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Some Possibilities of Improvement in Village Agriculture.

I.

It is well to remark at starting that we intend in these articles only to consider some of the possibilities of improvement in village agriculture, not all or even most of them. Without capital it is, of course, almost idle to look for improvement; the poorer villager cannot afford to try experiments nor even to adopt an improved crop or method, if any monetary outlay is at present required. Though he may know that an expenditure of ten cents will bring in a rupee, he must first have the ten cents. Experimental gardens and other similar methods of work for the improvement of agriculture and horticulture can do little for the poorer villager until this primary difficulty is got over. They may introduce or breed better varieties of plants than those the local cultivators use but the latter cannot afford to buy them, while if they are presented to the villagers, they are undervalued. A common experience in Ceylon has been to give good seed to a villager and then to find that he has eaten it in his curry or sown it somewhere that it has no chance of success.

One great, and perhaps the commonest, mistake that is made in endeavouring to introduce improvement in agricultural crops and methods is trying to go too fast. Evolution works now, and always has worked, by almost indefinitely small steps. Agriculturists, more especially Southern Asiatics, are about the most conservative of mankind. Great harm has been done to the cause of true scientific and lasting progress by enthusiasts anxious to go rapidly, forgetting that the gap between the native and the European—if indeed it can ever be, or is to be desired to be, bridged—is to be measured in centuries. Similarly unsound ideas have also been at the root of the ruin of many well-considered schemes for agricultural improvement. Instead of fixing upon a definite system, and adhering firmly to it for long periods till it has had a chance of showing results, we treat it only too often like children treat the plants in their gardens, digging them up at frequent intervals to see how they are getting on, and soon throwing them away because they have not grown unnaturally quickly to suit their wishes.

When we take a general survey of village agriculture, it is easy to see that there are many points in which improvement is possible. Such are:—

(1) The variety of products cultivated.
(2) The kinds or varieties of particular crops cultivated.
(3) The methods of cultivation.
(4) The cleanliness of cultivation and freedom from weeds and disease.
(5) The preparation of the produce for sale; and so on.

There cannot be the least doubt that all these are capable of vast improvement, though one still at times hears people state the contrary with regard to at least (3). Speaking broadly native agriculture is both wasteful and inefficient, and urgently needs improvement. But, and this is a point of the most vital and essential nature, we must go slowly, and be quite sure of what we are doing, or we shall do more harm than good.

The proper course is to find out first of all the actual facts of native knowledge in agricultural matters and to work from these, or in other words, to apply the methods of pure scientific research and induction. The science of agriculture is as yet largely in an embryonic condition and its generalisations are almost entirely based, as in the case of the other biological sciences, upon work done in the totally different climates of Europe and North America. To apply these directly to tropical conditions is often to court failure. We must begin again, using the results of work done in the temperate zones as a guide, and collect facts patiently, group them, make inductions from them, and test these again, until we have built up a sound science of tropical agriculture. Scientific agriculture in Europe and North America has now overtaken the empirical knowledge of generations of farmers in many departments, and explained it, using the generalisations thus obtained to deduce further rules of action, but this is by no means yet the case in the tropics. We must first learn all the facts that village agriculturists, planters, and others have learnt, and then use these as a basis for further work. Not merely must we learn the facts but we must find out the "why" of them. Why, for example, does the Sinhalese villager usually manure betel pepper only with the leaves of "Keppitiya," *Croton lacciferum*, and refuse to employ another manure apparently as good or better. He himself does not know, but we must find out, and perhaps in so doing we shall find some valuable knowledge throwing light on other problems, as well as on manuring.

To deal in order with the points in which improvement is required, the first is the variety of crops cultivated. There is a want of variety in village cultivations and "new products" are desirable in many places, to avoid the risk of having too many eggs in one basket, to lessen the risk of epidemic disease, and to increase the variety of products available in the local market, and thus help in raising the general standard of living. But to introduce and establish these involves many considerations. They must be shown to grow well in the district, to be easy of cultivation, and to yield greater profit or better food than those things that are already in cultivation there, or at least as much. There must also be a reliable market for them. In effect, therefore each product wants full and careful experiment in each district. To have an Experimental Garden in each district is beyond practicability; the cost would be too large in proportion to the result. But an Experimental Garden on a scale suited to each village can be easily provided in the schools. A preliminary investigation is needed to find out what products are already cultivated in the district, and then the garden should be supplied with others not yet familiar to the local people. In this way it can be tested whether the particular plants will grow well in that district and what kind of market or domestic use there is for the produce. The villagers will see the plants for themselves and be able to get a few for trial, and gradually those that prove desirable will come into local use. In Ceylon the School Gardens have already introduced a considerable number of new products into the villages at a minimum of cost. The products thus introduced are those likely to prove really suitable and are not likely to be thrown away or neglected like those casually distributed by Government officials.

GUMS, RESINS, SAPS AND EXUDATIONS.

A LONDON BROKER ON THE CEYLON RUBBER INDUSTRY.

Mr. A. O. Devitt, who has been making a visit of some duration to Ceylon, is, as our readers are probably aware, a partner in the well-known firm of Messrs. Lewis and Peat, brokers, who make a speeiality of rubber. Mr. Devitt eame out here to get a knowledge of the rubber planting industry first hand, and to assist planters here with his knowledge of what the rubber trade requires and to obtain an exehange of views between the planter and the broker whieh might bring about a result advantageous to both parties. Mr. Devitt by his personality and genial, frank manner has made friends everywhere, and we are assured by planters and others that his visit will be productive of much good to the Ceylon industry.

Mr. Devitt has been over some 65 or more Ceylon rubber estates and has met and exchanged views with a very large number of Ceylon men. He himself is well pleased with his visit and feels that he can now handle plantation rubber on the market with even more confidence than hitherto and with more advantage to the Ceylon producer. He is exceedingly pleased with the plantations he has visited and with the rubber he has seen everywhere. "The rubber" he says, "that is turned out on the Ceylon estates is excellent, and I came aeross very few biscuits that would not pass on a contract with a guarantee of 'fine plantation.' The sheet turned out is excellent; perhaps the best samples I saw were on Kondesalle." Sheet is made in kerosine tins, and these are eeonomic in space in eoagulating, drying, &e., and in Mr. Devitt's opinion very eonvenient for packing, as two layers of sheet ean be packed alongside and 150 lb. will go into an ordinary "Venesto" ease. This is the best way for turning out the rubber, he thinks, and in the form most attractive to buyers.

Ceylon plantation rubber in the order of its attractiveness to buyers runs as follows:—Sheet, biscuits, laee, erépe and worms, "But" says Mr. Devitt, "there is no differenee in their value whatever."

Lace, erepe and worms have been receiving much more attention lately in London as buyers have got over their prejudice and are taking them at sheet and biseuit priees. The buyer, says Mr. Devitt, likes something that he can pull about and test, like sheet and biseuit, rather than the worm rubber.

"I have personally seen the manufacture on estates of all kinds of rubber, and I shall be in a position to assure buyers and manufaeturers that these Ceylon rubbers are perfectly sound and as pure as possible." Mr. Devitt has had 10 years experience in London attending to nothing but rubber, and sinee it started he has closely followed the planting industry; with his further experienee gained out here and in the Malay Peninsula he should be in a unique position to help the planters to make the best of the market at home—and we think he will do it. It is his intention, he informs us, to push the planting produet as much as and wherever possible, and to do all in his power to get the rubber widely known and generally used. He thinks buyers will realise the importanee of plantation rubber, and he will get men to try it and test it in every way and will push its elaims among the regular buyers.

The New Draft Allowance.—Regarding the new draft allowance, we believe the new regulation is due to Mr. A. O. Devitt's reeommendations. The customary trade allowances were 2½ per cent diseount, and draft, which was, on packages weighing gross 28 lb. or under, nil, and on packages exeeeding 28 lb. gross 1 lb., and 2 lb. allowed where the tare of the paekage exceeded 28 lb. By the new regulation on every 100 lb. rubber only ½ lb. draft allowance is made. This is a step

in the right direction. Early in his visit to Ceylon, Mr. Devitt wrote to London strongly recommending this; his letter resulted in Mr. Devitt, snr., calling together a meeting in London of the rubber trade and proposing the abolition of the draft allowances and the $2\frac{1}{2}$ per cent discount. The meeting agreed to reduce the draft allowance (as stated), but refused to do away altogether with the discount. We understand that on his return home Mr. Devitt will do all in his power to further reduce the charges.

THE FUTURE OF THE PLANTATION INDUSTRY.—Mr. Devitt is even more optimistic of the future of the plantation industry than he was before his visit to Ceylon. Plantation rubber will hold its own, he says, and compete successfully with any rubber produced in any part of the world. Even if lower prices are reached the uses will extend—"the lower the price, the more rubber wanted," he says; and the uses to which it can be put are absolutely unlimited. The trade can take a yearly increase of 2,000 tons for many years yet.

HIGHER PRICES IN JUNE AND JULY.—The latest information from home regarding the rubber industry received by Mr. Devitt is that rather higher prices are looked for during June and July. A tip to planters ready to ship consignments!

Mr. Devitt does not think rubber will long continue to be marketed as it is now, but machinery has yet to be produced to deal with it properly and in large quantities. He would like to see it produced in a long continous sheet. As regards scrap, he says planters should wash their scrap in the washing machine and send it home as crêpe, as this would pay them well.

THE FUTURE CURING OF CEYLON RUBBER.

Our attention has been called to some lots of biscuits apparently well cured arriving here in a heated and sticky condition, and the query has been ventured as to whether the present mode of curing and the biscuit forms are the best, and if rubber so prepared will keep for any length of time without deteriorating; and further, whether plantation prepared is as strong as it might be made by other modes of curing.

In view of the increase of this rubber, we think it is of the greatest possible importance to planters that at this stage the comparative value and merits of plantation rubber as against smoke-cured fine Para, should be ascertained and thoroughly threshed out. The reasons, it will be seen, are vital, and our object, in addressing the planters through your medium, is to impress upon them the necessity of doing everything possible to establish plantation-grown rubber on a sound basis as a competitor of Amazon-grown smoke-cured, which, of course, is still the standard and has a record of 50 years and has maintained its character as the "best" up to this day, viz., for elasticity, strength, and durability for general purposes.

FIRSTLY.—It is essential that plantation rubber should be so prepared and cured that it can be used for all sorts of purposes by manufacturers. At present as far as we can ascertain, it is only used for solution and small special purposes and is not strong enough or suitable for waterproofing or tyres and many other purposes that fine Para is used for.

SECONDLY.—We have from time to time drawn attention to cases arriving here with the biscuits all sticking together and in some cases actually more or less in a congealed state of heat which never occurs in fine Para. We have hitherto attributed this to want of proper curing and drying, but after consulting a gentle-

man of great experience and knowledge, greatly interested in rubber, the very serious question has arisen as to whether the present mode of curing rubber in Ceylon and the Straits will prove the right one *as quantities increase.*

The theory our friend puts forward is this:—That Ceylon pancakes and Straits sheets are at present made too "pure," that is to say too much moisture, etc., is taken out of the latex with the result that the elasticity and strength is reduced and that it will be found the rubber in this form will not keep, but will inevitably become soft and treacly if stored for any time, or subjected to pressure and a raised temperature. He further believes that it is the extra moisture left in the Fine Para, "smoke cured" that renders it fit and strong enough for all purposes, and accounts for it not deteriorating if kept for any length of time. His argument is that the only remedy is for planters to smoke cure their rubber and make it into large balls, bottles or cakes like they do in Para. He further states that there are plenty of nut-producing trees in Ceylon of the Borassus family that when burnt can produce the thick heavy smoke containing the active principle "Creosote" which is the antisceptic that cures the Para rubber in Brazil.

He predicts that Plantation rubber so cured would fetch rather less than the biscuits and sheets, but that the gain in weight of the moisture left in the rubber would more than make up for the slightly lower price. He thinks that biscuits and sheets will have to be abandoned in favour of balls or other forms like Fine Para comes over in. He argues that the very form of thin biscuits lends itself to heating when under pressure whereas the ball shape and thick biscuits are far less liable, and he prophesies that when the article is coming in tons the defect will be very evident by the state the biscuits and sheets arrive in.

He adds that even if the rubber does not get heated on the voyage it would inevitably do so if stored for any length of time in warehouse. He gives as proof of his theory that the same thing occurred to certain other rubbers and the remedy in their case was making it into large balls and no further trouble has been experienced. His remedy is smoke curing and he is very positive and emphatic. We ourselves have seen Rangoon and Assam rubber washed and cleaned in India and very nicely prepared, arrive in London a mass of heat and with it the same rubber native cured and a little mixed with earth, &c. quite sound and free of heat, the idea being that the cleaning, etc., weakened and destroyed the fibre of the rubber and rendered it too weak to stand the heat of a ship's hold or variations of the temperature. Apologising for the length of this letter. We are, dear Sir, your obedient servants,

LEWIS AND PEAT.

London E.C., March 22nd.

Commenting on the above letter the *Ceylon Observer* says:—

We are well aware that many changes and improvements in the methods of preparing plantation rubber must be made before an entirely satisfactory product results; there are many objections that can be raised against the present Ceylon product and the method used in curing it. Messrs. Lewis & Peat write us to-day a lengthy letter on the subject; and their conclusion is that to prevent heating of the rubber it must be smoke cured and shipped in a much moister condition than is done at present. Hitherto the dry condition in which plantation rubber has been shipped has been considered one of its characteristics, and it yet remains to be proved that Messrs. Lewis & Peat's adviser is correct when he says that it is "the extra moisture left in the Fine Para, smoke-cured, that renders it strong . . . . and accounts for it not deteriorating." It may be that smoked-rubber will eventually be adopted but it will have to be by means of machinery, and already one machine has been invented; we refer to Mr. R. C. Dickson's, and

what progress the inventor has made with that we shall be interested to hear. It is doubtful if sufficient of the proper palm nuts are grown in Ceylon to supply the rubber industry as suggested; but certain timbers will probably supply smoke containing the active principle of creosote. We have heard it claimed that certain washed rubber will not heat; and a certain gentleman interested in rubber has given his opinion that carelessness in the use of acetic acid is responsible for heating. There may be something in both these arguments. Certain it is, however, that on the plantations machinery will largely come into use, and plantation rubber will not be turned out as "large balls, bottles or cakes," which would be very inconvenient for packing. We have had certain particulars given to us of a machine which will coagulate and wash the rubber and turn it out ready "creosote-coated," and that seems well on the way to what is sought by Messrs. Lewis and Peat. In his "Hevea Brasiliensis" Mr. Herbert Wright says regarding smoking rubber in the Amazon that the nuts used produce smoke containing small quantities of acetic acid, acetone and creosote; "acetic acid is probably the agent responsible for effecting the coagulation; the creosote.....acting as an antiseptic..... The decomposition may be prevented by the addition of suitable antiseptic reagents to the latex when the rubber is prepared in other ways, though quickness in drying and *complete extraction of the moisture* from coagulated rubber is often sufficient to bring about the same result." The italics are ours, and show how different is Mr. Wright's opinion from that of Messrs. Lewis and Peat's adviser. Further on in his book Mr. Wright says:—"The development of bacteria which has been shown to be associated with putrefactive changes of rubber can, however, be overcome either by inoculation, effective drying or the use of antiseptics." Mr. Wright will probably go into this matter more fully in his second edition. Meanwhile we shall be glad to hear from planters and others interested their opinion on the letter from Messrs. Lewis and Peat, and the matters therein brought up. The subject concerns the whole industry, and cannot be too well ventilated.

PLANTATION RUBBER MARKET REPORT.

LONDON, March 16th, 1906.—At to-day's auction, 124 packages of Ceylon and Straits Settlements plantation-grown rubber were under offer, of which all but 3 were sold. The total weight amounted to about 6¼ tons, Ceylon contributing less than ¾ ton and the Straits Settlements rather more than 5½ tons. These small supplies met with good competition, everything of importance changing hands at rates showing an advance on last sale of from ½*d.* to 1½*d.* per lb. Fine sheet was again in much request, 9 cases from the Highland Estate realising 6*s.* 3½*d.* Vallambrosa was also represented by a large invoice amounting to just over 2 tons which sold at an average of 6*s.* 2*d.* per lb. Quotations.—Fine sheet, 6*s.* 3*d.* to 6*s.* 3½*d.*; fine pale crêpe, 6*s.* 3*d.*; darker, 6*s.* 2*d.*, and dark from 5*s.* 1½*d.* to 5*s.* 4½*d.*; fine biscuits, from 6*s.* 2*d.* to 6*s.* 3*d.*; rejected biscuits, from 5*s.* 6*d.* to 6*s.*; good to fine scrap, 4*s.* 11*d.* to 5*s.* 3½*d.* Plantation Biscuit and Sheet to-day.—6*s.* 2*d.* to 6*s.* 3½*d.*, same period last year, 6*s.* 4*d.* to 6*s.* 9*d.* Scrap, 4*s.* 11*d.* to 5*s.* 3½d., same period last year, 4*s.* 2*d.* to 4*s.* 8*d.* per lb. Average price of Ceylon and Straits Settlements plantation rubber.—121 packages at 6*s.* ½*d.* per lb., against 139 packages at 5*s.* 10¼*d.* per lb. at last auction.

Particulars and prices as follows:—

CEYLON.

MARK	QUANTITY	DESCRIPTION	PRICE PER LB.
Kanambyle	2 bags	Ball and rejected biscuits	...3*s.* and 6*s.*
Tallagalla	3 case	Fine dark biscuits	... 6*s.* 3*d.*
do	1 do	Fine palish scrap	... 5*s.* 3*d.*
do	1 do	Barky scrap	... 5*s.*

MARK.	QUANTITY.	DESCRIPTION.	PRICE PER LB.
Warriapolla	1 cases	Very fine pale amber biscuits	... 6*s.* 3*d.*
do	1 bag	Very fine amber biscuits	... 6*s.* 3*d.*
do	3 cases	Fine pale biscuits	... 6*s.* 3*d.*
do	1 bag	Darkish biscuits	... 6*s.* 3*d.*
do	1 bag	Rough biscuits	... 5*s.* 6*d.*
Baddegama	1 case	Fine palish to darkish biscuits	... 6*s.* 3*d.*
Wararaka	1 do	Fine darkish biscuits	... 6*s.* 3*d.*
do	1 do	Good palish scrap	... 5*s.* 3*d.*
Glencorse	2 do	Very fine large palish biscuits	... 6*s.* 3*d.*

STRAITS SETTLEMENTS.

(S.K. in diamond) P. R.	4 eases	Good small biscuits	... 6*s.* 2*d.*
do	1 do	Sheet scrap	... 5*s.* 2*d.*
(S.H in diamond) P. R.	1 do	Rejected biscuits and sheet	... 6*s.*
do	1 do	Sheet scrap	... 5*s.* 2*d.*
V. R. Co. F.M.S. (in triangle)	14 do	Very fine palish to darkish narrow scored sheet	6*s.* 3*d.*-6*s.* 3½*d.*
do	3 do	Rejected sheet	... 6*s.* 2¼*d.*
do	1 do	Fine pale pressed crêpe	... 6*s.* 3*d.*
do	1 do	Dark crêpe	... 5*s.* 2½*d.*
do	2 do	Palish and darkish crêpe	... 6*s.* 1*d.*
do	2 do	Dark crêpe	... 5*s.* 1½*d.*
Horse	2 do	Fine palish sheet	... 6*s.* 3*d.*
do	1 bag	Rejections	... 5*s.* 5*d.*
Brink	1 case	Fine rolled scrap	... 5*s.* 3*d.*
L. E. (Muar in triangle) Straits	8 do	Very fine pale crêpe	... 6*s.* 3*d.*
do	1 do	Dark crêpe	... 5*s.* 3¼*d.*
do	1 do	Fine darkish scored sheet	... 6*s.* 3*d.*
C.S. L.	1 bag	Fine pale scrap	... 5*s.* 3½*d.*
L. & P. F.M.S.	1 do	Fine pressed sheet scrap	... 5*s.* 2½*d.*
Add	1 case	Good palish scrap	... 4*s.* 11*d.*
Highland Estate	9 do	Very fine amber scored sheet	... 6*s.* 3½*d.*
do	1 do	Very fine pale crêpe	... 6*s.* 3*d.*
do	4 do	Fine crêpe, little darker	... 6*s.* 2*d.*
do	3 do	Dark crêpe	... 5*s.* 4½*d.*
do	6 do	Very dark	... 5*s.* 2*d.*
A.S.C. A.A.	2 do	Fine large darkish biscuits	... 6*s.* 2¾*d.*
do	2 bags	Good rejected biscuits and pieces	... 5*s.* 8*d.*
do	1 case	Fine dark scrap	... 5*s.* 3*d.*

GOW, WILSON & STANTON, LTD.

THE LONDON RUBBER MARKET.

LONDON, 30th March.—The market generally continues very firm and fine Para is rather dearer although there has not been much doing. The receipts to date show a considerable falling off. In Plantation business has been done for arrival up to 6*s.* 4*d.*, and the following lots consisting of about 4¼ tons Ceylon and 4¼ tons Straits and Malay States were offered in sale to-day and sold as follows:—

CEYLON.

MARK.	QUANTITY.	DESCRIPTION.	PRICE PER LB.
Tallagala	1 case	Dark biscuits	... 6*s.* 2¾*d.*
do	1 do	Fair scrap	... 5*s.* 3¾*d.*
Ambatenne	4 do	Fine pale biscuits	... 6*s.* 3*d.*
do	2 do	Good scrap	... 5*s.* 4½*d.*
Hattangalla	2 do	Amber biscuits	... 6*s.* 2¾*d.*
do	1 do	Fair pale scrap	... 5*s.* 4½*d.*
Ellakande	1 do	Dark biscuits	... 6*s.* 2¾*d.*
do	1 do	Scrap	... 5*s.* 4½*d.*
Culloden	9 do	Fine pale biscuits	... 6*s.* 3*d.*

MARK.	QUANTITY.	DESCRIPTION.		PRICE PER LB.
do	1 cases	Lumps	...	5*s.* 6¼*d.*
do	5 do	Scrap	...	5*s.* 5*d.*
do	2 do	Inferior dirty scrap	...	3*s.* 3*d.*
V.S.K.M. in est. mark	1 do	Rough biscuits mixed colours	...	6*s.* 1¼*d.*
D. & Co.	4 do	Sheets	...	6*s.* 2¾*d.*
do	2 do	Scrap	...	5*s.* 3½*d.*
do	1 do	Cuttings	...	5*s.* 2¾*d.*
F.B.	3 do	Dark rough biscuits	...	6*s.*
Clontarf	1 do	Pale scrap	...	5*s.* 4¾*d.*
Tudugalla	17 do	Biscuits mixed colours	8 cases sold...	6*s.* 3*d.*
do	5 do	Scrap	5*s.* 5*d.* to 5*s.* 5¼*d.*	

STRAITS AND MALAY STATES.

W. P. M.	5 cases	Sheets mixed colours	...	6*s.* 3¼*d.*
do	2 do	Good scrap	...	5*s.* 3¾*d.*
B. N. S.	1 do	Rejections	...	5*s.* 8¼*d.*
do	1 do	Cut pieces	...	5*s.* 2¼*d.*
G. M. S. B.	1 do	Fair scrap	...	5*s.* 4*d.*
do	6 do	Large palish sheets	...	6*s.* 3*d.*
do	1 do	Scrap	...	5*s.* 4¼*d.*
P. R.	1 do	Black and white scrap	...	4*s.* 6¼*d.*
S. B.	3 do	Large sheets	...	6*s.* 3*d.*
do	1 do	Dark scrap	...	4*s.* 10½*d.*
L.S.H. in est. mark	1 do	Sheets	...	6*s.* 2¾*d.*
F.H.B. do	1 do	Red Rambong	...	4*s.* 6*d.*
do	1 do	Inferior scrap	...	4*s.* 7*d.*
do	1 do	Sheets	...	6*s.* 2¾*d.*
L. & P.	1 do	Stuck Sheets	...	6*s.* 2¼*d.*
F.M.S.	8 do	Very pale Crêpe	...	6*s.* 3*d.*
P.S.E. do	4 do	Sheets mixed colours	...	6*s.* 3*d.*
S. do	1 do	do	...	6*s.* 3*d.*
W.	1 do	Dark inferior scrap	...	4*s.* 5*d.*
O.O.	1 do	Sheets mixed colours	...	6*s.* 2¾*d.*
K.M.	2 do	Pale thin sheets	...	6*s.* 2¾*d.*
do	1 do	Scrap	...	3*s.* 10*d.*

To-day's value for Fine Para is 5*s.* 5¼*d.* spot, 5*s.* 6*d.* May—June delivery. Receipts this month 3,250 against 5,250 tons last year.

LEWIS & PEAT.

CEYLON PLANTATION RUBBER.

By Gustave Van Der Kerckhove.

(Translation of an article which appeared in a German Rubber Trade Journal.)

The English planters, who some years ago resolved to employ a considerable amount of capital in planting rubber trees in Ceylon and the Straits Settlements, are now beginning to reap the fruits of their enterprise and perseverance. The London market has been receiving for some time now regular consignments of raw rubber from the *Herea* (Para) Plantations in Ceylon and the Malay Peninsula.

Three or four years ago it created a great sensation on the London market when samples of the new rubber were offered, and it was my lot to be one of the experts who had to give a valuation of the new product. The opinions were unanimous that the rubber was of fine quality and had been very carefully prepared so that very good results would be obtained in the manufactories. The valuations were, therefore, higher than those for "fine Para." These opinions were confirmed by various sales and even today the fine sheets and discs (biscuits?) from Ceylon obtain a higher price than "fine Para." The new rubber has certainly gained the favour of the market.

These excellent results must of necessity give rise to numerous comments. For example, I read lately in a colonial review an article entitled "Brazil beaten by Ceylon." According to the arguments of the author Ceylon rubber has clearly deposed "fine Para" from its throne. These are, of course, merely phrases to which importance cannot be attached, but in certain Colonial circles they receive an interpretation which is not in accordance with the actual facts.

As mentioned above, since the commencement of the importation, the value of Ceylon rubber has been higher than that of fine Para. This higher value was based, and today is based, on the small loss in weight after manufacture and not on the condition as regards elasticity. In all probability I am saying nothing new when I maintain that fine Para is by no means dethroned and, as regards elasticity and resistibility, it remains so far the king of rubbers, and will remain king for a long time to come.

When one examines the special properties of the two rubbers, one finds that although Para rubber does not quite contain the special purity of the Ceylon rubber, yet that it, (the Para) is naturally more elastic and resistible than the latter. The expression "resistible" applies here to durability or in other words—the Para rubber is, if exposed to the influences of the weather, more durable than the Ceylon rubber. To what is this difference attributable? apparently to the system of coagulation.

Even when I fully recognize the splendid work done by the planters and notwithstanding the high prices obtained by the Ceylon rubber, I do not hesitate to give those interested in the cultivation of Hevea in Ceylon and the Malayan Peninsula the advice to study carefully the possibility of coagulating the latter through smoke. They will thus be able to impart to their product the resistibility which is the distinguishing feature of the Para.

That which is wanting in the Ceylon rubber is the antiseptic principle, the creosote which is contained in smoke. Besides this the planter must keep the future in view. For without doubt as soon as the imports from Ceylon and the Malay Peninsula attain to an important number of tons instead of the present output of a few thousand kilos, the prices will not be higher than those of fine Para; I maintain they will be lower. The one means to prevent this

situation is in my opinion to try and lend the same properties as regards elasticity and resistibility which now distinguish fine Para to the Ceylon article.

Note by translator.—I have translated "Widerstandsfähigkeit" which is literally "Power of resistance" as resistibility, perhaps "Resiliency" would have been the more correct technical expression.

THE GROWTH OF THE RUBBER TRADE.

In your article on "Growth of the Rubber Trade," published in the *Financial and Commercial Supplement* of *The Times* of February 26, you state that the estimated production of rubber in the year 1905 amounted to 65,000 tons, of which Brazil produced 34.000 tons, or rather more than half of the total production. You also state that the area of rubber plantations to date is estimated at about 150,000 acres, an area which is rapidly increasing. On the strength of these *data* you express the opinion that the activity in planting in various parts of the earth makes the outlook less promising for the shareholders in new rubber-growing companies, as the supply will overreach the demand.

I have had to do with the supply of rubber in my official capacity in India, and I have watched the development of the industry for many years. My experience has taught me two things—(1) that the natural sources are rapidly diminishing, and (2) that to supplant the natural sources we require not less than 800,000 acres of plantations. As regards the first point I can, unfortunately, not bring direct evidence referring to Brazil, but the following data regarding British Colonies may prove interesting to your readers :—

Production of rubber in 1896=12,457,187 lb.
„ „ „ 1904= 5,055,460 lb.

This represents a falling-off amounting to 60 per cent. It is my belief that the natural sources are being rapidly worked out. Owing to the natural rubber trees and plants being scattered over enormous areas, it is impossible to insist on a rational treatment of the trees, and they are sure to disappear everywhere within a limit space of time. Hence future supplies must depend on plantations Referring now to the second point, I am confident that to yield permanently a ton of rubber per year requires not less than 10 acres of plantation. Hence to supply 65,000 tons a year, we require 650,000 acres of plantation; or allowing for some to increase, 800,000 acres. There is thus plenty of room for further extensions. The danger connected with this industry is the possibility of an efficient substitute for rubber being discovered.

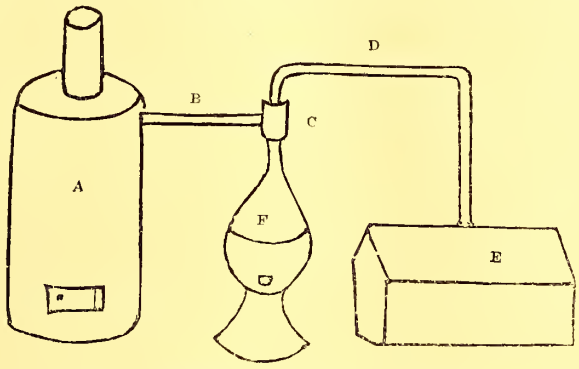
Oxford. W. SCHLICH.

—*London Times Supplement.*

RUBBER CURING: THE USE OF SMOKE.

