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BIOLOGICAL CONTROL OF THE PRICKLY-PEAR PEST.

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It was stated a few years ago that the estimated area of prickly-pear infested land in Eastern Australia was over 22,000,000 acres, about 20,000,000 being in this State and the remainder in New South Wales. It was pointed out that this area was one-third more than the total area under crops (including fruits of all kinds) in the whole of Australia, and that this immense total was being increased at the rate of about 1,000,000 acres annually in Queensland alone.(1)

Attempts have been made to control the pest by legislation; by mechanical methods; by chemical means; and, to a very slight extent, by biological agencies. Of these, the most effective, so far, has been the chemical method, which has been thoroughly tested in this State, especially by Mr. Brünnich and Dr. White-Haney.(2) It is known that certain combinations of arsenic are highly poisonous when applied in the form of a gas or vapour, as injections, or as sprays; but the cost of labour and material is commonly too great for these chemical methods to be economical, since the expense incurred in clearing infested land is very frequently greater than the value of such land when cleared. Even if an area be once freed from prickly-pear by such means, a considerable amount of time and money must be expended each year if such land is to be preserved from fresh infestation.

The biological method of attacking the problem, which has not yet been given a fair trial, necessitates a study of the plants themselves, and especially of the various natural enemies known to infest prickly-pear and other cactus plants in various parts of the world. Many such enemies are now known to occur, some of them being insects; others are fungi, and others are bacteria. Amongst the insects are included several kinds of moths which in their caterpillar stage bore into and feed upon the plant tissues: certain beetles, such as the cactus longicorns and weevils; cactus bugs

(1) "The Prickly Pear in Australia," by W. B. Alexander. Bulletin 12, Institute of Science and Industry, 1919.

(2) "Reports of the Prickly Pear Experimental Station, Dulacca," by Dr. Jean White-Haney—In Ann. Reports, Dept. Lands, Queensland, for 1912, 1913, 1914, 1915.

and the various forms of cochineal insects; sundry species of flies, including the cactus midges and many kinds of scavengers whose larvæ live in and assist in destroying injured and diseased plant tissues.

The Queensland Government in 1912 appointed a Travelling Commission, consisting of Mr. Henry Tryon (Government Entomologist) and the writer, to visit various countries of the world, in which prickly-pear plants occur either indigenously or in a naturalised state, in order to study the possibility of utilising biological means for the subjugation of the pest. As a result of its inquiry, the Commission recommended that certain of these enemies, known to be restricted to cactaceous plants, should be introduced, and their efficacy tested in Australia.(3)

Certain of these were actually sent or brought from abroad by the Commission, viz.:—the true cochineal, *Coccus cacti* (*Dactylopius coccus*), and one kind of wild cochineal, *Coccus capensis*, both from Cape Colony; another kind of wild cochineal, *Coccus indicus*, from Ceylon and from Northern India; a moth borer, *Zophodia cactorum*, from the Argentine Republic; and a fungus disease, "Shot hole" or Anthracnose, caused by *Glœosporium lunatum*. Only two of these agents became established in Queensland—viz., *Coccus indicus* and *Coccus capensis* (4)—both of which, unfortunately, restrict their attentions to one kind of prickly-pear, *Opuntia monacantha*, the attack by *C. indicus* being particularly injurious to that plant. In fact, the introduction of this insect has been so successful that the "*Monacantha*" pear has been practically eliminated in all districts where the wild cochineal has been able to obtain access to it. Instead of adapting itself to other kinds of cactaceous plants naturalised in Queensland, the organism, after destroying its favourite food-plant, dies. As this particular kind of insect attacks a species of prickly-pear native to certain parts of South America, Southern Brazil, and the adjacent parts of Argentine and Uruguay, and does not infest any of the other species naturalised in our continent—species whose original homes are Mexico, West Indies, and the neighbouring coasts of U.S.A.—it is reasonable to assume that the native home of the insect may be some South American locality. In fact, one species has been described under the name of *Coccus argentinus*, from the Argentine, where the writer has seen it infesting various species of cacti. It is not unlikely that the two names may be synonymous. It is known in animal parasitology that when a host animal and its parasite are imperfectly adapted to each other the latter may sometimes produce effects so virulent as to destroy the host, whereas related parasites may cause comparatively little inconvenience. It is, then, possible that *Coccus indicus* may not be a normal parasite of *Opuntia monacantha*, but may infest some other South American species of prickly-pears and cause much less damage than that noted as having been brought about in India, Ceylon, South Africa and Queensland by the attacks of this insect on "*monacantha*" pear.

The success which attended this introduction led the Commonwealth Institute of Science and Industry to approach the Governments of the Commonwealth, New South Wales and Queensland with a request that funds be set aside to allow the other biological recommendations of the Travelling Commission to be tested in accordance with a scheme of investigation drawn up by the Institute. The war hindered the progress of negotiations, but eventually co-operation was secured, and the writer was asked to undertake control of the scientific side of the investigation.

