae or Bean family is fairly represented and we will take these first.

The bean of *Entada scandens*, cosmopolitan in the tropics, variously known as, " Water-Vine" " Water Wythe," " Leitchhardt's bean," "Queensland bean," "Cacoons," "Mafootoowythe." My largest bean is the greatest I have seen; 34 inches long, 4 inches wide with 8 large seeds. The bean is what is known as a "somentum," deeply constructed between the seeds, with a very strong "sinus" all round by which it is held to the branch. In dehiscing each seed breaks away right across the bean, separating also from the sinus, carrying with it its own portion of the bean, which decays on the ground permitting the seed to germinate. The sinus hangs on the branch for a

long time. This specimen I purchased at Dominica on my way to Canada, where I also saw its large seeds, which are of a polished brown colour, 2 inches wide and deep, nearly ¾ inch thick, quite hard; these are made into snuff boxes and powerful whistles.

My second specimen is much smaller, 18 inches long, 3 inches wide with 6 seeds, given to me by Bishop Parry who obtained it from Queensland where it is known as the "Queensland bean." The plant is a strong growing woody climber with bipinnate foliage, often with tendrils; leaflets large in sveeral pairs; flowers in racemes. It is called the "water-vine" or "Water-Wythe" because the stems contain a large quantity of water which thirsty travellers have found most acceptable, this is obtained by cutting through the stems from which it flows freely. The stems are like what we know as "Supple Jack' or "Buck-rope," composed of long open tubes, the small stems pliable.

A congener of this is *Entada polystachya*, a very common climber all through this colony. The beans are 9—12 inches long, 2 inches wide, flat and thin, with many seeds, each in a separate compartment stretching across the bean ; dehiscing separately like a winged seed, a thin papery covering breaking away always before dehiscence laving the all-round sinus adhering to the vine. Foliage bipinnate with rather small leaflets in several pairs. Flowers small and whitish in large racemes of bottle-brush form, producing the beans in bunches. No use seems to be made of this plant.

The " Flamboyant" or "Peacock flower" bean, *Poinciana regia*, a native of Madigascar. This tree is so common that no doubt it is often considered as being indigenous. It never makes a large tree here, 20-25 feet in height is practically its limit, often much less; the stem becomes fairly thick, generally with buttresses; the head is always flat and spreading, the foliage bipinnate, rather large, with may small leaflets of a pretty delicate green; the large flowers are borne in great profusion of the most gorgeous colours The beans are also borne in great numbers, 18 inches long, 2 inches wide, ¼ inch thick, of quite a woody texture; dehiscence takes place after long drying, disclosing the seeds, which are many—

in separate compartments, an inch long, stone-like on like pieces of mottled bone, brown with a yellowish edge; they germinate freely and grow rapidly. The wood is yellow, close grained and very hard ; it should be useful for making such articles as are made from Boxwood.

The " Horse Cassia " or " Stinking-Toe," bean, *Cassia grandis*, of the West Indies and Guiana. The beans are large and borne in great numbers; hard wooded, roughish, 16-18 inches long, 1¼ inches wide, almost ronnd with a decided ridge at the back. The central sulture quite distinct with a ridge on side ; the substance prettily veined. The seeds are numerous, rather small for the size of the bean, brown, flattish, oblong, each one in a separate compartment wrapped in a thick glue-like substance. The beans are non-dehiscent, and as they decay on the ground the seeds are often seen germinating through the substance of the bean. Creoles are very fond of eating the matter in which the seeds are enclosed, although it has a very pungent odour, from which the name "Stinking Toe " is derived. The tree is of medium size with a fairly stout stem, though not often with much straight timber, it branches irregularly with a fair spread. The foliage is large, pinnate, with many pairs of oblong leaflets about 2 inches long, of a dark green colour The flowers, of a pretty pink colour, are borne on innumerable short racemes along the bare branches, never, or rarely, amongst the foliage. The wood does not seem to be made use of. In curiosity shops one sees occasionally strings of rattling necklaces made by Indians from the seeds with the ends cut off and the substance extracted. My specimens are from the Botanic Gardens.

Beans of the "Cassia-stick" or "Bois Casse" tree, *Cassia Fistula*, fairly cosmopolitan to the tropics, naturalised in Jamaica and the Caribbean Islands. The beans are hard, round, smooth and indehiscent; the ventral suture is plainly marked; 16-18 inches long, 1 inch thick. The seeds are very small, numerous and closely packed in separate compartments, each in a parchment like case, like a small button with sharp edges. wrapped in a glue-like substance which forms the ingredient of the Pharmacopoeia The separate compartments are easily traced on the outside of the

bean. Specimens from Trinidad. The tree is handsome in pyramidal form with small stem and pendant branches which spread little; foliage pinnate with several pairs of leaflets. The flowers are fairly large borne in large pendant racemes, bright yellow, on the naked branches; when in full bloom the tree is a glorious picture. It does not succeed well in this colony but in Trinidad and Barbados it is magnificent.

Beans of the "Apple-flowered Cassia," *Cassia javanica*, introduced from the East Indies, naturalized in Jamaica. The beans are indehiscent of a similar nature to those of *C. Fistula* but longer and narrower, 18-24 inches long, $\frac{3}{4}$ inch wide, roundish the ventral suture and the seed compartments plainly marked. This is a handsome, rather loosely formed, medium sized tree with long pendulous branches and long pinnate foliage of many pairs of oblong leaflets 2 inches long. The flowers, of a pretty apple blossom colour, are borne on the bare branches in masses of small racemes. This also does not do well here, my specimens came from Trinidad. Beans of the "West Indian Locust," *Hymenaea Courbaril*. The beans are of a dark brown colour, woody, rough, 5 inches long, $2\frac{1}{4}$ inches wide, $1\frac{1}{4}$ inches thick, sides rounded; the dorsal suture prominent like a ridge, the ventral suture well defined, with 3 to 4 large seeds encased in a thick mealy pulp, sweetish to the taste of which creoles are very fond; indehiscent, requiring force to break them open. The seeds are very hard, of a polished brown, and as the beans are also very hard it takes a long time for them to decay naturally so that germination can take place. The tree is a large growing forest tree, giving valuable timber. In old trees, a valuable gum is obtained known as Simin gum, of a bright yellow; this exudes at the base of the tree and has often to be dug out. The foliage is peculiar, leathery, unequal sided in pairs. The flowers are very small, borne in small terminal corymbs. Specimens from the Botanic Gardens.

Beans of "Ourasoura," *Pterocarpus* (*Valairea*) *guianensis;* as it name denotes it is indigenous. The bean is a peculiar looking object, almost circular with a blunt point and an oblique half base; dorsal suture with a sharp edge, 4 inches long, 3-$3\frac{3}{4}$ inches wide, very thick and spongy, dark brown, containing one large

seed, indehiscent; owing to the spongy material of the bean it soon decays. The tree is one of our forest trees of not great size, with pinnate foliage of 5½ pairs of leaflets; the inflorescence is a strong terminal panicle with large purple flowers. Specimens from the Botanic Gardens.

Beans of the "Roble," *Platymiscium polystachium*, a West Indian tree. The beans are thin, flat, papery, oblong with sharp edges, 4 inches long, 1½-1¾ inches wide, with one thin, flat seed in the centre, indehiscent, easily decaying for germination, the seed often growing through the papery skin. A tall growing forest tree with pendulous branches; foliage pinnate of 5 pairs of leaflets, 2-3 inches long, glabrous. Inflorescence in axillary racemes produced in abundance, flowers small, bright yellow, giving a strong, delightful perfume of violets. Wood yellowish. Specimens from Botanic Gardens.

(To be continued.)

THE AGRICULTURAL PROGRESS OF THE POMEROON BETWEEN THE YEARS 1905-1917.

By W. H. MATTHEWS, Resident Agricultural Instructor, Pomeroon.

Pomeroon and farming have long been synonymous terms. Long before the North West District was thought of in connection with farming the Pomeroon agriculturists were busy supplying Georgetown housewives with ground provisions. In recent years, however, so much has been said and written about the North West, while Pomeroon has been so little advertised, that the writer feels himself in duty bound to bring to the notice of the public some of the things that Pomeroon has done and is still doing.

Prior to the residence of an Agricultural Instructor in the District (1909) little or no reliable information with regard to the agricultural activities of the District was available. From information gleaned from trustworthy residents, however, it ap-

pears that prior to the year 1884 the cultivation of ground provisions was a speciality of the Pomeroon farmers, little attention being devoted to the growing of permanent crops. In those days, it is said, fewer but larger grants were worked; the producton of ground provisions being greater than at present. Owing to the absence of records at that period it is not possible to test the veracity of this statement. It is quite believable, though, that higher yields may have been obtained in connection with Tannias, for instance, as the land being freshly put under cultivation would naturally be of a higher fertility, containing a high percentage of humus, so necessary to the successful production of this crop. As the grants became exhausted the farmers took out new grants, thus always keeping up the yields by tapping fresh sources of fertility. The cultivation in those days consisted of the minimum amount of drainage, planting and weeding. No forking of the land was done. The ease with which farmers appear to have been then able to purchase land may be gathered from the fact that there are grants in different parts of the river at present owned, or formerly owned, by a single farmer. Before the importance of permanent crops was appreciated the lands that became unfit for further cropping with ground provisions were abandoned so that with the restricted area in which farming was then carried on the production of ground provisions would naturally show a falling off; worked as they were on the system of "catch and go."

In the year 1890 or thereabouts increased interest was shown in the planting of permanent crops and this came about through the introduction by Mr. im Thurn (now Sir Everard), of the Liberian coffee. Mr. im Thurn who was at the time Magistrate of the District obtained seeds of this coffee from the Botanic Gardens and planted them at the Marlborough Compound where, with proper drainage, they did exceedingly well and bore good crops. From these plants seeds were distributed by Mr. im Thurn who recommended farmers to plant them on their grants. M. J. Da Silva whose grant, Newport, is obliquely opposite the Charity end of the Pomeroon road, was the first to put into practical effect Mr. im Thurn's advice. He began by planting two acres and when the plants came into bearing he found that from these two acres of Liberian Coffee he obtained a

higher yield than from 50 acres of Arabian Coffee that he had previously planted. He mentioned this fact to J. Gouveia and a few others who also began planting the Liberian Coffee; Da Silva and Gouveia to-day are the largest coffee growers in the district. The few farmers who had previously been growing Arabian Coffee substituted the Liberian variety instead so that now the Arabian is found only as the relict of former days. In this vicinity the coffee cultivations stretch for about 6 miles on both banks of the river producing annually about 3,215 cwt. of berries.

Following on the heels of Coffee, interest was also directed to the planting of coconuts as a business proposition. There were growing previously a few coconut trees on some grants in the lower parts of the river but these did not promise well and accordingly farmers pronounced coconut cultivation as a failure in the district. Later, Miss Theobald, who came from the East Coast, maintained that coconuts would thrive, and, having purchased a grant near the mouth of the river, planted coconuts and by giving the necessary drainage, proved that these plants not only grew but thrived. Her neighbours, seeing how well coconuts grew when proper drainage was provided, followed suit and, so far from proving a failure to-day farmers are finding that coconuts give far more remunerative returns than coffee. With the assistance given by the Agricultural Department in the control of disease and selection of desirable nuts for planting purposes, the cultivation is being greatly fostered. The census taken at the end of 1917 showed that the output of nuts from the district was 2,352,088 together with 3,431 gallons of oil.

Cacao cultivation along the flat lands on the banks of the river is unfortunately not a success there being only one grant where these plants do fairly well, namely, Hope and Perseverance, a grant on the Akawini owned by F. E. Pierre. A sand reef runs across this grant imparting a loamy nature to that particular part of the grant and here the owner has quite wisely planted his cacao. There is, however, every reason to believe that a type of cacao fairly well suited to the district will be found and the Agricultural Officer of the District is engaged in studying the various types so as to find out the right kind. Whilst on the

subject of cacao cultivation it may not be out of place to state that there are ideal lands for cacao in the upper reaches of the river. The lands in that vicinity are hilly thus providing natural drainage and deep rooting for the plants. A steamer can easily travel up to these parts thus ensuring cheap transportation. The climate there is much healthier than in the lower parts of the river. These hilly lands are, however, situated in the Indian reservation; no doubt the Government will sooner or later consider whether these lands should not be let for the purposes previously mentioned.

Rubber (*Hevea brasiliensis*) thrives in the district. An experimental Rubber Station, established by the Government in the District has shown that the yield compares well with that obtained in other Rubber growing countries. The dreaded leaf disease is absent and visitors from the North West District speak of trees here as doing far better than there. Planting is at present confined to two farmers, Messrs. Gouveia and Da Silva; it is hoped that others will soon follow in their wake

With regard to lime cultivation nothing like the planting of this crop on commercial lines is being done. The absence of a favourable market accounts for this. With the drainage of the lots along the Pomeroon road and the hopes of the establishment of a lime factory in the vicinity, it will not be difficult to induce the farmers there to take up the cultivation of limes.

On the whole a great awakening in farming is noticeable in the district at the present time. With the establishment of a steamer service and the extension of the Essequebo road, Pomeroon is becoming more accessible to outsiders and many have taken advantage of the better travelling facilities to visit Pomeroon and in the majority of cases have settled down there. New lands to the extent of about 631 acres have been applied for, chiefly by small farmers in lots of 5 acres each. In addition to this. abandoned grants are being re-started, and the people show a desire to assist in the production of a greater quantity of locally grown food-stuffs. A better attitude is displayed towards the Agricultural Instructor and his services are more in demand; this by farmers who formerly were most antagonistic towards his visits to their cultivations. Slowly but surely the relationship between

the Instructor and the farmers is being recognised and already his work is bearing fruit. Better attention to drainage is being given and by paying closer attention to material for planting the old lands are giving satisfactory yields. Preparation of the land for planting and rotation of crops are being taught, while it is being shown how necessary it is to give attention to weeding and the execution thereof at the proper time.