I am, as you know, a rubber planter, having since 1898 planted, near Bluefields in Nicaragua, nearly 200,000 *Castilloa* trees, which now measure mostly from 4 to 10 inches or more in diameter . . . The coagulation of rubber latex has so far been a difficult problem. Drying in the sun in a moist tropical climate is tedious, and the sun is injurious to *Castilloa* rubber. Drying out of the sun is not practicable. Drying by steam is expensive and all methods of evaporation yield a *Castilloa* rubber prone to the viscous disintegration and tackiness, which characterise "Centrals." The same objections, I think, apply to the method of absorption by pouring the milk on blotting paper or porous clays or bricks, followed by my neighbours Belangers.

Because the best Para in curing is submitted to a heat probably greater than 212°, and because, on the best authority, the most of the best Congo is boiled in the curing, I tried boiling the *Castilloa* latex. The result was not satisfactory. A large proportion of the rubber in the latex coagulated, but there remained always a residuum of milky fluid which no amount of boiling would cause to give up its rubber. The Brazilian method was put aside as too expensive. Blowing smoke through the milk by means of a blacksmith's blower attached to a furnace was tried, without any success. When, however, the latex so smoked was boiled the rubber separated completely, leaving a lye-colored water without a trace of rubber. From these experiments the conclusion was made that smoke and heat would effect coagulation. Having a steam boiler, the apparatus of which I present a rough drawing was set up.



Rubber Smoking Apparatus.

[*a* Steam Boiler; *b* Steam Pipe; *c* Steam Syphon; *d* Discharge Pipe; *e* Latex Vat; *f* Smoke Making Furnace]

Steam passing from the boiler through the siphon continues through the discharge pipe, drawing with it into the latex the whole smoke supply of the furnace. The latex is violently agitated and gradually reaches boiling heat. As the boiling point is reached, the rubber completely coagulates. A few minutes of boiling is enough. The coagulated mass is then lifted out and sliced thin and hung over poles to dry. Because of the working of steam in the mass, it is porous and drys very quickly. Indeed, there is no other way of drying rubber except by reducing it to paper-like sheets.

The process is quick, simple, and cheap. Rubber so coagulated has been kept six months without sign of viscidity or shortness of grain. The method is in effect that of Brazil, and its chief merit, aside from solving coagulation, is, I venture to think, the diffusion through the rubber of the preservative elements of wood-smoke.

The active principle of coagulation with heat is doubtless acetic acid. It has been suggested to me by Professor Lang, of Toronto University, that crude wood alcohol, that is alcohol from which the acetic acid had not been removed, might be an effective coagulant.

It was found that it did not do to use woods for smoke production which blazed readily, and so, I venture, consumed the necessary elements of smoke. At last, it was demonstrated that the best fuel was the nuts of what is locally known as the silico palm, growing very extensively in the swamps of Nicaragua and possibly identical with that producing the rubber curing nuts of Brazil. No doubt, their virtue lies solely in the fact that they give off a dense smoke and simulate a wood distillation. But I bow to the chemists. We use, in bleeding, clay to make a continuous surface from the bark into the receiving cups. Some of this clay mingles with the latex and, if not removed by washing, will hinder by its mechanical action the success of the process of coagulation described above.—*Gordon Waldron in the India Rubber World.*

OILS AND FATS.

Citronella and Lemon Grass in Ceylon.

By Herbert Wright.

I have, on a previous occasion, made some remarks on the subject of Citronella and Lemon Grass in Ceylon, and to-day I propose to say a few words regarding the progress of our experiments with Citronella. In the first place it is pleasant to be able to record the assistance which has been given by Mr. Jowitt of Bandarawella, Mr. R. Jackson, Sita-Eliya, and Mr. Thomas in the Central Province; these gentlemen have established plots of Citronella and Lemon grass at various elevations and our series of co-operative experiments being now complete we may hope to obtain reliable information on the growth of these grasses grown 2,000 feet at Peradeniya, to 7,000 feet on the Horton Plains.

Paper from Ceylon Grasses.

Satisfactory progress has also been made, through Mr. Halbert in England, in connection with the manufacture of paper from the grass after the oil has been extracted; and also from the wild Maana grass, so common in many parts of the Island. One English firm has reported to the effect that the material is most satisfactory and another firm has asked for sample lots, 3 tons in weight, in order that the experiment may be carried out on a commercial scale. I have recently despatched one ton of the grass, and it is encouraging to know that Messrs. Tarrant & Co., Colombo, are able to bale the material at cheap rates, and that the home firms are not only willing but anxious to pay for the cost of collecting and baling the grass in large quantities. By the co-operation of firms in Colombo and England, I think we may confidently look forward to an accurate determination of the value of Maana and Citronella grass for paper manufacture.

Investigations undertaken.

But the most important work which has been undertaken is in relation to the yield and value of the unadulterated oil. It will be remembered that from May 1902, experiments have been carried on at Peradeniya and we are now in possession of information regarding the methods of cultivation, the yields obtainable at an elevation of 2,000 feet, the physical and chemical properties of the soils suitable for its cultivation, and the botanical and chemical characters of the grass itself. Obviously the one thing required to be done was to place the oil on the London market with a guarantee, from Government, that the extraction was absolutely pure. This has been done through the agency of Messrs. Clarke, Young & Co., Colombo, and thanks to them, and also to Messrs. C. P. Hayley & Co., of Galle, some very valuable reports have been obtained. I do not propose to trouble you with these reports in detail, as the whole of the information is about to be published in the Circulars and Annals of Botany, issued from Peradeniya. Furthermore, great interest has been aroused among London firms and chemists and Messrs. Sage & Harrison have already published some of their views on the oils, exported from Peradeniya, in the "Chemist and Druggist."

Standard tests.

There are a few points which may be dwelt upon, and the first is in regard to the standard required by the markets in England and New York. When Citronella oil is being valued it usually has to undergo a chemical examination, Schimmel's test being the one applied. If the oil will not pass this test, it is pronounced by the

purehasers at home as adulterated. It has, however, long been a matter of dispute as to the reliability of Sehimmel's test, and its applieation to what was guaranteed to be pure oil, has proved this suspicion to be correct. Samples of the same distillate have been taken by Messrs. Sage & Harrison, Messrs. Lever Bros., and Wm. Gossage & Sons., and Schimmel's test applied, and it is most remarkable to reeord that some samples have passed the test and others have not. Yet the oil was from the same distillate and was guaranteed to be free from any adulterant, because the whole of the processes from planting and distilling the grass to sealing the bottles was done under my supervision. Though some samples of the oil did not pass Schimmel's test, subsequent physical and chemieal analyses proved the oil to be free from any adulterant and the firms had no hesitation in pronouneing the oil of excellent quality and as one which would eommand a much higher priee than that ruling for ordinary Ceylon Citronella.

Fresh Tests Wanted.

If the one great test which has hitherto been employed by the biggest firms in London and New York, is not applicable, it beeomes a serious question as to how the value of Citronella oil ean be fixed in the future to the satisfaction of purehasers. The results of the investigation have so impressed some London chemists that they have been bold enough to propose that any of the tests hitherto suggested for use in determining the purity of Citronella oil should be disregarded; they state that tests are not necessary if Government or any known firm will guarantee the purity of the oil and quote the percentage of geraniol and eitronellal present. This suggested departure from old methods is indieative of the desire of home chemists to place the question on a sound scientifie basis. They are supported by the results of analyses which showed that though our oil did not pass Sehimmel's test it eontained 41% of geraniol and 36% of eitronellal or a total of 77% of acetylisable eontents calculated as geraniol; ordinary unguaranteed samples possess about 60%. To bring about such a radieal ehange will take some time and antieipating some opposition we have promised to forward another consignment of pure oil in order that the same analyses may be made.

Higher Prices Obtained.

The seeond point on whieh I desire to dwell is the market value of the pure oil, as the results obtained in this direetion are very satisfaetory. The oil was sent in the erude, freshly filtered state and the greater part of it eould have been refined by simply distilling with water and its value thereby eonsiderably enhanced. It was however, considered undesirable to in any way refine the oil, as it was neeessary to know the value of the crude material. The first report was reeeived from Messrs Marshall and Freneh who replied that they would have no diffieulty in getting 2*d.* per lb. more for it than the ordinary qualities of eitronella. Another firm subsequently offered 3*d.* per lb. above the ruling rates. Finally, though the greater part of the oil was in a very crude but *unadulterated* condition and the whole of the consignment was considered too small to attract the attention of big buyers, the lot was sold at 1*s.* 6*d.* per lb. when ordinary eitronella was selling at under 1*s* 4*d.*

Value of Pure Oil Proved Commercially.

The fact that the unadulterated oil, though in undesirable quantity and crudeness, was sold at a price 12% higher than the prevailing market rate, is encouraging not only from a scientific point of view but from the standpoint of profit to the cultivator. It means that on a citronella estate of only 300 acres and yielding 50 lb. of oil per aere, per year, the value of the oil is raised from Rs. 15,000 to Rs. 16,875 or an increase of over £120. It means that for

every 1,000,000 lb. exported from Ceylon, and last year we exported 1,162,876 lb., the value is raised by over £8,000. I consider this the most important result which has occurred up to the present from the investigation, and there is good reason to hope that a still higher figure will be obtained for the refined oil which is about to be prepared at Peradeniya and despatched to the London market.

In the face of these facts, it seems unnecessary to urge that the practice of adulterating the oil in Ceylon should be voluntarily stopped, as it is in the interests of the producers to build up a good name and to increase their profits. It is to be hoped that the results which have been very briefly outlined today will give a stimulus to those engaged in an industry which may yet be made profitable. Certainly, all cultivators of citronella can rely on our efforts being continued until the Ceylon oil has its old and good name again recognised on the markets abroad; it is an industry which we can now confidently hope to improve and is well worthy of attention since it provides suitable employment for a large number of the native population in many parts of the island.

We shall adopt the London suggestions and in a short time we may be able to report a satisfactory basis for producers in Ceylon and purchasers in Europe and America.

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LONDON REPORT ON CEYLON CITRONELLA AND LEMON GRASS OILS.

I have recently had submitted to me samples of citronella and lemon grass oils which were distilled, at the instigation of the Ceylon Government, at the Government Experiment Station at Peradeniya. Citronella oil has been subjected to such gross adulteration in past years that the trade in it has fluctuated considerably, and with a view to improving this condition of affairs the Government has had these two shipments of oil prepared from reliable material in such a way as to preclude any adulteration whatever. The oils have been offered in London, with the object of finding the price obtainable for a perfectly genuine article, and as a guide to future operations in Ceylon.

CITRONELLA OIL.

The sample of this which I received was of a dark orange color, and judged by its odor alone it would find a ready market. On submission to analysis it yielded the following factors :—

Specific gravity @ 15·5 deg. C...	0·884
Optical rotation	—3·3
Citronellal	36 per cent.
Geraniol	41 per cent.
Schimmel's test	Turbid solution.

The oil was fractionated under reduced pressure, and the fractions and residue were proved to be free from mineral oils and fatty matter. As the citronella oils sold on the London market are usually guaranteed to pass "Schimmel's test," and all the largest buyers in this country and America specify that test in their contracts, this individual oil would be unlikely to find a purchaser who would not demur, or ask for an allowance, on account of the turbidity mentioned above. As this difficulty has been noticed before with other genuine oils, the retaining of Schimmel's test as a criterion of purity, by buyers and sellers, seems undesirable. The test is designed to detect adulteration with kerosene, and does not discriminate between good and bad oils which may happen to be pure. The value of the oil depends entirely on the proportions of the odorous bodies geraniol and citronellal present, and the basis for sale or contracts should certainly be a determination

of the amounts contained by an oil, and not an arbitrary test which, although useful up to a certain point, gives no information as to quality.

LEMON GRASS OIL.

This sample was obtained from several parcels which were part of the same shipment. It possessed an exceptionally fine odor, but was dark in color. On analysis it yielded as follows:—

Specific gravity @ 15·5 deg. C...	0·899
Aldehyde contents (citral)	66·5 per cent.
Optical rotation	—0·2

The oil would not yield a clear solution with 70, 80 or 90 per cent. alcohol when one part was mixed with varying quantities of the alcohol up to ten parts, but it made a clear mixture with an equal volume of absolute alcohol, which became very turbid on the addition of more of the same solvent. As so much lemongrass oil is judged by its solubility in 70 per cent. alcohol, it seemed desirable to test for the presence of paraffin and fixed oils; but fractional distillation in vacuo did not yield any fraction or residue which could be considered abnormal. Whether this oil will be able to compete with the East Indian oil by reason of its finer odor remains to be seen, but the Government experiments show that pure oils are different in some respects from those in commerce, and before the growers can obtain a market for their products a satisfactory basis of selling and buying must be established.—*By C. Edward Sage, in Chemist and Druggist.*

The Ceylon Citronella Oil Industry.

By A. Jayasuriya.

The cultivation of citronella is a matter of the greatest interest and importance to the inhabitants of the Southern Province, where about 40,000 acres of land are covered by the plantations. Since it is an industry which supports a good part of the rural population even at the present day it has been not inaptly termed the "mainstay of the South." Some idea of the magnitude of the industry, as well as its steady advancement, may be gathered from the export figures for the years given below. There are no available figures before 1887.

EXPORTS OF CITRONELLA OIL.

Year.	lbs.	Year.	lbs.
1887 ...	551,706	1896 ...	1,132,141
1888 ...	659,967	1897 ...	1,182,867
1889 ...	641,465	1898 ...	1,365,917
1890 ...	909,942	1899 ...	1,478,756
1891 ...	603,974	1900 ...	1,409,058
1892 ...	844,502	1901 ...	1,430,168
1893 ...	668,520	1902 ...	1,294,750
1894 ...	908,471	1903 ...	1,062,594
1895 ...	1,182,255	1904 ...	1,156,646

Although the industry has been carried on for about 66 years, its development on an economic scientific basis has not been seriously attempted, owing to the lack of knowledge in economic agriculture on the part of those interested in the industry. Having appreciated the fact, several years ago, that the largest yield at the lowest cost could only be obtained by following the teachings of science and the results of practical experience, I devoted a certain amount of attention to the scientific study of the industry as far as I was able. I may not be able to give a definite explanation of certain phenomena observed in our practical experience, though undoubtedly such do occur. If the results of our experience be in any way

beneficial to those interested in the essential oil industry I shall feel myself sufficiently recompensed for my efforts. The history of the citronella plant at present cultivated is interesting, since it is shrouded in mystery. Some hold that the plant is indigenous to Ceylon, and that it has been improved by cultivation; by others it is thought to have been introduced into Ceylon from the East Indes. There is an element of truth in either view; further I am inclined to believe that the four different varities of the plant now existing and classified under the Maha pangeri and Lenabatu groups are the degenerate products of the exotic variety, or the product of a cross-fertiliza- between the indigenous and exotic varities. Or even it may be the indigenous variet has been improved as a result of cultivation.

The citronella plant is the *Andropogon Nardus*, Linnæus, of the family Graminæ, and is extensively grown for the distillation of oil in the Southern Province, on the declivities of hills where the soil is not by any means considered to be rich. There are 4 different varieties of the plant met with in plantations. They are grouped under 2 classes, the *Mahapangeri* and the *Lenabatu*. Each group has its advantages and disadvantages.

The *Mahapangeri* gives a large yield of oil, and a higher percentage of the aromatic constituents which go to increase the value of the oil from this group of plants. On the other hand its chief disadvantages are that it requires a comparatively rich soil, is not able to withstand prolonged drought and requires greater attention. Further, it has to be frequently replanted.

The *Lenabatu*, though giving a smaller yield of oil, is a more hardy plant, thrives in poor soil, requires very little attention and does not necessitate replanting. The oil it yields contains less aromatic constituents and always obtains a lower value than the oil from the other variety.

Since the bulk of the oil in Ceylon is that obtained from the *Lenabatu* variety of citronella, it is on account of its poor quality that Ceylon citronella oil obtains a lower market value than the oil from Java and Singapore. And as long as the people in Ceylon, for the sake of convenience or otherwise, prefer to grow the *Lenabatu*, there is no likelihood of Ceylon citronella oil gaining the patronage of buyers, who are keen on excellence in quality. But with the diffusion of knowledge through the medium of the Ceylon Agricultural Society and the valuable aid to scientific agriculture afforded by the Royal Botanic Gardens at Peradeniya, we hope it will not be long before the citronella planters are made to appreciate the fact that, if they want to regain Ceylon's good name, they must bid adieu to *Lenabatu* and throw in their lot with *Mahapangeri*.

Of course, this would be a serious operation, but I am sure you will agree with me that to effect a radical cure a serious operation may very often be found necessary. Does the end justify the means? I certainly think it does. How can this change be effected is the next step to be considered in a scheme to rehabilitate a once flourishing industry. This I think can only be done by apprizing the people of the loss to themselves, and the industry, that has resulted from their growing the bad variety of the plant, and the good that can accrue if they can replace it by the better variety, *Mahapangeri*. In such a scheme it will be necessary to establish Government plantations, where the better variety is grown and from which plantations the people can buy plants at reasonable cost and on easy terms of payment.

CULTIVATION OF CITRONELLA.

At present, in planting Citronella rootlets, holing is done in a haphazard fashion, no definite distance being observed by the majority of the planters. There are some who plant as much as about 40,000 plants to the acre. We have had better results with 15,000 to the acre. The advantages of planting the latter number of

plants are that the plants thrive better, harvesting and weeding are more convenient, whilst the initial expenses of planting itself are less than in the previous case. Another point requiring attention, and much neglected by cultivators, is the proper choice of rootlets. The rootlets should be from two or three-years-old bushes, and should be from plots which have never been cut for distillation. Rootlets when obtained under these conditions produce vigorous plants and highly satisfactory results.

DRAINING, WEEDING, AND MANURING.

DRAINING is not much adopted on citronella plantations. This I think is a penny-wise pound-foolish policy. It is quite an essential measure to prevent the wash-away on the hill sides. The stunted condition of many a plantation is due more to the neglect of this factor than the poor nature of the soil.

CLEAN WEEDING twice a year amply repays the additional expense that has to be incurred with a prospect of returns. There are some who weed only once a year, but, as citronella is a plant whose growth is much impeded by weeds, attention to this point should not be lost sight of. Besides weeding, cleansing bushes of the adherent dried grass once everry second or third year goes a great way to invigorate the plant.

MANURING. There is hardly any manuring done on citronella plantations except laying the grass, exhausted of its oil, as a mulch on the citronella fields. We have obtained better results with a mixture of ash of the dried grass mixed with farm-yard manure. Manuring should be done once a year, the best time for applying it being well in advance of the heavy rains of the North-east monsoon or immediately after it. It is about this time that the plant is in flower, and manuring at this season helps much to make the plant recover from the exhaustion of energy consequent on flowering.

CUTTING OR HARVESTING.

The command of cheap labour is always a matter which concerns the citronella planter very much and, indeed, unless there be a source of cheap labour-supply close at hand it is not possible to work any large plantation. As it stands at present the proprietor of a citronella plantation is at the mercy of the villagers for labour. If there is harvesting in the rice fields the command of sufficient labour is impossible, with the result that the crop of an entire plantation, or a good part of it, has to be abandoned. To obviate this it would be advisable to adopt reaping machines adapted to work on citronella plantations.

We learn that there are reaping machines working on the highlands of Scotland, and think that a modified form of machine might well serve to cut citronella grass, thereby also lessening the cost of production.

After the citronella grass is cut it is not advisable to distill it immediately. It should on the contrary be allowed to wither to some extent. Grass that has been properly withered yields a sweet-smelling oil, whereas grass that has not been withered gives an oil which is characterised by an element of disagree ableness. In the process of withering one should be careful to avoid any fermentation consequent on allowing the grass to remain in big heaps, especially when there is much moisture on the surface of the leaves. Grass that has undergone fermentation gives hardly half the normal yield, besides imparting a disagreeable odour to the oil distilled under such conditions. On some plantations four crops are gathered during the year, while on others only three are taken. The latter is preferable.

YIELD PER ACRE.

Up to the third year after the plants are laid down the yield increases. In the third year a citronella plantation is at its zenith of production, giving as much as 18,032 lb. of grass per acre for the year. This was the average yield of a 12-acre plot. The return of oil from above plot was 13,644 ozs. of oil. This is equivalent to a yield of 71 lb. 3 ozs. oil per acre per year. After the third year there is a decline in the yield of oil even when the quantity of grass obtained is comparatively high. The yield of oil begins to fall steadily after the third year, and I know of a plantation, which is in about its 18th year, which, in spite of its good appearance due to good attention, gives only an average of about 26 lb, of oil per acre per year. There is also a difference in the yield of the different crops of the year, the crops during the South-west monsoon giving a better return.

DISTILLATION.

The distillation is done one day after the grass is cut and exposed to the drying influence of the sun. In packing the vats or stills with the grass too much pressure should not be resorted to. In a factory there are generally two stills and an interchangeable alembic. The advantage of having two stills is obvious, for while the contents of one are still being steamed, the other can be packed with grass and got ready to be steamed as soon as the alembic has been shifted on to the same. The steaming is done by means of an ordinary regulation steam boiler provided with safety valve.

As a high pressure of steam is not necessary it has been found convenient to make use of old boilers removed from factories where they have been used driving engines. In some cases, when plantations have been located at places far removed from the main roads, boilers made by the native boiler smith have been successfully employed. In our every-day experience we have found tubular boilers to be anything but a success, while on the contrary. Cornish or Lancashire have given very good results, a decided advantage with the latter mentioned kinds of boilers being they can be easily repaired when occasion arises.

The steam enters the still at the bottom and, after traversing the grass, carries with it the essential oil and finds its way into the condensing pipes suspended in a tank of cold water. Often the water in the cooling tank gets so heated that the oil and water are not properly separated entailing considerable loss in the percentage yield of oil. The steam should flow in at a constant pressure, for any variation in the issue and pressure of steam lessens the yield of oil. The cooling pipes are in the majority of instances made of copper, and till 1889, when I introduced lead piping, were without exception made of copper. Lead piping, besides lessening the cost of distillation plant, ensures better cooling, whilst in addition it does not tend to colour the oil, which is the case when copper piping is used.

The cooling of the oil-laden steam is very unsatisfactorily done by the majority of the distillers. As a result of this a certain proportion of the oil is resinified. The adoption of a 60-ft. coil, as suggested by Mr. Wright, would be a decided improvement over the present state of affairs obtainable in most distillation plants. Still more satisfactory results may be obtained if the water used in cooling the distillate be made to travel in a direction opposite to the direction of the oil-laden steam in the coil. This is not at present attempted in any factory that I know of. I am inclined to believe that a factory fitted with the most recent and up-to-date distillation plant would amply repay the additional expense incurred thereby and greater returns could be ensured. Yet by the majority of the citronella oil distillers this is held to be a negligible quantity.

CITRONELLA AS AFFECTED BY METEREOLOGICAL CONDITIONS.

Metereological conditions effect citronella plantations in a definite manner. In estates situated at low elevations the oils produced are of good quality, besides being greater in yield than when the same plant is grown at higher elevations. My observations on this point are not quite complete, but anyway I have mentioned it to invite the attention of those interested in the cultivation of citronella to this highly interesting point. If we do not hereafter have occasion to change our opinion we may predict that citronella grown at high elevations would give poor quality oil even from the very start, and poor quantity of yield sooner or later. We could not say that it is due to any difference in the soil; if anything at all we seem to think it is due to the metereological conditions obtaining at high altitudes.

This raises an important question with regard to the cultivation of citronella on the patnas of the Central Province. Perhaps I may be excused if I express my opinion that it would not be a success. It is well-known that the maana grass of the patnas, in spite of its luxuriant growth, yields an oil which cannot be compared with citronella oil in point of aroma, while for percentage yield it is far lower in the scale.

ADULTERATED CITRONELLA OIL.

There is a popular belief that the low prices obtained for Ceylon citronella oil are due to the adulteration of the oil. No doubt there is adulteration in the citronella oil trade just as there is adulteration in many another trade. As a result of several years' experience in the cultivation, as well as the business side of the industry, I am inclined to believe that it is not so much the adulteration about which much has been said by theorists, but poor quality due to the bad variety of plant cultivated, and still more the present-day overproduction, that has lowered the prices of Ceylon citronella oil. In contradistinction to this there is the everyday spectacle of Java and Singapore citronella oil, which, taken together, do not constitute one-twentieth of the quantity produced in Ceylon, fetching higher prices. This is simply because only the better variety of the plant is grown there, which consequently yields a better quality of oil.

Further, there is no accumulation of stocks of this quality of oil, so that the market for the same is always firm. Not a few have their doubts about the possibility of raising the price of citronella oil by exporting it under a Government guarantee of purity. The Government might well leave the purity of the oil to be guaged by the buyers who are not a little too particular to see that the oil satisfies their test of purity before buying the oil. On the contrary, the Government might do better by encouraging the cultivators of the better variety of the plant, which, if done, will place Ceylon citronella oil on a par with the citronella oil of Java and Singapore. I might treat on lemon grass oil on a future occasion.

THE LONDON CITRONELLA AND LEMON GRASS MARKET IN 1905.

CITRONELLA has been offered now and again at the drug auctions, chiefly "Fisher's," but very few sales were made under the hammer on those occasions the bulk of the business done having been private, commencing early in January at 1*s.* 7*d.* spot for Ceylon both in tins and in drums and to arrive at 1*s.* 1½*d.* c.i.f., which prices have scarcely varied in the course of the year, except for those to arrive which have at times been much dearer.

LEMON GRASS, too, has now and again been offered at the drug auctions, with almost the whole of the business done privately as for the former, prices remained practically the same all the year round, opening early in January at 8*d.* to 8½*d.* per oz., spot and to arrive at 8*d.* c.i.f., and closing at 1*s.* 8*d.* spot and at 1*s.* 2½*d.* to arrive c.i.f.—*Oil Reporter.*

CEYLON CITRONELLA IN AMERICA IN 1905.

Citronella has followed a varying course during the year, our record showing twenty-five changes, touching the highest point at 42½c. (U.S.A. money) and the lowest at 31c. The year opened at 32c., but with a slight relaxation in shipment values, 31c. was named early in January, but before the close of that month the cheaper lots were out of the market and 32c., was again in effect. With a stronger manifestation of primary values, a 37c., spot basis prevailed in February, but a month later an abatement of the firmness abroad brought the market to 34c. The situation was again changed late in March by the withdrawal of early offers for shipment from Ceylon and the effort to concentrate the stocks available on spot and for nearby arrival at lately prevailing prices. Under these influences local values were enhanced, touching the highest point of the year at 42½c. This basis could not be maintained with buying, interest subsided and without any primary reaction, drums were available on spot at 38c., early in May. Some local dealers had apparently little faith in the maintenance of the market and were willing to dispose of comparatively cheap lots at a concession and values yielded to 34c., by the end of August. Stocks had become reduced considerably by this time and following active sales, the market was again on a 40c., basis by September. The upward course was aided by the reports of an attempt to withhold primary offers. Under a closer concentration of stocks, 42½c. was maintained by October, but the market has since yielded to the easier tendency of futures, closing at 34c. The course of values during recent years is shown in the following summary of high and low quotations for each month:—

CITRONELLA OIL.

	1905.		1904.		1903.		902.		1901.	
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.
Jan....	32	31	27	26	22	22	23	23	20	20
Feb....	37	34	27	27	22	21	23	21	20	20
March	37½	34	27	26	21	21	20	19½	20	20
April	40	37	26	26	20	20	19½	19½	21	19
May...	40	38	25	25	22	22	19½	19½	19	19
June	37½	36	26	25	22	22	19½	19½	20	19
July	37½	36	24	22	22	20	19½	19½	19	19
Aug...	36	35	24	23	20	20	19½	19½	19	19
Sept.	35	34	25	24	20	20	19½	19½	19	19
Oct....	40	35	28	25	22	20	19½	19½	19	19
Nov.	42½	40	32	30	22	22	19½	19½	19	19
Dec....	40	37	32	32	25	23	22	22	23	19
Year.	42½	34	32	22	25	20	23	19½	23	19

CEYLON COCONUT OIL IN AMERICA.

A REVIEW OF THE TRADE IN 1905.

Prices throughout the year underwent narrow fluctuations and at the opening of 1905 quotations for spot round parcels were quoted at 6⅝c. (U.S.A. money). The highest point touched was in January, July and August, when the market was quoted at 6¾c., and the lowest point reached was in April and May, when the price was quoted at 6⅛c. During the first four months of the year nothing of special interest occurred and under a steady demand and a firm primary market prices touched 6¾c. during the latter part of January, owing to scarcity of supplies and the blockade in traffic, due to snow storms causing a scarcity of freight cars and consequently delayed deliveries. In the absence of buying the market yielded and general dullness was experienced on and off up to the close of June. At the opening of July, however, prices started on an upward movement as a result of heavy purchases by principally large Western consumers. The active demand

was contrary to general expectations, as it was believed that the trade during the summer would be listless, as the view of reports were that the production of oil and copra this year was to show a decided increase over that of last year. The consumption of both copra and oil, however, abroad increased to such an extent that the increase in the production was more than taken care of. This was emphasized during the month of August, when prices ruled higher at 6½@6¾c., owing to the strong statistical position of the primary market, owing to the production of both copra and oil having dropped below the average. This was followed by decided firmness in the primary and distributing markets, the former having advanced several times, while the supplies were inadequate to meet the requirements of the trade. Heavy short sales were made here and abroad, which it was believed amounted to over 2,000 tons and the squeezing of short interests was looked for.

INCREASED CONSUMPTION OF COPRA AND OIL.

The consumption of both copra and coconut oil has increased at an enormous rate during the past few years, especially for edible purposes, and, consequently, the supply consumed by the soap manufacturers was restricted. The conditions governed the market up to the close of the year, which accounts for the high level of prices throughout the last six months of the year, and there is no relief in sight from the short supply before next spring, according to all information from the primary market.

The following table gives the high and low prices (in U.S.A. money) of Ceylon coconut oil in this market each month during the past five years, and the highest and lowest price for each year:—

CEYLON COCONUT OIL.