The scheme came into operation officially in June, 1920; and a visit was made to North and South America, assistants selected for the work in those two continents, and all arrangements made in regard to laboratory accommodation and assistance in the various centres proposed to be explored, as well as for the collection and transit of desired material, &c.

Some natural enemies were brought across from South America by the writer, the chief being two disease-producing fungi (*Sclerotinia cactacearum*, *Montagnella opuntiarum*), and a certain species of Syrphid fly which breeds in great numbers in injured or diseased prickly-pear joints and brings about their rapid destruction. Unfortunately, the flies which bred out readily from the larvæ that were imported, failed to breed, and, having now all died, the introduction has not led to their establishment in this continent. The fungi are being experimented with under laboratory conditions. Both of them are very important prickly-pear destroyers in Argentina, from the Andes to the Atlantic Coast.

Recently a consignment of cactus insects and disease-producing germs (both fungoid and bacterial) arrived from Southern Florida and Texas, chiefly from the former locality, where they were collected or bred by one of the writer's staff (Mr. J. C. Hamlin). Included in the collection were the following organisms:—(1)

(3) "Report of the Prickly Pear Travelling Commission, 1912-1914," by T. Harvey Johnston and Henry Tryon. Parliamentary Report, 1914.

(4) Dr. White-Haney, *l.c.*, 1914 (1915) and 1915 (1916). T. H. Johnston, Proc. Royal Soc. Queensland, 1916, pages 22-25.

Cactus moth-borers (*Melitara prodenialis*); (2) cactus weevils (*Gerstæckeria hubbardi, G. nobilis, G. porosa, G. clathrata, G. basalis*, the first from Florida and the remaining species from Texas); (3) cactus bugs (*Chelinidea vittigera* from Texas, *Chelinidea* sp. from Florida); (4) wild cochineal insects, one or two kinds from Florida and Texas); (5) three or four different kinds of scavenging flies which breed in injured pear (*Volucella esuriens, V. fasciata, Copestylum marginatum*, and a large dark-coloured species of *Hermetia*); (6) four different kinds of fungi (*Glœosporium lunatum, Hendersonia opuntiæ, Phoma* sp., and *Perisporium Wrightii*); (7) a bacterial rot.

From some of the fungi and from the rot pure cultures have now been isolated in our laboratory in Brisbane, and are being subjected to experiment. Subsequently a number of pure cultures of three fungi (*Glœosporium lunatum, G. cactorium*, and *Hendersonia opuntiæ*) have been prepared and forwarded by Dr. Berger from Florida.

A consignment of material collected in Argentina by another member of the staff (Mr. W. B. Alexander), is now in Australian waters, and should reach Brisbane shortly. In addition to *Zophodia*, it contains the Argentina cochineal, as well as the fungi *Montagnella* and *Sclerotinia*, referred to above.

There is also in the laboratory some of the wild cochineal, *Coccus tomentosus* (apparently the same as the Texan form recently received), forwarded by Dr. Griffiths from Chico, California, to Mr. A. T. Clerk, and by him handed over to the writer last year. This has attacked three of the Queensland prickly-pears—viz., the common pest pear, the spiny pest pear of the Burnett and Rockhampton districts, and the tree pear (*O. tomentosa*); but its effects are so far practically negligible, as also are those produced by some of the cochineals from the recent consignment.

Apart from the bacterial disease which is at present being carefully studied in the laboratory, where it is giving promising experimental results, the most important enemy amongst those now in Brisbane seems to be the moth borer, *Melitara*. Judging from our previous experience, the South American insect *Zophodia* acts similarly. These moth-borers perform their destructive work while in the caterpillar stage, the grubs boring into the prickly-pear joints and feeding there gregariously until ready to spin the cocoons. Our pest pears are readily attacked by these organisms, which, like all the other insects referred to in this article, restrict their attentions to cactaceous plants. The larvæ of *Melitara* are at present hibernating, and it is hoped that during the forthcoming spring they will emerge and breed up. Until then, one cannot say that the importation has been successful. Many cocoons of this moth were sent across in cold storage, but none of the few which emerged laid any eggs, the result being perhaps due to unsuitable temperature while in the "cold room" of the steamer.

The bugs (*Chelinidea*), weevils (*Gerstæckeria*), and cochineals all seem to have settled down satisfactorily, and are breeding. Scavenging flies have bred out in large numbers from the Florida and Texan material sent across in cold storage, but nearly all have died, and since none have bred, it appears as if this portion of the work has not proved successful.

It should be mentioned that extreme care was taken in Texas and Florida to eliminate all parasitic or predatory insects whose activities would have been detrimental to the organisms which have been imported. This was done by breeding the material under careful supervision at Miami, in Southern Florida, the work having been carried out by the writer's lieutenant (Mr. Hamlin).

The South American fungi have not, as yet, given satisfactory laboratory results, as they have not responded well to our cultural methods. They are, however, very serious disease-producers in Argentina. Fungi generally require certain conditions of temperature, and especially moisture, for their greatest activity, and, when such are favourable, may cause considerable havoc. This is true of such forms as *Glœosporium*, which destroys the whole or part of the affected prickly-pear joint. *Montagnella* seems to be even more destructive in the field, and is capable of killing the entire plant.