The establishment of a Loan Bank in the District is eagerly desired by the smaller farmers and every endeavour is being made to establish one. By providing funds for the exploitation of the farms appreciable increase in the areas cultivated will be shown, whilst the co-operative element inculcated by these Banks will undoubtedly tend to the progress of a class so useful but unfortunately lacking unity. With these aids to farming it is no vain prophecy to say that within the next five years Pomeroon will again be what in former years it undoubtedly was, i.e., the leading farming district of the colony.

Appended is given the returns of areas under cultivation for 1905, the earliest recorded, and those for 1917.

It will be seen from these comparative tables that considerable progress has been made in the planting of permanent crops, counter-balancing greatly the slight decrease in ground provisions that might have been grown in earlier years whilst increased attention is being given to the rearing of live stock.

Acres under cultivation 1905.		Acres under cultivation 1918.
Coconuts	355	2,025
Cacao	75	71
Coffee	550	1,393
Rubber	Nil	91
Corn	300	386
Ground provisions	820	715
Rice	*Nil.*	75
Live Stock:—		
Cattle	49	86
Goats	Nil	12
Swine	70	186

C. K. BANCROFT, M.A., (Cantab), F.L.S.
Died, January 11th, 1919.

C. K. Bancroft joined the Department of Science and Agriculture, British Guiana, as Assistant Director and Government Botanist in May, 1913.

He resigned his appointment whilst in Canada in November, 1918.

He received his early education and training at Harrison College, Barbados, and later at Trinity College, Cambridge, which he entered as a Barbados Scholar. Later, he became a major scholar of Trinity College and took a 1st class in the Natural Science, Tripos, Part i. In Part ii. of the same Tripos he specialized in Botany. After leaving Cambridge he worked for a year at the Jodrell Laboratory, Kew, and in 1910, was appointed Assistant Mycologist to the Department of Agriculture, Federated Malay States. He left there in 1912 to take up his appointment in British Guiana.,

His published writings consist of a Handbook of Fungus Diseases of West Indian plants, some scientific papers in the Annals of Botany and Kew Bulletin, bulletins and reports of the Department of Agriculture, Federated Malay States and a number of reports and papers on plant diseases published by the Government of this Colony and in the Journal of the Board of Agriculture, British Guiana. He was also a Fellow of the Linnaean Society.

His death will be keenly felt by a number of his colleagues in this Department and by a wide circle of friends both here and in Barbados which was his home.

We extend our heartfelt sympathy to his widow and bereaved parents.

G.E.B.

A NOTE ON THE PURITY OF MILK AS REGARDS ITS SPECIFIC GRAVITY AND PERCENTAGE OF FAT.

By K. D. REID, 1st Assistant Analyst, Government Laboratory British Guiana.

Milk vendors have on several occasions, when prosecuted fo selling milk which contains a percentage of fat below the lega standard of three and a quarter per cent. pleaded that the de crease is due to their having scalded the milk, which they clain to be genuine milk. Acting on the instructions of the Director o Science and Agriculture, a number of milk samples were an alysed in the Government Laboratory as regards their specifi gravity and fat content, and after careful note made of the re sults, the same samples were scalded and then re-examined, car being taken not to over-scald and so incur a possible error whicl might be due to over-evaporation.

In every case the solids-not-fat when worked out accord ing to Richmond's method using Veith's extension tables for cor recting the specific gravity of milk according to temperature, wa higher.

The specific gravity showed an increase but no definit opinion has as yet been formed as to whether the increase is du to a slight decrease in the percentagee of fat or whether the in crease was in any-way influenced by a difference in the tempera ture at which the specific gravity was taken—before and afte scalding.

This will be worked out when more data have been col lected; but as far as the information gained, the samples of mill in no way could be returned as being deficient in fat.

The following samples have been selected and represen milk of normal quality in this colony.

It may be mentioned that the scalded milk was first freed of that portion of its cream which is to be found on the surface before it was analysed.

It will be noticed that the gravities range from 1027 to 1032—the lowest and highest at which genuine milk samples are found here.

Before scalding			After scalding.		
Specific Gravity	*Fat*	*Solids not Fat*	*Specific Gravity*	*Fat*	*Solids not Fat*
1027	4.9	8.7	1027	5.2	8.8
1028	4.0	8.6	1032	3.4	9.8
1029	3.8	8.9	1030	3.5	9.2
1030	4.8	9.6	1032	4.2	9.9
1031	3.7	9.5	1031	3.9	9.6
1032	3.5	9.8	1032	3.7	9.9
Mean 1029.5	4.12	8.18	1030.7	3.98	9.54

It will be observed that only samples of genuine milk have been taken for analysis—that is, those samples which have a higher fat content than 3.25 per cent. and the solids-not-fat of which exceed 8.5 per cent.

The results fully confirm those obtained during the years 1892-3 when a number of samples of milk were similarly scalded and analysed in the Government Laboratory.

COCONUT CULTIVATION IN INDIA.

(The following extract from the Year Book of the Madras Agricultural Department 1918, which deals with coconut cultivation on the Malabar Coast of India, should prove o be of considerable interest to owners of coconut cultivations in this country. It, at least, evidences the increased yields which are obtainable through careful cultivation and manuring.)—EDITOR.

By far the most interesting experiment however has been carried out with some old trees which Mr. Davey purchased in 1906. The ages of these trees at the time of purchase cannot be correctly ascertained, but they were certainly over 20 years old and probably nearer 30 years. That the then owner did not attach much value to them can be realized when he agreed to sell the 49 trees and about 4 acres of land for the sum of Rs. 350.

(\$112.) Many of the trees had never borne a nut, and their stems showed clearly the poor condition they must have been in. At first Mr. Davey experimented only with local manures. The crops obtained were as follows:—

1907	516 nuts.
1908	861 ,,
1909	1,598 ,,
1910	1,424 ,,
1911	1,849 ,,

In 1911, Mr. Davey sent samples of the soil to Mr. Kelway Bamber and after analysis the latter recommended the application of the following mixture:—

Ground-nut cake	150 lb.
Milled fish	300 ,,
Blood meal	100 ,,
Con. Super Phosphate	100 ,,
St. Bone meal	100 ,,
Kainit	200 ,,
Sul. of Potash	50 ,,
	1,000*

This recommendation has been carefully followed though the mixture has had to be slightly modified lately owing to some of the ingredients being unobtainable owing to the war conditions.

The crops have been as follows:—

1912	943 nuts.
1913	2,083 ,,
1914	2,298 ,,
1915	2,614 ,,
1916	4,810 ,,

and the crop for the year 1917 will also exceed 4,000 nuts.

**Note on coconut cultivation at Alleppey. By W. McRae, Government Mycologist and R. D. Anstead, Deputy Director of Agriculture, Planting Districts.*

**Applied at the rate of 15 lbs. per tree per annum.*

These old trees are now looking particularly healthy, and are a real contrast to the surrounding trees under ordinary local cultivation. They have particularly fine crowns of large well-developed leaves and are crowded with bunches of blossom and nuts in all stages of development. Many appeared ideal trees and the swollen bases of the stems are especially noticeable. The 24 best trees averaged 121 nuts each in 1916 whilst the average of the whole 49 trees was 98 nuts.

These figures prove conclusively that the land is quite suitable for coconuts if cultivated on proper lines, and it will be interesting to see later on the results that are obtained from the younger areas that have received proper attention from the time of planting. It may be noted in both instances given that in the year after the first application of artificial manure, the crop fell, and this seems to point to this being usually the case. If this is so, it is important to call attention to it, as many cultivators would fight shy of continuing the treatment unless it was pointed out beforehand that it would probably happen.

It is interesting to compare these results with those obtained at the Porto Rico Agricultural Experiment Station. There it is found that while fertilisers produce but little increase in the yield of nuts during the first two years after application, marked gains in yield occur after this period. Thus, given a complete fertiliser containing 6 per cent. of nitrogen, 6 per cent. of phosphoric acid and 12 per cent. of potash at the rate of 10lb. per tree, a gain of over 30 per cent. in the yield of nuts per tree was obtained, and when 20lb. per tree was applied, a gain of nearly 60 per cent. per tree resulted. When nitrogen and potash were obtained, and when 20lb. per tree was applied, a gain of nearly when the potash only was omitted there was only a slight increase.

Another result of manuring is the increased copra contents of the nuts. Before commencing the application of these manures the number of nuts required to make a candy (660lb.) of copra was from 2,300 to 2,400 whereas now 1,950 to 2,050 nuts suffice—a considerable improvement which is worth noting.

There is a common belief in the locality that coconuts thrive best "in the sound of the human voice" and it is customary to place the dwelling houses in the coconut groves. On one plantation we visited, there had been a number of such houses, but Mr. Davey, finding his tenants unsatisfactory for various reason, had removed most of them. Wherever there had been a house-site the neighbouring trees had benefited, and were without question more flourishing than those situated elsewhere. It is obviously not exactly the human voice that these trees had benefited by, but rather the refuse, ashes, etc., which they had received from the human occupation. Under Indian conditions of sanitation, the fertilizing value of each household must be considerable. On tea estates it is a common practice to build a set of lines in the backward field of tea, and no other system of manuring brings it on so surely or so fast as this.

The yield of nuts in the neighbourhood of Alleppey appears to be high, frequently reaching 80 to 100 nuts per tree where manures are used, while we were told of a plantation 18 miles North which gives exceedingly high yields, some of the palms giving 400 and even 450 nuts yearly. This phenomenal yield is worth investigation. We are unaware of the average yield on the West Coast, but in other countries it apparently only reaches 60-80 nuts per tree per annum. Thus in their book "A Practical Guide to Coconut Planting" the authors, Munro and Brown, say "from large well cultured trees in full bearing all over the Peninsula (F.M.S.) we consider an average of sixty nuts a tree per annum the actual limit: nothing approaching this result, however, need be reckoned on without high cultivation."

Along the back-waters and sides of the canals the palms are much more vigorous, especially where they are not overcrowded—a very common fault apparently. Since the trees are valued at so much each, the cultivators think the more the trees per acre the more valuable the cultivation and lose sight of the crop yields. Here the frequent application of lime improves the growth and yield. Any other manure is scarcely necessary as the trees are grown in rich black alluvial soil dredged from the bottom of the lakes and brought considerable distances

baskets of river sand every second year which treatment is said to assist their growth.

We were specially shown two palms which bear particularly large nuts fetching high prices. These nuts, owing to their large copra contents, were fetching before the war Rs. 75 to 80 per thousand when ordinary nuts were sold at from Rs. 50 to 55. (1 Rupee=48c.) These trees have been used as seed-bearers and Mr. Davey showed us some small plantations raised from them. The type appears to be fixed, the progeny bearing similar large nuts while the growth is remarkably rapid. Three to six years old palms planted wide apart and lined show an astonishing development, and have particularly large bottled-shaped bases. We measured one tree of nine years and found it to be 110 inches in circumference at ground level.

TROPICAL SOIL SAMPLING.

(*The following instructions have been prepared by the Director of Science and Agriculture and given to the Botanical Officer for his guidance whilst engaged in the survey of the Rupununi Cattle Trail. They should prove of considerable interest and value to those engaged elsewhere in the examination of tropical soils.*—EDITOR.)

A rough sketch of the block of land from which the samples are to be taken should be prepared to accompany the samples. The spots where the samples are taken are to be marked on this plan, and are to be numbered. This sketch plan should also indicate the positions of the cattle track, creeks, gullies, ridges, as well as the general fall, and aspect of land, &c.

Should the soil in various parts of the block show a very marked difference, it will be necessary to divide the block into two or more parts. Should the different soil occur only in a small patch, this sample may be left out.

Not less than three samples should be taken in each block. A greater number is to be preferred as a better average will be obtained. In order to obtain a fair average sample of the soil from a block of land, as nearly as possible equal quantities of soil are to be collected from various parts of the block.

At the places chosen for the taking of the samples the surface is to be slightly scraped with a sharp tool so as to remove any surface vegetation which has not as yet become part of the soil.

Vertical holes from 10 to 18 inches square are to be dug in the ground to a depth of about 2 feet. The holes are to be dug out like post-holes; an earth-auger will facilitate the operation considerably, and the holes may be trimmed with the spade afterwards, and cleaned out

Careful note of the appearance of the freshly cut soil, of any intermediate layer and of the subsoil should be taken. The depth of the real soil, which in most cases is easily distinguished, is to be measured and noted for each hole. Note how deep the roots of the surface vegetation reach into the soil. If the soil changes gradually into the subsoil, as is the case in some places where the soil is of very great depth, this line of division can only be guessed approximately, and it is best to take the soil uniformly to a depth of 12 inches.

With a spade a slice of soil, from 3 to 4 inches thick, down to the beginning of the subsoil or to a depth of 12 inches, is to be cut off and put on to a clean bag. The same is to be done with the subsoil, the slice being taken from where the soils ends (or 12 inches) to the bottom of the hole, and this subsoil placed on another bag. Stones over the size of a pea may be picked out, the rough quantity of such stones estimated, and a few enclosed with the samples Fine roots must not be taken out from the soil samples. The same operation is repeated at the other places chosen. Take careful note and give description of soils in each hole, as numbered and marked on plan. The samples of soil collected on the one bag are to be thoroughly mixed by breaking up any large clods, and about 3lbs. of the mixed soil are to be put into a clean canvas bag, which is to be securely tied up and labelled. The same is done with the samples of subsoil collected separately on the other bag.

All the samples collected are afterwards to be placed in a wooden box.

A short description of the land must accompany the samples and the sketch plan. State if the land is heavily timbered

or not, and if scrub or forest land, what sort of timber is chiefly growing on it. In all cases a description of the neighbouring land, outcropping rocks, &c., will be of great value. Also state if the land is naturally drained or not; and describe the land as regards its position to the cattle track, Indian paths or trails, hills, creeks, ridges, &c

Great care must be observed that the land whence the samples are taken is land of potential agricultural value. When the land is purely sandy land from divides between rivers or streams and hence of little or no potential agricultural value, that fact should be carefully noted. Single samples from areas of this sort will suffice if full notes are made as to the extent of such areas.

Only by adhering strictly to these instructions and by giving minute details can benefit be derived from the soil analyses.

MOSQUITOES.

HOW THEY LIVE, HOW THEY SPREAD DISEASE, AND HOW TO DESTROY THEM.