	1905.		1904.		1903.		1902.		1901.	
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.
January ...	6¾	6⅝	6	5¾	5⅝	5⅝	8	7¾	5¾	5¾
February ...	6⅝	6¼	6¼	6	5⅝	5¼	7¾	7¾	5.65	5.60
March ...	6⅞	6¼	6¾	6¼	5¾	5⅜	7¾	7¼	5.60	5½
April ...	6⅜	6⅛	6¼	6	5½	5½	7¼	7¼	5¾	5⅝
May ...	6½	6⅛	5⅞	5¾	5⅝	5½	7⅝	7⅛	6	5⅞
June ...	6⅝	6¼	6⅛	5¾	5⅝	5¼	7¼	7¼	6	5⅞
July ...	6¾	6¼	6¼	6	5½	5¼	7½	7¼	6	5⅞
August ...	6¼	6½	6½	6¼	5⅜	5	7¼	7	6	5¾
September ...	6½	6⅞	6⅜	6⅜	5½	5⅜	7	6¾	6	5⅞
October ...	6⅜	6¼	7½	7	5½	5	6¾	6	7	6⅝
November ...	6½	6⅜	7	6¾	5⅝	5	6½	6	7¼	6⅝
December ...	6½	6¼	6⅞	6½	5¾	5¼	6½	6¼	7⅞	7½
Year ...	6¾	6⅛	7½	5¾	5¾	5	8	6	7½	5½

COCHIN COCONUT OIL.

Trade in this department was fairly good, and the volume of sales for the year show an increase over those for 1904. Prices were firm and tended upward throughout the year, owing to the light available supplies and the stronger and higher reports from the primary markets. The usual difference in the price of Cochin and Ceylon oils is ½c. per lb. in favor of the former oil owing to its superior quality, and this margin was fairly well adhered to throughout the year. At the opening of the year dealers quoted 7¼@7⅜c. for spot, and there was an improved inquiry for arrivals with sales at 6⅝c. Distant deliveries were held at 6 15-16@7c. Owing to the scarcity of supplies, which increased in July, and in response to a good demand, prices were firm at 7½c. and for parcels to arrive 6¾@7c. was named, which resulted in fair sales. In September the demand was invariable, but the market showed decided firmness, due to a strong primary market. During October parcels to arrive were advanced to 6⅞c. and upward and spot parcels ruled firm with limited offerings at 7½@7¼c. which price ruled throughout the month of December. Parcels to arrive were firmer and held at 6·80@7c.—*Oil Reporter.*

DRUGS AND MEDICINAL PLANTS.

CEYLON PRODUCTS IN LONDON IN 1905.

Areca Nuts.

Areca nuts were selling at the commencement of the year at 16*s.* per cwt. and on January 19, 43 bags were offered at auction and 10 were sold at the price just mentioned. On March 16, 46 bags were limited to 16*s.* and subsequently selling privately thereat, but on April 13, no less than 160 bags were brought under the hammer and meeting no demand only a small lot of 2 bags found buyers at 15*s.* 6*d.* Owners, however, declined soon after to entertain this price for further business and stuck to 16*s.* per cwt. well into the month of July, and a good demand then springing up with hardening prices to follow, 38 bags were held on August 21 for 20*s.* Towards the latter part of September the price was advanced to 25*s.*, owing to greatly reduced supplies, and 21 bags offered at auction on the 28th of that month were firmly held for 25*s.* A short while after 25*s.* to 27*s.* 6*d.* was asked, according to quality and at the close of the year nothing can be bought under 27*s.* 6*d.*

Cardamoms.

Cardamoms were again in large supply at the drug auction, during the year, amounting to 6,768 cases, against 7,691 cases in 1904 and 3,669 were sold under the hammer, as compared with 4,253 disposed of during the previous twelve months. Those left unsold, however, found buyers almost always soon after each sale, and on January 19, 551 cases were offered, but there was no demand, and it was very difficult to induce buyers to make bids, with the result that only 182 cases were disposed of the best Ceylon Mysore bringing 1*s.* 7*d.* to 2*s.*, the lowest 6½*d.* to 10*d.* and seeds from 10*d.* to 10½*d.* per lb. The stock on January 31 was 2,153 cases, against 2,187 at the same time last year, and at the next five auctions the offerings did not exceed 400 cases at any one of them. A generally good demand prevailed with rising values and the best left off on March 30 at 2*s.* 3*d.* to 2*s.* 5*d.*, the lowest at 7½*d.* to 10½*d.* and seeds at 10*d.* to 11*d.* On April 13 and on May 11, 437 and 478 cases were offered respectively, with 283 and 338 sold at firm to dearer rates, the best at 1*s.* 10*d.* to 2*s.* 6*d.* the lowest at 7½*d.* to 11½*d.* and seeds at 10*d.* to 11½*d.*, whilst fair Malabar obtained 10*d.* also bold brown Mangalore 1*s.* 7*d.* and seeds of the latter 1*s.* At the next auctions on May 25, 329 cases were brought forward and 279 were disposed of. Qualities over 9*d.* met a good demand at full prices to 1*d.* and occasionally 1½*d.* advance; at 9*d.* and below values were steady, whilst seeds opened unchanged but closed ½ to 1*d.* dearer, the best Ceylon Mysore realizing 2*s.* 7*d.* to 2*s.* 10*d.*, the lowest 7½ to 11½*d.*, seeds 10*d.* to 1*s.*, Malabar medium 10*d.*, seeds 11*d.* to 11½*d.* and Tellicherry 8½*d.* to 1*s.* 3*d.*, according to quality and seeds 1*s.* To June and July, covering four auctions, the supplie brought forward were smaller; however, the slackness of demand usual in the summer months kept the values down to a small proportion, the prices for which fluctuated a little, but, were on the whole, somewhat easier except for seeds.

Cardamom stocks in London.

On July 31*d.* stocks were 2,228 cases, against 3,234 the previous year and showing a decrease of about 1,000 cases. On August 3, 17 and 31, values were about maintained; however, on September 14, when 401 cases were catalogued and 284 sold, good bold kinds were 1*d.* to 2*d.* dearer, other kinds and seeds slightly easier, including fair to fine bold Ceylon Mysore at 1*s.* 6*d.* to 2*s.* 11*d.* lowest at 8*d.* to 1*s.* 1*d.* and seeds at 10*d.* to 11*d.* A fortnight later on September 28, the largest quantity but one offered during the year amounted to 463 cases, of which 148 were disposed of (the smallest offerings of 30 cases were made on August 17, when 16 found buyers) some qualities being dearer and others steady, including seeds at 10*d.* to 11*d.* During the next two months and to the last auction of the year on December 7, the total of supplies brought forward was moderate, which met a varying demand at prices showing at one time a slight decline and at another firm to dearer rates, the best from 1*s.* 2*d.* to 2*s.* 11*d.*, the lowest 8*d.* to 9½*d.*, and seeds 11*d.* to 1*s.*, whilst long wild brought 1*s.* 9*d.* to 2*s.* for good heavy. Stocks in London on December 31, 1905, were 1,713 cases, against 2,411 at the same time in 1904.

EDIBLE PRODUCTS.

Tomato Cultivation in the Tropics.

The Tomato is one of the best salad fruits that can be grown in the tropics. It is always popular and in demand for salad making, and is also an excellent fruit for culinary purposes, being cooked in various ways. It is a matter of surprise that tomatos are not more extensively grown in Ceylon, for they will always find a market, and well-grown fruit, of good shape and flavour, will fetch enhanced prices among European buyers in Colombo, Kandy and Nuwara Eliya.

At present in Ceylon the tomato is not grown sufficiently extensively; adequate care and cultivation is not given to the plants, and poor kinds only are grown as a rule. The varieties that would pay best locally are those having medium-sized fruit, of good shape, and with smooth skins. Seed should be obtained from a reliable English seedsman, and varieties recommended for field-growing selected. In England glass is used extensively for tomato growing, but in Ceylon they can be easily raised from seed and grown in the open at all elevations. The following cultural directions have given excellent results in another part of the tropics—Cuba—and should be studied by anyone thinking of growing tomatos to advantage in Ceylon. They are from a pamphlet on "Tomato Culture" by Messrs. C. F. Austin and E. W. Halstead, published by the Cuba Central Agricultural Station in its bulletin (Havana Province).

GROWING THE PLANTS.

It has been found best to have some form of seed beds where the seed can be sown and the young plants transplanted once before they are set in the field. For this country (Cuba) we have found that a simple board frame made five feet wide and forty or sixty feet long is the most convenient style. The sides should be from eight to ten inches high.

These frames are useful for all kinds of garden plants that are grown from seed and transplanted. One who is growing tomatoes for commercial purposes will find it convenient to have the frame in which the seed is sown located near the house where the seedlings can be looked after carefully. The frames into which the seedlings are to be transplanted should be placed in different parts of the field,—say two frames, five by seventy feet, to the acre, for it is much cheaper to distribute the young plants for transplanting than to distribute the grown plants at setting time, as must be done if the frames are all in one place.

The soil for the frames should be made very fine, loose and mellow for a depth of three to five inches. The best results are obtained if the soil contains a good per cent. of sand. Give each of the beds a top dressing of one or two inches of well rotted stable manure. The manure should be screened through a one-half inch mesh to get it as fine as possible, and should be thoroughly incorporated into the soil.

A few shades should be provided for use when sowing the seed to keep the soil moist and also to use when transplanting, to protect the young plants from the sun. A shade made on a frame three by five feet is of a convenient size. The lumber for these frames should be from two to three inches wide and one inch thick. We cover our frames with a cheap grade of cotton cloth.

The length of time required from the sowing of the seed until the tomatoes begin to ripen varies with the variety, season of the year and the soil. Usually from eighty to one hundred days should be allowed; that is, if tomatoes are wanted for

the Christmas market the seed should be sown early in September. The seed should be sown in rows three or four inches apart across the seed beds. Sow the seed thickly so as to have a good stand of young plants. To produce plants enough to set one acre of ground sow at least one ounce of good seed. When the seedlings have the first rough leaves started, or are from one to two inches high, they should be transplanted into another bed. In transplanting it is best to set them in check rows four inches each way. In transplanting be sure to make the soil firm around each plant. The young seedlings should be watered thoroughly and covered with the shades for a few days until they have struck root. The plants should be carefully hoed and watered so as to keep them in vigorous growth. We want strong plants from eight to ten inches high to set in the field. A little extra work pays, for the success of a tomato crop depends upon having vigorous plants to start with. Our observation in Cuba has been that too many vegetable growers are contented with weak, spindling, poorly grown plants. We believe this is a mistake and that far better results will be obtained if more pains are taken to grow healthy, stocky plants.

SOIL AND ITS PREPARATION.

The tomato is exceedingly cosmopolitan as to soil. During the past season we have seen very good tomatoes upon nearly all classes of Cuban lands, but they do best where the soil is mellow, loose, and well-drained, and do not succeed upon low wet soils unless well-drained. We believe that the black, mulatto and rich sandy soils are best for commercial purposes.

The preparation of the soil is a very important part of the work, and one that is often neglected. Nothing pays so well as to have the ground well prepared for the crop. It should be plowed deep so as to turn all the weeds, grass, etc., under the surface. After plowing, follow with a good harrow and work the surface down as smooth and mellow as possible. Some form of a spring-tooth harrow will be found best for this work. During the dry season the fields should be harrowed very often so as to preserve as much of the soil moisture as possible. The finer the earth the less surface there is exposed for evaporation by the action of the sun and wind.

SETTING THE PLANTS.

As soon as the land is in good shape the plants should be set. The usual distance is four feet each way. One of the most convenient methods of setting tomato plants is to lay the ground off every four feet with a furrow. A single shovel plow is the best tool for this work. Now if we have followed the method suggested of having our beds of transplanted plants located over the field, the question of setting out is a very simple one. The beds of plants should be thoroughly wet so that the soil will stick together. Then the frame of the bed should be knocked away and, with a long knife, the soil should be cut in four inch squares, with a plant in the centre of each. Take a thin spade and shove under each plant and lift it into a light hand barrow. When the hand barrow is filled with plants two men carry it to the rows and set out the plants in the bottom of the furrow. Two men follow with hoes and cover the roots, making the soil firm around them. By being careful the plants can be transplanted from the frames to the field and very few of them will ever wilt or know they have been moved. As soon as a field is set it should be gone over with a cultivator and with hoes, for nothing starts a plant to growing as well as the frequent hoeing and cultivating of the surface soil. Too much care cannot be taken to see that the plants are carefully and properly set.

CULTIVATION.

This is one of the most important parts in the production of a successful vegetable crop of any kind, and probably the one most neglected. Few farmers can see the value of careful, frequent, and thorough cultivation of the soil. Many consider that if they have cultivated once in two or three weeks to kill the weeds,

that they have done all that is necessary. During the dry season of the year cultivation to kill weeds is one of the minor parts of the work. It is to prevent the evaporation of the soil moisture by keeping the surface of the soil loose and mellow. The smoother and finer the soil, the less surface there is exposed to evaporation by the action of the sun and air, and the more soil moisture is held in the soil for the use of the plants.

By means of capillary attraction the soil moisture is constantly passing up toward the surface and is given off into the air by evaporation. Now, by means of frequent cultivation we prevent a good deal of this passage of water off at the surface by evaporation.

Plants that are set one day should have the soil around them stirred the next with a hoe, and cultivation should begin as soon as possible. A careful cultivation should by all means be given after each rain or irrigation, just as soon as the soil can be worked, for, with every hour that the soil is left to dry out and bake, just so much of the valuable soil moisture passes off in evaporation. Our observation has been that the question of cultivation has been very largely neglected in our vegetable districts. The growers have been depending upon frequent irrigation and heavy fertilization to do the work that belongs to the cultivator. Tomatoes cannot be successfully grown by this method, for the result is a soft watery fruit that will not ship or sell well. Tomatoes respond especially well to frequent shallow cultivation, and it should be kept up from the time the plants are set in the field until a horse can no longer get through the vines.

The question of cultivation with modern tools is one to which the farmers of this country must give more attention, for observation makes it very plain that there is too little work done with horse cultivation and too much by the more expensive method of hand hoeing. The fine tooth cultivator, having from twelve to fourteen teeth is good for all kinds of small plants, which are in danger of being covered by earth thrown from the blades. It is an especially fine tool for tomatoes when they are first set out. There is a larger style of cultivator having from five to seven teeth. It is a very useful tool for the cultivation of all classes of plants and has many advantages, being fitted with different styles of teeth so as to throw the dirt either to or away from the plants.

IRRIGATION.

Some form of irrigation is absolutely essential for successful winter vegetable growing on most soils in Cuba. There are many more sections where streams could be utilized. Other regions will have to depend upon wells for securing the water necessary to take the crop over dry spells. The amount of water needed will vary greatly with different years and in different parts of the Island. In some regions, principally along the north coast, there is sometimes rain enough during the winter months to produce a crop, while during other winters very little rain falls. There are sections of the Island where there is scarcely any rain for several months. Most of the soils require a large amount of water as they are open and porous and dry out quickly. In irrigating one should give water enough to thoroughly wet the soil. As soon as the ground is dry enough it should be given a smooth, shallow cultivation so as to preserve as much of the moisture as possible. These cultivations should be kept up every few days until another irrigation is needed. The number of irrigations will vary greatly with the soil, climate and amount of rain during the winter months. Water should not be applied oftener than is absolutely necessary to keep the plants in vigorous growth. Too much water, at the expense of cultivation, produces strong rank plants and soft watery fruit. The above is especially true where an excess of nitrogenous fertilizer has been used. We cannot too strongly recommend keeping

the surface of the ground smooth and mellow by means of frequent shallow cultivations in order to save water for the plants. Every drop of water which we let pass off into air by means of careless cultivation, is a drop wasted.

FERTILIZATION.

Along with the preparation of the soil, the cultivation and irrigation, comes fertilization. These four operations overlap and interlock so that it is impossible to say which one is the most important. It is probably true that in the sections of the Island which have been longest settled the soil is more or less deficient in the essential elements of plant food. By essential elements of plant food, we mean nitrogen, phosphoric acid and potash. There are many other elements that help to make up the soil and are essential to plant growth, but these three elements are the ones we have to buy and pay dearly for in the form of commercial fertilizers, stable manure, or any other means of soil improvement. All soils contain more or less of these elements in combination with many others. Very frequently these elements are present in sufficient quantities, but in an unavailable form so that the plant cannot get them for its use. In other cases a part of the elements are available so that the plant makes a fair growth, but we must supplement its food before it can make a really strong growth.

The question of maintaining the fertility of the land is largely an individual one with every farmer and for every field in the farm. With the varying conditions of soil and climate it is impossible to give rules for fertilization that will work out satisfactorily in all cases. Each farmer must test and find out for his own farm the kind and amount of fertilizer that will give him the best results.

Nitrogen is the element that gives strong growth to the plant, and a very dark, healthy green colour to the foliage. When a plant is suffering for the want of nitrogen it has a poor weak growth and the leaves are of a pale yellow colour. Phosphoric acid is supposed to be the plant food that promotes fruitfulness and early maturity. Potash is the element that gives solidity, firmness, colour and carrying qualities to the fruit.

AN EXCELLENT FERTILIZER.

A fertilizer that has given us excellent results during the past year with tomatoes and all other classes of vegetables, is a mixture, by weight, of one-half part nitrate of soda, one part sulphate of ammonia, one part sulphate of potash, and three parts acid phosphate, or ground bone. This formula, used at the rate of five hundred to fifteen hundred pounds per acre, according to the soil, ought to give good results. There is no doubt that in the light sandy soil an application of from one thousand to two thousand pounds per acre will give very profitable results with tomatoes.

HARVESTING.

This is an important operation and one too little considered by many growers. Nearly every shipper of tomatoes picks his fruit too green. It is almost useless to pick and ship half-grown tomatoes, for they will never ripen sufficiently to be fit for eating. Care should be taken in picking to see that the tomatoes have reached full maturity as to size. They should have passed the dead green colour and reached the white stage of ripeness. When gathered in this stage they will carry in excellent shape to their destination and ripen to their full colour. In the best tomato sections they usually assort the picked fruit into three grades, the ripe, the medium ripe and the green. Each one of these divisions is usually divided into first and second grade as to size. For the best sales it is necessary to have the fruit in each package as nearly uniform in size and stage of ripeness as possible. Some growers are very careless about

the packing and pay too much attention to having the top layer of choice specimens, and give little attention to the quality of the fruit in the centre of the package. No vegetable grower, or vegetable section, can build up a name by being careless about the matter of grading and packing.

In packing each fruit should be wrapped with paper and carefully placed in the basket. Too much care cannot be taken to see that the fruit is not bruised in any way, and that the fruit in each package is packed solidly so that it cannot move in transit.

THE DISPOSAL OF TEA PRUNINGS.

Bearing in mind the great controversy which has existed for some years in reference to the most practical and profitable treatment of tea prunings, I was much interested to read in the *Overland Ceylon Observer*, under the date of February 24th, the remarks made by Mr. Joseph Fraser as Chairman at the annual meeting of the Pitakande Tea Company.

He stated that the average yield of tea during the past year had been 528 lb., per acre, the best yield having been 833 lb., and the lowest 243 lb., and that all the prunings had been *burnt* at a cost of 5·58 cents per lb.

It would be generally useful, as well as interesting, if the Chairmen of other tea Companies would afford, either in the annual reports or in their own remarks at the meetings, some information as to the treatment of tea prunings namely, whether they were *burned* or *buried*. The rapidity, with which Ceylon has hitherto established new industries and carried them to a successful issue, has been largely due to the good fellowship of those in authority, and the willingness to make publicly known each improvement as it was introduced. In fact the general publication of new ideas has resulted in general advantages and successive improvements have followed the introduction of new machines or processes.

On the 23rd December, 1903, the writer addressed a short note to the *Ceylon Observer* which was published about the middle of January, 1904, pointing out that the indiscriminate burying in all kinds of soil and under all conditions of climate of the prunings, which had been too generally adopted, was likely to lead to unsatisfactory results, and that while in theory the idea of supplying humus to the soil by the use of leaves and small twigs was correct, still that to be of practical use the conditions of soil and weather must be favourable.

Damp green leaves, associated with large branches if buried over six inches deep in a stiff ferruginous clay soil, saturated with water in a wet district, were more likely to be a source of fungoid disease than to afford plant food to the tea shrub.

The damp acid fermentation of green leaves must always be injurious to the rootlets of shrubs and plants.

Instead of the wholesale burying of the prunings in trenches between the tea, the writer suggested their removal to a central spot, where the leaves should be stripped off, placed in a heap, and allowed to decay with some soil and a little freshly burned lime; while the branches and twigs should be stacked and subsequently used for fuel.

It would be interesting to know after the lapse of three years what is now the generally adopted treatment of tea prunings on Ceylon estates.—Yours faithfully,

JOHN HUGHES.

Analytical Laboratory, Mark Lane, London, E.C., March 23rd, 1906.

Commenting on this letter the *Ceylon Observer* says:-

Mr. John Hughes, the well-known analytical chemist of Mark Lane, who in December, 1903, questioned the utility of burying tea prunings in trenches in all conditions of soil and weather, returns to the subject in our correspondence columns to-day. Mr. Hughes' letter is induced by a remark made by Mr. Joseph Fraser at the annual meeting of the Pitakanda Tea Company to the effect that the full manuring programme and all the prunings had been *burned* at a cost of 5·58 cents per lb. We find on reference to Mr. Fraser's speech that, while he is reported to have used the word "burned" the printed report of the Company indicates the prunings were *buried.* The objective of Mr. Hughes' letter, however, is to induce if possible an exchange of opinions that may assist a definite conclusion being arrived at as to what is the most practical and profitable treatment of tea prunings. Mr. Hughes' own suggestion is an elaborate one and was, we recall, at the time it was first put forward considered by several leading planters as prohibitive on account of the cost.

Mr. Hughes admits the correctness of the theory of supplying humus to the soil by burying prunings with certain reservations. His idea is that the prunings should be removed to a central spot, the leaves stripped off and placed in a heap and allowed to decay, subsequently to be returned to the soil, while the twigs are utilised as fuel. This is a scheme which obviously entails a vast amount of labour and we are not aware that it has been adopted to any great extent in Ceylon. Mr. Kelway Bamber in the course of his admirable address to the Dimbula Planters' Association in November 1903, recommended the burial of prunings, not as an effective manuring but as a basis of manuring. He disapproved of the burning of prunings on the ground of the very large loss of nitrogen—one of the most expensive constituents to replace—which it entailed.

We think that burying prunings on the lines then laid down by Mr Bamber is probably the most generally resorted to method in Ceylon at the present time. One system we have seen in practice on a crack Dimbula property, and which is found very effective is as follows. Before pruning, holes are dug. After the prunings have lain for a few days it will be found that most of the leaves become detached from the twigs or branches. The wood is then gathered to one side and the leaves swept into the holes and covered up. The branches might be left to rot or gathered up, but the coolies, we imagine, take good care they are not left to be too long on the field! The question is an interesting and important one to tea growers and we shall welcome an expression of opinion from any of our planting readers on the subject.

CHANGES TAKING PLACE DURING THE RIPENING OF A COCONUT.

The following are probably the changes which a young coconut undergoes before it reaches maturity :—

When the young fruit first appears it consists of a white, astringent tasting, semifibrous mass, which afterwards is destined to form the husk; and of a thin, green outer skin. The nut gradually increases in size, with very little change in composition, until it has grown to be about 3 inches in diameter. It then has a comparatively small, hollow space in the centre which is completely filled with a watery fluid of an astringent, slightly acid taste, and which is much like the juice from a green husk. As this period begins, a rudimentary shell is formed around the inner surface of the nut; at first this is very thin and soft, but slowly it becomes thicker and harder.

Not until the nut has reached its maximum size, with its shell completed, is there any indication of meat or of oily material. When the shell has been formed the milk changes in character, it becomes rather sweet, and a slimy, gelatinous mass, having a sweetish taste and containing comparatively little oil begins to deposit on the inside of the former. At first this forms chiefly on the lower half of the nut, but finally it covers the whole inner surface. This pulpy mass soon grows thicker and denser, it increases in oil content at the expense of sugar in the milk, until it assumes the well-known characteristics of ordinary coconut meat. During this last stage the evolution of carbon dioxide which previously was mentioned occurs.

Even in ripe nuts, after they have been picked from the tree, there seems to be a slight continuation of the hardening process in the meat, covering a period of from two to three months, or until the sprout makes its appearance. Then other changes occur, the reverse of those which had taken place previously; the nourishment concentrated and stored up as fat is now transformed into sugars and other bodies capable of being directly assimilated by the young plant. As this process goes on the embryo or "foot" gradually increases in size until it occupies the whole space inside the nut and makes use of all the nourishment contained therein for the growth of the young tree.

Therefore, for the largest yield of copra and oil, only thoroughly ripe nuts (the husks of which have begun to turn brown) should be used, and it is often advisable to allow the latter to stand in a dry place for a few weeks before they are opened. The greatest care should be taken to avoid using green nuts, as it is shown by the tables given above that a loss of almost 50 per cent may thus result.

On the other hand, coconuts should not be stored too long, for in about three months the embryo begins to grow, and, even before that time, those nuts which may have been cracked or bruised in gathering, have a tendency to become rancid.—*Philippine Journal of Science.*

PLANT SANITATION.

Entomological Notes.

By E. Ernest Green.

(Illustrated).

The long continued drought is now making itself felt in the increase of various insect pests, such as the Tea Tortrix and the "Case-worms" (*Psychidæ*). The recrudescence of the Locust pest in the Matale district is probably another sign of the abnormal weather.

Attempts to combat these pests have drawn attention to the serious evils of the prevalent system of cultivating large unbroken areas of one product. With such a system there is no check to the spread of a pest, nor any means of isolating a particular field for purposes of remedial treatment. Under existing conditions, as soon as a field has been cleared of disease, it is liable to be reinfected not only from neighbouring fields but from adjoining estates which are often quite undivided by natural boundries. The remedy lies in the formation of belts and boundries of either jungle or cultivated trees of other kinds. Such belts should be at least 20 feet in depth and composed of close growing trees with a good cover of foliage. An undergrowth of more shrubby plants should be encouraged to complete the screen.

In the R. B. G. Circular, Vol. II., No. 2, (Further Observations on Helopeltis), published in 1902, I wrote: "In districts suitable for them, economic trees and plants might be employed for the belts. For the larger trees, Para Rubber, Nutmeg or Kola-nut suggest themselves. For the undergrowth, Croton-oil, Annatto, Castor oil, or Tapioca might be used. Or the screens might consist of trees and plants, the clippings of which would be suitable for green manure, such as *Albizzia moluccana*, or "Dadap" (*Erythrina lithosperma*), with *Crotalaria* as an undergrowth."

The above was written before the prsent boom in Rubber cultivation was anticipated. Similar precautions in this new cultivation are quite as important, and are in great danger of being neglected. Large areas are being planted up with Para rubber, which in time will present an unbroken sheet of this one plant, offering an ideal opportunity for the rapid spread of disease. Though no serious pest has yet threatened Hevea, this immunity cannot be relied upon to continue. A serious warning to rubber planters is urgently called for. The anticipated profits from a single rubber tree are so great, that proprietors are tempted to plant up every available spot, and are unwilling to allow a single yard of suitable soil to be occupied by what they would consider unprofitable growths. This is surely a very short-sighted policy. But to meet this view I would suggest that screens composed of other species of rubber (*e.g.*, Rambong and Castilloa) might be interposed between adjacent fields of Para rubber. Both the "Rambong" (*Ficus elastica*) and Castilloa are members of the family *Urticaceæ*, while Hevea belongs to the distinct family *Euphorbiaceæ*. They are consequently less likely to be subject to the same diseases. An undergrowth of some kind would be required to complete the screen. The most suitable plant for this must be a matter for experiment. Tea—if it would grow under "Rambong" and Castilloa—would form an effective screen when allowed to run up unpruned.

Another difficulty that besets the economic entomologist in Ceylon is the want of any establishment from which stocks of insecticides can be procured as required. At present, if any special treatment is advised, serious delay is incurred

in obtaining the necessary material. I have recently had occasion to recommend the application of Paris Green on a somewhat extensive scale. It was important that the treatment should have been carried out promptly. But, on enquiry in Colombo, no sufficient supply of the material was procurable, and it was found necessary to import the insecticide from Europe or India. The local firms assert that the demand for such goods is too uncertain, and that it would not pay them to stock material that may be lying in their stores for indefinite periods. This being the case, it will devolve upon the estate agencies to lay in their own supplies, and it is important that this should be recognized. A delay of a few weeks may make all the difference between success and failure in the treatment of a serious disease.

"Case-worms" (often miscalled 'caddis-worms' by planters) have been in evidence during the past month. Specimens of *Clania variegata*, *Psyche albipes*, *Acanthopsyche subteralbata* and *hypoleuca* have all joined in the attack upon the tea plant. On old tea, these caterpillars do not seriously affect the plant, but when hosts of the young case-worms invade a clearing of young tea, the result may be quite serious. They gnaw the bark of the young stems and branches and cause an extensive dying back. In such cases an arsenical spray is clearly indicated. A mixture of Paris Green with twelve times its bulk (by measure) of lime should be applied as a spray, with water.

Case-worms are the larvæ of various species of moths belonging to the family *Psychidæ*. The caterpillars construct cases, of very diversified forms (see Plate), composed of pieces of leaves or twigs or fragments of bark fastened together with tough silk. They carry this case about with them, exposing the head and front part of the body only when feeding. In this case also they undergo the resting or chrysalis stage. The male eventually emerges as an active moth, but the female has no wings, limbs, or mouth parts, and remains inside the case and deposits her eggs there. The males are usually very much scarcer than the females. I am just now making a study of this interesting family, and shall be grateful for assistance in the form of living specimens of case-worms from the different tea districts. The term 'caddis-worm' is wrongly applied to these insects. The true caddis is an aquatic arva of a distinct order of insects.

Experiments against "Shot-hole-Borer" on tea have been conducted with a patent mixture sold under the trade name of "Smearoleum." It is still too early to determine the effect upon the pest. But it is evident that the application of the mixture would be far too costly for general use. It has to be applied with a brush, and only a small number of trees can be treated by one cooly in the day. Moreover, the oily coating has a distinct tendency to prevent the development of buds, new shoots appearing only from areas that had not been covered with the mixture.

A correspondent asks for suggestions for getting rid of "Red ants" (*Œcophylla smaragdina*). He writes: "In one of my tea fields they are so bad that I can hardly get the pluckers to work." MacDougall's solution will be found useful in such cases. The nests should be broken open and the mixture (2 parts in 100 of water) sprayed or syringed into them. It is even more effective if applied warm. A second application may be necessary to finally rout the enemy.