By L. D. Cleare, Jnr., F.E.S., Biological Division, Department of Science and Agriculture.

In most parts of the Colony there are times when mosquitoes force themselves on one's attention, and when even the most unobservant must consider them. This alone would be sufficient reason to cause their study, but when we know that they are the carriers of malarial and filarial fevers—and it must at once be understand that there is not the slightest doubt about this—they become insects of the greatest importance to us.

Mosquitoes, like house-flies and many other insects, were up to within recent years looked upon as harmless and mere nuisances on account of their habits of annoying man; but this idea has been change. Mosquitoes have within the past twenty or thirty years been extensively studied, and it has been proved beyond the slightest doubt that both malaria and filaria are not

only transmitted by mosquitoes but that they are essential for the life of the organisms causing the diseases; while yellow fever is at least transmitted by these insects.

The prevalence of both malaria and filaria in this colony, and the suffering caused through these diseases—let alone the financial loss—should, when we know that mosquitoes are responsible, cause every inhabitant of the colony to wage a deadly war against these insects.

THE DIFFERENT KINDS OF MOSQUITOES.

Almost everyone must have observed that there are many different kinds of mosquitoes in the colony, and as a matter of fact up to the present sixty-four different species have been found here. While the majority of them will attack man the careful observer must have noticed that the different mosquitoes have different habits and are to be found in different localities; some are 'bush mosquitoes' and frequent the forests, others inhabit damp and bushy places, while still others are to be found about our houses and enter them in order to bite us.

It is these last kinds that we will consider here, the 'domestic 'mosquitoes,' as they have been called, for, on account of their close association with man, they have become transmitters of malaria and filaria, both diseases of vital importance to the inhabitants of British Guiana.

LIFE HISTORY.

Before we try to distinguish the different mosquitoes let us learn how they live. As might be expected with so many different kinds their life histories are somewhat different in detail, but in the main points they are the same and the following may be taken as a general life history.

The greater part of their lives are spent in water. First the eggs are laid in water, or sometimes on floating objects, either singly or in rafts depending on the kind of mosquito. In from one to four days, these eggs hatch to larvae or wrigglers which also live in water. Although mosquito larvae live in water they are air-breathing and a notable feature in the anatomy of such larvae is the breathing tube situated at the posterior end of the body. When mosquito larvae float near the surface of the water this tube is projected above the surface to obtain air. Failure to ob-

tain this supply of air soon results in the death of the larva through drowning; advantage is taken of this fact in the control of mosquitoes by the spreading of a film of oil on the surface of the water—a method of which will be discussed under the control of mosquitoes.

After moulting or shedding their skins two or three times, extending over a period of between one to three weeks, the larvae change to pupae. Pupae resemble larvae in a general way, for they look like larvae coiled up at one end and are best described as comma-shaped (9). They are almost as active as larvae and water is essential for their life. Instead of breathing through a single breathing tube the pupae breathe through a pair of trumpet-like organs situated at their head end. Both larvae and pupae differ according to the kind of mosquito they will form, but as far as general appearances go they are all rather alike.

The winged adult emerges through a rent in the skin of the pupa and after resting long enough on the discarded skin to dry its wings, flies away a fully developed insect ready to transmit loathsome diseases to man. It is only in the adult stage that the mosquito lives away from water and even then they do not usually travel far from their breeding places. Wherever we find mosquitoes we can be sure that not very far off there are accumulations of water, and this is particularly the case with the domestic species.

What is the length of life of an adult mosquito is a question that is often asked. The answer can at best only be approximate. As a rule the males are short-lived, in most cases only a matter of a few days, but under unusually favourable conditions they have been known to live between two and three weeks. The females, however, live a much longer period and two or three months is not an overestimate for some species at least. The female of *Stegomyia* have been kept in captivity for as long as 154 days, though this appears to be far in excess of their normal span of life.

HABITS OF ADULT MOSQUITOES.

The habit of sucking blood is probably the best known and at the same time most important habit of the adult mosquito. It is only the female, however, that has developed this habit—the male living on the juices of plants, etc., his mouthparts being

unsuitable for sucking blood—and it is probable that the female of any mosquito will such blood provided the opportunity occurs. It is not, however, the casual blood-suckers that are important to us, but the mosquitoes that are found constantly associated with man—the domestic mosquitoes—for the more closely associated any insects become with human beings the more likely they are to transmit diseases. It is only the domestic mosquitoes that we find constantly associated with man and entering his house.

Almost as important as the habit of sucking blood is their necessity for water. In fact as far as control measures are concerned it is the most important feature. As we have seen, water is essential for the life of the mosquito in its early stages, and when they become adults one of their first instincts is to seek water for the deposition of their eggs. It is this habit that is taken advantage of in such control measures as draining and screening.

THE DOMESTIC MOSQUITOES.

Of the domestic mosquitoes there are three kinds. 1, the Malaria mosquito or *Anopheles;* 2. the Filaria mosquito or *Culex;* and 3, the Yellow Fever mosquito or *Stegomyia.*

We will first see the differences between the Malaria and Filaria mosquitoes and then compare them with the *Stegomyia.*

The adult mosquitoes of *Anopheles* and *Culex* can easily be distinguished for there are a number of characters that are peculiar to each. Probably the most striking character is the difference in the wings. In the *Anopheles* the wings are spotted (at least in all the species found in British Guiana) while in the Culex they are clear. Projecting from the head of mosquitoes there are three appendages besides the feelers (antennae). The middle appendage is the beak or proboscis and it is through this that the insects suck blood. On each side of the beak is an appendage called a palpus and the differences between the palpi of the *Anopheles* and *Culex* are so marked that, along with the differences of wing markings, it serves as a very distinctive character. The palpi of the *Anopheles* are long, as long as the beak, while those of the *Culex* are short, being only one-fourth the length of the beak. There is yet another, and perhaps the most easily recognised difference between *Ano-*

pheles and *Culex*—it is their resting positions. When at rest the body of an *Anopheles* forms a distinct angle with the surface while in *Culex* the body is parallel with and almost touching the surface. This characteristic will at once distinguish an *Anopheles* from any other mosquito.

The eggs, larvae, and pupae also show noticeable differences.

The differences in he stages of the two groups are given in the following table:

MALARIA MOSQUITO OR ANOPHELES.	FILARIA MOSQUITO OR CULEX.
Adult see Fig.	*Adult* see Fig.
Wings spotted. Palpi as long as beak. When at rest body forms an angle with the surface of wall.	Wings clear. Palpi shorter than beak. When at rest the body is parallel with the surface of wall or almost touching it.
Eggs	*Eggs.*
Laid singly on water,	Floating in raft-like masses.
Larvae or 'wrigglers.'	*Larvae* or 'wrigglers.'
Have no breathing tube.	Have a long breathing tube at the end of body.
Body parallel with the surface of water when at rest.	Body hangs at angle to the surface of water when at rest.
Breeding places	*Breeding places.*
Usually earth pools, edges of slow streams, or ponds with vegetation.	Usually tanks, barrels, old tins, bottles, drains, cesspools, and their like.

The third domestic mosquito, the *Stegomyia*, is easily recognised. It is a distinctly black and white (or silver) mosquito. The characteristics of the different stages are given in the following table :

YELLOW FEVER MOSQUITO OR STEGOMYIA.

Adult.

Wings transparent. Palpi short in the female, long and curved in the male. The general colouration is black with markings of silver white. The markings on the back (thorax)

form a distinct lyre with two cords. This is particularly characteristic of the species. Abdomen and legs banded with white. When at rest the body is parallel to the surface as in *Culex*. The posterior pair of legs are raised and lowered alternately. When in flight it appears grey and resembles a bit of down.

Eggs.

Laid separately. The eggs are invariably deposited in accumulations of clean water such as vats, water barrels, bath cisterns, tins and broken bottles, defective guttering, etc.

Larvae.

Breathing tube rather long but not as long as in *Culex*. The attitude when at rest in the water is somewhat like *Culex* too but the body hands more perpendicular to the surface of the water.

Breeding places.

All receptacles capable of containing water found in houses or in their immediate vicinity: vases, cisterns, vats, gutters, tubs, old saucepans, the bottoms of upturned bottles, etc.

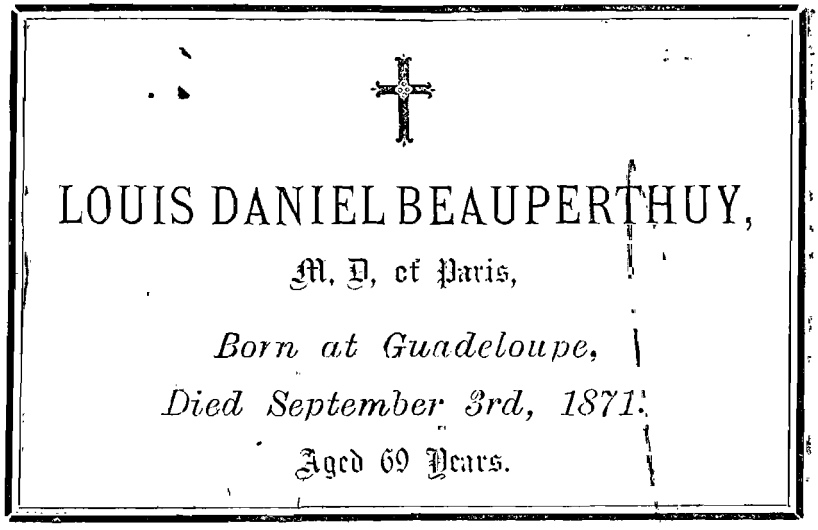
MOSQUITOES AND DISEASE.

The actual proof of mosquitoes as carriers of disease dates back only twenty-five years, but it was long before that that these insects were suggested as carriers.

In the year 1853 the French physician Louis Daniel Beauperthuy agrued that yellow fever and various other diseases were transmitted by mosquitoes, and set forth his case in the most explicit manner possible. He thought, however, that the source of the virus, which the mosquito took up and accidentally inoculated into man, was decomposing matter. Sir Rupert Boyce who quotes extensively from his work says "It is Dr. Beauperthuy whom we must regard as the father of the doctrine of insect borne disease."

It was years, however, before any proof was forthcoming.

It is worthy of mention here that Dr. Beauperthuy himself died of an attack of yellow fever contracted at His Majesty's Penal Settlement, Mazaruni River, where he was medical officer at the time. His grave, which is in a good state of preservation, may be seen in the cemetery there. On a brass tablet it bears the following inscription.



In 1877 Sir Patrick Manson, while working in China, discovered that the minute worm *Filaria* (*bancrofti*), which was present in the blood of a large percentage of the natives underwent development in the mosquito *Culex fatigans*. Manson's observations in this connection laid the foundation of subsequent investigation on the part played by biting flies as carriers of disease.

With the above exception our knowledge of the transmission of disease by insects has been acquired within the last twenty-five or thirty years. It was in the year 1897 that Sir Ronald Ross announced his epoch-making discovery of the development of the malaria parasite in *Anopheles* mosquitoes and placed the eradication of malaria on a scientific basis.

Following close on the discoveries with regard to malaria came those of yellow fever. In 1899 Reed, Carroll, Lazear and Agamonte investigated this disease and succeeded in proving beyond all doubt that yellow fever was carried by the mosquito *Stegomyia faciata* F. (*Aedes argenteus* Poiret).

All of the above mosquitoes (Culex, Anopheles and Stegomyia) are common in British Guiana and two of the diseases—Malaria and Filaria—are prevalent. Outbreaks of yellow fever have occurred in the colony though not within recent years. Al-

although yellow fever does not occur here now *Stegomyia* remains of importance to us on account of the possible introduction of the disease.

MALARIA FEVER

A large number of people still talk of the 'mosquito theory' when referring to the transmission of diseases, and particularly malaria, by these insects. Before we go any further let it be understood that it is no longer a theory—it is a fact—proven beyond the slightest doubt, mosquitoes transmit 'fevers.'

Malaria fever is caused by a microscopical organism in the blood. For a number of years it was observed that in cases of malaria these tiny organisms were always to be found and they were fully recognised as the malarial parasite. But just how these parasites got into the blood remained a mystery for years. Eventually the mosquito was suggested as a carrier. In August 1897, after two and a half years of arduous work, Sir Ronald Ross made his wonderful discovery and found certain stages of the parasite in a "dappled-winged mosquito."

THE MALARIA PARASITE.

The malarial parasite has several different stages. The stages are divided into two groups—the asexual forms which are found in man; and the sexual forms which occur in *Anopheles* mosquitoes.

When an anopheles mosquito feeds on a person whose blood contains malarial parasites, these parasites along with the blood enter its stomach. If the sexual forms of the parasite are present they at once unite. The parasite then undergoes certain changes in the mosquito's stomach passes through the stomach wall and comes to rest on the outer surface. Here it grows considerably, and, under favourable conditions after a week produces a large number of spores. These spores set free in the body cavity find their way to the salivary gland

The salviary glands of a mosquito secrete an irritating fluid which is injected by the mosquito when it begins to feed. Thus when one of these mosquitoes, which has previously fed on a malarious person and in which the parasites have undergone their

sexual development, bites another person after a week it injects these spores together with its saliva under the skin and into the blood. Man thus becomes infected.

In man the parasites multiply—asexually. Each of the spores (sporozoite) injected into the blood enters a red-blood corpuscle and after various changes divides up into a number of smaller ones (merozoites). The wall of the corpuscle now bursts and the parasites are set free in the blood stream. These enter other healthy blood corpuscles and the process is again repeated.

When a large number of blood corpuscles have been attacked the person feels the effects, and an attack of fever occurs. For the sexual reproduction of the parasite it is necessary for an anopheline mosquito to imbibe blood containing parasites. If no mosquitoes of the requisite species are present to suck the blood the parasites eventually die, but this takes a long time. The parasites are much quicker destroyed by the systematic taking of quinine.

WHERE DO ANOPHELES BREED ?

That well known entomologist the late Professor John B. Smith, famous for his work on the mosquitoes of New Jersey, U.S.A., in answer to his question "Where does *Anopheles* breed?" says "Everywhere."

The principal breeding places for Anopheles, however, are pools, small drains, drainage and drinking trenches with grass or other vegetation, old burnt earth pits, ill drained cane and rice lands—in fact any accumulation of water overgrown with grass and other vegetation especially if it is shady as well. Other breeding places should, however, not be overlooked for Anopheles have been found breeding in barrels, troughs, fountain basins, and even in water collected in the holes made by the footsteps of cattle and horses.

LOSS CAUSED BY MALARIA.

Many examples could be given of the loss caused to communities through malaria but let us consider our own colony.

In the year 1917 the deaths due to malaria in the whole colony were 1,436, which worked out at 46.0 per 10,000 inhabitants and 15.1 per cent. of all the deaths. In the city of

Georgetown during the same year malaria was responsible for 83 deaths or 5.1 per cent. of the total deaths in Georgetown.

Apart from the number of deaths if we think of the number of cases of fever—a number which will never rightly be known—the amount spent in doctors, hospitals, and medicines, the loss of actual labour during the period of attacks, and the reduced vitality after, we must begin to think in hundreds of thousands of dollars—and this for one year only.

Then there is the reduction of the value of real estate. We all know that land about 'fever holes' is not much valued.

MOSQUITOES CARRY MALARIA.

FILARIASIS.

Under the name Filariasis are included those diseases known as Elephantiasis or Barbados leg, Fever and Ague, Rose, Varicose groin glands, etc. The cause of the disease is a parasitic worm known as *Filaria* and mosquitoes are the carriers.

As previously mentioned it was Sir Patrick Manson who, in 1879, first discovered that the Filaria worm underwent certain changes in the mosquito *Culex fatigans* (*quinquefasciatus* Say). It was, however, not until 1900 that Low showed how the parasite again reached man.

When the blood of an infested person sucked up by a mosquito reaches its stomach the small filaria worms, after escaping from their sheaths, migrate to the body cavity of the mosquito and settle down in certain muscles (thoracic). During the next sixteen to twenty days they undergo a number of changes, including the formation of a mouth, alimentary canal and trilobed tail, at the same time increasing enormously in size.

The transformed worms re-enter the body cavity and eventually reach the mouthparts of the mosquito where they await an opportunity to enter their human hosts. The filariae are not introduced into man with the bite of the mosquito but at that time escape from the mouthparts and bore into the skin. Having once entered man they quickly become mature and may produce the symptoms known as 'fever and ague' and sometimes result in elephantiasis.

The carrier of Filaria is the Filaria mosquito, *Culex fatigans* (*quinquefasciatus*). The characters of this mosquito and its breeding places have already been given.

LOSS CAUSED THROUGH FILARIA.

While the number of deaths caused by Filaria are not large the loathsomeness of the disease and the suffering it causes to some persons who have developed it makes it of much importance to the inhabitants of the Colony. Dr. F. G. Rose, Government Bacteriologist, in a recent examination of primary school children in Georgetown found that 25.3 per cent. showed signs of Filaria. It has been estimated that from 13 to 15 per cent. of the native population (Negroes and East Indians) are infected with Filaria though nothing like this number show the pathological effects. Those who do are often laid low with ' fever ' several days each year even if the more unfortunate results such as elephantiasis and groin glands do not appear.

YELLOW FEVER.

Since 1885 there has been no outbreak of yellow fever in the colony and we can say that it does not occur here now.

The yellow fever mosquito, however, has not disappeared, far from it, it is probably the commonest mosquito in Georgetown.

During the latter part of October these mosquitoes were very prevalent in Georgetown, and as the weather was particularly dry at the time it was evident that their breeding places were artificial accumulations of water. This led to a suspicion of the water vats, and an inspection of a number of these receptacles was carried out by the writer in different parts of the town. In all forty-six vats were examined and of this number twenty-six or 58.6 per cent. were found to be breeding *Stegomyia fasciata* (*Aedes argenteus* Poiret). That is more than half of the vats examined were breeding these mosquitoes.

PROTECTION AND CONTROL OF MOSQUITOES.

The control of mosquitoes is a vast subject and much has been written about it. In a short article like this it can only be touched upon, and in the following paragraphs therefore only the methods most important to us will be dealt with. For our purpose we may divide the control of mosquitoes into two sections—1. Protection from bites, and 2, Prevention of breeding.

While the protection against bites of the adults is necessary and offers immediate relief, for more lasting results and the successful control of mosquitoes it is necessary to direct ones efforts

against the larval and pupal stages of these insects, and this is effected by the reduction and treatment of their breeding places.

PROTECTION FROM BITES.

Screening.—The most extensively employed means for protection against bites is that of screening. First we have mosquito nets around our beds to protect us from their bites during sleep, while a more elaborate employment of the same principle is the screening of the house—windows, doors, galleries, etc. There is no need to go into details with regard to this method, sufficient to say that for screening to be effective the screen or net must not be broken and that the mesh must be fine enough to prevent the entrance of mosquitoes. A suitable mesh is one measuring not less than 18-20 squares to the inch.

Repellants and Fumigants.—Other methods employed against the adults are repellants and fumigants. Repellants are substances which, when rubbed on the clothing and exposed parts of the body, prevent by their odour the attacks of these insects. Fumigants are substances which when burnt give off fumes that act either as a deterrent or poison to insects.

A number of different liquids have been used to rub on the skin as repellants against mosquitoes. Oil of Citronella is one of the best substances used in this way. The following mixture is recommended by Dr. L. O. Howard, prepared from the formula of Mr. C. A. Nash of New York, as one of the most effecacious mixtures tried.

1 oz. Oil of Citronella.
1 oz. Spirits of Camphor.
½ oz. Oil of Cedar.

Dr. Howard found that "Ordinarily a few drops on a bath towel hung over the head of the bed will keep *Culex pipens* away for a whole night."

Another repellant which is apparently quite effective is a mixture known as "Bamber Oil" which is extensively used by coolies on the plantations in Ceylon. It is made as follows:

Oil of Citronella (not lemon-grass)	1½	parts
Kerosene oil	1	,,
Coconut oil	2	,,

Add Carbolic acid 1 per cent.

Its efficacy lasts for from four to six hours.

Any dense smoke will drive away mosquitoes, and the burning of various substances are practised by hunters and campers. In this colony the burning of vegetation is often employed for this purpose.

For household use a number of different substances have been tried such as Pyrethrum powder, Mimm's Culicide, Sulphur dioxide, etc. Their various merits will not be gone into here.

Catching adult mosquitoes.—An easy and at the same time very sure way of catching adult mosquitoes is the simple method smearing the inside of a wineglass or 1 inch test tube with kerosene oil and gently placing this over the insect. In its effort to escape the mosquito flies up into the glass and is entangled in the oil.

Another method that at times works satisfactorily is the employment of box traps. A box of about 12 to 18 inches square with a hinged lid is painted black inside, lamp-black serves admirably for this, and a hole bored in the side to which a tight cork is fitted. Owing to the habit of adult mosquitoes of seeking dark places to rest, if the box is placed on its side in some dark corner of the room and the mosquitoes be driven from all their hiding places they will usually enter the trap. The lid may then be closed and fastened and by the removal of the cork, now at the top, a teaspoonful of benzine or chloroform may be introduced and the cork replaced. Allowed sufficient time this kills all the mosquitoes inside and the box is then thoroughly aired and replaced. The best time to do this is probably in the early morning.

Remedies for mosquito Bites.—Mr. H. E. Ewing in a very recent paper gives the results of his experiments in this direction. After trying a number of substances including soap, bay rum, alcohol, Hydrogenperoxide, glycerine and ammonia, finds "Strong alcohol and strong ammonia have the greatest value as "palliatives, both giving a marked reduction in the pain. There "is tendency for the former to leave a hard lump in the place of "the wheal, and the latter is rather harsh on the skin."

PREVENTION OF BREEDING.

As has been pointed out before the most lasting and most successful work in mosquito control is only to be accomplished by preventing the insects from breeding. This can be done either by the abolition of their breeding places or, where this is not possible, by their treatment and close attention and so preventing the insects breeding therein.

Abolition of Breeding Places.—Where possible this is, of course, the ideal method of control. It includes such methods as the levelling of lands, the filling up of all unnecessary holes, trenches, etc., and finally the proper drainage of land. Remarkable results have been obtained by these methods in many countries especially the United States and Panama.

Treatment of Breeding Places.—It is, however, not always possible to abolish breeding places and this is particularly true on the coastlands of British Guiana. A certain number of trenches are essential for drainage purposes while with our imperfect water-supply vats in towns and 'sweet-water' trenches in villages are necessities. The fact that they are necessities is no excuse for them to be breeding places for mosquitoes. Trenches kept free from weeds and properly flushed and vats that are properly screened cannot breed mosquitoes. Again it must be mentioned, although it should be obvious, that for screening to be effective it must be such as to entirely exclude the mosquito, above all the correct size mesh must be employed. In the survey previously mentioned several cases were observed where the mesh was of such a size as to allow the entrance of mosquitoes. In one instance one inch wire mesh was employed in such screening—surely it was not with the object of excluding mosquitoes.

Wire mesh to be used for screening against mosquitoes should have at least 18 squares to the inch, 20 squares for preference.

In the treatment of breeding places the use of 'larvicides' has been extensively employed.

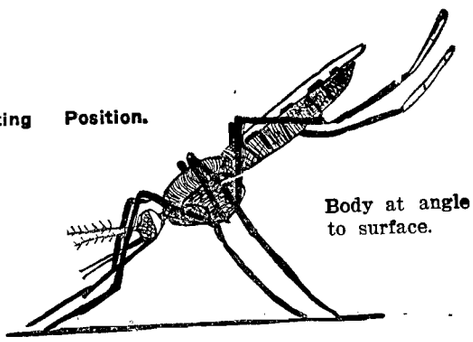
Howard, Dyar and Knab define larvicides as "'substances " which are applied to bodies of water in which mosquito larvae " are living and which results in their destruction in one way or " another." They add "These substances, for the most part,

MOSQUITOES

MALARIA
OR
ANOPHELES

ADULT.

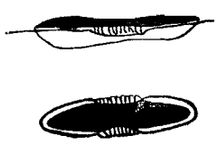
Resting Position.



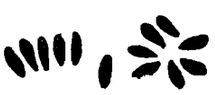
Body at angle to surface.

EGGS.

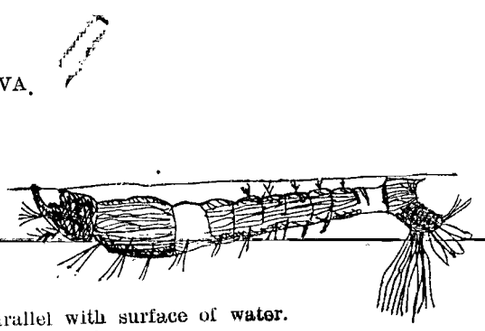
Laid singly.



Single ovum greatly enlarged.

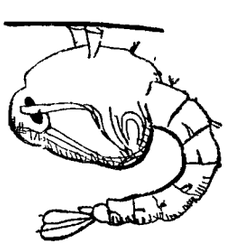


LARVA.



Body parallel with surface of water.
No breathing tube.

PUPA.

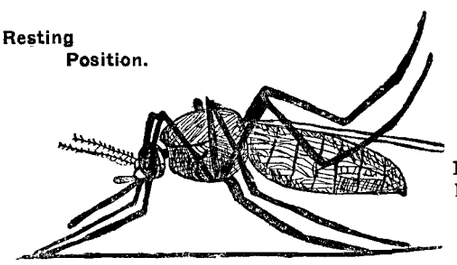


LAURENCE CLEARE—Jr. 1918——

FILARIA
OR
CULEX

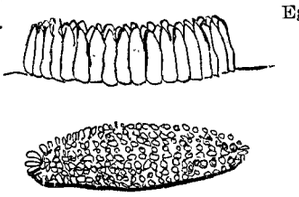
ADULT.

Resting Position.



Body paral. lel with sur. face.

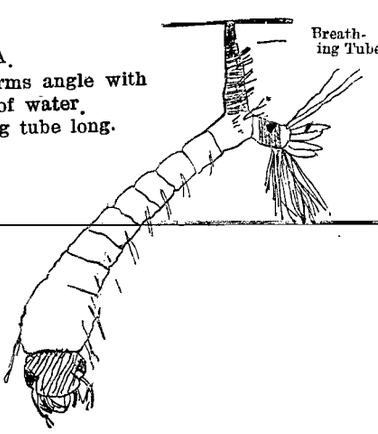
EGGS.
Laid in masses.



Egg Mass.

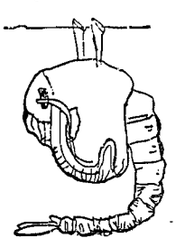
Single ovum.

LARVA.
Body forms angle with surface of water.
Breathing tube long.



Breath- ing Tube

PUPA.



" are either poisons or more frequently oils which forming a " surface film, destroy the larvae when they come to the surface " to breathe."

Besides oils the substances that have been used include, Permanganate of Potash, Copper Sulphate, Carbolic acid, and Salt.

The way in which oils act has already been mentioned in the paragraphs on the life history of these insects. The larvae and pupae, which are air-breathing, come to the surface to obtain their supply of air, and as the film formed on the surface prevents this they eventually die from drowning. . . .

One of the most successfully employed larvicides is that recoommended by the Isthmian Canal Commission and known as the I.C.C. Larvicide. It consists of a mixture of carbolic acid, resin, and caustic soda. The action in this case being poisonous.

Larvicides are very effective under certain conditions and can be extensively used, but when more permanent measures are possible they should be employed. Another disadvantage is that they, of course, cannot be employed where the water is subsequently required for drinking or domestic purposes.

NATURAL ENEMIES.

Many small fish prey upon mosquito larvae. The well-known 'millions' (*Girardinus poeciloides*) of Barbados are a good example. These small fish have been introduced into a number of West Indian Islands and in every case appear to have done good work in the reduction of mosquitoes. The small fish found in the street drains and which rejoice in the name 'Kaka-belly' (? *Girardinus sp.*) also have this habit and must certainly reduce the number of *Culex* that would otherwise be found in Georgetown. Small fish should be placed in ponds, fountains and trenches wherever possible. The use of larvicides will thus be reduced to a minimum for in trenches thus stocked it will only be necessary to keep them free from weeds so that the fish can get at the larvae.