The black-headed Coconut caterpillar (*Nephantis serinopa*, Meyr) is again giving trouble in the Batticaloa district. I am informed that the pest has greatly increased within the last few years, and that, instead of being periodic in its visitations, it now shows a tendency to become chronic. The pest is at its height in March, which (in that locality) corresponds with the termination of the wet season. Removal of the infected fronds has been found

impracticable, as it would mean the almost complete defoliation of the trees. My correspondent states that he has been very successful in trapping the moths by means of a powerful acetylene lamp set in a large basin of water with a film of kerosene. He has satisfied himself that the pregnant females are captured, as he has observed them—in their dying struggles—laying strings of eggs. The pest more especially affects certain spots on every estate, resulting in the permanent weakening of the trees, some of which even succumb to repeated attacks.

The rice-fields at Padiapalella (near Maturata) have been infested by the minute caterpillar of a species of *Nymphula*, (probably *N. fluctuosalis*). The caterpillars enclose themselves in small cases composed of pieces of the rice leaves. They are said to be nocturnal, hiding during the day low down amongst the stalks and coming up to feed at night. The caterpillar is adapted to an aquatic existence, being provided with tufts of filaments on each side which act as gills, and enable it to breathe water instead of air. When it comes up to feed it carries in its case a sufficient quantity of water to keep its gills wet. Wood-Mason described and figured a similar larva, under the name of *Paraponyx oryzalis*, from Burma, where it is reported to be very destructive to rice crops. From our knowledge of its habits it is evident that any attempt to destroy the pest by flooding the fields (as has been practised against some air-breathing caterpillars) will be useless. But I have suggested the employment of the opposite process—the withdrawal of the water from the fields—if it can be effected without serious injury to the plants. If the insects could be cut off from any supply of water during the heat of the day, I believe that their respiratory apparatus would be dried up with fatal results.

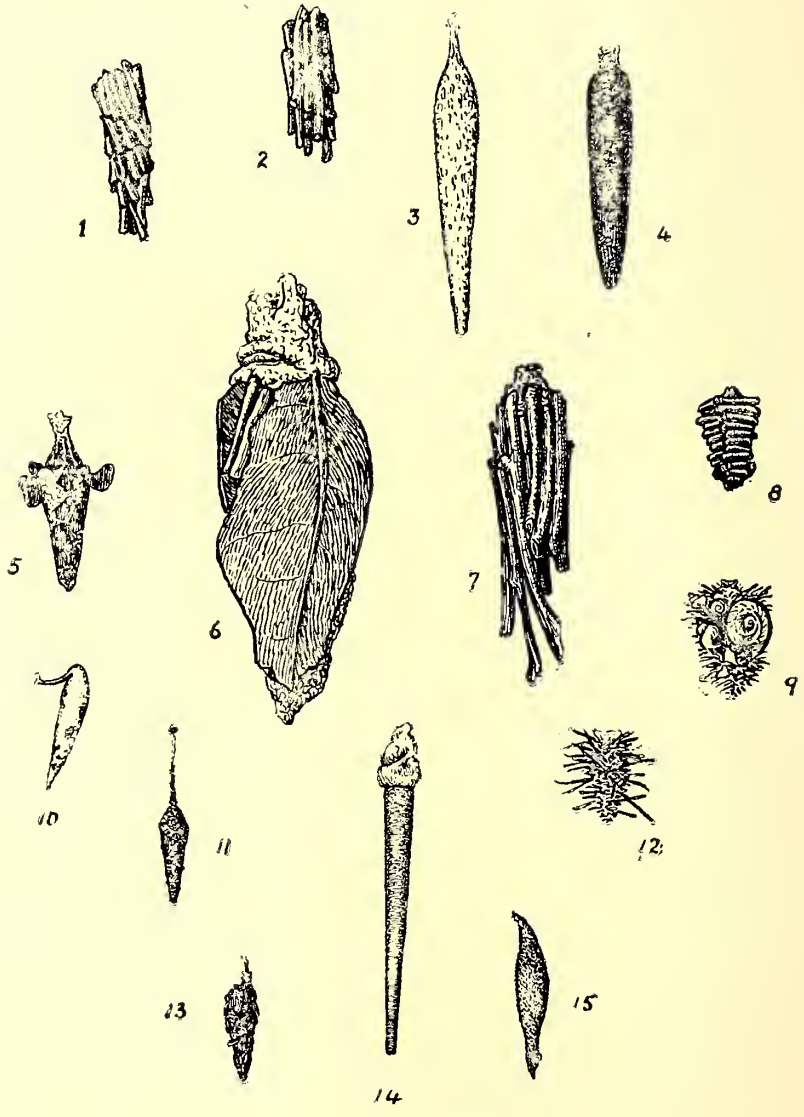
Cultivators of Crotalaria are again complaining of the destruction of their seed crop by a small larva that bores into the pods and consumes the seed. This is the caterpillar of a blue butterfly (*Polyommatus boeticus*). The eggs are laid upon the blossoms of the plants. Powdered sulphur might be used as a deterrent against the deposition of the eggs. The treatment would cost very little if applied to a limited area, and would ensure a supply of seed for replanting.

Seed heads of the castor-oil plants on the Experimental Silk Farm are infested by a boring caterpillar which proves to be identical with the well-known Cacao-pod borer (*Dichocrocis punctiferalis*, Guen).

Large numbers of a handsome bronze-green Buprestid beetle have been received from the Cotton Experiment Station, where they were found resting on the cotton plants. The larvae of the Buprestidae are known to bore in the stems of various trees and plants. *Sphenoptera gossypii*—a beetle belonging to the same family is a notorious pest of the cotton plant in India. Specimens submitted to Mr. Maxwell Lefroy have been referred to a distinct species (*Psiloptera fortuosa*, Fabr.). No signs of boring larvae have as yet been observed in our cotton plants.

While investigating an obscure disease of Dadap (*Erythrina*) trees, the Government Mycologist observed that the soil around the roots was crowded with the larvae and pupae of a spieces of Cicada. It was at first thought that these insects might be the cause of the death of the trees; but against this idea is the fact that the roots themselves have a quite healthy appearance, and that the trees are dying from above downwards. Examples of the adult cicadas have since been submitted to me, and have been identified as *Cryptotympana intermedia*, Sign.

Swarms of young locusts (*Aularches miliaris*), newly emerged from the eggs appeared about the middle of March in the Matale district. When first hatched they cluster upon shrubs and low herbage, and are said to be independent



"CASE-WORMS."

(PSYCHIDÆ.)

From Original Drawings by E. E. Green.

of food for the first month. During this period they remain almost stationary and can be easily collected and destroyed.

I have received several enquiries relating to the chemical (Carbon bisulphide), that I have been recommending for the extermination of "white-ants" (Termites). As the shipping companies refuse to carry it, it will be necessary to manufacture the Bisulphide locally. The Government Chemist has designed a handy apparatus to generate the gas directly into the ants' nests, thus avoiding the difficulty and danger of condensation. A sample machine is now being made, and will be tested in the Botanical Gardens. The machine will be portable and easily transported from place to place.

EXPLANATION OF PLATE.

Fig. 1. *Psyche* sp. undetermined.
2. *Chalia doubledayii.*
3. *Psyche vitrea.*
4. *Acanthopsyche cana.*
5. *Psyche albipes.*
6. *Clania variegata.*
7. *Clania crameri.*
8. *Psyche griseata.*
9. *Acanthopsyche minima.*
10. *Acanthopsyche hypoleuca.*
11. *Acanthopsyche subteralbata.*
12. *Acanthopsyche minor.*
13. *Psyche rotunda.*
14. *Psyche* sp. undetermined.
15. *Pteroxys goniatus.*

The Tortrix Pest.

(*Report of a Meeting of the Maskeliya Planters' Association held 25th April, 1906.*)

The tortrix pest, which has for some time been prevalent in the district. to a greater extent than ever before, was mentioned by the Chairman, who was presiding over his first general meeting. He said it had seemed to him previously that he was going to have an easy year of office, but he thought they would agree with him that the subject of the tortrix pest, which was on the agenda of the meeting, was a very serious one, not only in that district but in the other parts of the island. To that meeting they had to welcome the Government Entomologist, Mr. Green, and also the estate inspector of one of their largest companies, the Chairman of the Dikoya Association, Mr. R. H. Eliot, both of whom were going to take part in the discussion.

THE CHAIRMAN'S OPINION.

The Chairman continuing said: I think that most of you will agree with me that it has become a matter of extreme importance to this district. There is no doubt whatever that on many estates it is now much worse than it has ever been before, and that it has spread to several estates which have never had it at all badly until this year. I understand that on one estate it is so bad on one large field that for months the coolies have hardly been able to get any flush off it, and that the field instead of being green is brown all over. There is, however, one comfort, and that is that it is not by any means a new pest. We were informed at our last Committee meeting that there was a very bad attack on Gorthie flat 30 years ago. Speaking from my own experience, I well remember a very bad attack on my factory field the year I came to Maskeliya, 17 years ago. There was also a very bad attack about five years ago on several fields, but undoubtedly we have had it worse this year

than on any previous occasion. I believe that most of us are agreed that the pest is always worse when we have abnormally dry weather. Both years that I remember our having it badly were dry years; and this year we have had a more obstinate drought since the middle of November than I ever remember before. If we have an old-fashioned monsoon, followed by a wet N.-E., I dare say many of us will think this time next year that we were unduly pessimistic; on the other hand if the S.-W. and N.E. are partial failures this year, and we do nothing, then Heaven help us, as I fear the present attack will be nothing to what we shall have next year. At present I believe we know very little about this pest. From the time the female deposits its eggs until the moth is hatched is, I believe, about six weeks. From what I have noticed myself, and from what others have told me, it is generally worse on wind-blown ridges, and on poor soil where little or no cultivation has been done. It is, I think, natural that it should be worse on the ridges, as the tortrix does not like damp, and the sooner the leaves dry the better the tortrix thrives. Mr. Pole, who is undoubtedly the leading entomologist in Maskeliya, informs me that it is never bad under grevilleas. If we had not cut up our grevilleas he says the pest would not have been nearly so bad, as the tortrix infinitely prefers grevilleas to tea. To a certain extent I agree with him, as I find the pest on the whole much worse where there are no grevilleas than where they are growing thick. On the other hand I have found it decidedly bad on places where the grevilleas are growing thick, though it is certainly not nearly as bad as where there is no shade. On the other hand, another resident reports that it is not bad except on the fields where the grevilleas were thick! So you will notice how divergent our views are. So far several remedies have been tried, but with no great success on the whole. The one that has, perhaps, been most tried is that the pluckers should bring in all egg masses they see, and they are paid a small sum per hundred. This on the whole has, I fear, been a failure. It is quite impossible for the pluckers to take off every egg mass, and the egg masses left probably hatch out stronger caterpillars as they have more to eat. Another plan has been to hang up grevillea branches, and to send coolies round to collect and kill the moths every morning.

This again has been more or less of a failure, as most of the females caught have already deposited their eggs. Another proposal is to at once burn or bury all prunings. I have doubts as to whether this would do much good, as nowadays almost every leaf is taken off, and there would be nothing for the caterpillars to feed on. It would, however, be interesting to know if the egg mass could live in the dead leaves of the prunings, and hatch out when the young shoots have started. The only other remedy I can think of is that we should send separate gangs round, whenever either the superintendents or kanganies notice any signs of egg masses, and have them all carefully taken off, and at once burnt. The plucking kanganies would soon notice if there were any masses, and would at once inform the superintendent. I understand that Mr. Neale, on Chapelton, tried this experiment with great success. I believe, at the present moment, it is not much use doing this, as most estates will want their labour for plucking. The probability is that the monsoon will destroy most of the tortrix, and I have never known the pest bad in June, July, and August; but if everyone from August on to the end of the year was to tackle the pest seriously, I think a great deal of good would be done. However, whatever we finally decide is for the best, I earnestly appeal to every planter in Maskeliya to co-operate, and to do everything in his power to cope with this pest. If we can only all combine, I believe that half the battle is won. Whatever we decide on to-day I strongly urge that every superintendent in the valley back up to the best of his

ability, and will endeavour to get his agents to back him up, too, even if it does cost some money. I also hope the Dikoya Association will try to help us. If the two District Associations will only loyally support one another, I have great hopes that we may at any rate greatly reduce the destructiveness of this pest. I would, in conclusion, propose that we form ourselves into a General Committee, and thoroughly discuss the subject, and I beg that any one present will tell us anything he knows on the subject, and will help us in every way he can. Finally, I would impress on you all the necessity for unity. If we are only unanimous I firmly believe we can check this pest. If not, we must simply trust to nature and luck.

THE COLLECTION OF EGG MASSES.

The CHAIRMAN then proposed that the meeting form itself into a General Committee to discuss the subject, and this was decided upon. In Committee:

Mr. GREEN said that the collection of egg masses had been tried on individual estates for some years, but not continuously. A certain amount of good must have followed from the wholesale destruction of egg masses, as each egg mass contained about 250 caterpillars, so that collectors of egg masses were bringing in eggs by the million. Unless, however, something could be done systematically, unless the collecting were done under some system, money was practically being thrown away. On that account he wished to support the Chairman's views on co-operation. He thought they in that district should try to agree upon some method of treatment. Collection of eggs should be given a fair trial, but it should be done systematically. Mr. Green went on to say that he had found a large percentage of the caterpillars were parasites, and he thought nature should be encouraged in that direction to work for the destruction of the pests. He would like to point out, he said, that it was very dangerous to rely upon the monsoon to relieve them. After the experience of a certain estate in the district he could not say that the monsoon would relieve them very much. He was on the estate mentioned during the last S.W. monsoon, and the pest was simply rampant over a large number of fields. The rain certainly did kill off a number of them, not by drowning but by allowing fungus enemies of the caterpillar to get a hold, the damp air and the moisture on the leaves allowing fungus to spread from caterpillar to caterpillar. As to grevilleas he had no evidence to show whether they did good or harm. As the Chairman had pointed out, the evidence was very contradictory.

It was the same with the shot-hole-borer. Some planters had brought evidence to prove that shot-hole-borer did live in grevilleas, and others that they would not. One could find such evidence every day, and he did not think grevilleas had much to do with it. The Chairman wanted to know whether egg-masses would be likely to survive the drying of leaves. Perhaps a certain number of caterpillars, hatched out, finding nothing to feed on, would be dried up, but others would easily reach and feed on other leaves. The only thing to be done just now, he thought, was to find out whether everybody was agreed to the recommendation with regard to the collecting of eggs and to decide how it should be done. (Hear, hear.)

Mr. POLE was called upon by the Chairman to give the results of his experience. He said he had very little to add to what Mr. Green had said. They had all seen and proved that his opinion was the correct one at the end of the valley. Mr. Green had impressed upon them the necessity for system and co-operation in the attempts to exterminate the destructive pest, sentiments with which he entirely agreed. Unless there was systematic collecting, for instance, collectors were wasting their time and the planters their money, as all they were doing was to lay open their own estates to the ravages of insect immigrants from

other places. They must all help to get rid of the pest, and they must have co-operation all round, not on a few estates but in the whole of the Association's district, and in adjoining districts if possible. Of course, they knew well how difficult it was among planters to get such co-operation, but unless the co-operation was got the question resolved itself into one of serious legislation. They were not certain that they could depend upon the monsoon. In the meantime every effort must be made to get rid of the young; the chief thing was to destroy the eggs. Mr. Pole went on to assert that the pest originally came from the jungle and was blown probably by some gust of wind, and not finding grevillias—he was afraid he had a fad in that direction (laughter)—it dropped on to the tea. It was for them to see whether they could combine and prevent the pest spreading. Mr. Pole then went on to describe a certain pest-ridden tea estate in the district. There were, he said, acres of tea, not quite as though they had been burnt by fire, but rather scorched. The trees had not dropped their leaves, which were perfectly brown, but he could show tea from which every leaf had fallen—which had happened during the last few weeks. The owners of that tea could not expect to make anything of it for the next few months. The pest, he felt sure, was increasing year by year. They had done something—they had destroyed eggs—but nothing had been done systematically. The speaker mentioned an estate from which 74 million possible insects had been taken, yet, through lack of co-operation of surrounding estates, the pest was as bad as ever.

Mr. GREEN said he would not advise planters to wait for legislation. There was the Pest Ordinance going through, but let them not wait for that, but go in for systematic action at once.

In answer to a member, who asked amidst laughter, whether the Government would combine with them in clearing the jungles, the Chairman thought that was impossible; and

Mr. GREEN said it was a mistake to think that the pest came from the jungle. It was by no means abundant in the jungle.

Mr. POLE said he had seen a few tortrix, chiefly males, in the forest at night, plainly proving that the females were up above in the trees among the young tender bushes. Within the last few days he killed a number of female tortrix in the forest boundary between two estates.

Mr. GREEN: That was at the edge of the forest close to the tea, of course.

The CHAIRMAN expressed himself of opinion that there were few tortrix in the jungle. They were, of course, constantly coming into the jungle.

Mr. BRAYBROOKE: Mr. Pole described to us a considerable acreage without leaf. Did he mean to say the pest had taken off the large leaves as well as the small?

Mr. POLE: Not exactly the leaf entirely, but the cuticle, leaving an apparent red blotch on the surface.

Mr. DE MOWBRAY: I have seen where they have taken off every leaf from the trees, the old as well as the young.

Mr. BRAYBROOKE said that taking off the old leaf did a great deal of good. He could not say whether the remedy was a good one, however, or whether it did not do a great deal more harm than the disease. Of course, it was a very drastic remedy.

A MEMBER said he took off everthing last year, and this year his tea was worse than it had ever been before.

Mr. CRAIB thought they were all agreed that they ought to combine. If everybody would begin collecting egg-masses, it would be the best thing they could possibly do.

Mr. GREEN said they would probably find they would have to collect egg-masses on the hills one month and down in the valley the next. They would have to determine by experience when collecting should be done.

Mr. BRAYBROOKE said there would be difficulty in collecting egg-masses among irregularly-planted tea. If it were planted in rows the pest could be got at in a much easier manner and at a much smaller expense.

Mr. GREEN asked Mr. Braybrooke whether he had noticed whether the tea was not worst in August.

Mr. BRAYBROOKE: Yes, July and August.

The CHAIRMAN said he really did not think the system of collecting the egg-masses by pluckers was any good. He defied any coolie to bring in a decent kanak of leaf if he was to take egg-masses off properly. In the old days they used to think it was on the top; now it was in the middle of the bushes. They should give a thorough trial to putting on special gangs whose duty it would be to pluck off egg-masses properly. After that he thought they would find the coolies would do the work better. It was absurd at present to expect that the pluckers would collect the egg-masses properly.

Mr. GREEN said it ought to be possible to keep records of the collections made. If they could do this and the records were properly tabulated by the Secretary it would give them a fair idea of the life history of the insect at different elevations in the district, and it would be of great assistance in the work of extermination.

The CHAIRMAN: I think that would be an excellent idea.

WHAT THE INCREASE IS DUE TO.

In answer to a member's question, Mr. GREEN said the increase was no doubt partly due to the abnormally dry season. However, it had now got to such a pitch that it would not be advisable—it would be suicidal—to wait for the monsoon and expect it to bring relief.

Several members remarked that there had been a scare with regard to brown blight, but that went away with the monsoon.

The CHAIRMAN: That was a very wet monsoon, as a matter of fact.

Mr. GREEN observed that naturally an abnormally dry season was favourable to the insect pest, and a wet season was just as naturally unfavourable, as he had explained, but it was just possible that the expected monsoon might not have the desired effect.

Mr. ELIOT said when the old estates were planted in tea there was no grevillea and no pest. They were now covered with grevillea and the pest was among them.

The CHAIRMAN spoke of an estate which had its worst attack but one 17 years ago when there were not seventeen grevilleas on the estate.

Mr. GREEN again asserted that he did not think grevilleas affected the pest very much one way or the other. The evidence for and against did not come to much. The only effect grevilleas could possibly have would be in this way. There was the possibility of grevilleas harbouring the pest.

Mr. CRAIB said he was sorry to disagree. He could point out two areas, one thickly-wooded which had got very few, and another exactly the opposite.

Mr. GREEN: It is quite right. I have seen that, too, and I have been to other fields and found the conditions exactly opposite and providing no evidence one way or the other.

The CHAIRMAN remarked that at the last meeting Mr. Turner stated the pest was the worst in grevilleas.

A question was asked whether it was possible for the caterpillars to get back to the grevilleas again.

Mr. BRAYBROOKE said the insects lowered themselves by means of their own threads and could pull themselves up again.

Mr. POLE said it was just possible if they were not touched they would climb up again. The tortrix could not do much damage to the grevillea. Therefore, if they adopted the plan of keeping their tea bushes clean, he thought they would accomplish something. Whether they could free themselves entirely of the pest they could find out later. Let the tortrix get at the grevillea as much as it liked if they could keep their tea clear. It could do no more damage to the grevillea than the planter could by lopping. He advised the planter not to lop, or they would lose their timber, and tortrix-damaged timber was worse than nothing at all. (Hear, hear.)

Mr. GOSSAGE said he was quite in agreement with Mr. Pole. At the present time he had no tortrix where there were no grevilleas.

Several members said their experience showed them there was no rule.

Mr. GREEN said the only possible harm that grevilleas could do was to infect other trees.

Mr. BRAYBROOKE: Can the tortrix caterpillar live and turn into chrysallis on the grevillea.

Mr. GREEN: Yes.

INSECT PESTS AND EXTERMINATION.

A member asked if there were cases of such a pest having been effectually stamped out.

Mr. GREEN said there was a tremendous fight against a similar caterpillar in North America which was cleared off in districts, but probably, through lack of unanimity, not altogether. It was an introduced pest, and of course introduced pests were more troublesome to deal with and exterminate. When he said exterminate he meant keep down. It was almost impossible to say whether such pests had been exterminated or not, but they had been reduced to such a degree as to be of no account.

Mr. BRAYBROOKE gave an instance of an insect pest in one of the forest districts of Germany having been exterminated by vigorous treatment.

Mr. CRAIB: Then let us speedily combine.

The CHAIRMAN said he hoped no one would pay absurd prices for the collection of egg masses. Separate gangs being set to work would give much more satisfaction than the payment of so much money per thousand.

THE RESOLUTION.

The following resolution was then proposed:—

"That this Association is of opinion that all superintendents of estates should approach their agents with the view to concerted action in the matter of picking off egg masses of the tortrix moth, as they consider the matter is a very serious one and calls for unity of action; and that particulars of the collections be sent to the Hon. Secretary for tabulation."

Mr. CRAIB seconded, saying, as he did so, that he left that matter of payment to individual members.

Several members expressed themselves of opinion that the agents would not agree with the proposal to tabulate.

The CHAIRMAN: The records are not for publication. It is only a matter for our own private knowledge.

Mr. SIDGEWICK: It goes all the way round. Everybody will eventually get to know, and the agents are sure to object.

Mr. ELIOT considered that as much knowledge on the subject as could be got was essential.

Mr. GREEN: The records would be a tremendous help. They need not be for publication, but merely for the edification of the Association in making its records and going about its concerted action.

The CHAIRMAN: Well, I think we had better leave that phrase out, and merely advise those who can send in records to do so. I want the resolution to be carried unanimously.

Mr. GREEN: Remember that the more records you get the better.

The resolution was carried after the phrase with regard to records had been deleted.

Mr. ELIOT said: As far as Dikoya is concerned we are entirely in sympathy with you. The matter has been put into the hands of a Pest Committee, and they will report, and their recommendations will be acted upon by the local P.A. I have no doubt their recommendations will be the same as yours—to collect the egg masses It seems to be the only thing possible. (Hear, hear.)

The CHAIRMAN: I think that will help us considerably. The boundaries of the districts are so near that it would be little use us taking any action without the co-operation of Dikoya. (Hear, hear.)

Mr. DE MOWBRAY asked if it would not be a good thing if, as well as egg masses being collected, prunings were burnt.

Mr GREEN: I am strongly in favour of that, but I would not insist upon it. It is a good thing against any pest.

Mr. BRAYBROOKE: Under the present system of manuring you would lose a lot of manure.

Mr. BRAYBROOKE: I am sure a great many agents will not allow their superintendents to burn prunings.

Mr. POLE thought it was a very important and interesting point that had been raised, and they ought, at least, to be united upon the matter. If anyone objected to burning his prunings why should they not argue the matter and fight it out to some conclusion as to whether it was good or not. By burning the prunings they certainly got rid of any pest that might be lurking there, and millions of caterpillars would be destroyed. The method would be very serviceable, but it would be hard to bring everybody to carry it out because they knew agents were sure to object. Unanimity, however, was the great point about everything If one set himself against an idea it would make the money spent by the others in carrying it out a dead loss.

Mr. GREEN remarked that young caterpillars were not necessarily killed by the leaves dying off. The mere fact of the prunings dying would not necessarily kill the insect. It was surprising how retentive of life they were.—*Times of Ceylon*, 27th April.

A COCONUT PEST IN SELANGOR.

A caterpillar is doing serious damage to coconut palms on an estate in Selangor, says the *Malay Mail.* As this caterpillar, which is a species of *Thosea*, or "nettle grub," is omnivorous and will eat both Hevea and Rambong leaves, it is important that on all estates a careful look-out should be kept for the first appearance of the pest.

The caterpillar is easily recognised. It is from one to two inches in length, lozenge-shaped, of an apple-green colour, with bright purple or pink patches on the back. It has bunches of spines or hairs dispersed over its back, and these hairs are cuticating, *i.e.*, when they pierce the skin they cause stinging and irritation. It eats the whole of the soft part of the coconut leaf, leaving only the mid-ribs of the leaflets, and when about to pupate falls off the leaf and spins its cocoon on the ground. These cocoons are dark brown, round or egg-shaped, smooth and compact, and about the size of a large coffee bean.

The area over which the damage is being done is at present very small—in fact, only a few acres, and rigorous steps are being taken to stamp it out at once. But, if the matter is overlooked at the beginning, the task of eradicating such insect pests is enormously increased. In Ceylon another species of the "nettle grub" attacked a tea field, and in one week after it was first observed it had completely stripped twenty-five acres; and it was only the most strenuous measures that eventually put a stop to the spread of the evil.

HORTICULTURE.

The Propagation of Plants.

By J. K. Nock.

A great deal might be written on "Propagation of Plants," but on an occasion like this, where space is limited, it cannot really be dealt with fully. The object here will therefore be to state in as concise a form as possible the different methods of propagation, giving sufficient practical hints concerning each to allow of their adoption by those interested, and in the case of the methods needing illustrations for their better explanation merely to mention them so as to have the list as complete as possible. Plants are propagated by seed to create new individuals, and by cuttings, division, slips, bulbs, corms, tubers, rhizomes, offsets, leaves, runners, roots, suckers, grafting, budding, and layering to increase these individuals.

PROPAGATION BY SEED.

This is the most natural mode and the most advantageous unless a plant exactly similar to the parent is required, when other modes to be described hereafter must be resorted to. The finest and most vigorous plants are produced from seed. The provisions of nature in such ways as causing the seeds of certain deciduous trees to drop before the fall of leaf, so as to provide a covering to protect them and leaf-mould for them to germinate in, and others requiring less depth to drop their seeds after the fall of leaf, form an interesting study, and afford valuable hints as to their requirements. We gather that seeds usually fall in their natural state among decaying vegetable matter and therefore require a light, rich soil to germinate in, also that the depth they should be sown varies as a rule with their size. Some kinds are furnished with a hard covering as those of *Acacia decurrens* and require to have boiling water, about four times their quantity by measurement, poured over them to facilitate germination. The water is allowed to cool down, and after 24 hours most of the seeds will be found to have swollen; the process must be repeated *with that still hard.* Others, such as Ceara rubber, need to be filed. Seeds imported from good merchants in England are generally specially dried before despatch, and Peas, Beans, etc., should be soaked in water, not necessarily warm and certainly not boiling, for 12 to 24 hours before sowing.

All seeds must be ripe, *i.e.*, possessing perfectly developed embryos, and have been well kept or germination will not be satisfactory. Storing should be done in a cool, dry room from which all moisture can be excluded, but as a rule this is hard to get in the Tropics and most imported kinds soon lose their vitality. Some seeds retain their germinating powers for only a short time, others for several years, and the time taken for germination varies considerably, those of the English Holly for instance being known to take so long as two years. The soil should be made fine but porous enough for water to drain off well. If too fine it is apt to cake on the surface after constant watering and the action of the sun, the tender plumule in forcing its way through becomes injured and the resulting plant is invariably poor. The addition of sand will be found to bring it to its proper consistency. As regards the depth seeds should be sown it is a good principle to cover them with soil about equal to their own thickness, but this must be done with judgment. As an exception I may mention beans which are planted 2 inches deep, though only an eighth or quarter of this in thickness.

Very small seeds such as Petunias, Gloxinias, Begonias, &c., need only to be just covered, and are often mixed with finely-sifted sand or soil so that they may be more easily and evenly distributed over the soil, overcrowding being most injurious to the young seedlings. Others stick to each other, and, with the same object in view, should be rubbed between the hands along with dry sand before sowing. Those of the tender plants are usually sown in pots or pans, sometimes placed on a hot bed, or in boxes and pricked out when large enough to be handled without injury, into sheds or beds until sufficiently strong to go into their permanent situations. The strong kinds are sown in the open ground in beds which must be protected in the early stages from strong sun and heavy rains. In all cases light and air are essential for their growth or the seedlings become "drawn" and moisture must be carefully regulated, taking care when watering not to dislodge the small seeds for which a very fine-rosed watering pot is needed. The pots containing the smallest seeds may be immersed almost to their tops in water for a short time to allow sufficient moisture to be absorbed by the soil.

Thinning-out is necessary where the sowing has been too thick, or the plants get weakened and spindly. Sowing may be done in drills or by broadcasting the seed. When practicable the former method is to be recommended, as it allows of weeding and stirring of the soil. If broadcasted they must be scattered about as thinly as possible.

TIME OF SOWING.

Methods of drying and packing seeds for export have reached such a pitch of excellence, in England at any rate, that we are now able to regulate our orders for the different kinds to arrive at seasons most suitable to their growth, or for them to commence their career when the climatic conditions most resemble those of their native homes. Most of the local seed merchants now realise this fact and import their seeds accordingly. For indigenous species nature teaches us that the best time is when they naturally drop from the plants.