'MOSQUITOES CAN BE DOMINATED.'

That mosquitoes can be dominated is now well known and need not be dwelt on here. One has only to remember the work

done in Panama and be convinced. This work was held up for very many years under the French occupation largely through the enormous mortality among Europeans caused by yellow fever. Since the United States Government has taken over this area, and effective mosquito control has been enforced, yellow fever has been eliminated and malaria very greatly reduced.

Mr. C. A. Ealand in writing on mosquitoes well sums up the facts when he says " There is one family of insects, a large " and cosmopolitan family certainly whose members, collectively " and individually, have probably done more than any other " group in the animal kingdom, to impede man's progress in the " universe, have certainly brought upon man more illness and " disease than any other insects, and have actually " held up " " some of the greatest human undertakings. The mosquitoes, " for these are the obnoxious individuals, belong to the family " *Culicidae* which, it is almost unnecessary to state is one of the " families of the order *Diptera*, or two-winged flies."

BIBLIOGRAPHY.

Boyce, Rupert. Mosquito or man? London, 1909. xvi. 267 pp. 44 fig.

Faure, J. C. Mosquitoes and Malaria. In the Agriculture Jl. of the Un. of South Africa. Feb. 1914.

Ealand, C. A. Insects and Man, London. 1915. 341 pp. xvi. pl. 100 figs.

Ewing, H. E. The use of palliatives for mosquito bites. In Jour. Econ. Ent. Vol. II. No. 5. pp. 401-404, Oct. 1918.

Hegh, E. Comment nos Planteurs et nos Colons peuvent —ils se protege contre les Mostiques qui transmettent des maladies? Royaume de Belgique, Ministere des Colonies Service de l'Agriculture. Etudes de Biologie agricole No. 4. 1918. 200 pp. 105 figs.

Howard, L. O. Remedies and preventives against mosquitoes. U.S. Dept. Agric. Farmers Bull No. 444. 1911. 15 pp.

Preventive and remedial work against mosquitoes. U.S. Dept. Agric. Bur. of Ent. No. 88. 1910. 126 pp.

Some facts about malaria. U.S. Dept. Agric. Farmers Bull. 450. 1911. 13 pp. 6 figs.

Howard, L. O., Dyar, H.G., and Knab, F. The Mosquitoes of North and Central America and the West Indies. Carnegie Institution, Washington, U.S.A., Vols. 1-4. 1912-15.

Quayle, H. J. Mosquito control. Univ. of California. Coll. of Agric. Bull. No. 178. 196. 55 pp. 35 figs.

PLANT DISEASES AND PESTS NOTES.

Experiments with substances for protecting domestic animals against the attacks of Blood-sucking flies.

The account of these experiments constitutes Bulletin No. 76 of the Agricultural Research Institute, Pusa, India. Among others the following materials were experimented with:—Kerosene Oil, Emulsion, Asafoetida solution, Creosol emulsion, Citronella oil, Aniseed oil, Cod liver oil, Castor oil. Camels were used throughout the investigations, which were carefully carried out on sound principles. The kerosene oil emulsion, on application, kept away *Stomoxys calcitrans* L. (the well known blood sucking fly) for only 20 minutes. Tabanidae (cowflies) appeared at the same time. Three hours after the application Tabanidae were feeding on the sprayed camel. An increased quantity of spray had no better effects. The Asafoetida solution had no deterrent effect whatsoever. As soon as Creosol oil had dried on the animals the flies commenced to feed. Citronella had the effect of keeping the flies away for a few hours. After 17 hours it had no repellant action. Cod liver oil was found to be useless. Aniseed oil was only slightly repellant.

Four pints of castor oil, well smeared on, prevented biting flies from feeding for three days. The only substance that was found to be successful consequently was castor oil. It cannot be recommended however on account of its cost.

Prevention and Cure for Lice, Chiggers and Bete Rouge.

Bête Rouge.—Nothing will satisfactorily cure the itching set up by the penetration of the bête rouge into the pores of the skin. Prevention, here, is infinintely better than cure. A good plan, when about to walk over land that is suspected of harbouring bete rouge, and when no other material is at hand, is to take an ordinary piece of soap (no matter how cheap as all kinds of soap are here equally efficacious) and, by rubbing, produce a stiff lather from the ankles up to above the knees. Socks and shoes, etc., can then be donned and the walk taken; no bete rouge can penetrate the soap or climb above it for 3-4 hours at least. Afterwards it is advisable to change one's clothing and have a wash down. All the best anti-bete rouge mixtures consist of strong smelling compounds usually incorporated with an oil or grease of some kind. Their efficacy lasts just as long as the odour of the compound which they contain. In nine cases out of ten the cost of such compounds are out of all proportion to their relative value. The previously described soap method is hard to beat.

Crab Lice.—Many cures have been put forward for these disgusting parasites. Oil of Bergamot is one of the best and most certain of all. It should be well rubbed on the affected areas prior to retiring to rest at night. A further application in 7 days time to destroy any young which may have developed from the 'nits' (Bergamot does not exterminate the 'nits') is necessary.

Chiggers.—The following is a preventative for chiggers (*Dermatophilus penetrans.* L.) in the bush. We have the assurance of one who has witnessed its use and the efficacy thereof in giving the prescription. Some seeds of the Mora (*Dimorphandra Mora*) are obtained (ripe ones which have fallen to the ground are necessary) these are

grated finely, well mixed with kerosene oil and heated so as to form a fairly stiff paste. This compound is well rubbed into the feet leaving no part untouched. The intensely bitter quality of the seeds combined with repellant powers of the kerosene will secure immunity from chiggers for several days.

Head Lice.—Sometimes these are extraordinarily difficult to get rid of; one of the most effective remedies known and one recommended by the most competent authorities is a mixture of bichloride of Mercury and vinegar. The head and hair is first well soaped and washed and the mixture, consisting of one part of bichloride in 300 parts vinegar or 10 per cent. acetic acid, applied. The scalp and hair are moistened with the mixture; rubbing may cause irritation. When the solution causes a burning sensation it is due to sores which have been produced by scratching. If present they should be treated, prior to the application of the compound with vaseline containing salicylic acid.

Clothing infested with body lice can be successfully treated with the same mixture.

G.E.B.

GARDEN, FIELD AND FOREST. *

A word in season :—To those who take an interest in their vegetable garden, and appreciate a table well furnished with a variety of vegetables (a table rarely seen here, by the way) a hint may be given to have their seeds ordered and the ground ready for the coming rain. This is the season to take advantage of, as in the reduced temperature of the next few months much better crops are obainable than during the rest of the year. Many, if not most, of our vegetables belong to temperate countries and they appreciate the fall of even the few degrees in temperature which takes place in the winter months; and some that may be sown in vain at other seasons may be induced to yield a crop

*Reproduced by kind permission of the Argosy Co.

now. The same information holds good in regard to the flower garden, and the temperate flowers, annuals and perennials, required to embellish it. They are fuller, better formed and coloured, and less ready to perish than in the summer months. Our advice is intended in regard to temperate subjects, such as are grown in cool houses in English gardens or in the open borders in summer; but the rains being less heavy, and the weather more genial, it is also a good season for growing the majority of what may be called, to distinguish such subjects, but in a wider sense than the term is usually applied, florist's flowers.

The Saman-Tree.—During the last ten or twelve years considerable interest has attached to this tree. It was brought into public notice about that period ago as a so-called "rain-tree." At some place on the eastern mainland of South America, which I have forgotten, it was said that the ground in dry weather beneath the tree was found wet each morning with the dripping from the foliage during the night. I am not sure that the phenomenon was ever rightly traced, but among other explanations it was ascribed to the excreted moisture of a certain caterpillar that abundantly infested the foliage. However, whether the story was fact or fiction, the undoubted valuable qualities which the tree possesses were thereby brought extensively before the world, with, as a consequence, a considerable demand from tropical countries for seeds—especially from India.

The finest trees known to me are found in Jamaica, where the species is called Guango, and was introduced in the seed stage in the intestines of cattle imported from the mainland many years ago. These trees are among the largest of any kind on the island, and are second only in size to the cotton-tree, which is the giant of the western tropics. They are found chiefly in the drier districts, most plentifully between Kingston and Spanishtown, where as a pasture tree, with large herds of cattle sheltering beneath, they form one of the principal and most interesting features of that part of the country. At the instance of the Kew Gardens authorities, I visited that district to report on the character of the tree at the time in question, and my favourable report as regards its valuable qualities had much to do subsequently with

the popularity it acquired as an avenue and pasture tree. Observation since has shown me that there is considerable variety in small details of character in the species, but there is one feature that every member which has had room enough to develop invariably shows when mature, viz., the dome-like contour of the head. The arc that it forms is not deep, but it is perfect and characteristic in its symmetry. Standing beneath one of those large Jamaica trees, the ramification of the immense branches is a study in nature that charms the artistic taste; and seen from without, the dark glossy foliage and perfect form are features equally pleasing. When in flower the colour of the foliage is varied by the abundant pinkish-red bloom.

Its merits as a pasture tree are several. The wide-reaching branches of even a single tree will shelter a good sized herd of cattle. Then the shade is never heavy, and owing partly to this, and partly that the foliage closes together and hangs pendent at night, thus admitting due abundantly to the ground, the grass grows freely beneath. When the fruiting season arrives there is an immense crop, and the branches are laden with the large sugary and mucilaginous pods, which in Jamaica have been found highly nutritious to cattle. These drop to the ground when ripe, and are eaten by the cattle, or gathered and put away till the drier parts of the year, when herbage is very scarce, and are then given to the stock. I have never heard of any evil effect attending cattle from eating these pods. It was suggested that, like the Carob of the Mediterranean, they should be crushed and made into a saleable cattle-food and some attempts were made I believe with that view, but from some reason unknown to me, it has not become an article of trade. Yet they are rich in flesh making matter, and we may hope yet to see cattle food made of them. So palatable indeed are they that the coolies here beg to be allowed to gather them to convert into paste as they do green mangoes, and dry in the sun for food. Boys and girls, too, I am sorry to see, have acquired a taste for them, and stone throwing is rife wherever a tree in fruit stands. This will be a misfortune connected with its use as a shade tree in town.

The Saman is one of the most hardy of trees, and adapts itself apparently with equal satisfaction to any tropical climate, wet or dry. I have described how well it thrives in the very dry districts of Jamaica; it thrives also in the salt ponds of the same region; and in India cultivators have found that it will prosper to their heart's content in very wet districts, and, as in Jamaica, it is described from that country as drying up salt-ponds and other apparently uncongenial situations of that kind. With age the wood becomes hard and durable.

On dams and the drier parts of pastures in this colony it might be planted to shelter cattle, but strong guards should be erected around the young trees till they are strong enough to bear the rubbing of the cattle. Planted in lines it would make useful shelter belts for other vegetation and to break the strong wind that sweeps over much of the open pasture districts in wet weather, from which cattle suffer much. Its natural distribution is described from Nicaragua and Venezuela to Brazil.

The Cannon-ball tree.—The question was asked some time ago as to where the Cannon-ball trree—*Couroupita guianensis*—was to be found in this colony, to which it has always been ascribed in books, and after which it is named. The specimen at the Promenade Gardens which has made the species familiar to every one in Georgetown, was introduced, and the smaller specimens in private gardens about town have been derived from that tree. Now, however, the matter is set at rest. Mr. McTurk tells me that on one of his journeys some months ago he found it growing wild at the mouth of the Yuruari river in latitude 6° 42' 48" north. The half breed Spaniards there call it 'Tapara da Suco," and the Caribs "Cokoi monoh." The latter is not an Indian term, and Mr. McTurk thinks it a corruption of the Spanish Coco de monos, that is monkey cocoanut. The tree he says is plentiful in the upper Cuyuni river region, and grows to a very considerable size. The trunks are straight and clear of leaf branches nearly to the top, but from about 10 ft. from the ground upwards they bear many of the peculiar flower and fruit-branches, which are always abundantly bearing. The heads of the trees and their general appearance in the distance resembled, and re-

minded Mr. McTurk of the bullet-tree. A very characteristic feature of the Cannon-ball tree, which I cannot recall another instance of among forest trees, is presented in the frequency with which it changes its foliage. This occurs uniformly three times a year, and is complete on each occasion, not a leaf of the old crop being left on the trees. All the trees, too, change dress at the same time, there being no variation of time due to age, situation or other circumstance. It occurs too, regardless apparently of the character of the weather, in the midst indifferently of both wet and dry seasons. The gradual shedding of the foliage takes three or four weeks, and at last every leaf has dropped, and the trees stand bare; in a few hours, rarely more than a day, the new foliage bursts forth, and in a day or two, as if by magic, they are vested again in full dress. The flowering branches spring from the trunk, are two to five feet long, branched, pendent and interlaced, persistent like the foliage branches, and flower and fruit are perennial. A small *Brownea*, Mr. McTurk says, grows in the same place, a foot or eighteen inches high, with large clusters of its typical bloom hanging from the nodding end. Having regard to the very dwarf size of this plant, it may not unlikely be a distinct species from *B. latifolia*, which grows along the banks of several of our rivers, and reaches eventually a height of 50 ft. Two other species are recorded in Guiana—*B. racemosa* and *B. guianensis*.

Labbas breeding in domestication.—A year and a half ago I announced the birth of a labba, *Coelogenys paca*, in domestication at the Botanic Gardens, and now the same doe has produced another young one. Though a large animal, at each birth she has only produced one, but whether one is the usual number at a birth I have not experience to say. There is no doubt, with these instances on record, that labbas might be bred in domestication for table use as readily as other animals, and, as their flesh is so highly prized, the practice would be worth adopting on a general scale. The only difficulty I perceive in the way, is in regard to penning them. Nothing but iron bounds will keep labbas in. They can gnaw through, burrow under, or climb over a fence, unless these modes of exit are all efficiently provided

against. The greatest security would probably be in an extended run. Wire-netting fence, nowever high, they most readily climb. Escape by burrowing might be prevented by running wire-netting along the bottom of the fence to the depth of eighteen to twenty-four inches under the ground. Labbas require much the same kind of food that hogs are fed on, and are fit for table in from twelve to eighteen months from birth. It has been asserted that the old males destroy the young, and that, therefore, the females should be isolated from them when a birth is anticipated. It is not unlikely, from what we know of the habits in this same particular of some other animals, that the mature males do in some cases destroy the young, but the one whose birth I have just now announced came into the world in the company of two full-grown males one of which, its *pater*, is of a most peculiarly savage and ferocious nature, as formidable for one to approach as a vicious dog, and which destroys and eats all birds and other small animals he can pounce upon—characteristics in which this beast is singular for domesticated labbas are as a rule as docile as tame rabbits. Yet the little one nestles as much with both these males as with its mother, and they caress it and seem to pay more attention in the way of petting and licking it than she does. Young strange ones introduced to the pen, the young of the same age attempt to kill, but this is from a different motive. Older ones are allowed to live unmolested by both sexes so far as I have observed: but I have only introduced females full-grown, and it is possible that strange males might have to prove their metal in frequent and terrible combats with the males in possession before them. The males are more sleek and thickly coated with hair than the females, whose hair is thin, dull, and partly erect, showing the hide all over the body.

Parrots in the Botanic Gardens.—Parrots are rare visitors in the near neighbourhood of Georgetown. I have occasionally in past years seen a pair, rarely four, cross the Gardens, winging their way with rapid flight, and frequent cries, apparently passing from the west to the east coast, for in this direction they have nearly always flown. Of late however, a green parrot in large flocks has been very plentiful in the early morning and up to mid-day on

the trees in the avenue and other parts of the Botanic Gardens; and on occasions I have counted from fifty to sixty or more in flocks that have risen, screaming, from the trees as I passed underneath, when they flew up, circled round, and returned, or away in the direction of the Lamaha savannah. Other smaller companies have flitted only to other trees near by when disturbed. Were there many trees producing suitable fruit for them to feed on, I have no doubt that, while such fruit was in season, parrots, which are in the habit of flying long distances to suitable feeding grounds, would be more frequent visitors among the feathered tribes to be seen in the Gardens. A similar visitation to that described above in Georgetown seems to have occurred, judging from reports published from there, at the same time in New Amsterdam. This flocking of parrots from the forests inland to places so widely separated as the two chief towns of the colony, seems to indicate a general migration at the period to the coast, but of the influence or object which caused it I have heard no explanation. The wind at the time was from an unusual quarter, namely, north-west, and it prevailed from the same point for several days together. It seems to me probable that to this cause must be attributed the rare phenomenon described, and that, travelling with the line of wind, the flocks came from our heavily wooded North-West territory. The heavy rain of the time, which flooded completely the savannah region, causing terrestrial animals to seek higher ground, could not have affected the question, as parrots feed exclusively on the undropped fruit at the tops of trees "All the commonly occurring parrots of the colony," Mr. Quelch tells me, "are referable to the genus *Chrysotis*. There are several species, such as *C. festiva*, with a blue cap; *C. amazonica*, with yellow cheeks; *C. ochrocephala*, with yellow cap, &c., &c. They are very closely allied to each other in their characters, and look very much alike owing to the prevailing green tint." I did not shoot one to determine the species, but *C. ochrocephala* is the commonest, and probably composed the flocks alluded to. It is occasionally very plentiful on the estuary of the Essequibo, and the abundance on one occasion some years ago tempted a well known sportsman and

hunter of the colony to shoot large numbers and send them to the Georgetown market daily, parrot-flesh, though very tough, making one of the most delicate flavoured and best soups known.

THE USE OF ARTESIAN WATER FOR IRRIGATION PURPOSES IN THE CULTIVATION OF RICE IN BRITISH GUIANA.

BY THE DIRECTOR OF SCIENCE AND AGRICULTURE.

The question of the utilisation of artesian water supplies for irrigation purposes arose soon after the completion of the D'Urban Park well which was not constructed with a viw to utilizing its output for irrigation purposes. His Excellency Sir Walter Egerton, K.C.M.G., directed me to lay out a plot of land on the D'Urban Park for the trial cultivation of rice using a part of the water from the well for irrigation. It was soon realised that with the flow of water from the well even at its then rate of approximately 200,000 gallons a day, it was not possible to satisfactorily irrigate rice-lands on the local system of, from time to time during the crop period, flooding the land to a depth of from four to six inches. An inch in depth of water over an acre measures 22,500 gallons. The full flow, 200,000 gallons a day, of the well for six days would be required to flood nine acres of land to a depth of six inches. A well giving such a yield would obviousy be of little use in rice cultivation on the large scale if the irrigation is carried on in the manner usual here. To meet this difficulty, the rice field was so arranged that a constant shallow flow of water was secured;—in other words the rice was grown in shallow running water instead of in deeper stagnant water.

An experiment has been in progress since September, 1914, on the growth of rice by irrigation with artesian water. The water used is supplied by this artesian well in the D'Urban Park and is obtained from the surface of the gneissose rocks which at a depth of 559 feet there underly the coastlands. Its temperature is 90.1 Fahr. and it has the following composition:—

	Grains per Imperial Gallon at 80 deg. F.
Ferrous carbonate	.03
Calcium carbonate	.50
Magnesium carbonate	.70
Sodium carbonate	.16
Sodium chloride	1.17
Sodium sulphate	.01
Potassium carbonate	1.30
Ammonia	.0014
Silica	1.14
	5.0114

The first crop was planted in September 1913, and 5 crops were obtained in a little less than 25 months. The yields of paddy in bags of 140lbs. were:—

1st crop	19.0 bags
2nd ,,	17.7 ,,
3rd ,,	25.0 ,,
4th ,,	30.0 ,,
5th ,,	19.1 ,,
Total ..	110.8 bags

The paddy during the second crop was devastated by birds whilst during the fifth crop it suffered from fungus attacks. The results, however, prove that fairly heavy yields of paddy can be obtained by the continuous growth of rice on lands irrigated by artesian water."

The sixth successive crop was reaped in February, 1916, giving an acreage return of 18.6 bags (of 140lbs.) of paddy per acre. After the seventh crop was reaped in September, 1916, I addressed to the acting President of the Board of Agriculture the following minute:—

" The rice plots on the D'Urban field have just been reaped with the following mean results per acre:—

Variety	Bags of 140lbs. paddy
75	24.76
Creole	21.26
6	19.48
Mean	21.83

Our mean yield using Lamaha water has been 35 bags of 140lbs. per acre per crop during the past ten years. It is now quite evident we cannot approach this by *continued* growth without any period of fallow, using artesian water. Mr. Bancroft and I think this trial should now cease. I am of opinion that we should let the land rest until December, then plant for a March-April crop, let the land rest from April to June and then plant for an October crop. The result will be that we shall be making the best use of the rainfall aided by the artesian water in place of using the artesian water aided by the rainfall.

The artesian water is anaerobic in composition. The continued use may have adversely affected the soil. This should be combatted by extra tillage. I propose, with your sanction, to arrange the fields so as to give half of them extra aeration by an additional ploughing.

We have proved that we can raise fair crops of rice by the use of artesian water getting five crops in two years and one month and seven crops in three years. We might now try to get higher total yields by taking fewer crops planted to get full benefit of the weather conditions instead of irrespective of them."

The proposal received sanction and the following were the results of the first trial:—

Half the land under trial received two ploughings at intervals of about five weeks, the other half being ploughed once only just previous to the planting of the rice. The results were striking:—

Paddy, Bags of 140 lbs. per acre.

Two " Ploughings "	One " Ploughing "
27.19	20.22

Thus the additional ' ploughing ' or forking costing in normal times about $6 per acre, followed by five weeks exposure to

the air gave an additional yield of seven bags of paddy or an increase of 34 per cent. on the crop. This is a very decisive result. Irrigation with anaerobic artesian water to give full return *must* be accompanied with increased aeration of the soil.

After the crop had been reaped, the land which had been only once forked was forked, allowed to remain fallow for several weeks, reforked and planted with paddy. The land which in the first trial had been twice forked was not again forked until just before planting. We thus had the following comparison:—

Land once forked	Land twice forked.
Cropped	Cropped
Forked	
Rested	Rested
Re-forked and Planted.	Forked and Planted.

The plots forked, rested and re-forked gave 29.6 bags per acre, thus fully confirming the results of the first trial; whilst those which were twice forked during the first crop and once forked for this one gave 27.6 bags per acre. In a third trial the land which was twice forked yielded 24.1 bags per acre, whilst that once forked yielded 20.6 bags. The mean results of these trials are that by forking twice before planting the average yields were 27.6 bags per acre as compared with 22.8 when the land was only forked once.

The results of the trials may be summarised as follows:—

Period	*Crop*	*Yield per crop.*
1913-1916	7 crops in 3 years	21.6 bags
1917 and 1918	3 crops in 20 mths	
	double forking	27.6 „
	single forking	22.8 „

Taking the total yields and comparing them with the yields using Lamaha water during the same period we get:— . . . . . .

	Bags of 140lbs. paddy per acre	Bags of 140 lbs. paddy per acre

	Artesian water Bags per acre	*Lamaha water.* Bags per acre.
3 years. 1913-1916	(7 crops) 151.2	(3 crops) 108.6
20 months 1917 & 1918		
Double forking	(3 crops) 82.8	(2 crops) 63.3
Sngle ,,	,, 68.4.	

In some of the earlier years of the experimental cultivation of rice at the Botanic Gardens using Lamaha water for irrigation, two crops of paddy per year were raised. The average yields of the two crops were approximately 48 to 50 bags of paddy per acre. We could have obtained during the 20 months' period of 1917 and 1918 by this system three crops of paddy per acre amounting to about 72 to 75 bags of paddy per acre. The yields of paddy obtained by irrigating with artesian well water with duoble forking or thorough cultivation compare favourably with this.

There cannot be any doubt as to the suitability of artesian well water for the irrigation of rice; whilst it is now certain that to obtain full crops using this water it is necessary to till the land so as to fully aerate it prior to planting the paddy The artesian water is not quite as suitable for rice-growing as is the Lamaha water or bush water as it is practically free from nitrogenous matters of which the latter carries a relatively high burden. It is on the other hand at least as well suited for rice growing as rain-water, the only water naturally obtainable in the non-irrigated districts of the colony. Personally I think that artesian water obtained by tapping some of the upper aquifers as well as the deeper ones as suggested in my report of 1914, will be very well suited for rice cultivation,, and certainly better suited than is the exceptionally pure water yielded from the D'Urban Park well.

The results hitherto obtained do not indicate that growing rice solely by irrigation with water yielded by artesians wells of relatively small bore—the D'Urban Park well has now only an

effective bore of 6 inches, that of the internal strainer—can be regarded as a business proposition. But where the artesian water is used as auxiliary to the irrigation of rice by other but insufficient methods, it may become of high value. To make rice growing by irrigation with artesian well water successful from a business point of view, various engineering questions will have to be considered such as the most economically effective bore of the casing and especially the storage of the artesian water during periods when it is not required for irrigation. Economical and effective modes of storage of the water during such periods may prove to be the key to the situation. The problem has been more or less satisfactorily solved in the Southern States of the United States, and there does not appear to be any valid reason why it should not be placed on a similar position here.

BOTANICAL NOTES.

SOME INTERESTING SPECIES OF PALMS.

Oreodoxa. As far as I know there are but two species of this genius, though there are one or two varieties or forms. The principal species is the "West Indian Royal palm, *O. Regia*, which shews its magnificent head above all other vegetation; a truly royal subject, though there has been an attempt, not long since, to disparage this grand subject in favour of a less important one, the "Cabbage palm" *O. Oleracea.* It has a splendid grey columnar stem, very large at the base, tapering slightly for its whole length. Up to 50 or 55 feet high it may be said to be at its best; after that height it frequently becomes attenuated, losing its perfectly straight form and leaning slightly, and sometimes much to one side on the other, giving it the appearance of having lost its royal dignity and becoming more or less like a tall cabbage palm. Frequently tall Royals may be seen with this changed appearance due to being grown where the soil is undoubtedly impoverished, and they shew plainly that the nourishment they have been getting for a long time has become insufficient. But there is one item which never changes, which always distinguishes the Royal from the Cabbage, and that is the number of leaves to the

head,—although they may become smaller in length—the Cabbage palm has less leaves than the Royal, are smaller, and the curve of the leaf is shorter.

In the avenue at the head of the Brickdam, near the late Orphan Asylum, now Queen's College, the greater number of the plants are cabbage palms; the difference between these and the few Royals there is very plain. In the grounds of the "Deanery" near the Cathedral are several very tall "Cabbage" palms with a few "Royals" near by; there the difference between them cannot be mistaken. The avenue at Houston is probably one of the finest palm avenues in the world. There we have all the varieties or forms of the "Royal," including "Jenman's." The second length of this avenue is spoilt by the introduction of Euterpe's which do not blend with the "Royals," but there are no "Cabbage" palms in its whole length.

O. Regia. The head is composed of a large number of long, heavy, beautifully arched and drooping leaves with broad leaflets set on four different planes, the sheathing leaf bases forming that part of the stem between the leaves and the inflorescence. The spadices, enclosed in the spathes, are like large clubs, and when the spathes fall and the inflorescence becomes free, it is like a large, rigid, scrubby broom; the branches of which are stiffly sinuous, as if the space in the spathes had not been sufficient and thus they had been cramped. The fruit is rather small, oblong. The sexes are monœcious on the same branches, a female between two males, or side by side.

Two forms are noticeable in this species, differing only in the droop of the leaves, in one, the lower leaves droop till the points are level with, or a little lower than the inflorescence; in the other, the points of the lower leaves never droop lower than the level of the top of the sheathing leaf-bases.