PROPAGATION BY CUTTINGS.

A cutting is a detached portion of a plant usually provided with buds, or buds and leaves, and capable of emitting roots and becoming a plant similar to its parent in habits and requirements. Selection at the proper time, a suitable temperature and degree of moisture are the requisites to effect this. The age at which the cutting should be taken varies greatly in the different species of plants, the soft wooded kinds generally succeed from very young shoots, others from half or well-ripened wood, but the subject is too large to be thoroughly gone into here. A remarkable instance of cuttings striking from thick stems several years old is to be seen in the low-country fences of *Thespesia populnea* "Tulip Tree," and also with Dadaps. The stakes of all sizes are driven carelessly into the ground but shoot readily. If the operator is uncertain concerning the plant he is dealing with, shoots of all ages should be inserted to ascertain the degree of firmness necessary to obtain the greatest success. For the majority, well-ripened wood of about a year's growth will be found the best. They should be taken only from healthy plants that are in active growth with the leaves in a state of forming woody tissue. For deciduous trees they must be taken after the fall of leaf and before the sap commences to flow again. The weather must be propitious for those to be inserted in the open, and as there are usually refreshing showers of rain during October, November, and December, these be regarded as the most suitable months. For those to be placed elsewhere they may be taken at periods when

their growth is as required, provided due attention can be given them. The length of the cutting should be 5 to 9 inches with 3 or 4 nodes or joints. However, they cannot be too short if sufficient buds are present.

The cut must be made horizontally close beneath a bud with a sharp clean knife. Some kinds strike more readily when slit upwards for about half an inch after being cut across. As many leaves as possible should be left, as the more there are the quicker will the sap descend and form roots. The petioles of those cut off at the base must be cut as close as possible without injuring the bark as they are apt to decay and destroy the cutting. The lower buds should be cut or rubbed out of the kinds that shoot from the buds underground. The shoot is frequently torn off with a heel, *i.e.*, a small portion of the older wood from which it sprang, which is smoothed off with a sharp knife and then inserted. This is often successful where the ordinary method fails.

The temperature of the soil the cuttings are inserted in should on no account be less than that in which the parents are growing, rather let it be slightly in excess. Many plants strike in ordinary garden soil, and in substances such as brick-dust, &c., but the former should have plenty of sand mixed with it. The best composition is certainly pure sand about half an inch thick placed over soil in which the plant thrives best. For pots the bottom should be well drained with potsherds, over this place a layer of leaves or moss, then sandy loam, and the top half inch pure sand. Insert the cuttings near the edges. They cannot be inserted too shallow if made firm. The most expeditious mode of inserting in beds is to cut a shallow trench, lay the cuttings in, and press the soil well around them. For pots the dibber is generally used and is most satisfactory. Water must be given judiciously in small quantities and often. As much light as possible should be afforded, some kinds bear more than others. Shade when necessary and admit more light as they become rooted.

PROPAGATION BY DIVISION.

This is very simple, the plant being merely taken up and divided into numbers with roots to each. The Daisy and "Fever-few" are good examples. Perennials of a shrubby nature may often be induced to strike root, after division, by heaping up soil among the branches. Many instances of this could be given.

Propagation by slips is generally classed with this mode, the term being used when herbaceous perennials are split up into slips with roots to each.

PROPAGATION BY BULBS, CORMS, TUBERS, RHIZOMES AND OFFSETS is easily effected. Nearly every bulbous-rooted plant requires to be managed in its own particular manner, but there are a few rules of general applicability. Most kinds require to be separated (some annually, others every two or three years) when their leaves die down, and stored in dry sand, the growth afterwards being better if moisture is to some extent evaporated, though of course not altogether, This allows of their being kept for planting till convenient times. In all cases where it is necessary they should be moved when in a state of rest. The length of time they may be kept out of the ground varies with different species, and depends to a large extent on the manner in which they are stored. The rest causes them to produce stronger plants and consequently better flowers. There are exceptions to the rule of "drying off," as an example the corm of the Cyclamen should never be allowed to become absolutely dry at the roots, though a season of rest is certainly needed; this should be afforded in a cool, moist atmosphere keeping the roots damp. Tubers, such as the Potato, may be

cut up into pieces and planted, provided there is a perfect eye or bud left to each piece. It will be well to give a short definition of each of the subjects of this paragraph as they are often confounded.

A Bulb consists of a stem with internodes suppressed, covered by a cluster of partially developed scale-like leaves. Its fibrous roots die annually, but the bulb retains the vital powers of the plant, *e.g.*, Lily.

A Corm is a solid bulbous root bearing a surface bud, such as Cyclamen. It resembles a bulb with which it is often confounded.

A Tuber is a thickened underground stem bearing buds, as Potato.

A Rhizome is a creeping underground stem giving forth roots from its under-side and developing leaf buds at intervals on the upper surface, as Iris.

An Offset is a side bulb produced by some bulbous plants, or a prostrate shoot which takes root but does not branch again.

PROPAGATION BY LEAVES.

This is a successful mode with such succulent plants as Begonias, Gloxinias, &c., and it is possible that most other plants could be propagated in the same way if their leaves could be kept alive sufficiently long for roots to strike. The selection of the leaves is important as they should be neither too young nor too old. The young leaf expends its energy on its own growth, while that *too old* will be found to have reached the stage when it ceases to be active and commences to decay. Those nearly full-grown are the best. The petiole (leaf stalk) may be left its full length or be partly cut off, inserting it well up to the base of the leaf in pure sand, with a compost underneath suitable for the growth of the plant after it has struck root. If the leaf stalk is cut close the base of the leaf must be partly inserted and kept in position with a peg or small stone. Shading from sun is necessary and bottom heat advantageous where practicable.

Everyone is familiar with the way in which leaves of *Bryophyllum calycinum* produce young plants from their crenatures, even if nailed up against a wall. Hence the common name of "The Plant of Life" has been attached to this plant.

PROPAGATION BY RUNNERS.

The Strawberry is an excellent example of a plant sending forth slender prostrate stems which proceed along the surface of the ground and are termed *runners*. These are nourished by the parent, and leaf buds form at the joint on the upper side, rudiments of roots (known to Botanists as spongioles) appearing on the lower side. The latter develop and take hold of the soil, forming a complete plant which may be detached when established. To assist rooting, the runner should be pegged down near the joints. It goes on growing and forms a new plant at each joint, but if extra-strong plants are required the ends should be nipped off after two to three have developed, so that those left may have the full benefit of all the flow of sap.

If many plants are required the parents should be prevented from flowering and fruiting by cutting out all flower buds.

PROPAGATION BY ROOTS.

Such plants as Plums, which readily throw up suckers from the roots, may be propagated in this way. The buds which appear on the roots and send up these shoots are termed adventitious buds. Plants raised by this mode are true to the parent in character and reach maturity sooner than when raised from seed. The best and most certain method is to take cuttings from the roots 4 to 8 inches

in length,and plant them with their tops level with the surface of the ground, taking care that the uppermost portion be that which was nearest the stem. The more vigorous kinds will readily strike if healthy roots chopped up into short pieces are laid on the surface of prepared ground, and covered lightly with soil.

Conifers generally are especially difficult to raise from branch cuttings, and this method is often resorted to for some of the kinds.

PROPAGATION BY SUCKERS.

Suckers are of two kinds—root-suckers and stem-suckers. *A root-sucker* comes up from the buried portion of the plant as in the Plum, originating from an adventitious bud which has formed on the roots owing to an exuberance of sap, and is fed by the root from which it springs. When the weather is suitable the suckers should be removed with all the roots belonging to them and planted out, care being taken not to injure more than possible those of the parent plant. It will thus be seen that the mode is a very simple one. A drawback is that the plants produced in this way tend to send up more suckers than if raised by other means; these should be checked immediately they are noticed, if no increase is wanted.

A stem sucker comes up from the base of the stem of a plant when the collar is below the surface of the soil. It weakens the parent supporting it which is often seen to become more and more stunted as the growth of the sucker proceeds. On removal of the sucker it is generally found that the stem growth is great in proportion to the number of roots attached, and should be cut down accordingly and nursed in good soil for a year or so until the roots and top are reasonably in proportion to each other, when it may be planted out in its intended situation. New suckers will issue from the buds around the scar caused by its removal, and where a number of plants are required may be encouraged by heaping up soil around them. In cases where the plant is known to readily send up stem suckers the stem may be cut right down. This will give an increased number of plants.

There are three other most important modes, viz., Propagation by Grafting Budding and Layering. An illustrated article on Grafting will be found in the August number of this Magazine.

Budding and Layering require to be dealt with in a similar manner to be thoroughly understood, and so are omitted in this paper.

Shade Trees.

THEIR IMPORTANCE, INSTRUCTIONS FOR PLANTING THEM, &c.

By H. F. Macmillan.

Shade trees in the Tropics are a boon to man and beast; they afford cool shelter from the fierce sun, beautify our surroundings and render them healthy; they form effectual wind-breaks, and enable us to grow beneath their shade various crops which will not thrive under full exposure to the sun.

2. Therefore it should be one of the first duties of every person who owns, or is responsible for the upkeep of, roads to plant suitable shade trees along them. Open bleak areas, or bare pasture land may be rendered congenial and productive of tender herbage by the planting of shade trees. Remember that trees grow while we sleep, and that in a few years they may practically convert a wilderness into a paradise.

3. For roadsides generally select kinds with a spreading top and an upright clean trunk for at least 15 feet. These are also suited for parks and pasture land, though in this case it is as well to select trees which combine the purpose of ornament with that of shade. Fruit trees in many cases may afford profit as well as shade, but their use in public places has obvious drawbacks.

4. Some time previous to planting make holes 3 feet deep and the same in width, from 15 to 20 feet apart, and, if possible, about 15 feet from the road. Water the plants thoroughly, support them individually with stout sticks if necessary, and shade with cadjan or other durable leaves.

5. Protection from cattle is usually indispensable; it may be troublesome and expensive to provide this at first, but it is economy in the end. The ground round the plants should be kept free of weeds, and forked on the surface occasionally. Always look for vacancies on the approach of wet weather, and supply these without delay.

6. When pruning be careful to cut the branches with a clean cut surface close to the stem; never leave a stump when cutting a branch, as this will rot and most probably bring disease to the heart of the tree, causing the latter to assume a distorted and stunted shape, if not premature death.

7. Trees suitable for the wet low-country:—Inga-Saman or Rain-tree, Pelimbiya, Gal-mora, Balsam-tree, Del, Timbiri, Peltophorum, Pterocarpus or "Gammalu."

8. Trees suitable for dry districts:—Kohomba, Tamarind, Timbiri, Suriya, Mara-illupai, Inga-saman, Mahogani.

Gardening Notes for the Hill Districts.

By J. K. Nock.

The routine work for the month of May will be found in the Calendar.

Flower Garden.—The fine specimens of the two undermentioned perennials exhibited at the Nuwara Eliya Agri-Horticultural Show, and numerous queries since as to their cultivation, have prompted the following remarks:—

Antirrhinum, "Snapdragon," is a hardy perennial but generally is treated as an annual. There are three classes—dwarf, medium, and tall—the latter being the class of the exhibit which elicited so much attention. They will grow almost anywhere, but a well-manured light dry soil in a sunny situation suits them best. Seed sown in September will produce plants to flower the following February, *i.e.*, in about six months' time. The best plan is to sow the seed in pans, prick out into sheds or boxes, and plant out when large enough, in dull weather. If it is desirous to increase a special colour or variety cuttings should be taken and inserted in light sandy soil.

Streptocarpus.—This is a tender perennial from South Africa and known as the "Cape Primrose." The hybrids are very showy and produce a succession of gloxinia-like flowers throughout the greater part of the year. They are easily grown and take five to six months to come into flower from the time of sowing the seed which should be done in pans, pricking off the seedlings into pots as they become large enough. There seems to be a general idea that a glass-house is necessary to grow them in, which is wrong. They certainly do best under cover (very ornamental as a verandah plant) in a cool place but are flowered at Hakgala in the open. A suitable compost is rich loam and leaf-mould with manure and sand added. They may be increased by divisions.

VEGETABLE GARDEN.—It now becomes necessary to cease growing certain kinds, *vide* Calendar. Excessive rains and strong winds will do a lot of damage which must be tried to be overcome as much as possible by making more frequent and larger sowings.

Carrot, *Daucus Carota*, L., of the natural order Umbelliferæ. A common vegetable, rather inclined to be difficult to suit, and not often grown to the perfection possible, chiefly on account of shallow tilling and heavy soils which could be obviated by more care, adding sand &c. To get clean roots of a good length these two matters are very important. A deep soil (18 inches to 2 feet for the long kinds) is essential, and ground which has been heavily manured for a previous crop is preferable to one specially manured as this causes the roots to fork. Break the soil up well and bring it to a fine tilth, making the beds four feet wide. The seeds have a tendency to stick together, and should be rubbed between the hands with dry sand or thick sowing will be the result. Sow every four weeks for a succession of crops, in drills eight inches to one foot apart according to the kind grown, and cover with a sprinkling of fine earth. Keep down weeds and thin out to suitable distances two or three times. The chief point is not to prepare the ground in a hurry.

EDUCATION.

AGRICULTURAL EDUCATION IN VARIOUS COUNTRIES.

By H. W. Potts.

Part II.

Canada.

Despite the rigorous climate, this Colony may be considered one of the most advanced in so far as agriculture is concerned. No finer example can be instanced to-day of the beneficial results of well-considered State action in the enlargement of a national industry. Twenty years ago agriculture in the Dominion was very much depressed. To-day the out-put of wheat, dairy, and other natural products is marvellous. It is admitted by all the farmers that this is mainly due to timely and wise Governmental action.

In 1885 Dr. Wm. Saunders was commissioned to visit the agricultural colleges of the United States and Europe, and obtain preliminary information for the Government. An Act of Parliament, based on Dr. Saunders' report, was passed for the establishment of experimental farms and the proper control of agricultural education and efficient organisation.

The Act has been liberally interpreted, and administered with judicious enterprise. Example and precept are utilized to create responsive vigour in the farmers, the chief aim being to induce them to abandon the old practice of wasteful farming by robbing the land of its fertility without returning an adequate equivalent. This is scientifically demonstrated. The results obtained from deep ploughing, clean land, rotation of crops, good seed, and an economic system of manuring are clearly brought home to the farmer's mind. Each experimental farm devotes itself to work out the problems of agriculture for that particular district. From this centre a proper distribution of acclimatised seeds and plants is made to the surrounding farmers. More than 100,000 farmers have received free during the past ten years 3 lb. sample bags of seeds. Twelve thousand packages of seedling trees, shrubs, and plants, and more than six tons of seeds of hardy trees, have been sent out free.

Agriculture is taught in the State rural schools, and proper training provided for the teachers. A text-book is published. An examination must be passed by the scholar in agriculture before admission is permitted to the High Schools. The Agricultural College at Guelph, Ontario, presided over by Dr. Mills and a highly-trained staff of educational experts, provides training leading from short courses of six months, up to the term needed to qualify for the Bachelor of Science in Agriculture Degree of four years.

In addition special effort is made to organise Farmers' Institutes, for both men and women, Live Stock Associations, and Dairying Associations, all of which are highly educational. At their annual conferences, papers are read, and instructive discussions follow. These are published in pamphlet form and distributed.

Dr. Saunders states: "The occupation of farming has been elevated in the eyes of the community. It is no longer looked upon as a sort of drudgery suited to the dull and slow-going, but is now regarded as a suitable field for the higher intelligence of cultivated minds. It is recognised as a calling requiring much skill to conduct it successfully, and as giving ample scope for the exercise of the most active and earnest minds, and one in which information of almost every sort may be turned to practical account."

UNITED STATES.

In 1894 the Secretary of the Board of Agriculture (Major Craigie) after investigating the working of the Morill and Hatch Acts in the States by direction of the British Government, states :—

"The American Government seems willing to face any cost to the community that promises the better to equip the farmer with the knowledge of his business. The authorities seem assured that in indicating methods of profitable production and still more by the careful perfecting of the produce of the vast lands of the Republic in whatever direction of extensive or intensive culture the economic circumstances of the moment may prescribe, they are providing a solid means of advancing the well-being of the nation as a whole."

The Morill Act of 1862 laid the foundations of superstructures, and created an organisation for the furtherance of agriculture, the value and extent of which are unequalled in any other country. In that year Congress alienated 10,000,000 acres of land to provide funds to establish, endow, and maintain agricultural colleges and experimental farms in every State of the Union. This created an activity and interest in agricultural education and research which developed with extraordinary celerity. In 1885 a Convention was held by those associated with agriculture, when the following resolution was passed :—

> "That the condition and progress of American agriculture require national aid for investigation and experimentation in the several States and Territories."

The Hatch Act of 1887 was formulated and became law—

> "In order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

In order to render this effective and defray expenses, a sum of £6,000 per annum was voted to each State. In addition large sums are annually voted by the State Legislatures, and these are augmented by private benefactions. With these funds so amply provided, thousands of experiments have been and are being conducted in every branch of farm work, as well as in rearing live stock, particularly in regard to co-operative tests. The results of these are distributed to the farming community in the most complete way, and entail a lavish expenditure for printing.

Dr. True, Director of Experiment Stations, states all this has been accomplished with splendid results, and he reports "a remarkable awakening of our farmers to the desirability of having more definite information regarding all matters connected with their business. The result has been that the stations and this Department have been led to publish a vast amount of information, both old and new, which has been freely distributed to farmers in every State of the Union. Nothing like it has ever been seen before. No country has ever attempted so systematic and so thorough a distribution of information to its agricultural population, and no masses of farmers have ever so eagerly sought for information as have our own within the past few years. Such an intellectual awakening must have most important results, and there is every indication that it will go on increasing in volume and force until it has thoroughly permeated the entire agricultural population."

He points out the special features responsible for their success as follows :—

1. The wisest leadership, by well-trained men.
2. Scientific investigations in agriculture systematically conducted.
3. The thorough organisation of the agencies for distributing information among the farmers.

4. Energetic teaching in the agricultural colleges.

He does not hesitate to caution his countrymen against permitting political influence to interfere with the management of the colleges and stations. Experience in this direction has been of a most objectionable character in the past.

Mr. Wilson, the U. S. Secretary for Agriculture, thus sums up the work of his Department :—

"The Department, through its bureau, divisions, and offices, is getting into more immediate contact with all classes of producers throughout the country . . . . Especial attention is being given to the reclamation of soils that have been reduced in fertility by injudicious management. Production from the soil in all parts of the United States is being diversified by importations from foreign countries. The scientist and the cultivator are working together for greater national prosperity through more economic production. . . . . The especial attention of the Department in the future will be given to the production, under United States jurisdiction. of products of the soil that now come from foreign countries, keeping steadily in view the object for which the Department was organised—the help of the producer who is struggling with Nature."

The fundamental basis of national education in the primary education of America is Nature study. A leading writer states :—"It designates the movement originating in the common schools to open the pupil's mind by direct observation to a knowledge and love of the common things in the child's environment." In the successful adoption of this method the personality of the teacher is pre-eminent; there must be enthusiasm. The aim is the development of mental, reasoning, and observant powers of the child. It enlivens the means of teaching to both tutor and pupil. The study of plants and animals can be associated with the earliest lessons in the common school. The readiness with which children improved under this method has resulted in its universal adoption in the States.

Recently an organised movement has been made to introduce the elements of agriculture into the rural schools, preceded by the establishment of school gardens. These were the outcome of the nature study education, and developed a trend towards agricultural training. The American League of Industrial Education, the National Educational Association, and the American Civic Association have all included in their propaganda the promotion of school gardens and farms, and the teaching of agriculture in the common schools.

The Dean of the College of Agriculture in Illinois gives the following reasons for teaching agriculture in these schools :—

1. To cultivate an interest in and instil a love and respect for land and the occupation of agriculture.
2. To create a regard for industry in general and an appreciation of the material side of the affairs of a highly civilised people.
3. To cultivate the active and creative instincts as distinct from the reflective and respective that are otherwise almost exclusively exercised in our schools.
4. To give practice in failure and success, thus putting to the test early in life the ability to do a definite thing.
5. To train the student in ways and methods of acquiring information for himself and incidentally to acquaint him with the manner in which information is originally acquired and the world's stock of knowledge has been accumulated.
6. To connect the school with real life and make the value and need of schooling the more apparent.

> As an avenue of communication between the pupil and the teacher, it being a field in which the pupil will likely have a larger bulk of information than the teacher, but in which the training of the teacher can help to more exact knowledge.

Several States have made provision for training the teachers in agriculture, and make it a compulsory subject in their examinations. At Cornell University a two-years' normal course is provided in nature study and gardening. Ten normal training-schools have been opened in Michigan for the express purpose of training teachers for rural schools.

Text-books have been published suitable for the various States. In North Carolina State 12,000 children received instruction in agriculture last year.

In addition to the education in the rural schools, the provision made in the splendidly staffed and equipped agricultural colleges in every State, in proportion to its population, is not rivalled in any part of the world. The courses are arranged to meet the requirements of all classes of agriculturists, and extending from periods of twelve weeks to five years. The longer period course in most instances entitles the student to present himself for the Bachelor of Agricultural Science Degree, which is granted at all the American Universities.

The training in the High Schools is essentially such as to mentally and physically equip a lad for the specific education in an agricultural college. The subjects of manual training, physiography, elementary chemistry, physics, geology, algebra, mathematics, and geometry are taught.

POPULAR EDUCATION OF THE FARMER.

For those farmers and their sons who are unable to attend the agricultural colleges of the various States, several schemes have been evolved. Short courses have been offered, and farmers' clubs organised on the University Extension plan. Under the auspices of the agricultural colleges and kindred establishments, such as the experiment stations and agricultural associations, farmers' institutes are now very popular, at which lectures and demonstrations are provided by the State experts, and often by those sent by the central authority at Washington. Michigan set the example in 1892. The railway companies realise how important it is to their revenue to have a welll-educated class of farmer on the land through which their lines run, and offer the greatest facilities to farmers to attend courses of instruction. In fact, they supply special trains free to bodies of farmers of sufficient number to convey them to the agricultural colleges on special occasions to inspect the crops and methods pursued at these and the experiment stations where lectures are given by the officers.

One of the most recent methods adopted to reach the farmer is for the State to fit out two railway cars, one as a store for roots and seeds and as an agricultural museum or exhibit, the other suitably seated to act as a lecture room and sleeping apartment. Expert itinerant lecturers are engaged, and are conveyed through the rural districts free. A systematic course of lectures is thus given at every station where these cars are left, to the farmers in the district, either during the day or in the evening, whichever is found most suitable to the local residents. Instruction is given, the exhibits are fully explained, seeds and roots are distributed free, and the railway companies are recompensed for their enterprise by the increased production and carriage on their lines, as a result of this advanced technical education.

This brief and necessarily incomplete precis of educational effort as it is conducted in the advanced countries of the world evidences the great attention now being devoted to it, and the stimulus thus provided for increasing the value of the primary industries.

One of the great factors towards this end is the experiment station or farm. A recent publication issued by the States Department of Agriculture by Messrs. True & Crooby, gives a brief account of 720 experiment stations and similar institutions throughout the world, embracing all civilised countries, the largest number of separate agencies being in Russia. There are 102 experimental stations and three experimental forests, the bulk of which are for the purpose of introducing new agricultural industries and teaching the peasants.

Germany possesses	... 80	Australia possesses	... 34
France ,,	... 71	Netherlands ,,	... 7
Austria ,,	... 41	Sweden ,,	... 26
Great Britain ,,	... 30	Norway ,,	... 12
India ,,	... 11	Japan ,,	... 15
Belgium ,,	... 15	Switzerland ,,	... 10
Hungary ,,	... 20	Canada ,,	... 12
Italy ,,	... 22	United States ,,	... 58

It will be seen that an attempt has been made in this lecture to demonstrate the necessity for preparing the child for rural occupations.

The primary system of education hitherto conducted has been more adapted to the requirements of urban than of rural children. Many who attend rural schools are unable to attend continuation or high schools. It would further enhance the training of a child for country life by receiving its earliest training in Kindergarten. Children of both sexes are rendered more fitted for any occupation where manual effort and a trained eye are essential to success. To direct the child's mental and physical development to useful purpose, and in keeping with its surroundings, is the commendable aim of the new education. The education for a child intended for rural life should commence in the primary school from the first impulse to use the fingers in Kindergarten, to the unfolding of natural processes by nature study; the school garden, the study of flowers, fruits, vegetables, birds, insect life, the domestic animals, and manual training.

Sir Philip Magnus, one of the highest authorities upon educational work, writes:—

"People often talk and write as if school time should be utilised for teaching those things which a child is not likely to care to learn in after life, whereas the real aim of school education should be to create a desire to continue in after life the pursuit of the knowledge and skill acquired in school. In other words, the school should be made, as far as possible, a preparation for the whole work of life, and should, naturally, lead up to it. The endeavour of all educators should be to establish such a relation between school instruction and the occupations of life as to prevent a break of continuity in passing from one to the other. The methods by which we gain information and experience in the busy world should be identical with those adopted in schools. It is because the opposite theory has so long prevailed that our school training has proved so inadequate a preparation for the real work of life. The demand for technical instruction, both in our elementary and in our secondary schools, is a protest against the contrast which has so long existed between the subjects and methods of school teaching and the practical work of every day life."

Any system of education tending to direct children's attention from rural industries in country districts is to be regretted. In the new Syallabus issued by our Education Department, correlation, self-activity, and reality are prominent, and the schemes for nature study and the rudiments of agricultural and elementary science are set out in such form as will tend to provide one of the missing links to the higher agricultural education.

This training will illustrate the phenomena of nature, train and expand the child's power of observation, excite an impulse to work, reveals attractive features in what has hitherto been considered menial work, and unfolds elevating influences in the child's surroundings.

This, however, opens up the question of training for our teachers. This may be regarded as the bed-rock of success in this connection. All the enthusiasm and earnestness of a teacher may be thrown away in the absence of a competent knowledge of the subject. We have in our Agricultural College all the equipment for conducting the work, with the exception of the teaching staff. Already a start has been made at the Hawkesbury Agricultural College, where five acres have been set apart for conversion into an orchard. flower, and vegetable garden, and experi mental plots. Another missing link is the education in the secondary schools tending towards the preparation of the student to rural life, and an entrance to the Agricultural College; in fact, complete the co-ordination of the different branches of primary, secondary, and technical education.

Many leaders of education in new countries such as ours will agree with Professor Ray Lankester, when he declared in the course of his Romanes lecture, delivered in the Sheldonian Theatre, Oxford, in June last, "That he wished to see the classical and historical schemes of education entirely abandoned, and its place taken by a scheme of education in the knowledge of nature." He urged the study of Physics, Chemistry, Geology, and Biology.

Our secondary schools might, with advantage, teach elementary agriculture, zoology, physiography, or physical geography, elementary physics, chemistry, botany, geology, mathematics, manual training, book-keeping, and physical exercise.

The Agricultural College is becoming more popular every year; greater provision will require to be made to meet the demand for further accommodation. The effectiveness of the tuition will be vastly increased by students who have gone through the training outlined in the primary and secondary schools. The usefulness of the College and Experiment Farms might be extended in such a way as to assist the elementary schools in training the teachers, and in supplying seeds, roots, trees, plants, &c., for the school gardens.

The University should prove the ultimate aim of those students whose attainments warrant them going to the higher training of a degree in Agricultural Science. New Zealand and Victoria grant such degrees, why not the Sydney University? One of the most urgent demands of our agricultural system is competent and trained men as teachers. This will become more emphasised, and to complete the chain of our work the degree is essential.

I would, in conclusion, also urge a system of teaching to reach the farmer. Natural difficulties present themselves in our large areas, where the agriculturist is difficult to reach, but such are not unsurmountable. Farmers' institutes, reading courses for farmers, educational conferences, have been made a success in Canada and the United States by means of peripatetic lectures. Our agricultural societies can be utilised as a basis to extend their work from that of organising an annual show, to technical education. One form especially commends itself to those whose life work in the country is associated with live stock, *i.e.*, "First aids to sick and injured farm animals." Immense losses are annually made through ignorance in the treatment of live stock.

I cannot close the subject without paying a tribute of praise to the New South Wales Parliament and the Department of Agriculture for the splendid organisation in the founding and conduct of essential aids to our producers. The Agricultural Gazette, The College, Experimental Farms, the staff of trained Experts, the Scientific Staff, have built up, and are engaged in desigining a system of agriculture suitable to our conditions, and of incalcuable value to the country.—*The Agricultural Gazette of New South Wales*, October, 1905.

LIVE STOCK.

Poultry Notes.

By G. W. Sturgess, M.R.C.V.S.

DISEASES OF POULTRY.

(*Continued.*)

Bumble Foot.—This disease is characterised by a swelling on one or both feet generally on the sole, sometimes on one of the toes. It is very painful and causes great lameness. It is due to bruising or a small wound caused by a thorn or splinter of glass. A hard corn is formed and suppuration follows, and the matter penetrates between the tissues of the foot, sometimes up the shank. It becomes of a peculiar cheesy nature and is very difficult to get out completely when the swelling is cut.

Treatment.—The foot should be poulticed for a day, and then when the swelling is soft it should be completely opened up by a free cut with a sharp penknife and all the cheesy matter squeezed or scraped out and the wound washed with clean cold water and blood clots removed. Then dry with cotton wool, dress with plenty of Benzoated Lard or Encalyptised vaseline, and wrap up with soft rag and keep the bird in a box on straw without a perch. Dressing should be done daily in the above manner until healing has taken place. (See also wounds of the Feet.)

Blindness.—(See wounds of the Eye.)

Chicken Pox.—This disease is very common in the tropics and may occur in all young poultry. It commences as brownish yellow crusts or warts near the base of the beak and may spread all over the face and neck. If the crusts are broken matter is found underneath. It is due to a fungus.

Treatment.—Isolate all affected chickens. The scabs can be softened by bathing with Jeyes' fluid and water and removed and the sores carefully touched with a camel hair brush dipped in pure Jeyes' fluid or carbolic acid.

The following ointment is also useful :—

Oil Eucalyptus 20 drops.
Turpentine 20 ,,
Benzoated Lard or Vaseline 1 dram.
Mixed.

Care must be taken not to injure the eyes. Chickens should be liberally fed and get plenty of green food. A little tonic medicine such as Parrish's Chemical food may be given daily in the food or drinking water.