There is however one plant growing in the Botanic Gardens which is probably a distinct third form, though till lately I have considered it only as a well grown robust plant of our Royal with the drooping leaves. There are points about this plant which are decidedly different to the others; the foliage is much heavier and droops much lower; the inflorescences are much more pronounced and in greater number, and although there are sinuosities in the

spadix branches they are much less in evidence, and the branches are more like those of the Euterpes. It is a pity there is but the one plant; it will be necessary to propagate from this to find out if these distinct characters are continued in the progeny. This plant is a seedling of a very tall handsome plant at Kensington, Barbados. Whilst there many years ago I pointed out this plant to a friend declaring it to be a true Royal, he obtained seeds of this and one plant is the only result. Three plants were planted in the bed on the south-east of the Gardens but two died when very young.

O. oleracea, the Cabbage palm. This species is somewhat similar to the Royal palm, yet is fairly easy to distinguish. The stem is as large at the base as that of the Royal and grows as much in height, but is sharper in the tapering, so that it is not so solid, becomes smaller at the top and forms a less straightened column. The head of leaves is smaller being composed of a less number of leaves, and shorter so that they are less heavy, the curve of the leaves is shorter too, though the leaflets are arranged similarly on four different planes. The inflorescence and fruit are almost similar, but smaller. Both species provide palm cabbage from that portion of the stem covered by the leaf bases; of course this means the destruction of the plant, but there are almost always plenty of young strong plants growing which can be sacrificed when cabbage is needed. On the West Coast, Berbice, there are large tracts—or used to be of the Cabbage palm; and during a prolonged flood several years ago, which inundated the whole of that coast, hundreds of these tall palms were cut down and used as bridges connecting the road with the dwellings and these to each other, there being no other means of doing so except by batteaux.

O. regia, var *Jenmanii*. This is a variety grown by the late G. S. Jenman, the first Government Botanist, which, as far as I know, has never been published in botanical annals. It is a most conspicuous object with an almost erect head of leaves. Jenman found a very tall and very erect Royal palm in the grounds of the Alms House in Georgetown. He had slats of wood nailed all the way up its stem and secured fresh fruits from its head. From these he raised a batch of seedlings which were

carefully guarded. The first plant planted from these seedlings is that very tall and erect palm growing in the Botanic Gardens obliquely opposite the Band Stand. Since then many others have been distributed in and about Georgetown, all conspicuous for the very upright character. Several are growing in the Houston Avenue of palms. A magnificent avenue of it is to be seen in Le Repentir Cemetry though planted too closely, and another splendid avenue of the West Indian Royal, besides many plants of the same scattered about. Two very fine specimens are in the grounds of 'Broomknowe,' the residence of Stewart Cameron, Esq. with others of the West Indian Royal shewing the great contrast between them. Others are scattered throughout the city.

The stem is a perfect grey column perhaps a little slighter than that of the Royal. The head of heavy leaves more or less upright with little droop, the lowest leaves standing at an angle of 45° or 50°; the leaflets also more or less upright making the leaves quite dense, arranged on four different planes. The inflorescence and fruit are similar to those of the Royal but much smaller.

Euterpe. This is a genus of the same sub-tribe as the *Oredoxa*, but is never likely to be confused with it, though seeds thereof have often been received under the wrong generic name. As young plants, Euterpe's are always more upright and with much narrower leaflets than Oreodoxa's, and the various species of Euterpe are then all more or less alike so that, should they get mixed, it is not possible to separate them with accuracy, and this is what happened when the plants were chosen for planting the avenues at the Lamaha Canal and Broad Street, where, instead of one kind there are three. We have several species in the city, two of which are indigenous, and these two are widely different in appearance to the others, in that they have narrow straight stems and the others larger and fusiform stems. The one special thing by which they may be distinguished from the Oreodoxa's is the inflorescence,—apart from the fusiform stem in most of them, which is not a character of the Oredoxa's.

E. edulis, the "manicole" or "Assai" palm of Tropical America and of this colony. It is a swamp palm, but it is to be noticed that wherever it is growing in land constantly submerged

it lasts but a few years, so it is by no means an aquatic palm. It grows best in slightly damp ground where water does not constantly stand, and there it forms magnificent clumps of very many stems 20 to 25 feet high. The stems are about 6 inches in diameter at the base, slightly tapering to the summit. The leaves are of a pale green and delicate texture, long, beautifully arched, with two rows of long, narrow leaflets. The inflorescence is composed of strong, white simple branches 12 to 18 inches long, bending forward with the weight of the fruit, this quite globose and rather less than half inch in diameter. The young unopened spadices are used for pickling when the substance is quite white and crisp. The mature stems are often used for flooring dwelling houses in the country, light bridge work, and lattice-work.

E. stenophylla, the "Rayhoo" palm. This is also indigenous and very similar in every respect to the "Manicole," but with one stem only.

E. ventricosa, the "Cuban Royal" palm. This is a conspicuous plant which cannot possibly be mistaken for any other. Seeds of this have been received from India and various places under the name *Oredoxa regia*, but they have invariably proved to be the "Cuban Royal." It would seem incredible that such an error could be made with plants so unlike in stem, inflorescence and seed. The stem is of a particularly long and large gouty form, much more pronounced than that of any of the other Euterpe's; the head also, is pronounced with a large number of heavy dark green drooping leaves, with long narrow leaflets set on four different planes, the lower leaves drooping as low as to almost hide the inflorescence. The spadices are large and long, spindle shaped, standing erect, and when the spathes fall the inflorescence shews a large number of compound branches, the secondaries all short and straight, the mass falling forward with the weight of the fruit. The fruit is the smallest of all the Euterpe's, almost globose.

E. acuminata, from Venezuela. This is tall, growing with a medium sized fusiform stem and a medium head of stiffly arching leaves, with fairly broad leaflets set on four different planes in the middle of the leaves, the end leaflet sticking out straight like a

pointing finger. The inflorescence is similar to that of the "Cuban Royal;" the fruit globose, about $\frac{3}{8}$ inch in diameter. This is the species which preponderates in the lines planted each side of the Lamaha Canal and in the avenue in Broad Street.

E. Jenmanii. This is one of the prettiest palms of this section, similar to *E. acuminata*, but of a more delicate character. The stem of medium size, fusiform, the head of leaves rather smaller than that of *acuminata*, gracefully arching and drooping. the leaflets narrow, set on four planes in the middle of the leaves. The inflorescence similar to *acuminata* but the fruits a trifle smaller, globose. Jenman found three plants of this species growing on one of the parapets in the centre of the city of Georgetown from which he obtained fruit and raised a batch of seedlings. I also found a fine young plant of this—some 12 feet high—growing in a property on the side of the Brickdam opposite the Alms House; this I purchased for the Botanic Gardens and transplanted it. It is now to be seen—a particularly pleasant feature—in the front border opposite the Director's House. The lines of palms on either side of the Lamaha Canal, from the Water Works to the Vlissengen Road, are composed of the three species, *E. acuminata*, *E. Jenmanii* and *E. ventricosa*, as aso the avenue in Broad Street; evidently *acuminata* was the species intended as it preponderates.

The Botanic Gardens has one more species, but only two plants of it. I am not sure what species it is but think it is *E. utilis.* It is a handsome tall growing palm, with a long, large, fusiform stem; the leaves few, large and long, gracefully drooping, the longest of all the Euterpes, the lower leaves drooping to below the inflorescence; this is similar to that of the "Cuban Royal," the fruits just a trifle larger, but smaller than in the other species.

There is one more species of Euterpe in Georgetown, though only one plant of it, but it is quite conspicuous. It is one of a pair (?) planted at the gate of a house called "Palm Villa" in Carmichael Street; evidently the pair were planted as "Royals," as the other plant is a true Royal. A large growing palm with

a very dense head of large, long leaves, drooping so low as to completely cover the inflorescence. I believe this is the same species of which there is a great quantity in the town of Paramaribo, Dutch Guiana.

J.F.W

PICKLING AND BARRELLING PORK.

*We have lately received a number of queries as to pickling pork. The following information on the subject is extracted from a recent publication**—EDITOR.

For salt pork, one of the first considerations is a clean barrel, which can be used over and over again after yearly renovation. A good way to clean the barrel is to place about ten gallons of water and a peck of clean wood ashes in the barrel, then throw in well-heated irons, enough to boil the water, cover closely, and by adding a hot iron occasionally, keep the mixture boiling a couple of hours. Pour out, wash thoroughly with fresh water, and it will be as sweet as a new barrel. Next cover the bottom of the barrel with coarse salt, cut the pork into strips about six inches wide, stand edgewise in the barrel, with the skin next the outside, until the bottom is covered. Cover with a thick coat of salt, so as to hide the pork entirely. Repeat in the same manner until the barrel is full, or the pork all in, covering the top thickly with another layer of salt. Let stand three or four days, then put on a heavy flat stone and sufficient cold water to cover the pork. After the water is on, sprinkle one pound best black pepper over all. An inch of salt in the bottom and between each layer and an inch and a half on top will be sufficient to keep the pork without making brine.

When it is desired to pickle pork by pouring brine over the filled barrel, the following method is a favourite: Pack closely in the barrel, first rubbing the salt well into the exposed ends of bones, and sprinkle well between each layer, using no brine until

*Home made pork making. By A. W. Fulton. Published by Orange Judd Co. 315-321. Fourth Avenue, New York, U.S.A.

forty-eight hours after, and then let the brine be strong enough to bear an egg. Allow the pork to remain for six weeks.

RENEWING PORK BRINE.

Not infrequently from insufficient salting and unclean barrels, or other cause, pork placed in brine begins to spoil, the brine smells bad, and the contents if not soon given proper attention, will be unfit for food. As soon as this trouble is discovered, lose no time in removing the contents from the barrel, washing each piece of meat separately in clean water. Boil the brine for half an hour, frequently removing the scum and impurities that will rise to the surface. Cleanse the barrel thoroughly by washing with hot water and hard wood ashes. Replace the meat after sprinking it with a little fresh salt, putting the purified brine back when cool, and no further trouble will be experienced, and if the work be well done, the meat will be sweet and firm. Those who pack meat for home use do not always remove the blood with salt. After meat is cut up it is better to lie in salt for a day and drain before being placed in the brine barrel.

WEST COAST AGRICULTURAL ASSOCIATION.

HAGUE, WEST COAST.

On Thursday evening, 21st November, 1918, despite the inclement state of the weather the regular monthly meeting of the W.C.A.A. was held in the Walters' A.M.E. Zion Church at Hague when the Rev. W. A. Deane, Hony. Secretary, presided. The attendance was meagre. Minutes were read, roll was called and subscription taken. The Hon. Secretary praised the officers of the Association under whose auspices Armistice celebrations were held in the village on Friday, 15th November, 1918—Some sixty children and twenty-one poor were well treated; a local brass band being in attendance. The thanks of the Association village are due to the prominent Government Officers on the Coast who liberally contributed to the celebration. The Hony. Secretary informed the meeting, that

the Commissioner of Lands and Mines had been written to so that villages under him might not be overlooked with regard to a part of the Government grant for the expected Peace celebrations in the villages. The meeting then immediately rose.

The monthly meeting of the W.C.A.A. met as usual on the evening of the 17th October, 1918, at the Walters' A.M.E. Zion Church at Hague, West Coast, Demerara, when the Rev. W. A. Deane, Hony. Secretary, occupied the chair; the President and Vice-President being absent. The Assistant Secretary, Mr. Wharton, acted as Secretary. Mr. A. M. Barcellos, Hony. Treasurer, was present with many others. Additions were made to the membership. Forty-eight cents was voted out of the fund for a couple of each issue of the Board of Agriculture Journal for a year. Communications from the Rev. Eric. R. O. Robertson, member of the Agriculture Board and Hony. Secretary of the B.G.F.A. were read. One announced the appointment of the Hony. Secretary, Rev. Deane as one of the joint deputation of the Village Chairmen's Conference and B.G.F. Conference to meet the Local Government Board for the discussion of Drainage and Irrigation. The meeting's consent was given. A very lively discussion was engaged into as regards drainage and irrigation with the result that a deputation was formed to interview Mr. Grantham, Clerk to the Lands and Mines Department, at Den Amstel, W.C. The Hony. Secretary, Rev. Deane, was authorised to write Mr. G. D. Bayley, Commissioner of Lands and Mines, in order that a plot of land for the cultivation of ground provisions might be obtained. It was decided that Uitvlugt members should form themselves as a branch. The acting Chairman urged the members to pay up their contributions and related the good done already by the Association.

TICK-RESISTING CATTLE.

We here know that there are often cows in a herd which seldom or ever have ticks, even if they have no Indian blood in them. Of course Indian cattle and crosses of these are nearly tick proof, but not quite. In Queensland, however, a cattle-

breeder with whom we have had interesting correspondence—Mr. Monroe Hull—asserted years ago that he had developed a tick-resisting strain of cattle. These have no Indian blood but are apparently a mixture of the ordinary British breeds, bred for some generations in Queensland. Mr. Hull's cattle have not been treated with any dips, arsenical or otherwise, for five years, and for long he asked for investigation, test and report from the Government Stock Department, but they rather scoffed at the idea. To us it has always seemed feasible. At last, however, the Commonwealth Government has taken up the matter. These cattle can be exposed to tick infection, the ticks die on them promptly, and the stock never show signs of tick worry.

We shall follow the results of Government investigation with great interest.

It seems feasible that here, a race of tick-proof cattle can be developed without Indian blood or only a trifle of it, by selecting apparently, tick-proof cows and breeding from these only. Of course, this would take time, patience and enthusiasm. Suitable blends of Indian blood would expedite the results.—*The Journal of the Jamaica Agricultural Society.*

RUBBER ARTICLES.

It has been reported by the principal medical officer, Federated Malay States, that five years ago it was discovered in a small hospital that rubber articles kept in an atmosphere of kerosene were maintained in a serviceable state for a very long time, and that orders were then given that every hospital was to be provided with a metal box containing moveable, perforated trays, the lowest tray to have legs, raising it off the bottom of the box where kerosene is kept and the lid to be made to fit well.

All rubber articles (except those covered with varnish which becomes sticky when influenced by paraffin) are kept in this box and with but few exceptions even after five years it has been found that disintegrating processes do not occur. This method is said to have proved most economical and the purchases of rubber

articles for the hospitals have been greatly reduced in consequence Moreover, those in charge of hospitals can always rely on having a rubber tourniquet, catheter, bag or other instruments in a serviceable condition, when urgently needed, after they have been stored away some time.