Fowl Cholera.—This is a very terrible disease to get into the poultry yard. It is highly infective and is caused by an organism (a Bacillus).

The symptoms are drowsiness, weakness in legs and wings, great thirst, greenish discharges which may become whitish and frothy, comb usually very dark in colour, progressive stupor and death which commonly takes place within thirty-six hours. The owners' attention is drawn to it by the illness or death of several birds in rapid succession. On postmortem the intestines are inflamed and there may be haemorrhages present. Ordinary diarrhœa does not run so rapid a course and is not so fatal. In inflammation of the bowels the discharges are yellowish. (See Enteritis.)

Treatment.—It is practically hopeless to treat birds attacked by the disease. If it is desired to treat a valuable bird such medicines as camphor, chlorodyne, and opium may be tried with liquid nutritive food such as a little soup and egg and milk beaten up and a little brandy.

The main efforts must be directed to isolation and disinfection. Birds should be isolated *singly* in small boxes or tethered to pegs for at least seven days, so that they do not come into contact with each other. Infected birds die out, and with care the disease may be checked. Ashes or peat moss may be put down to absorb the droppings which are highly infective and afterwards burned. Plenty of disinfectants should be used, fresh runs made and the ground of old runs dug over. Vessels, drinking water and food must be perfectly clean and fresh. Beneficial results may follow the administration to all the poultry of such medicines as Turpentine, Eucalyptus oil and Jeyes' fluid on grain. A small quantity of these may be mixed with water and a handful of grain damped and scattered widely, so that each bird gets a few grains once a day. Salicylic acid may also be given in the drinking water. A vaccine is prepared by the Pasteur Institute of Paris, and valuable birds should be at once vaccinated against the disease.

Castration of Cattle in Ceylon during 1905.

REPORT OF WORK DONE BY THE GOVERNMENT VETERINARY SURGEON'S DEPARTMENT.

The vote of Rs. 1,500 made by the Society in April last—to enable me, as desired by the Board, to introduce generally the ordinary surgical operation of castration of cattle instead of the common method of crushing—has now been expended, and it is my duty to inform you what value has been given for the money.

After consideration of the information now given, and proper independent inquiries having been made as to the reception of the method of operation and the use made of the men trained pretty well all over the Island at the request of the various Local Associations, the Board will be able to decide whether the work should be carried on or not.

I have heard of no fatalities. Owners and men trained have expressed their approval of the operation, and have freely said it was preferable to crushing. However, the Board should find out from the Local Societies particulars on these points.

A statement of demonstrations given, with number of cattle operated upon at each, number of owners bringing cattle, and number of men trained is annexed for information.

You will see that 64 demonstrations have been given :—Western Province, 3 ; Uva, 11 ; Southern, 13 ; North-Central, 5 ; North-Western, 6 ; Eastern, 8 ; Central, 15 ; Northern, 3 ; Sabaragamuwa, 0 ; total 64. Cattle to the number of 1,518 have been operated upon, brought by 1,214 owners, and 65 men have been trained, of whom 49 have been granted certificates. The cost is under Re. 1·10 per head of cattle, all travelling expenses and fees to inspectors included, the training of men thrown in free.

The following applications for demonstrations stand over, awaiting further action by the Board :—

> Galle District Agricultural Association, Wellaboda pattu and Four Gravets, Mr. Charles Pieris of Colombo at Polgahawela, Maniagar of Delft at Delft, Katunayake Local Society at Katunayake, Mr. H. L. Daniel at Padukka, and Local Society, Chilaw, four centres in Pitigal Korale Central division and five centres in Pitigal Korale Northern division.

Thanks are due to Mr. Hoole, Assistant Veterinary Surgeon, Kandy, who carried out the demonstrations in the Central and Eastern Provinces, and to the Stock Inspectors in the Provinces where demonstrations have been given, for their great care in carrying out the work successfully—hard outdoor work under a hot sun which I can assure the Board is of a most trying nature.

The men trained were granted certificates in the following form :—

This is to certify that————has been taught the operation of castration of cattle. Colombo,————, 1905. (*Signed*)————*G. V. S.*

The names of men trained in each province are those who gained certificates.

Western Province.

Men Trained.—Nawagomuwage Hendrick Perera, Talangama; D. H. Samaraunga, Hanwella; Jasaya, Hanwella; Martin Fernando, Panadura.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Hanwella ...	... 20	... 13	... 2
Talangama ...	... 20	... 14	... 1
Panadura ...	... 26	... 18	... 2

Central Province.

Men Trained.—D. K. Banda, Aluwihare; L. V. A. Mohammadu Casim Lebbe Udunuwara; H. G. A. Abdul Rahim Lebbe, Yatinuwara.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Matale District :—			
Udupihilla, Aluwihara } Matale South	... 13 ... 15	... 13 ... 8	... — ... 3
Palapatwela	... 10	... 10	... —
Paldeniya, Alutgama } Matale North	... 20 ... 22	... 19 ... 21	... 3 ... —
Rattota, Matale East	... 52	... 42	... —
Udunuwara, Kandy District :—			
Dulagala	... 28	... 27	... 1
Yatinuwara :—			
Entilmigama	... 48	... 45	... 1
Harispattu :—			
Nugawela	... 38	... 36	... —
Uda Dumbara :—			
Urugala	... 24	... 24	... —
Pata Dumbara :—			
Walale	... 41	... 38	... —
Pata Hewaheta :—			
Ududeniya	... 32	... 28	... —
Uda Palata :—			
Hindagala, Gampola	... 52	... 49	... —
Uda Bulatgama :—			
Nawalapitiya	... 21	... 12	... —
Tumpane :—			
Galagedera	... 43	... 41	... 1

Northern Province.

Men Trained.—Kather Kamar Sinnathamby, Nunavil East; Arumugam Chinniah, Koilankandy; Kadiramer Cadiravelu, Koilankandy; Kadiramer Supper, Koilankandy.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Jaffna	... 5	... 5	... —
Chavakachcheri	... 25	... 22	... 2
Vavuniya	... 33	... 23	... 2

SOUTHERN PROVINCE.

Men Trained.—Rajapakse Punchi Appu, Sultanagoda; Game Kankanamage Appu, Talpe; Yatagama Gamage George, Yatagama; Paranamanage Karolis, Wailmmade; V. R. P. Baba Appu, Matara; W. David, Matara; P. H. Don Carolis, Matara; H. P. Deiris Hamy, Hambantota; C. P. N. Pedris Hamy, Hambantota; Saibu, Tangalla; Ismail Marikar, Weeraketiya; Gonapinuwalage Odoris, Ratgama; Hewa Suduhakuruge Dingi Appu, Coigoda; Denes Hamy, Hakmana; Gallé Radage Puncha, Ambalantota.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Immaduwa ...	42 ...	11 ...	2
Sultanagoda ...	25 ...	21 ...	2
Tangalla ...	14 ...	13 ...	2
Matara ...	40 ...	31 ...	3
Weeraketiya ...	60 ...	44 ...	2
Ambalantota ...	30 ...	19 ...	1
Hambantota ...	32 ...	17 ...	3
Hikkaduwa ...	20 ...	10 ...	1
Ambalangoda ...	40 ...	34 ...	—
Kamburupitiya ...	54 ...	39 ...	—
Dikwella ...	40 ...	38 ...	2
Hakmana ...	26 ...	22 ...	1
Morawaka ...	7 ...	7 ...	—

EASTERN PROVINCE.

Men Trained.—Casinader Kanapathy Pillay, A. L. Mohammadu Casim Lebbe and Pokar Mohammadutamby.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Batticaloa ...	21 ...	17 ...	—
Chavalakadi ...	20 ...	12 ...	—
Kalanuvai ...	15 ...	12 ...	—
Samanuturai ...	27 ...	21 ...	3
Nindaoor ...	14 ...	9 ...	—
Paddurupu ...	50 ...	30 ...	3
Sengallody ...	15 ...	7 ...	—
Maha-oya ...	18 ...	14 ...	—

NORTH-WESTERN PROVINCE.

Men Trained.—In 1903 K. D. Lazarus Appuhamy, Tikirala Arachchilage Punchi Appuhamy at instance of the Hon. Mr. Hulugalle before the regular Society's work started.

M. Charles Appu, Gokarella; A. Francisco Appuhamy, Gokarella; A. Nicholas Appu, Wariyapola; J. Sertansingo, Wariyapola; Weera Mohatalage Punchirala, Gokarella; P R. Karnis Appu, Gokarella; Santiago Pulle Anthony Pulle, Puttalam; Walter Nawaratna, Puttalam; J. Samara Henaya, Hiripitiya; Waranasuriya Mudiyanselagé Juse, Hiripitiya; Don Cornelis Appu, Talagaswewa; Heratamige Punchirala, Talgaswewa.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained
Gokarella ...	30 ...	27 ...	4
Wariyapola ...	36 ...	34 ...	2
Puttalam ...	25 ...	23 ...	2
Hiripitiya ...	22 ...	21 ...	2
Talagaswewa ...	9 ...	6 ...	2
Katalagama ...	12 ...	9 ...	—

NORTH-CENTRAL PROVINCE.

Men Trained.—Velatege Punchirala, Wattewewe; K. Punchirala Gonuhaddenawa; C. M. Punchirala Korala, Kalpe Korale; T. Sinnayah, Morawaka.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Maradankadawala ...	10 ...	8 ...	—
Eppawela ...	3 ...	1 ...	—
Gonahaddenawa ...	58 ...	52 ...	3
Morakewa ...	26 ...	24 ...	4
Kalawewa ...	32 ...	32 ...	1

PROVINCE OF UVA

Men Trained.—Babanhamy, Buttala; Appuhamy, Okkampitiya.

Place of Demonstration.	No. of Cattle.	No. of Owners.	Men Trained.
Buttala Division :—			
Okkampitiya ...	10 ...	6 ...	—
Kahambara ...	2 ...	2 ...	—
Marawa ...	4 ...	4 ...	—
Kolanwinna ...	15 ...	13 ...	2
Vedykumbura ...	2 ...	2 ...	—
Halandewa ...	5 ...	4 ...	—
Kurundugastota ...	3 ...	1 ...	—
Buttala ...	2 ...	1 ...	—
Weragoda ...	1 ...	1 ...	—
Badalkumbura ...	7 ...	3 ...	—
Ankade ...	6 ...	1 ...	—
Total ...	1,518	1,214	65

G. W. STURGESS, M.R.C.V.S.,
Government Veterinary Surgeon.

Colombo, November 20th, 1905.

THE IMPROVEMENT OF INDIAN CATTLE.

The Madras Government have approved the Board of Revenue's recommendations in regard to the measures to be adopted for the improvement of the breeds of work cattle and milch cattle, and practical action on the lines suggested will be taken without delay. The Board's recommendations are based on the advice of Major W. D. Gunn, Superintendent of the Civil Veterinary Department, and may be divided under the following three heads :—(1) The improvement of Indian work cattle for agricultural purposes; (2) the improvement of Indian milch cattle; and (3) the age at which bulls should be sent out into the herds.

With regard to the first, all the expert evidence points to the importance of the principle of "improvement from within," *i.e.*, selection from purely local breeds, and of improving herds by using only the very best bulls of local breeds. All past experience points to the conclusion that the selection of suitable sires from indigenous breeds is preferable to cross-breeding from cattle of other places. Next to the selection of sires the most important point is the provision, for the breeding cows and their progeny, of suitable grazing, proper food, and adequate shelter.

The principal defects to be contended with in the existing system of cattle management are insufficient feeding, depriving the calves of their natural nourishment and the keeping of large herds of "wasters," as Major Gunn calls them, which are neither good for breeding nor work. As Major Gunn points out, the latter wretched creatures eat fodder which should be reserved for the better class, but he doubts if the ryots will ever be brought to accept the view that it is better to keep a few cattle well than a lot of cattle which remain thin and starved and are incapable of giving milk or doing work. The provision of a good stock of good fodder is indispensable to the success of any scheme of improvement of either work cattle or milch cattle. Experiments which have been carried out at Saidapet prove

that Southern India is especially fortunate in the fodders it can grow, both in quantity, quality and cheapness, and the Board of Revenue suggests that Agricultural Associations and the estates under the Court of Wards should take the lead in this matter of providing good fodder.

In connection with the improvement of the milking strains among the indigenous cattle other important points are (1) close attention to breeding; and (2) the provision of pure and plentiful nourishment to the progeny of selected sires during the first two years after birth, with a view to ensure full development of the "milk flesh."

Before any attempt is made to import and acclimatise the milch cattle of Northern India, every effort should, in the opinion of the Board, be made to keep the famous Nellore breed up to a high standard by the continuous award of substantial prizes and medals to the owners of the best cows and bulls exhibited at Cattle Shows, and timely steps should also be taken to encourage ryots to save the Tiruchengodu and Punganuru breeds from extinction. The wisdom of the policy now laid down need not be insisted upon. It is patent to all who know to what extent the wealth and prosperity of India depend on her cattle.—*Madras Mail.*

MISCELLANEOUS.

Illuk or Lalang Grass.

A TROPICAL WEED PEST; WITH MEASURES FOR COMBATTING IT.

By the Hon. John Ferguson, C.M.G.

The "Illuk" grass of the Sinhalese is the *Imperata arundinacea* of botanists, of which the late Dr. Trimen tells us that it is "common in the hotter parts of the Island—the panicle being silvery white." A pest (he adds) in ground that has gone out of cultivation. The leaves make an excellent thatch, in this respect resembling "Mana" grass which indeed is a name often given by Tamils to "Illuk." It is found, I believe, in every province where coconuts are cultivated. In the Chilaw district, under favourable conditions it grows freely to a height of from 4 to 5 feet, and the roots go down quite 12 inches into the soil, the grass growing thick and close.

The manuscript of the article below by Mr. Frederick Ponsford of the Federated Malay States was sent to me a short time ago by Mr. Colin Murray, who continues to take a great interest in the advancement of Ceylon, and who thought that this paper, if published, would be of service to coconut planters, especially in the Batticaloa district. I do not suppose, however, that planters are worse off for illuk there than in some parts of our Western districts; and I thought it best, before publication, to get the opinions of a few practical planters of experience within reach; their comments follow below, and include those of Mr. W. H. Wright, the veteran Mirigama planter, Mr. William Jardine, another very experienced planter, and Mr. Gerald T. Nicholas of Golouapokuna Estate, Katunayake, who has favoured me with some useful details of his mode of dealing with illuk.

From "Notes on Grasses growing in Ceylon" by the late W. Ferguson, F.L.S., I quote the following description:—

Imperata Arundinacea, Cyrill l. cylindrica, Beauv. Lagurus cylindricus, Linn. is the large European form of this plant; Sir W. Munro, Lin. Jl. 6, p. 48. This has a large number of botanical names and has been described by several authors. It is the famous *Ilook* of the Sinhalese, the *Lalang* of Java, *Weri* of Amboina, *Alang-Alang* of the Malays, and is well-known as a great pest in some places. It is common in Ceylon from the sea-coast up to several thousand feet elevation, and in consequence of the great depth to which its underground stems extend, is most difficult to eradicate once it gets into a coffee estate or other cultivated ground. On some of the coconut estates beyond Negombo, it was got rid of by penning cattle over it. It is used for thatch in Ceylon. "It is a native of moist stiff ground, and particularly common in Bengal, where the fields are white with its tall silvery spikes when in flower after the first rains in April and May. Cattle are not fond of it, particularly when old. It is used in the marriage ceremonies of the Telingas. In Bengal it is much used as thatch."—Rox. Fl. Ind. I, pp. 234-235. It is a native of Southern Europe, Northern Africa, Senegal, all India, and Chili.

I would also refer to the report of a Badulla planter, contained in the *Tropical Agriculturist* for May, 1894, where he shows how seven acres of coffee choked by illuk grass and fern were treated with success. First he dug it all over, between the coffee, to a depth of 18 inches, removed the roots and burnt them; and the coffee prospered amazingly thereafter. He had also tried coolies with gunny bags over their hands, to pull out the stems or blades of the illuk and by repeating this weekly, for two months, he exhausted the roots of all nourishment and they then rotted away.

Lastly, I would refer to a statement by a Ceylon planter at present visiting Kuala Lumpur in the Malay States. In a letter to the local "Times" the other day, he says:—"All the country has been opened as far as Kuala Lumpur, but most of it is overgrown with lalang grass—a beast of a weed, something like Ceylon illuk grass, only worse." This reminded me of a paper in the *Tropical Agriculturist* for December, 1887, which reported an experiment that a Java planter near Buitenzorg had got leave to make by erecting machinery for the manufacture of paper from lalang and other grass, paddy straw, etc. The advantages of grass pulp for making certain kinds of paper have long been recognised, especially in France; and Esparto and New Zealand flax, we know, have been so utilised. But I cannot learn of the success of the Buitenzorg experiment or whether the manufactory is now in existence. Our Straits friends in 1887 anticipated a great paper industry to arise from their own extensive fields of Lalang-lalang, one that might perhaps rival the industry in tinned pine-apples, of which as many as 500 cases (each containing 24 tins) were then being sometimes shipped by a single steamer. But since 1887, Rubber has developed and is the chief object of attention now in the Malay Peninsula.

THE "LALANG-LALANG" OR COARSE RANK PRAIRIE GRASS OF MALAYA, BEING A METHOD ADOPTED BY THE TOBACCO PLANTERS OF SUMATRA FOR GETTING RID OF IT OUT OF THE SOIL REQUIRED BY THEM FOR THE CULTIVATION OF OTHER CROPS.

By Frederick Ponsford.

That coarse rank grass known to the Malays as "Lalang-Lalang" is found in every tropical country, state, or island to the southward and eastward of Ceylon. It is met with in islands near Australia and also in most of the Philippine Islands. But in no other island or country does it thrive so well and grow so luxuriantly as it does in the Island of Sumatra, west of Singapore, the seat of culture of that very excellent and extremely fine tobacco leaf which is exclusively used as wrappers or covers for cigars. In that island one sees vast areas, miles upon miles in extent, of the ever verdant "lalang-grass." It grows there so luxuriantly that a man six feet in height in his helmet will be completely hidden from sight when standing in this grass.

The grass, though green, is very coarse and dry, and a smouldering match thrown in the midst of it, fanned by the slightest breath of air, will almost immediately kindle an enormous and truly magnificent prairie fire, before which will hasten, seeking a haven of refuge, wild animals, reptiles and birds of every description; graceful deer, and fat wild pig, will be found running side by side with the tiger and panther; and partridges, pheasants and jungle fowl flying, hopping and running, inter-mingled with the ravenous jungle cat. It is grand, yet it is dangerous; and planters and settlers have to be constantly on the alert both night and day and tax their resources to cope against these prairie fires, which are extremely frequent in the dry season. Such extensive damage do these fires inflict, destroying property, and causing loss of time and money, and great inconvenience to the planters and settlers, that the Dutch Government passed a law enacting six months' rigorous imprisonment for any native wantonly setting fire to this grass.

It is quite a mistaken theory that where this grass grows, the ground must of a necessity be poor; for, on the contrary where there is lalang, you can be sure that the soil is good if not rich. It is a notorious fact that lalang will not grow luxuriantly where the ground is poor, there rather secondary growth jungle takes its place. This fact is too well realized by the tobacco planters and native agriculturists of Sumatra, that they are eager to clear the soil of the noxious grass, and to grow thereon crops of tobacco, rice, mace, or tapioca.

Various methods have been tried to get rid of this most persistent of grasses; one so persistent that the smallest particle of root left in the ground will sprout and grow, and in time will create another large and extensive lalang patch. If one merely burn off the lalang, and then hoe or dig up the roots 4 to 6 inches in depth, once or even twice, and then upon the ground plant and cultivate some other crop, the lalang will grow up side by side with the crop and eventually kill it. The only efficacious remedy for really ridding the soil of this grass was thought to be to dig and turn the ground completely over to 2 or 3 feet in depth according to how far down the lalang roots had penetrated, and then to pick out by hand and to destroy by burning every minute particle of lalang root visible. Now this method, although effectual, was exceedingly costly, so much so as to prohibit its being followed save in very exceptional cases. In the course of time European planters began to think out and practise a scientific method of ridding the soil of this wholly useless, mischievous weed. By observing closely the conditions under which the plant throve, it was found that lalang required good dry soil and any quantity of sun and warmth. It was found that lalang will not thrive on poor soil; it will not thrive upon damp soil; it will not thrive in a swamp; and it will not thrive under shade. Consequently it is never found in the forests, except where the jungle has been extensively cleared by the hill-men for a dry rice or hill-paddy clearing.

Moreover the planters observed that the Malay and other native settlers had a fairly efficacious and comparatively easy method of temporarily getting the better of any lalang surrounding their houses or which grew in their plantations. They did this by the simple process of pressing the lalang flat down on the ground whilst it was in full growth, with the aid of a long bamboo pole upon which one or two men kneeled. They thereby caused the lalang to smother itself and this retarded its growth for a few months. I have witnessed this time after time in my wanderings among the Malay villages. The parent lalang grass flattened down in this way died, and rotted, and caused the land to be temporarily shaded from the sun, so that the new lalang shoots sprouting from the parent stock became too weak and frail to penetrate the thick outer covering of the old grass. Hence, regarding this, and bearing in mind that lalang must have sun, the planters decided upon making use of the lalang itself as a weapon of extermination.

The method thus adopted and which is now in use all over Sumatra is to mow down the lalang by aid of an instrument called by the Malay a "Tajak," which consisted of a sharp heavy blade about four inches broad by 1½ to 2 feet long, with a handle from 4 to 5 feet long sloping at an angle of 45° from the blade upwards when the tool is laid flat upon and parallel with the ground in a position for cutting. This long handle enabled the coolies to use the same constantly without suffering from that universal complaint among Asiatics of "Sakit Pingang" (or pain in the back). The lalang was thus hewn down close to the roots by this tool, and was then gathered up in bundles and carefully laid upon one side; the ground was then dug up or hoed about 4 to 6 inches deep sufficient to turn completely over the thickest part of the lalang root; the implement used for this purpose is a big hoe, called by the Malays a "chunkol" and by the Tamils a "mamoty." It is usually very sharp and heavy and measures from 8 to 10 inches in breadth and is from 10 to 14 inches in length. The Malays and Tamils use a short handle from 2½ to 3 feet long, but the Chinese use a handle from 5 to 6 feet long.

Each coolie is alloted a certain task, which he has to complete for his day's work before he can get a full day's pay. When the ground has been completely hoed over, it is then inspected by the European assistant planter in charge of the gang, and if the work is correct, permission is given to shade the ground with the

lalang grass previously cut. This must be done very carefully, as not a vestige of ground must be visible to the sun's rays, otherwise the lalang will grow again.

The above remedy is very effectual, and is not expensive, and it seldom fails to completely rid the soil of the lalang. The roots that are left in the soil rot, and serve to make the ground more porous and to manure it. The operation should be attended to before the lalang goes to seed. The ground should also be left covered by the lalang for several weeks, and then just before planting one's crop it is well to give the ground another hoe over and to bury the now rotten grass.

I have myself seen very excellent tobacco grown on lalang ground treated after the foregoing method, and it is well known how excessively tobacco takes its richness out of any soil. Again, the tapioca plant is considered by the Malay and Chinese cultivators to be a plant that can effectually combat against the grass if planted in a lalang field treated as above. I have often seen tapioca planted by the natives in the midst of a coconut plantation in order to kill the lalang which had sprung up. But this latter remedy is considered by some to be worse than the disease; for tapioca is said to do a large amount of harm to the palms by way of impoverishing the soil.

KILLING ILLUK BY SUCCESSIVE WEEDINGS.

Mr. W. H. Wright of Mirigama writes to me:—

"In reply to yours I am of opinion that Illuk grass can be got rid of by giving it successive weedings, the first to be a mamoty weeding 6 inches deep. After that, weed it by pulling it up with the hand, seven times successively as the blade grows.' I have done this myself and have seen it done on several estates. The cost of the work will depend on the condition of the estate and the kind of soil in which the Illuk grass grows. It should be easy to root it out after the third weeding."

VARIOUS METHODS FOR KILLING ILLUK.

"Many thanks for sending me the interesting, well-written, and useful paper on the method adopted by the planters of Sumatra for effectually getting rid of that pest, the "Lalang-Lalang" of the Malays, and the "Illuk" of the Sinhalese. I have no doubt that, with the grass growing close and thick and 6 feet high, the method adopted in Sumatra would prove effectual; but it is rare to find such luxuriant growth in Ceylon. At any rate I have only occasionally come across a few patches. Usually the growth is thinner and not more than 4 feet high. Many a sleepless night has the thought of how to get rid of this grass caused me, and I doubt not other planters who have had to do with it. I tried the method of pressing down and rolling the grass, and that checked its growth for a few months. I tried cutting it down with grass knives and thatching the ground with the grass, but as there was not enough of it to cover the ground thickly it was only a partial success.

There is a kind of "Illuk" that grows freely in the Chilaw and Puttalam districts. It rarely exceeds 3 feet in height and has a tendency to fall over. The blades are thick and flaccid, and the roots surely penetrate more than 8 inches. This kind might be effectually dug out for Rs. 25 an acre, provided a sufficient force of men could be got to do the work at the right time.

The writer of the article on "Lalang-Lalang" says that the work should be done before the grass blossoms. I cannot say in how many years it does blossom. Where I have seen it left for quite some years I have never seen it blossom. But if once interfered with, either by cutting down or burning, it at once springs up in blossom; and if this blossom is cut off, another follows within a month, and I think it would go on doing this till it exhausted itself and died. Our good friend, Mr. C. Murray, I see still interests himself in Ceylon, and he deserves thanks for getting us such an interesting letter on a subject of so much importance to all low-country planters."—
WILLIAM JARDINE.

A SIMPLE AND INEXPENSIVE METHOD OF SUPPRESSING AND EXTERMINATING "ILLUK" OVER LARGE AREAS ON COCONUT PLANTATIONS.

Practical coconut planters in Ceylon who have had to contend with this pernicious weed-grass know that *speedy and complete* eradication can only be effected at a cost that is prohibitive. There are but two effectual ways of accomplishing speedy extermination that the writer is acquainted with, and they are both equally expensive:—

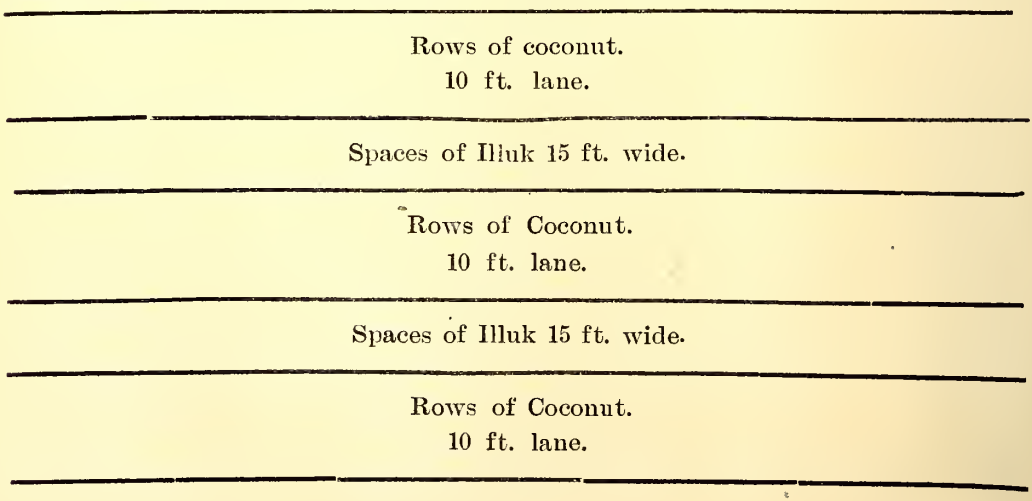
1. To dig and turn the soil completely over the whole of the effected area for rather more than the actual depth the roots have penetrated, and then carefully to pick out by hand every bit of the root and destroy it by fire.

2. To pen herds of cattle for five or six consecutive nights on the illuk in enclosures so compact that the animals cover the ground with their droppings. The latter plan, however, can be carried out only where the coconut palms are so advanced in growth that they cannot be knocked about, or otherwise damaged, by the cattle. Either of these methods will cost from Rs. 40 to Rs. 50 per acre according to the character of the growth of the illuk. The second plan, however, would also considerably enrich the soil, so that a part of the cost would be covered by the manure.

Sickling the illuk with grass knives, or mowing it down with scythes, then ploughing the ground, or digging and turning it up with the mamoty to a depth of 6 or 8 inches, and finally thatching the surface with the weed grass or several layers of coconut husks are effectual remedies, and if they are not quite so quick in their operation, they are certainly less expensive than the two methods previously described.

But unless the ground is completely shaded by a heavy covering success is only partial. The writer has known illuk blades penetrate thin layers of coconut husk when the latter were not carefully laid down. But the difficulty is to get either coconut husk or the illuk grass in sufficient quantity near at hand, as the grass cut on the ground on which it grew seldom suffices to cover it to the required depth, and owing to their bulky nature the carriage of husks for a considerable distance is expensive. On a coconut plantation it is not absolutely necessary for the well-being of the palm that the whole surface of the ground should be perfectly bare of herbage.

When illuk has got a firm hold of the soil and a large area is involved, the simplest and cheapest plan of dealing with it is, in my opinion, to open lanes 10 feet wide along the rows of palms, thus:—



and to keep the lanes clean and free of illuk and other miscellaneous weeds by digging or weeding them as often as may be necessary, but the growth of ordinary grass herbage should be encouraged until a close sward is established. The best way to open lanes where the growth of illuk is strong, is to first sickle it down close to the roots, remove the grass and lay it on the intervening spaces, then dig and turn up the ground to the full depth of a mamoty. If Crotalaria is thickly sown in the lanes immediately after the fast digging it will shade the ground completely and help to suppress the growth of illuk, besides enriching the soil. The improvement effected by such a course of treatment on the condition of young palms which had been previously stunted in growth and almost killed out by illuk was simply marvellous. By the sixth month they begin to make vigorous growth, and in eighteen months they are often far and away finer and bigger plants than those of the same age growing in land free of illuk. By this time the illuk, also, will have disappeared along two-thirds of the lanes and given place to a close sward, and it may be confidently expected that by the end of the second year all the land (in one case over an area of 217 acres) will be absolutely free of illuk. As for the strips of illuk, between the lanes, it soon becomes apparent that confining the weed grass to a space 15 feet wide has the effect of considerably weakening its growth, and it has been further noticed that a climbing plant මදුරු (*Maddu vel.*, Sing.) and a low shrub පුපු (*Pupula.*, Sing.) *Vernonia Zeylanica* (?) were inimical to it; the tendrils of the climber putting down the blades of illuk and the shrub pressing upon it and gradually choking it out. The spread of such friendly weeds should be encouraged, all other "chaddy" growth among the illuk being rooted out, and in less than two years most of the illuk will be killed out, maddu and pupula flourishing in its place: but these weeds are easily got rid of at any time afterwards.

The initial cost of opening 10 ft. lanes averaged in my experience Rs. 8 per acre, and subsequent digging or weeding, and rooting up "chaddy" in the strips of illuk between the lanes Rs. 1 per acre per month, or Rs. 12 per year. The total cost of exterminating illuk by these measures is therefore about Rs. 32 per acre. The writer has had quite 12 years' experience in the treatment of coconut plantations over-run with illuk, and after careful trial of various methods he is of opinion that a simple, less expensive, or better plan of exterminating illuk over large areas on coconut plantations can scarcely be devised than that just described.

GERALD T. NICHOLAS.

Following the reading of the above paper at the meeting of the Board of Agriculture (March 5th), an instructive discussion ensued.

Dr. WILLIS said his experience of the grass in both the countries mentioned had showed him that the grass in Ceylon was hardly worth mentioning in comparison with what it was in parts of Malaya. It was no unusual thing there for one to look round from horizon to horizon and see nothing but thousands of acres over-grown with this grass, which grew in a way we never dreamed of in this country. One method of getting rid of it that had been discovered in the Straits was by mowing. With regular mowing, little by little, other grasses got a footing on the land, which was thus turned into decent pasturage. Referring to a certain estate in the Straits Dr. Willis said he was told that ten years ago it was a mass of illuk grass. It had been mowed regularly, however, with the result that the illuk grass had gradually given way to other grasses. Dr. Willis went on to advise the abolition of the custom of burning illuk, saying that burning did no harm to that grass and did much damage to everything else. If fire was kept away, and mowing resorted to, trees would grow up and the shade would grow over the illuk, causing it to die down.

The Hon. Mr. FERGUSON observed that in cultivated districts, where the coconut plantations were well cared for, illuk was exceedingly rare, because of the cultivation, but he could show Dr. Willis some beautiful coconut plantations into which illuk had unfortunately got, and, as Mr. Jardine, who went back 50 years as a coconut planter, had said, many sleepless nights were spent in thinking how the pest might be got rid of.

Mr. FRANCIS BEVEN said he had seen illuk on good land and poor land, and he thought the only way to get over it was by digging out the roots. It was most difficult indeed to get rid of it once it was established. In the North-Western Province the method was to tie up bullocks to pasture on the grass, and their constant trampling was said to get rid of it in time.

Dr. MARCUS FERNANDO said a method adopted at Kurunegala was to burn off the grass, afterwards allowing the buffaloes to eat the young shoots, and in that economical way 100 acres of illuk had been stamped out.

H. E. THE GOVERNOR mentioned that a planter in Batticaloa had told him that the method adopted by him was to cut lanes in the grass and plant a certain creeper. His Excellency said: I do not know what the result has been. It is over 12 months since I heard of this method. The papers read by Mr. Ferguson have been very valuable, and no doubt they will assist people who are trying to get rid of the pest, especially in the Eastern Province.

The Work of a Local Agricultural Society.

BY J. A. WICKREMERATNE, MUDALIYAR.

This paper deals with the aims and scope of the local Agricultural Society of Telijjawila in the Weligam Korle, and of local societies in general. It includes a brief resumé of the work done. It is necessarily of a prosaic character, devoid of any matters of historical or scientific research. This deficiency perhaps may be made up by the earnestness which, as will be seen, has characterised the work. The Society owes its origin to the suggestion of the Ceylon Agricultural Board. On a persual of the proceedings of that body it will be seen that there was a mandate issued to all headmen to interest themselves in the cause of agriculture; and it also occurred to the headmen themselves that an opportunity was here offered them of signalising their tenure of office by improving the condition of the labouring classes, which would go further towards their social and moral well being than any legislation.

The first public meeting of the residents of the Korle was held on the 3rd January, 1905. A branch Society was formed with the Mudaliyar of the Korle as Vice-Chairman and Hony. Secretary. Fifty-eight members were enrolled, and the annual subscription, which was fixed Rs. 2 a head, was paid on the spot. The number of members has since increased to 123. The objects of the Association, as laid down then, were "to enable the villagers to add to their necessaries of life by the means already at their disposal, to improve the existing methods of cultivation so as to bring better returns, to extend the cultivation of vegetables and other products that form the daily diet of the villagers to such an extent that every villager will not only have enough stock for his own use, but also something to spare for the market, to encourage the cultivation of fruit trees, and introduce new products, and to improve our stock."

To achieve these objects a working Committee was appointed consisting of the nineteen Vidane Arachchies of the Korle, and the Mudaliyar as Hony. Secretary. This Committee meets on the 15th of each month, and in order to keep

more in touch with the class in whose interests these efforts are made, th attendance of not less than ten representative cultivators from each of thes nineteen divisions is secured at these monthly meetings.

On this occasion seed is issued, instructions regarding its cultivation are given, leaflets are distributed, and proceedings of the meetings of the Central Board are explained in the Vernacular, and the details of new proposals are discussed. Experimental gardens have been, and are being, opened in central situations on the high roads to the villages, and in these gardens fruit trees, new products and vegetables, native and English, are being introduced; and whatever is introduced in these village gardens is also distributed to the surrounding villages. These gardens will in a short time be scattered all over the Korle. But except three principal gardens they will be on a smaller scale, more like school gardens.

A proposal has been matured and will soon, it is hoped, be adopted to open seed paddy stores in the Korle for the purpose of giving seed paddy to small holders, who will then be able to borrow seed at 25 per cent. in lieu of the 100 per cent. now levied. To improve the stock two villagers have been trained by the Veterinary Surgeon and equipped, and are now working steadily on certain days in specially appointed places. Between the 17th May and December, 1905, 255 animals have been gelded in ten divisions.

A farm has also been established in a conspicuous situation where useful work is done. The ground is a hundred acres in extent, of which about 40 acres have been utilised already. A part of it has been set apart for housing the cattle belonging to the farm. At a small fee the cattle of the surrounding villages are served by a stud bull supplied from the Government Dairy primarily for raising a stock of our own.

The rest of the ground is being planted up with various kinds of fodder grasses to serve as a pasture land for that part of the Korle, with reservation for a poultry run, already stocked on a small scale with native birds, and for a stock garden where various products are grown. While thus affording every facility for improving the village stock both at the farm and in the villages, and the lessons illustrated by a model farm, we are also providing the material to supply, at no distant date, a superior kind of animal for draught purposes generally, and for working English ploughs which the Society proposes to introduce as tending to obtain, as they did obtain with the primitive ploughs of old, better results in paddy cultivation than by tilling with manual labour. This prospectus of the Society scarcely needs any further explanation. Every villager has now the means of raising all his wants if he will use them. But few do so at present; and the object of our Society is to induce them to do so. A few want persuasion, the majority instruction, and to the latter class belong the large number of idlers who contribute largely to the criminal population of the Korle. We are making provision for both, and in order that these may not be ineffectual, the police officers and constable arachchies who attend the Mudaliyar's office on the 1st day of the month to report on matters criminal are furnished with the details of the previous meeting, and also themselves report on that day any defaulter who has specially been required to do something for himself and has failed. A little reproof generally is all that is wanted. And in this manner I was able to report to the head office, after ten months' work, that cultivations which were peculiar to three divisions of the Korle had been taken up on a larger or smaller scale in all the nineteen divisions.

The cultivation of English vegetables has also been introduced. During the year seeds to the value of nearly 75 rupees have been distributed. The results of the last distribution will soon come under public notice. And I venture to

submit that it will be a gratifying sight of a villager of one of the Northern divisions, who never before had made a garden bed, exhibiting vegetables, both English and native. In this manner either yielding to persuasion, or emulating their betters, or through the hope of mere reward, there are at present in my Korle a small but appreciable number of converts to industrial habits. It is thus within the sphere of every headman to use with excellent effect, in this opportunity offered by the Agricultural Society of Ceylon, his vast influence to make the villager use his opportunities, at present ignored in objectionable pursuits, in a way which he has only to adopt to appreciate. In the introduction of new products the incredulity of the native in the good of anything new to him has to be reckoned with. If, however, he sees the first experiment is successful and remunerative at a minimum cost of labour, he will readily adopt it and will be more ready later on to try other things.

Such a product has been found in ground nuts, which seem to grow anywhere except in damp soil, with varying results indeed, but always remunerative. This with the further inducement of free distribution of seed, was soon in cultivation all over the Korle, and now as a highly remunerative product, yielding according to our experience up to 110 fold, affording with jak and yam another substitute for rice, a cheap substitute for lighting purposes, as well as food for cattle it is already highly popular. Its cultivation may be left to itself.

Our attention is now being given to the cultivation of cotton, and seed is being distributed free. I hope at no distant date to submit a satisfactory report in regard to this cultivation.

The staple industry of the village is paddy cultivation. The same method that obtained in the time of our forefathers obtains now, and the standard of remunerativeness is necessarily the same. No new methods have ever been tried, and in adopting one we were solely guided by the consensus of opinion that we gathered from the discussions at the Central Board in favour of transplanting. Information gleaned from districts where this is a usual method of cultivation with enormous results, has further helped to decide on its adoption, and at present thirty-six fields of uniform area have been dealt with in this manner, the results of which will soon be submitted to public judgment. But the intermediate lessons learnt are so astonishing as compared with previous methods that we have cause to congratulate ourselves for adopting it. The figures I have carefully collected for the purposes of this paper leave no doubt as to what the results will be, and that it will be, where possible, the method of cultivation in the future. The plants of two kurunies of paddy have been found to be enough to transplant an area of twelve kurunies—thus effecting a saving of ten kurunies of seed paddy, and one plant so transplanted has put out on an average fifteen suckers or clusters to the six produced by ordinary sowing. A few cases where fifty to eighty suckers are seen in very rich soil are mentioned merely to show what a soil enriched by artificial means is capable of producing. Measures have been taken to experiment upon a kind of paddy that required only sixty days to come to maturity, to overcome the distress that has been known to occur to small holders who from climatic or other causes get belated in the season. The method of preparation of the soil for cultivation in regard to yield has received careful consideration. It is the general opinion that ploughing even with wooden ploughs, which furrowed the surface only, was attended with better results than tilling with manual labour. How this practice fell into desuetude cannot be definitely ascertained.

The Society is now making arrangements to introduce English ploughs. The only objection that may be raised against them is that the ordinary native

bull will be unequal to the draught which lies not in the weight of the plough, but in the depth of the furrows which it makes, in which lies its superiority over other ploughs and over all other methods of turning up the soil. This, however, is a difficulty overcome by procuring native or other bulls specially of a superior type.

But by far our greatest enterprise is the proposed establishment of a seed paddy store for the purpose of issuing to small holders seed paddy at 25 per cent. in lieu of the 100 per cent. they invariably pay now. Much has been done in the past, and is yet being done to improve paddy cultivation by the construction of new and by the restoration and improvement of moribund irrigation works. These works are lasting monuments of skill, of beneficent administration, and of well spent time and opportunities. They have, as far as our part of the country is concerned, afforded a more regular water supply. They have vastly improved the lot of the extensive land owner, but they have in no measure improved the condition or added to the stock of food of the poor cultivator who, under a system of usury, frequently carries home nothing from his plot or field, and is all the year round in the grip of the paddy lender. It is to remove this blot in village life that this proposal, now mature in all its details, is to be put into operation. The work will be a simple one, involving no expense except the capital required for the initial stock, for the raising of which, without outside help, we have devised plans which have already been submitted to the Central Board.

If anything were wanting to further commend this venture, it is furnished in the universal feeling of satisfaction with which it has been received. These Agricultural Societies are, at least in their early stage, educational bodies, and like all other bodies require that their labours should be submitted to a periodical test of a more or less competitive nature. That test would take the shape of annual shows. The first of such shows, for its own success as well as for the success of others to follow, must be essentially a function. It should draw to it the whole Korle, and there should be some attraction to draw them to it greater than collections of vegetables and grain, of specimens of the various industries, and of hackeries and bulls. I need hardly say what that greater attraction will be, and it is humbly hoped by the inhabitants of the Korle that the occasion would be considered important, although only a village show, for the great in the land to shew their appreciation of it by their presence. If the success of the first show is thus assured I can safely predict, after a long experience in similar matters, that, given a fixed venue and date, all further shows will be not functions but purely business affairs, to which the people will go as they do now to local fairs held yearly. The stimulating effect of these shows cannot too highly be estimated, not only as regards agricultural enterprises, but also as regards various other industries of the Korle as well, to exhibit which every encouragement would be given and they will also afford an opportunity to the local Society of showing that their labours are real and have not been given in vain. They will secure a continuity of our work. The cultivator will every year have something to look forward to, and the Society, whose objects naturally must have in them, like in the case of individuals, some share of selfishness, will have yearly an opportunity of showing advance in their work.

Not the least desirable feature of the show will be that it will afford to the people a holiday in their own Korle that does not involve any expenses of travelling, or a long absence from home. To sum up, it should be the aim, and it is within the scope of all local Societies, to make every villager raise the necessaries of the villager's humble diet table; who would be all the healthier by the freshness of the produce, and the happier by the sense of gratification

of having raised it, and that it has cost no money; (2) to introduce other staple products of food like those which now take the place of rice, for those who cannot at both meals afford the latter luxury; (3) to grow fruits for the market; (4) to avail themselves of the beneficent offers of Government to assist them in the cultivation of cotton and other products; (5) to raise the owners of small holdings from the hand-to-mouth existence in which they now live by freeing them from the hands of the lender; (6) and to improve the village stock and so raise its money value. I would conclude with one word of caution.

It would be a mistake at this early stage to depend solely on the working Committee to inculcate these worthy objects on the villager. I must say to their credit that the success of our work so far has been the wholehearted manner, which has attracted the notice of our Assistant Government Agent, in which the headmen of the Weligam Korle as a body have co-operated with the Secretary. But the Committee being a selection of villagers cannot be quite free from the inertia of the body from which they are drawn. In the distractions, too, of their daily occupations they are apt to forget, or to defer as not being of any urgency, the dissemination of these objects. They are therefore at present supplemented by agents or lecturers, who are specially sent out to each division once a month to speak to the people and inquire from them and examine the progress they are making. The chief Headman and President also have unlimited opportunities of meeting the people on their circuits, and those opportunities should be made the occasions for informal Agricultural Society meetings to repeat the details of the monthly meetings. There is great efficacy in repitition of this kind on the uneducated mind; and opportunity should be taken to inspect humble efforts, however small they may be, to carry out their instructions. Such recognition will often be considered an honour, and would serve as a stimulus.

Working with the machinery above indicated and aided by the school garden, which is a most powerful instrument for disseminating agricultural instruction, Agricultural Societies are bound to succeed in adding to the comforts of the people. They will reduce idleness and thus remove one of the chief causes of village disorder. These are our aims, and they are within the scope of any Society to achieve. They involve much work of a kind, but it is work that should and does afford much pleasure also—all the more so, because with assiduous attention to detail, these Societies will be one of the few uplifting agencies that will bring quiet and prosperity to the country.

EXPERIMENT STATIONS AND AGRICULTURAL INSTRUCTION.

The statement has recently been made that scientists often retard the progress of general and industrial science by their impractical views of practical affairs. The idea was not that investigation should be confined to utilitarian lines, or that research in pure science should be restricted—for what is pure science in one connection becomes applied science in another—but rather that in various lines of research more rapid and surer progress would be made if investigators brought to their work more practical knowledge of its economic relations. This appears to be a reasonable deduction, and there is much evidence to bear it out. Granting that all knowledge is useful, its useful aspects must be brought out, and there must be intelligence in its application.

In olden times men of science recognized that to secure support for their investigations they must "disguise their work under a utilitarian cloak." As time has gone on the world has become more sympathetic toward science and less exacting in its demands to be assured of its immediate application. This is a result

of education and its broadening influence, which has spread by contact to people of all classes; but nevertheless a large body of people continue to distinguish between what to them is theoretical or pure science, and what is applied science. To such, Doctor Jordan's estimate of the value of science that it "lies in its relation to human conduct," and the value of knowledge that it "lies in the use we can make of it," will come as a vindication of a possibly unformulated conviction. As a matter of fact, institutions of research supported by public funds have gained popular support largely because they succeeded in devising helps in economic and utilitarian affairs.

The public expectations of practical results vary somewhat with the character of the investigation and of the institution. In the case of agricultural investigation the expectations have come to run very high, largely as a result of past experience and the confidence which has been inspired in this line of work. The experiment station is an institution for investigation in science as applied to agriculture. It is regarded as a utilitarian institution. Its purpose is the attainment of results which will have a direct application to one of our fundamental industries—direct in the sense that the gulf which often intervenes between abstract research and its application will be bridged over.

Definite practical knowledge is at a higher premium than ever before. The scientist who is carrying out investigations is more and more expected to develop the economic relations of his work. While we are more and more patient in awaiting conclusions, we expect that a definite ultimate aim will be kept constantly in view, which centres about some phase of agricultural production. This will constitute the real purpose of the undertaking, and will distinguish it in general character from research in pure science.

Furthermore, the final results and suggestions must not only be practical in their relations, but they must be practicable as well. Certain practices which might be suggested are not practicable because they cannot be fitted into farm operations, which have to be governed by certain conditions of first importance.

The ability to see clearly the practical bearings of his work and to make its application is not given to every investigator. There are still some evidences of this in our experiment stations, although as a class our station workers possess this ability in probably a greater degree, and are closer in their contact and relations with agricultural practice, than any similar class of workers in the world. The most successful of them have made a study of the farmer's methods and shown a close sympathy with his needs.

We still need in some directions more of intelligent, well-aimed investigation, which will be started right and pursued with a clear purpose to the very end. Our work in some lines is not carefully enough planned. It is fragmentary and not thorough. It needs systematizing, and to have supervision which will stimulate it while giving general direction. This need is enhanced by the division of the men's time between college and station duties, and the interruptions which come from other causes. It is one of the arguments for a director and for a closer organization.

One of the chief criticisms made upon our experiment station work has been the striving to secure practical applications too rapidly, and not giving time enough for the fundamental research on which these applications must rest. It has been asserted that "the proportion of applied science in agriculture is too great in this country," and that "while we do not need fewer workers in applied agricultural science, we do need more workers who would devote themselves to fundamental research"—with an outlook to practical agriculture, doubtless.

No one will dispute the need of more investigation of a fundamental character. The experiment stations themselves have demonstrated this, and their work has led up to it. Before their advent the limitations of our knowledge of agricultural science were not realized, and the gaps which we now perceive were not apparent. As the work has advanced the problems have become more intricate and the call more imperative for systematic and thorough investigation. To realize its importance we have only to remember how the work upon silage preservation was promoted by the discovery of the real nature and cause of the changes, and the influences governing them. Immediately the way was open for more intelligent understanding of the problems. And in cheese making the fundamental investigations which showed the character of the compounds formed, the nature of the changes, and the influence of conditions clarified the whole subject of manufacture and ripening, and simplified the solution of minor problems.

We are approaching the point in a number of departments of the work where there will be much waste of effort and much delay in reaching the final conclusions unless some classic fundamental investigations can be carried out. To enable this will require some relief from the routine of the class room and the laboratory, and from the various forms of extension work. There is a very perceptible movement to free certain of the station experts from heavy teaching duties, which is already affording some measure of relief; but the demands of the farmer's institute upon the station staff show no general diminution.

Last year the station men in forty-three of the United States and Territories took a prominent part in the institute work. This involved three hundred and sixty men, who devoted to it an aggregate of over twenty-six hundred days. In one State alone the station specialist delivered two hundred and twenty-three addresses at institutes and similar farmer's gatherings. This shows a just appreciation of station men as institute workers. They have a message for the farmers, and are in position to give advice upon a wide range of practical questions. This work has increased in diginity and importance, as the great majority of farmers now go to the institutes to be instructed, and these meetings afford opportunity for the oral presentation of the station's work and results. But important as the relation is, it is becoming more and more evident that to a large extent a separate staff of workers will have to be provided for the institutes.

Too much of our work is done under pressure. This applies not only to the experiments themselves, but to the preparation of matter for publication. This seems inevitable under our present system, and where such a mass of material is published, some of it is bound to be immature. But the matter might be much improved by more careful editing and supervision.

The lack of editing impairs the usefulness and effectiveness of these writings, especially in the case of stations where little attention is evidently paid to the matter. In reviewing publications we are not infrequently misled or in doubt as to some important points, owing to the way in which the matter is presented. The data should be carefully computed and compared, and summaries of the more important results given in the clearest manner. A table is a difficult thing for many people to understand, but the difficulties are greatly enhanced if the table is improperly constructed. There is often a feeling that the publications must be the complete record of the station's work, and hence publications are loaded down unduly with the data which adds to the expense of publication and are of interest to only an occasional reader. Ultimately the station's publications should give the permanent record of their work, as far as the important results and application are concerned; but much, if not most, of the data should be retained in the station's unprinted records.

The question may well be asked whether, considering its real purpose, a bulletin should be published for general distribution until it has a definite message to carry. Bulletins which merely record data are very doubtful value to the general public, and hence their publication in large editions is an unnecessary expense. We still have meteorological bulletins, although not as many as formerly, which give only a record of the weather conditions, with no possible means of comparing them with the crop conditions of the season, and no attempt to trace any relationship. We likewise have soil temperatures reported without reference to anything else, so that they can be of very little value to any one except the writer, who presumably has other observations related to them. We have descriptions of flora, though fewer than formerly, which stop just short of the vital point to agriculture; and we have weed studies which give the botanical relation ships, distribution, and habits of the plant, but only an imperfect method of eradication or subjection, if indeed an attempt is made in that direction.

In the preparation of matter for popular distribution the point of view of the reader should be kept constantly in mind. In a weed bulletin, for example, unless it be merely a preliminary warning, the vital thing to the farmer is a method for eradication, and he has a right to expect when he picks up a bulletin that this has been studied in a thorough manner, and will be presented to him along with the more technical part in a clear, straightforward way. To nearly eradicate a weed is only to reduce its quantity, and the partial remedy will be only temporary. Furthermore, the farmer is encouraged to believe a halfway method will do. If the plant reproduces by rootstocks, the scattering joints, if allowed to remain will rapidly produce more rootstocks and seeds and the difficulty will continue, often in more serious form.

Instead of being content with a halfway method, the author should endeavour to work out and present a thorough method of eradicating the pest, even though it involve some added labour on the part of the farmer. If the weed is a sufficiently troublesome pest to command attention it is worth serious study and the attempt should be to prescribe an effective and practicable method of ridding fields of it.

Unfortunately, not all investigators are good writers. They do not have the ability to present what they report in a logical, orderly sequence, so that one can follow clearly step by step and understand without a partial re-reading of the article. This lack of co-ordination is the most serious editorial fault of our station literature, and the inference from it often is the serious one that the writer has not analyzed his subject and coordinated its different parts. The subject is frequently befogged by bringing a side issue into the discussion, and suggestions often lose their force from the manner in which they are presented. Clearness and simplicity of presentation are of far greater importance than form and style, and are especially desirable in publications intended for popular consumption, like the majority of the station bulletins.

There should be some person connected with each station whose business it is to edit the station publications, to read them critically and see that the text and tables are clear and logical. He may not be a special officer, but he should represent the director in this important function. While this work calls for great tact, a discreet and conscientious editor may exert great influence on the character of the literature of a station. This has been demonstrated at several stations where more attention is given to these matters. The investigator should welcome the editor who can suggest some more effective and attractive form for presenting his ideas. The text should be edited for fact as well as for clearness, and in this scrutiny of specialists in a number of lines will often be helpful. It will prevent

narrowness, and will make the bulletin the product of the constructive and critical skill of a number of minds. It were well for every station man to regard the publication of his bulletin as the culmination of his work upon the subject up to that point, the product by which his colleagues and the world will judge him. His real interest lies in that which will endure, will serve as a basis for science, or will at once serve an economic end. And the people's real interest is that the economic relations of scientific work be so clearly developed that their application can be made in everyday affairs.

The exercises connected with the installation of Dr. Edmund James as president of the University of Illinois were of an unusually interesting character, because of the large number of administrative officers and professors connected with foreign and American universities and colleges who were in attendance, the variety and scope of the papers read, and the subjects discussed at the meetings held during the week. . . . . Agriculture, as a subject on which has been based one of the main divisions of the university, and which in recent years has fully shared in the general prosperity of the institution, was given full recognition in the programme of the installation exercises. In his inaugural address, in which great stress was laid on the importance of maintaining the courses of instruction in the university on a high grade and increasing research work, President James used the college of agriculture as an illustration of a university department which had developed so rapidly in number of students that it was evident the day was not far distant when it would be impracticable for the university to care for all the students in agriculture who would come for instruction on the present basis. He was therefore in favour of raising the requirements for entrance to the college of agriculture, and at the same time seeking to provide for the secondary education of thousands of students in special public schools to be established in different parts of the State. . . . . In the response to addresses made by Doctor Colman, the history of the Hatch Act and the consequent development of agricultural education and research in this country were described in outline. In this way attention was drawn to the fact that the National Government, through its Department of Agriculture and Congress, had been largely instrumental in laying the foundations of our present system of agricultural education and research, and had co-operated with the colleges and stations during all the stages of their development. Last year the trustees of Cornell University passed a resolution creating what is virtually a board of visitors for the college of agriculture, composed of representatives of the State and district agricultural societies. The trustees invited each of these societies to send a delegate annually, at the expense of the university, to visit the college of agriculture and make an inspection of its work.

In accordance with this provision, delegates from a large number of these societies visited the college early in October of this year. An opening talk was given by President Schurman, and Director Bailey spoke to the delegates on the purpose for which the college farm should be utilized. A tour was made of the farms, laboratories, and other buildings of the college and the experiment station, and the work was described. The delegates formed a permanent organization, called the New York State Committee for the Promotion of Agricultural Education and Research, adopted a constitution, and elected officers. The president of the State Breeders' Association was elected president of the new organization, the president of the State Fruit Growers' Association was elected secretary, and the secretary of the Western New York Horticultural Society, treasurer.

The committee will meet at the college in October each year. The authorities look for very good results from this organization. It is official and

representative. It will bring all the farmers of the State into more intimate knowledge and touch with the work of the college and station, and will help to give the various agricultural organizations an individual interest in the institution. It is a recognition of the relation of the college of agriculture to the farmers of the State, and of the fact that the college to be most effective should understand and appreciate the agricultural needs, problems, and aims of that class of people.

Professor Bailey's remarks to the delegates upon the purpose of the college farm are of interest as representing the prevailing views of agricultural educators upon this point, and as showing the gradual evolution of ideas which has taken place. The purpose of the farm in connection with collegiate instruction in agriculture has been a fruitful topic of discussion ever since the establishment of agricultural colleges, and the prevalent notion regarding its relation to instruction has undergone many changes.

Professor Bailey presented abstracts of letters bearing upon this point from deans and professors in some of the leading agricultural colleges. The general consensus of opinion was that the college farm should be looked upon as an outdoor laboratory for instruction in those things which require contact with practical things, rather than as a model farm or one for growing maximum crops, or for giving students a large amount of practical training.

"It seems to me," Professor Bailey said, "that we have now come to the final and proper stage or idea, that the college or university farm must be a laboratory. The pattern farm, model farm, commercial farm, and illustration farm are all incidental and secondary to this general purpose. . . . A college farm is a means to an end. The end is the teaching of students; the growing of maximum crops may or may not be the best way of attaining this end. We hope to conduct our farms on the best business principles and in conformity with the very best farm practices; we expect to make them interesting and attractive to students and visitors; nevertheless, the laboratory utilization of these areas is to be our first consideration. If we are not using farms as a means of training men, then we are not using them for pedagogical purposes, and the future will not justify our possession of them."—*Experiment Station Record*, Vol. XVII, November, 1905, No. 3.

The Gampola Agri-Horticultural Exhibition.

I have the honour to report as Judge on Classes 1, 2 and 3 of the Gampola Show, held on 30th and 31st March, 1906.

At the outset it should be remembered that, from a horticultural point of view, no more unsuitable time of the year could have been selected for a show in this district, and the object of holding it now was presumably to avoid clashing with other shows.

Class 1, "Flowering Plants in Pots," &c. was extremely poor, there being only two exhibits, and one award made, which was for fair specimens of Begonias.

Class 2, "Cut Flowers," was somewhat better, but the exhibits were most carelessly labelled by the show clerks. For the 37 prizes offered there were some twelve competitors, and these were chiefly for Roses and Lilies.

Class 3, "Ferns and Foliage Plants in Pots," was very poorly represented, there being only six entries for the 19 prizes offered. These exhibits included, nevertheless, a few well-grown ferns and palms.

H. F. MACMILLAN,
Curator, R.B.G., Peradeniya.

I have the honour to forward the following report on classes IV and V which I judged with Mr. C. Drieberg in the Gampola Agri-Horticultural Show held on the 30th and 31st ultimo :—

Class IV. Fruits.—There was very little competition, and only 14 out of the 36 prizes offered were entered for excluding Sour-sops, Nam-nams, and Tree Tomatoes which were of such poor quality, that no awards were made. I think it may be accounted for by the season for fruit not being until later in the year. The prize winning bunch of Bananas, Mandarin oranges, Kew Pineapples, and Tamarinds were especially fine. An exhibit of excellent Mulberries from Lantana Hill Estate was entered in this class, and awarded a special prize.

Class V. Vegetables.—As in class IV there was practically no competition, and it was disappointing to find only 16 out of the 33 prizes offered entered for. There can be no excuse for this, and one was surprised to find no entries for Lettuce, Peas, Celery, Vegetable Marrow, Radishes, Carrots, Turnips, Artichokes and general Salad vegetables, all of which could very easily be grown in the district. The exhibits of Cabbages, Leeks, Parsnips, Knol-Khol, Beet root, and Pot Herbs were very creditable, and well deserved the prizes awarded. Tomatoes, Cucumbers and Onions should have been of better quality.