A japanned tin box for the purpose, size 16 by 12 by 8 ins., can be supplied for 35s. —*The Colonial Journal.*

PALM KERNELS AND FIRE.

Care should be taken that kernels do not cause a fire on board ship. In Nigeria six sacks of palm kernels were submitted by the police department for investigation as to the cause of a fire which occurred in the hold of a ship loading in the Lagoon. The fire seems to have broken out in several separate places in the cargo which consisted of bags of kernels solidly packed, tier on tier. No person could have got in to start such fires in each place at the same time, so the probable cause lay either in some incendiary bombs having been criminally laid in with the bags or in the possibility fo spontaneous combustion. The conclusion arrived at favoured the latter idea, as all the circumstances seemed to support it. The kernels had been stored some time in the bags, and it was the dry season. There had been a blazing sun and little breeze for several days previously during the period of unloading, and so not only was the fibre of the sacking made very dry, but also it would have become more oily from the heated kernels exuding oil and there was very little chance of the heat being reduced in a closed full hold. Such oily fibre would absorb oxygen from the air very readily, and in these circumstances the temperature would rise so high as to cause oily vapours to inflame and so start the fires. The sacks showed that the fires started at them and not inside among the kernels, and after the fire the fibre of the sacks held from 20 to 25 per cent. of oil.—*The Colonial Journal.*

FLOW OF RUBBER LATEX.

Experiments made in Java seem to prove that, in Hevea, the latex flows in a horizontal as well as in a vertical direction. The horizontal flow is less rapid.

The use of a 15 per cent. salt solution for cleaning the channel has little influence on the flow, and the use of ordinary water none at all.

Experiments made on a number of trees of equal yield showed that the maximum latex flow occurs at 6 o'clock in the morning and not at 10 o'clock.

Further experiments proved that:—

(1) A crooked incision yields as much as a V incision, the total length of whose two branches equal that of the crooked incision.

(2) Two crooked incisions produce about 12 per cent. more than two straight incisions.

(3) If the incision is renewed at the end of two hours the bark is spared and the production increased from 7 to 10 per cent but about 4 to 6 per cent. less is obtained than by making two different incisions in one day.—*The Colonial Journal.*

THE COCONUT BEETLE.

To control the ravages of this insect in British East Africa some two years ago the Department of Agriculture inaugurated a system of experiments in the shape of breeding places, as is done in most coconut growing countries.

These breeding places or traps are 300 in number and are situated in three of the principal coconut districts adjacent to Mombasa.

The average number of insects collected per trap is:— Beetles, 6; grubs, 80; pupae, 5; eggs, 3.

The traps are constructed by digging a hole about 9 feet square and about 18 inches deep, in which a number of coconut stems cut into sectons of about two or three feet are placed together with other decayed vegetable matter: they are visited

riodically and the insects found in them are carefully collected, unted and destroyed, after which they are refilled, labelled and ted.

Prior to the construction of these traps it was no uncom-on sight to see a number of fully grown dead palms standing out the various shambas in the districts visited. At the present ie, judging from the healthy appearance in the growth of the ung palms and the few fully grown dead palms seen, it may t be amiss to assume that the construction of these traps has ly justified the purpose for which they were intended, i.e., attract the beetle from the palm to the trap.

It has been clearly pointed out to the native shamba ners willing to undertake the making of their own traps that it st be borne in mind that such places must be examined three four times during the year and any insects collected should be stroyed, otherwise the traps will be serving the opposite pur-se for which they were intended.—*The Colonial Journal.*

STORAGE OF SULPHATE OF AMMONIA.

Sulphate of ammonia may be stored in two ways, either in bags or loose in a heap. Whichever method is adopted, the building in which it is stored should be dry and free from dampness. Buildings easily penetrated by rain, or with damp walls or floors should be avoided.

If stored in bags, a platform under which the air can circulate should be constructed with a space about 6 ins. from the floor, and the sacks piled carefully one on top of the other, lengthways, with mouths turned outwards. Care should be taken to leave a space all the way round the pile. This not only facilitates loading, unloading and packing, but also allows air to circulate all round. If the building of the platform presents any difficulties the sacks may be piled on one or more layers of hurdles. Before constructing the platform, the floor underneath should be covered about 3 ins. deep with some dry substance, which will absorb any moisture which may drain off from the sacks.

The best substances for this purpose under ordinary circumstances are castor meal, rape meal, bone flour or raw bone meal as they can be used afterwards as fertilisers; but in determining whether it is profitable or not to use them at the present time, regard must be paid to the price at which they are obtainable. Failing these a layer of dry earth, sand, peat, moss, or sawdust will suffice. It is not advisable to use superphosphate for this purpose. Neither chalk, lime, nor basic slag should on any account be employed, as they " set free " the ammonia and thus cause wastage.

In this connection it may be remarked that unless brought into contact with running water in which it will be dissolved and washed away, sulphate of ammonia will not lose any of its fertilising value, however long it is stored. Except in the case of the "neutral" quality, which is practically dry, there might be a slight loss in bulk during storage owing to evaporation of moisture, but this will not exceed 1 to 2 per cent., and does not affect the fertilising value, as there will be no loss of ammonia or nitrogen.

Farmers will find it to their advantage to secure the " neutral" quality* wherever possible, as this contains practically no free acid and will, therefore, not attack or rot the bags. With ordinary qualities of sulphate of ammonia in which free acid is present, there will always be a tendency for the bags to rot during storage, and it is in view of this that some farmers prefer to empty out the sacks on receipt and store the sulphate in bulk.

The same principles apply to storing in bulk as to storing in sacks. The floor should be covered about 6 ins. deep with one of the absorbent substances indicated above, and if the heap touches the sides of the building, the eaves should be carefully inspected from the inside to see that there is no discharge of water from leaky spouts. The building and its walls and floor should, of course, be perfectly dry.

The sacks should be well shaken out, and if subsequently required to contain other materials, they should be washed out immediately in water.

Before applying to the land, care should be taken to see hat the sulphate of ammonia is not in a lumpy condition, and it vill be found advantageous to pass it through a $\frac{1}{4}$ in. riddle, breaking the lumps down with a piece of wood.

This procedure will not be necessary if "neutral" sulphate can be secured as this quality does not cake nor contain lumps, but remains free like sand. Sulphate of ammonia in this condition can be supplied through a drill. When a small amount is being applied unmixed with other manures it is usually found advantageous to mix it with an equal quantity of sifted earth or sand to help even distribution. *Journal of the Board of Agriculture,*

**Sulphate of ammonia containing less than .025 per cent. of free acid is known commemrcially as "neutral" sulphate of ammonia*

ROBERT SERVICE.

KILLED IN ACTION IN FRANCE.

October 1918.

Robert Service assumed the duties of Horticultural Superintendent in the Department of Science and Agriculture, British Guiana, in June, 1914. In February, 1917, he severed his connection with the Government and went North to Canada where, after a short training, he was sent to England and later to France as No. 1257927 Gunner R. Service of the Canadian Divisional Trench Mortars. He was wounded once in the neck by shrapnel; exactly how he met his death is uncertain but those who knew him know that he could only have died fighting according to the best traditions of his country.

He received his early training in Horticulture at Kew Gardens and was a member of the Kew Guild, a distinction which he shared with Mr. R. Ward of this Department. He was a native of Dumfries, Scotland, and is survived by a sister and an elder brother. Whilst in this colony he made a host of friends for he was one of the keenest of sportsmen, being, amongst other things, an ardent fisherman, footballer and cricketer.

Service was one of those happy people who have a laugh for every event of the day; nothing could despond him for long. Even his letters, written very much in the muddy trenches of Flanders to his friends in British Guiana, indicated that no frightfulness on the part of the Bosche could make Robert Service depressed, and it is probable that his 'gift of gladness' will be long remembered by his fellow soldiers in France as it will certainly be by his fellow-workers and intimates in British Guiana

Meteorological Data, 1918.

BOTANIC GARDENS, GEORGETOWN.

Months.	RAIN FALL.	NUMBER OF DAYS OF RAIN						EVAPORATION
	Inches.	Under .10 Inches	.10 to .50 Inches	.50 to 1.00 Inches	1.00 to 2.00 Inches	Above 2.00 Inches	Total Days	Inches
January ...	8.47	7	12	2	1	1	23	4.49
February...	3.41	9	7	2	...	...	18	4.55
March ...	13.88	8	4	3	2	3	20	4.52
April ...	7.45	4	11	2	2	...	19	4.28
May ...	15.59	4	9	1	4	3	21	4.59
June ...	8.70	4	14	2	3	...	23	4.48
July ...	10.12	7	9	3	4	...	23	4.34
August ...	4.54	4	2	3	1	...	10	5.34
September	.10	...	1	...	...	...	1	6.66
October ...	.19	2	1	...	...	...	3	6.57
November	7.06	4	5	3	3	...	15	5.20
December	9.18	3	15	3	2	...	23	4.00
Totals ...	88.69	56	90	24	22	7	199	59.02

The Rainfall in 1918 varied from the normal* in the following respects:—A normal January was succeeded by an unusually wet February and an extraordinarily wet March. The precipitation in April was normal though during May more rain fell than in any one month throughout the year. Little variation from the normal was experienced during June and July. In the latter days of August exceedingly dry weather set in which developed

*The rainfall, temperature and humidity figures which we have taken to constitute a normal year will be found in the report on Meteorology for the calendar year 1916, which is included in the 1916 Annual Report of the Department of Science and Agriculture, British Guiana. They are the averages of the rainfall, etc., records for the period 1846-1916.

into a severe drought that lasted till the end of October. November was wetter than usual; December was normal. March and May were remarkable inasmuch that in both these months 3 days were recorded during which more than 2 inches of rain fell. The evaporation percentage of the rainfall was 66.5.

Below is a table showing the day of the year (1918) during which the greatest precipitation of rain took place and the amount thereof, also the day on which the highest shade temperature was recorded. These figures refer to Georgetown (Botanic Gardens), New Amsterdam (Botanic Gardens) and Onderneeming (Industrial School). No temperature records were kept at Morawhanna (Police Compound) North West District.

Stations.	Wettest day.	Rainfall.	Hottest day.	Tempe rature.
Georgetown	15th May.	3.34 inches	27th Oct. also 4th & 8th Nov.	90.0 F
New Amsterdam	28th Oct,	3.12 ,,	9th Oct.	97.0°F
Onderneeming	3rd April.	4.01 ,,	23rd' & 26th. Oct.	91.0°F
Morawhanna	12th May	4.33 ,,	No records	kept.

AIR TEMPERATURE AND HUMIDITY IN THE SHADE, 1918.

BOTANIC GARDENS, GEORGETOWN.

Months.	Air Temperature in the Shade			Humidity.
	Maximum.	Minimum.	Mean.	Mean.
January ...	82.9	74.1	78.5	81.1
February ...	82.5	74.0	78.2	80.9
March ...	81.9	74.3	78.1	79.5
April ...	82.6	74.2	78.4	83.1
May ...	83.5	75.5	79.5	83.4
June ...	84.9	75.2	80.0	81.7
July ...	85.8	74.3	80.0	81.9
August ...	85.7	74.6	80.1	80.3
September ...	86.7	75.8	81.2	78.0
October ...	88.2	76.1	82.1	78.9
November ...	87.2	76.4	81.8	78.8
December ...	84.0	75.2	79.6	82.2
Means ...	84.6	74.9	79.8	80.8

By comparison with the figures for a normal year the maximum air temperature in the shade was, generally speaking, lower than usual. The minimum air temperature in the shade varied but little from the normal. The humidity was greatest in May and April and least in September.

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,200
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,886
1918								
1st Quarter	1,085	812	397	1,013	409	684	518	4,918
2nd Quarter	1,110	554	427	727	526	609	529	4,482
3rd Quarter	1,285	794	498	702	559	796	376	5,010
4th Quarter	1,354	921	331	229	668	701	644	4,848

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the year 1918. The corresponding figures for the two previous years and the averages for the four years previous to that are added for convenience of comparison.

Product.	*Averages 1912-15.*	*1916.*	*1917.*	*1918*
Sugar, tons ...	97,140	101,649	114,006	93,901
Rum, gallons ...	3,455,495	4,386,854	3,415,921	2,614,481
Molasses, gallons...	94,474*	...	149,940	208,262
Cattle-food, (Molascuit) tons	4,158	997	2,424	2,754
Cacao, cwts. ...	396	416	71	85
Citrate of Lime, cwts.	76	466	155	31
Lime Juice, gals. ...	No records 1912—15	8,565	17,287§	13,846†
Essential Oil of Limes, gals.		290	251	180
Coconuts, thousands	1,223	1,631	1,911	1,516
Copra, cwts. ..	1,396	2,117	1,507	2,487
Coffee, cwts. ...	1,440	4,474	2,347	4,751
Kola-nuts, cwts. ...	5	25	34	24
Rice, tons ...	6,664	13,008	14,367	8,017
Ricemeal, tons ...	1,078	300	140	81
Cattle, head ...	571	632	872	332
Hides, No. ...	4,641	4,587	1,549	3,291
Pigs, No. ...	1,315	1,160	455	None
Sheep, head ...	66	69	18	10
Balata, cwts. ...	10,287	12,069	14,249	10,185
Charcoal, bags ...	63,942	53,527	44,986	41,310
Firewood, Wallaba, etc., tons ...	9,134	10,364	7,307	7,260
Gums, lbs. ...	2,020	1,118	112	60
Lumber, cub. ft. ...	305,448	360,439	191,091	116,771
Railway sleepers, No.	7,371	5,525	30,633	7,743
Rubber, cwts ...	15	130	132	214
Shingles, thousands	20,307	2,355	3,208	2,842
Timber, cub. ft. ...	261,980	138,342	51,769	31,082
Coconut Oil, gals....	No records	17,948	26,674	30,652

* For 1912, 1913 1914 only, No molasses exported in 1915.

§ Raw Juice 13,596 gallons. Concentrated 3,671 gallons.

† Raw Juice 12,996 gallons. Concentrated 849.