It is hoped that at the next show this class will be better filled, produce more competition and show improvement in quality for which there is plenty of room yet.

J. K. NOCK,
Curator, Hakgala Garden.

Class VII. Native Products.—The exhibits were decidedly poor. A brave show of paddy varieties was made by putting the same variety in under several names. One of the best exhibits was that of pepper, which one would think should be more frequently cultivated round Gampola. In a large number of the groups no prizes could be awarded, either because there were no exhibits or because these were of such poor quality. The season of the year must, however, be remembered.

JOHN C. WILLIS,
Director, R.B.G.

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By J. C. Willis.

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THE PROGRESS OF AGRICULTURE IN THE UNITED STATES.

The report of the Secretary of Agriculture of the United States for 1905 departs from the usual form of a progress report for the year, with a result which is unusually interesting. It is noteworthy as being the ninth annual report issued by Secretary Wilson, and owing to this unusual period of service he takes occasion to review some of the more salient features of development which have taken place in his time, and to sum up the progress in a number of new lines. It is therefore a progress report for the past eight years, with such comparisons as are necessary to an understanding of the great change which has been wrought.

Such a review as this is extremely useful as well as interesting, for it will enable the general reader to get a proper perspective of the Department's work, and furnish convincing evidence to legislators and others who are watching the growing appropriations for this branch of the Government. Growth has been so steady that it is necessary to pause and view the Department in retrospect in order to realize the extent and character of the changes which have been involved. The appropriations have more than doubled in the past eight years, although it had required more than forty years to reach the figure they had attained in 1897. This large increase in itself suggests the desirability of a report as to what has been accomplished in the upbuilding of a great Federal Department, and in the promotion of agriculture as a national industry. By anticipating a call for such a showing the Secretary indicates his desire to keep the public fully posted in this respect and to still further strengthen confidence in the Department.

In order that the magnitude of the interests consigned to him, as well as the far-reaching influence of this basal industry upon other industries, may be properly appreciated, Secretary Wilson prefaces his resumé with some striking statistics of agricultural production. He estimates the wealth of production on farms in 1905 at $6,415,000,000, "the highest amount ever attained by the farmer of this or any other country, a stupendous aggregate of results of brain and muscle and machine." This is an increase of thirty-six per cent. over the census figures of six years ago. It is not only sufficient to supply the wants of eighty-three millions of our own people, but last year farm products to the value of $827,000,000 were exported. The enormity of the non-agricultural industries which are directly dependent upon the farmer and his extraordinary productive ability is likewise supported by striking figures.

In a recent address Secretary Wilson said that when he came to the Department he found it necessary to build it up and strengthen it, before he could render the aid he had in mind to the agricultural colleges and experiment stations of the country. One important measure of the extent to which this upbuilding has taken place is found in the personnel of the Department. The total number of persons on the rolls of the Department in 1897 was 2,443, including 925 who were rated as scientists and scientific assistants. Last July there were 5,446 persons on the rolls of the Department, 2,326 of whom were rated as scientists and scientific assistants. These figures show an increase of over 3,000 persons in the total force, and of 1,401 in the scientific staff.

This increase in personnel and in appropriations has naturally gone hand in hand with the development and extension of the Department's work. Taking up the different branches, the Secretary points to some of the more important developments and achievements as indicating the lines along which growth has taken place, and illustrating the methods by which the Department seeks to work for the practical benefit of the farmer. There has been important reorganization, such as bringing together several straggling divisions into a Bureau of Plant Industry; and other lines have been enlarged and strengthened and developed into bureaus.

The work in forestry, for example, which has grown to a position of such recognised importance, may be said to be a product of the past eight years. At the beginning of 1898 the Division of Forestry employed eleven persons, six of whom filled clerical or other subordinate positions. Practically all of its work was office work. The actual introduction of forestry began in 1898, when, with the offer of practical assistance to forest owners in the management of their tracts, "the field of action shifted from the desk to the woods." The growth of interest in forestry, in conservative lumbering, in forest reservations, and in education in

this branch is too familiar to call for comment. Public opinion has undergone a great change, and a sound national sentiment has been created. The large and varied interests dependent upon the forest have been awakened to the urgent need of making provision for the future, and States have been led to enact wise laws and enter upon a well-considered forest policy. The Secretary holds that if the Forest Service had not taken the lead in finding out just how practical rules for conservative lumbering might be laid down and carried out, forestry would not have reached the point at which it now stands in the United States.

The agricultural experiment stations in Alaska, Hawaii, and Porto Rico have been established and placed upon an efficient working basis under the present administration, and the influence and assistance of the Department have thus spread to these remote possessions. The investigations in problems relating to irrigation from an agricultural standpoint, as distinguished from that of engineering, have been inaugurated and organized upon a comprehensive scale. This work has proved so eminently practical and so important to irrigated agriculture that it has grown rapidly in extent and in the scope covered in its studies Out of it have sprung the work in land drainage, which has already demonstrated great possibilities of usefulness, and the still newer investigations upon agricultural machinery, so that there has been created and put into operation a new feature of work covering the whole range of rural engineering, as a highly important division of the Department's activities.

The Weather Bureau has greatly extended the range of its observations and investigation, which has been attended by increasing efficiency and a wider application of its work. It is now said to be the most highly developed weather service in the world. The work in economic entomology has been extended to many new lines of study upon injurious and beneficial insects of the farm, garden, forest, and household, and has been more than doubled in scope, not to mention the extensive scale on which the Bureau has worked in the campaign against the cotton-boll weevil. The soil survey has been entirely developed during the present administration, and constitutes the first systematic attempt to make a comprehensive soil survey of the United States.

The Secretary points to the successful eradiction of the foot-and-mouth disease in New England, and the diverse efforts which have been made to offset the evils of the cotton-boll weevil in the Southern States, both prosecuted with special appropriations for the purpose. In the latter connection, as well as independent of it, the breeding and selection of plants and varieties better adapted to special conditions or uses has been a conspicuous feature; and closely related to it is the introduction of plants from foreign countries. In 1898 Secretary Wilson secured authority to use a small portion of the Congressional seed fund for agricultural exploration, which has resulted in extensive introduction of seed and plants which have been tested the country over. The largest collection of date palm varieties in the world has been secured in this way, and several important cereal introductions have been made, such as durum or macaroni wheat, the Spanish select oat, and the Sixty-day oat. Durum wheat was first introduced from Russia in the spring of 1899. It is estimated that from twelve to fifteen million bushels of this wheat were grown this year in the three States of North Dakota, South Dakota, Minnesota, and that the crop in other sections of the country will bring the production up to twenty million bushels for the entire country. This wheat has evidently passed the experimental stage and is now an established crop in a considerable number of the semi arid States.

Referring to the propaganda for sugar-beet culture, inaugurated soon after the present Secretary came to the Department, and the widespread tests of its

adaptation to different parts of the country, this industry is pointed to as one which has become well established in favoured localities, whose farming side has been greatly benefited by scientific investigation. In 1897 there were but nine beet-sugar factories in the country, with a combined output of thirty thousand short tons of sugar; the estimated output for 1905 is two hundred and eighty thousand short tons. Similarly, rice culture in the Southern States, especially Louisiana and Texas, has been exploited and encouraged by the introduction of Japanese varieties, and has grown very greatly in extent.

In addition to the important investigations of the Bureau of Animal Industry on contagious diseases of animals and their means of control, the meat inspection in its charge has steadily increased. Upon this work depends in very large degree a foreign trade worth millions of dollars yearly to American stock raisers. This year the inspection covered sixty-six million live animals before slaughter, and over forty million carcases after slaughter, representing an increase in this work of about 33⅓ per cent. in the past eight years. The inspection work has also been extended to other food products intended for export, and to all foods imported into the United States, for which purpose branch laboratories of the Bureau of Chemistry have been established in the Ports of New York, Boston, Philadelphia, New Orleans, San Francisco, and Chicago. A system of food standards has also been worked out as a basis for guidance in Federal, State, and municipal food inspection.

And so on throughout the report. Taking up the work of the different bureaus and divisions, the Secretary points out the more important lines of development, and enumerates the many lines in which investigations have been prosecuted with practical application to American agriculture. The showing is indeed a gratifying one. The presentation is clear and direct, and affirms how definite has been the aim in the development of the Department's work along the various lines of activity. No one can read the report without a fuller appreciation of the extent and the ramifications of the Department, and of the very many ways in which it is serving the farming public and contributing to the general welfare of the country. It is as broad in its sympathies as the relationships of the industry it stands for, and no legitimate interest within its scope will fail to awake a responsive chord when it appeals to the Department for aid.

But the very breadth and diversity of the interests concerned suggest that the Department cannot be sufficient unto itself, and the Secretary is not unmindful of the other agencies which have contributed in such an important degree to this great work. He makes appreciative acknowledgment of the services of the agricultural experiment stations as co-operative agencies, and of their importance from both a local and a national standpoint.

The Secretary outlines as the twofold object of the Department that of adding to the sum of intelligence of the man, and increasing the productive capacity of the acre, and he adds that, "in this important work it has the hearty co-operation of the State agricultural colleges and experiment stations, all of them working with the Department of Agriculture towards the same great end." By means of the close relations which have existed "the range and effectiveness of many agricultural investigations have been enlarged, and it has been possible to bring the Department's work into vital touch with agricultural industries and agricultural people. . . Not only have the stations been a vital factor in making the Department's work more effective, but they have by their own investigations lifted American agriculture to a higher plane."

Furthermore, the Department and the Experiment stations are "gathering the materials which will constitute the future of education in agriculture, and the permanent impression which their work will make on agricultural practice will be largely determined by their success in incorporating the results which they obtain in courses of instruction to be given the youth in agricultural colleges and schools." These are, after all, the most important considerations, for they are the most abiding and will have the greatest permanent influence in elevating and improving American agriculture in the broadest sense.

Secretary Wilson declares his purpose to render all the assistance to the stations which the Department can give them, but he recognizes that something more is required for further development along their own particular lines of endeavour. He accordingly indorses their appeal to Congress for increased appropriation in the following language: "In the increasing demand for more light on agricultural practices and the growing interest in rural life generally, the stations must have the means for meeting these demands. It is hoped that Congress will recognize this need, as it is already being recognized by some of the States themselves. There is no direction in which public moneys can be appropriated that will bring more certain and lasting returns than in helping the State Experiment Stations to do more research work."—*U. S. Department of Agriculture, Experiment Station Record*, December, 1905, Vol. XVII., No. 4.

Correspondenc .

CALATHEA ALLOUYA OR "TOPEE TAMPO."

SIR,—In your December number of the *Tropical Agriculturist* Mr. Macmillan is good enough to give us the results of his experience in treatment of the West Indian "Topee Tampo" or *Calathea allouya*. As the person who is responsible for the distribution to Ceylon and elsewhere of this plant, I may perhaps be allowed to point out that for some reason or other it does not appear to possess the same qualities after cultivation in Ceylon that it shows in its native wilds. It may be that the efforts of the Ceylon "Boy" cook have had something to do with the matter. Instead of boiling for two or three hours—30 to 45 minutes suffices in the West Indies, and the water in which they are boiled is well salted. With us so treated the tubers in reality possess the "agreeably nutty flavour" previously described, but if they have been boiled for two hours or more as described in the article, it is not at all surprising that they should want the qualities which recommend them in the western world. Of course "what's one man's meat, is another man's poison" has its force all over the world. And I cannot believe that Ceylon is the exception, and they may not in any case suit Ceylon taste. The fact remains, however, that in Trinidad markets the vegetable finds a place, is readily sold in bundles in a cooked state, and is as readily eaten by the peasantry, to whom it has come down as a legacy from the former Carib inhabitants.

The vegetable is one which should be eaten by itself rather than in conjunction with other food, and not with meat as a substitute for potatoes but as a nutty relish at any time of the day, as one would eat a filbert; and even the wine which so often accompanies the table nuts may be used with it to considerable advantage in the opinion of *non* abstainers.

That it does not merit consignment to the limbo of the forgotten is proved with us by its widespread cultivation and its sale in our markets,

That it cannot be considered a first-class vegetable goes without discussion; but that it deserves further trial in Ceylon is, I think, proved by the admitted treatment "*two or three hours' boiling*" to which it has been subjected in the East; and its continued presence with us in the face of abundant supplies of Potatoes, Yams and Tannias &c. which are here produced is further evidence of its value.

(Signed) J. H. HART, F.L.S.

Botanical Department, Trinidad, 5th February.

ANONA PALUSTRIS.

DEAR SIR,—In a recent number of the "*T.A.*" I saw the *Anona palustris* described as a non-edible fruit. I bought seed, and have now a lot of young plants growing, under the impression that it was an edible fruit. Can you tell me if it has any use, as, if not, I may as well root up the plants. I have also some young plants of *Garcinia xanthochymus* (Cochin Goraka) and Sapodilla ready to plant out. Can you tell me whether they require to be planted under shade or not?

Yours faithfully,

GEORGE WYLIE.

Delagoa Bay, E. Africa, 3rd February.

[The fruit of *Anona palustris* is, so far as I know, nowhere considered edible. Although it has been grown here for some years I have not known of anybody developing a taste for it. It is said to contain a narcotic principle, and in the West Indies is known as the "Alligator Apple." Cochin-goraka (*Garcinia xanthochymus*) and Sapodilla (*Achras sapota*) are all the better for moderate shade during the first few years of their growth, after which it should be gradually reduced and dispensed with; mature trees do not require shade.—H. F. MACMILLAN, Curator, Peradeniya.]

The Ceylon Board of Agriculture.

The Eighteenth Meeting of the Board of Agriculture was held at the Council Chamber at 12 o'clock on Monday, April 2nd, 1906.

His Excellency the Governor presided.

There were also present the Hon'ble Messrs. H. C. Nicolle and H. L. Crawford, Messrs. J. Harward, W. D. Gibbon, H. T. S. Ward, M. Kelway Bamber, Herbert Wright, G. W. Sturgess, Drs. Willis and H. M. Fernando, and the Secretary.

As Visitors:—Messrs. M. Suppramaniam and A. B. Jayasuriya.

BUSINESS DONE.

1. The minutes of the previous meeting were read and confirmed.

2. A list of applicants for membership was read, and they were declared duly elected.

3. Progress Report No. XVII was circulated.

4. A paper on "The Citronella Oil Industry in Ceylon," by Mr. B. Samaraweera of Weligama, was read by Mr. A. B. Jayasuriya. Mr. Herbert Wright read a report on the experiments made with Citronella at the Government Experiment Station at Peradeniya, and the reports received on samples of oil sent to England. Samples were circulated. His Excellency and Dr. Willis spoke on the subject.

5. Dr. Willis moved "That the Society offer a Gold Medal or a prize of the value of Rs. 100 to the Local Society which exhibits the best collection of samples of native products at the Colombo Agri-Horticultural Show to be held on June 22nd

and 23rd—the products to be of a kind which will permit of their being exported to England—all collections to be sent to the Imperial Institute. In awarding the prize allowance to be made for the conditions—climatic, etc.—of the different districts competing." The Hon'ble Mr. H. L. Crawford seconded. Dr. Willis stated that each sample should be at least 3 to 5 lbs. in weight. Dr. Willis was requested to draw up a Circular to be sent out to each Local Society. The motion was carried.

6. Mr. J. Harward moved "That the Society take steps to erect and equip a seed store at the Government Stock Garden at a cost not to exceed Rs. 1,000." It was decided to apply to Government to meet the cost of the seed store from General Revenue, and the words "at a cost not to exceed Rs. 1,000" were omitted from the motion with the consent of Mr. Harward. The motion as amended was seconded by Dr. Fernando and carried.

7. Dr. Willis read a report by Mr. J. K. Nock on the Weligama Show. Mr. G. W. Sturgess, Government Veterinary Surgeon, read a report on the Live Stock Exhibits at the Show.

8. His Excellency spoke on the subject of a Tobacco Expert, and stated that Mr. Kelway Bamber would assist the Society with the information obtained by him in Sumatra.

The Meeting terminated at 1·25 p.m.

Agricultural Society Progress Report. XVIII.

There are now 1,073 members of the Ceylon Agricultural Society, being an increase of 26 since the last meeting. All members joining now are sent back publications from November last.

Local Societies.—Since the last Meeting of the Board I have visited the Branch Societies at Balangoda, Ratnapura, Kuruwiti korale, and Badulla, and held meetings at Passara and Welimada, where new Branches have been formed.

At *Balangoda* it was decided to hold a Fair on a market day later in the year; prizes to be offered for fruits and vegetables. The Branch has now over 80 members, an increase of 40 during the past six weeks.

Mr. S. D. Mahawalatenna has kindly promised to allow his garden at Balangoda to be open to the public as an experimental garden, on the side walks being cleared and vegetables planted by the Local Society, who will take the produce from the new plots opened. There is now a very good flower garden on the land, with many varieties of plants imported from Australia and India.

The Balangoda Branch has undertaken to arrange for a demonstration in castration.

The *Ratnapura Branch* has done very little up to date. A paper was read at the meeting by Mr. Attygalle Mudaliyar on his experiments with Kiushu paddy. Some new members joined the Branch, and it is hoped that more work will now be done. It was agreed to arrange for a castration demonstration and to open an experimental garden. To do this the membership of the Branch must be considerably increased, and steps are being taken for the purpose.

At *Pussella*, the centre of the Kuruwiti korale, there was a number of villagers present.

The *Kuruwiti Korale Branch* has only very recently been affiliated with the Parent Society. The Ratemahatmaya reports that it was difficult to get members to join, as the villagers were unwilling to pay in subscriptions. It was decided at the meeting to make it a rule of membership that each member should

undertake to carry out an experiment, the choice of the experiment to rest with the experimentalist; all experiments to be registered by the Secretary of the Braneh. Members would be required to attend at the Branch meetings and report results. Failure to carry out their experiments to involve loss of membership.

Members undertaking to earry out experiments to be exempt from payment of subscription. Thirty-two members joined, twenty-two of whom gave a donation to the Branch, in addition to undertaking an experiment. Rs. 11·25 was paid in donations. There was a large number of applications for seeds, espeeially for chillies and yams, which have been sent to the Braneh. With very few exceptions, all the members are villagers with small holdings. The experiments to be made are principally in opening up vegetable gardens.

The meeting at *Badulla* was held on the day following the Agricultural Show, and was attended by many of the leading planters of the district. A paper was read on the "Propagation of Plants" by Mr. J. K. Nock, and a Progress Report by the Secretary of the Branch showing what steps had been taken to hold castration demonstrations and distribute seed.

At *Passara*, with the assistance of Mr. James Duncan, Capt. H. Gordon and the Ratemahatmaya of Yatikinda, a Branch was started on the same lines as the Kuruwiti Korale Society. Twenty-three working members joined; seeds were distributed, and applieations for a further supply reeeived.

At *Welimada* there was a very good attendance at the village school which won the First Prize for its garden at the Badulla Show.

The Branch was very recently started, and with the additional members who joined after the meeting it has a membership of 28—all "working" members—that is to say, members undertaking to carry out experiments or pay subscriptions.

Rs. 75·50 were promised at the meeting in prizes for the best cotton, sugarcane, chillies, pumpkins, onions, potatoes, tobacco, and manioca grown in the distriet, for the best native vegetable garden, and for the best cultivation in a paddy field in whieh it was not possible to raise a crop of paddy. There were thirteen applieations for seed. It was decided to affiliate the Branch with the Parent Society.

At a meeting held at Teldeniya on the 3rd April it was decided to start a Branch of the Agrieultural Society for the *Dumbara District.*

The *Delft Branch* of the Society has decided to plant cotton on a large scale in Delft.

The *Katunayaka Branch* decided to offer two prizes of Rs. 10 and Rs. 5 for the best crop raised from sixty-days paddy. Twenty-five bushels were procured by Mr. A. E. Rajapakse, Muhandiram, Chairman of the Branch, who distributed it among the villages, half a bushel to each applicant.

The *Telijjawila* (Weligam Korale) Branch has decided to open up fruit gardens. Seven Vidane-Arachchies agreed to start gardens with thirty plants in each garden, five plants of each of the following six kinds:—Loquats, Rata Karapincha, Chinese Guava, Star Apple, Hog Apple, and Sapodilla.

It was further decided to purchase Rs. 30 worth of vegetable seeds and to hold a small Vegetable Show at the end of the year.

The Mudaliyar has procured three boxes of French *mushroom* spawn for members of this Branch, as there is a considerable demand for better varieties of mushroom in this district. Results will be reported in June.

The Agricultural Education and Publications Committee held a meeting this morning to consider the cost of the "Tropical Agriculturist and Magazine of the Ceylon Agricultural Society," and the continuance of the vote to the Mahawalatenne Garden.

The Hon. Messrs. H. L. Crawford and P. Arunachalam have joined this Committee. Mr. R. B. Strickland, Acting Director of Public Instruction, takes Mr. Harward's place as Chairman of this Committee.

Agricultural Shows.—Since the last meeting of the Board Shows have been held at Nuwara Eliya on the 17th and 18th April, and at Badulla on 7th and 8th May. A Market Show was held at Minuwangoda on the 7th April.

Reports on this Show and on the Gampola and Nuwara Eliya Shows are tabled to-day. The Nuwara Eliya Show was probably one of the best shows of flowers and imported live stock held in Ceylon.

Mr. C. Drieberg, who visited the Minuwangoda Market Show—one of the first, if not the first, of its kind held—reports that "as a first beginning the Show was decidedly promising. The collections of vegetables were nearly all good. Many of the vegetables were specially fine specimens, such as snakegourds, bandakkai, vetakolu (luffa), long beans (vigna), and chillies." The prizes, which amounted to Rs. 105, were all awarded by members of the Local Branch. The success of the Show was largely due to the efforts of Mr. J. E. de Silva, President, and Mr. A. Namasivayam, Secretary of the Branch.

The *Kegalla Branch* has decided to postpone the Show originally fixed for 6th and 7th July, on account of the heavy drought in the district. The final dates have not yet been fixed.

An excellent exhibit of flowering plants and specimens of disease on plants, &c., was made by the Royal Botanic Gardens at the *Nuwara Eliya Show.* One of the Assistants at Hakgala was sent to this Show to instruct exhibitors in the vernacular and to explain any cultivations shown.

The attention of Local Branches is invited to the prize of Rs. 100 (or a Gold Medal) offered by the Society to the Local Branch making the best exhibit of samples of native products grown in its district at the Colombo Show on 22nd and 23rd June. Samples should be five pounds in weight, and should be well dried Samples of paddy need not be more than 2 or 2½ pounds. Allowance will be made in making the awards for the climatic condition, &c., of the different districts competing.

It is proposed to hold Agri-Horticultural Shows at Kandy and Teldeniya in 1907.

Cotton.—Messrs. Nieland & Wilson of the "Times" Buildings, the Fort, Colombo, undertake to purchase any cotton sent in to them, and to supply Sea Island cotton seed free. There will be a supply of this seed available later at Maha Illuppalama, which can be sent free to any member of this Society.

Reports of successful experiments with cotton in the North-Western Province, at Balangoda, and in the Udakindapalata of Uva have been received by this Society.

Ground Nuts.—Messrs. Freudenberg & Co. have applied for quotations for 10 tons ground nuts with their shells on and 10 tons without shells. The attention of Local Societies and individual members have been invited to this request. It is most important that a local market be found for this cultivation, which, as regards yield, has been found to do very well in different parts of the Island.

Soy or Soya Beans.—A supply of ½ cwt. of Soy beans has been received from the Botanic Gardens, Singapore, and sent to the Telijjawila Branch, which applied early for this variety.

Avocado Pears.—The United States of America, Department of Agriculture, has promised to forward early a supply of good varieties of Avocadoes for planting.

Improved Agricultural Implements from India.—A number of orders for these implements have been received. It may be useful to state here the implements to be procured :—

Cawnpore Model Plough, wooden. Cost Rs. 1·75
Cawnpore Model Plough, iron. Cost Rs. 7·25
} Light. Both can be drawn by a pair of ordinary bullocks ; leaves no intervals of untilled land between furrows.

Improved Common Plough. Cost Re. 1·06. Nearly as useful as No. 1. Digs land twice as deep as the common, obviating the necessity of second ploughing.

"Nolla," for levelling land. Cost Rs. 2·06.

"Gorru," seed drill. Cost Rs. 2·50.

"Guntaka," weeder. Cost Rs. 3·81.

"Papita," for covering seeds with earth. Cost Rs. 3·81.

Vegetables.—Seeds of the following varieties have been imported by the Society. A list is being sent to all Local Branches and Members of the Society. Applications should be made to me as early as possible :—

Peas	Leek	Knol-Kohl or Kohl-Rabi	Amaranthus
Beans	Radish	Cucumber	Kale
Spinach	Cress	Melon	Cauliflower
Onion	Turnip	Swiss Chard	Egg Plant or Brinjal
Carrot	Broccoli	Brussels Sprouts	Tomato
Beet	Gourd	Endive	Mustard
Cabbage	Parsley	Indian Corn	Okra or Bandakka
Lettuce	Capsicum	Cowpea	Long Bean (me)
Celery	Chili		Snake gourd
Parsnip			

Cost 10 cents a packet. Applications from Local Branches will receive the first attention.

Castration.—Demonstrations have been arranged for in the Trincomalee District (6); in the North-Central Province (13); in the Central Province (1); and in the North-Western Province (5).

Publications, &c.—A leaflet on *Dhall* by Mr. C. Drieberg has been issued by the Society in English, Sinhalese, and Tamil. Leaflets on "Tobacco Cultivation," "Manioc," "Transplanting in Paddy Cultivation," and "Method of Taking Samples of Soil" are with the Government Printer.

The Editor of the "Dinakaraprakasa" has kindly sent 100 copies of two editions of his paper containing the proceedings of the last meeting of the Board in Sinhalese, which have been circulated to Local Societies.

E. B. DENHAM,
Secretary, Ceylon Agricultural Society.

May 14, 1906.

Errata.

THE CEYLON CITRONELLA OIL INDUSTRY.—The article under this heading on page 283 is by Mr. B. Samaraweera, not by Mr. A. Jayasuriya, as printed. In the writer's absence the paper was read by Mr. Jayasuriya at the meeting of the Board of Agriculture.

ENTOMOLOGICAL NOTES.—In Mr. E. Ernest Green's notes on page 300 in line 38, paragraph commencing "Large numbers of a handsome bronze-green Buprestid beetle . . ." for *Psiloptera fortuosa* read *Psiloptera fastuosa*.

THE CEYLON RUBBER EXHIBITION.

List of Prizes and How to win Them.

(Reprinted from the "Ceylon Observer" June 19.)

We published last week a series of special article on the Prize List of the Ceylon Rubber Exhibition, giving explanations and comments on the various subjects for which prizes are offered. These will no doubt prove useful to planters. Most planters in Ceylon, the Straits and India have now obtained a copy of our second edition of Mr Herbert Wright's "*Hevea brasiliensis.*" In order to help exhibitors at the forthcoming exhibition we have drawn up a list of most of the prizes and the reference pages where information of value of the subject is given in the edition just published. Those planters who have not obtained copies should do so at once and read up the portions indicated opposite the classes in which they wish to enter exhibits.

List of Prizes and How to win them.

Prizes offered for :—	Useful or explanatory reference in the Second edition of "Hevea brasiliensis." PAGES.
1 Para Rubber "biscuits" ..	123, 124, 109, 142
2 Para Rubber "sheet" ..	142, 144
3 Para Rubber "crêpe" or "lace" ..	143, 144, 129, 131—133, 142
4 Para Rubber "worm," "flake, block" or any other form ..	144, 143
5 Para Rubber "scrap" ..	133, 144
6 Castilloa Rubber "biscuits"	76, 124, 125
7 Castilloa Rubber "sheet" ..	
8 Castilloa Rubber of any other form (excluding "scrap") ..	76, 124, 125
9 Ceara Rubber "biscuits"	125, 130
10 Ceara Rubber "sheet"	
11 Ceara Rubber of any other form (excluding "scrap")	
13 Rambong Rubber ..	126
13 The best collection of Rubber other than those given above	137—144
14 The best commercial sample of Rubber in the Show (open to all exhibitors) ..	137—144

COLLECTING AND COAGULATING APPARATUS.

1 Best instrument or series of instruments for tapping Para Rubber trees:	51, 52 53
(*a*) paring ..	54
(*b*) pricking ..	
2 Best instrument or series of instruments for tapping Castilloa trees ..	55
3 Best instrument or series of instruments for tapping Ceara trees ..	56 and 57
4 Best instrument or series of instruments for tapping Rambong trees ..	56 and 75
5 Best instrument or apparatus for tapping high parts of trees ..	54, 74
6 Best apparatus or method for assisting the flow of latex from Rubber trees	65, 66
7 Best apparatus or method for centralising the latex from separate trees ..	63, 64, 65
8 Best apparatus or method for storing latex in a good and uniform condition before coagulation ..	66
9 Best sample of preserved liquid latex of not less than 4 gallons ..	65-67
10 Best apparatus or method for determining the amount of acid required for coagulating latex ..	100, 110, 112, 114
11 Best method of coagulating latex to marketable Rubber, whether by acid, by decay, by smoking, or otherwise	108-118, 137-144
12 Best apparatus or method for removing mechanical impurities in freshly coagulated Rubber ..	129-133
13 Best apparatus or method for expelling water from freshly coagulated Rubber	133, 119-122
14 Best apparatus or method for preventing putrefaction of Rubber	106, 114, 115, 153, 154.
15 Best apparatus or method for drying Rubber ..	119-122, 133
16 Best apparatus or method for recovering Rubber from bark shavings ..	99
17 Best macerating machine for obtaining Rubber from twigs, leaves, or prunings of Rubber plants ..	99, 129-131
18 Best Rubber-washing machine ..	129-131
19 Best appratus or method for protecting the tree during tapping operations	64
20 Best model of curing house or curing apparatus ..	119-122
21 Best mothod of packing Rubber for export ..	141
22 Best method of testing resiliency and other qualities of prepared Rubber	137-141
23 Best and most promising method of vulcanising, hardening, or colouring Rubber ..	134, 135, 136
24 Best machine for uprooting stumps of trees	151, 152, 153
25 Best method of destroying stumps of trees	