In this biological attack on the prickly-pear pest, the writer is endeavouring to utilise organisms which act in various ways:—

(1) Firstly, there are those insects which actually eat pear—*e.g.*, moth-borers in their larval stage—and, to a less extent, the weevils and certain other beetles in both larval and adult stages.

(2) Then there are those which feed on the juices of the plant, interfere with its normal health, sicken it and may even poison it to such an extent as to kill part or the whole plant—*e.g.*, the cactus bugs and the various kinds of wild cochineal insects.

(3) Some insects attack and destroy the fruit wholly or in part—*e.g.*, certain midges, which have not as yet been imported (*Itonida, Asphondylia*).

(4) Injuries such as those caused by the first group allow the introduction of larvæ of scavenging flies which feed on the decomposing tissues, greatly aggravate the lesions and bring about a rapid destruction of the segment. Such organisms (*e.g.*, certain *Syrphidæ, Stratiomyidæ*, &c.) also passively assist in the introduction of sundry saprophytic fungi and bacteria which help greatly in the disintegration of the affected tissues.

(5) There are actual disease-producing organisms such as the fungi and bacteria referred to earlier in this article. Some are able to invade the plant through its stomata during warm moist weather (*e.g.*, *Glœosporium*). Others apparently enter through wounds whether made by insects, such as those referred to in (1), or made in some other way. No doubt sucking insects, such as cactus bugs, are capable of acting as inoculating agents for these disease-producers, especially the bacteria.

After having established the various organisms in the laboratory, experiments will be undertaken with a view to ascertaining whether any of them would be likely to become enemies of plants of economic value. When these tests shall have been satisfactorily passed, the pear-attackers will then be studied under field conditions in some selected prickly-pear centres. After that, such of them as prove to be of value will be distributed widely, but this is not likely to occur for some time, owing to the nature of the investigation.

When these desired and desirable natural enemies of prickly-pear shall have become fully acclimatised in Australia, they should then need little or no further attention after having been once liberated. They should go on propagating and attacking pear, their activities being controlled only by the climate and by the kind of pear attacked, unless some Australian parasite should adapt itself to these new hosts and thus limit their numbers and their usefulness. Biological control should then, theoretically, be ultimately inexpensive because natural. In some cases it has been necessary to keep a breeding stock under laboratory conditions to supply fresh material for districts in which conditions are not very suitable for some particular organism.

It is perhaps too much to expect that the new arrivals will act towards our prickly-pear as destructively (and as cheaply as far as expense goes) as the "Indian cochineal" did in regard to the "*Monacantha*" pear, but it is reasonable to hope that they will make a marked impression and so reduce the quantity of pear that the remnant will be more easily handled. Biological methods are the only means likely to be efficient in attacking pear in poor, inaccessible, or rocky country where time is not an important consideration, but where the excessive cost of chemical means of destruction would be. The biological attack, if successful, is likely to be much slower, but ultimately more effective, than the chemical; and, of course, the great difference in cost, not only at the time but in subsequent years, is also to be borne in mind.

This article has been written so that the public of this State may be aware of what is going on in regard to the attempted biological control of the pest, and also that the readers may realise that results cannot be promised within a definite time. The whole work is really a scientific investigation along certain special lines. As information of value becomes available, as a result of our experimental work, the writer proposes to make it known in the public interest.

GROUND COTTON SEED: AN EXCELLENT FEED FOR CATTLE.

BY CUTHBERT POTTS, B.A., Principal, Queensland Agricultural College.

There are several diverse elements in the present economic situation which have a close inter-relationship with regard to use of cotton seed as a feed, particularly for dairy cattle. Thus:—

(1) The war declared that we required to grow cotton within the Empire. Queensland is one of the countries where cotton of superior quality can be grown, and we are making strenuous effort to induce our farmers to plant this crop.

(2) The price of butter has fallen, and is likely to go still lower.

(3) Wages have risen to a marked degree, and, though they may fall again, it cannot be expected that they will ever reach the low level of pre-war days.

Let us briefly examine how these three elements react on one another.

With regard to cotton, it is improbable that Queensland will grow this crop on big plantations. Rather, our development of cotton-production will be along the lines of planting comparatively small areas on each farm. This means that the cotton will have to be transported to some central station to be ginned. It has to be remembered, however, that after the removal of the lint there remains a large quantity of seed which has a high commercial value, both for the oil and feed nutrients it contains. If the oil is extracted and the residue is ground into a meal (cotton seed meal), it forms as rich a feed for stock as linseed meal. But if the oil is not extracted, the whole seed can be ground, as it forms an excellent cattle-fodder. The fact that our cotton has to be removed from the farms for ginning largely prevents the farmers from appreciating the high feed value of cotton seed. But the feed value of the seed should be stressed, and, if once generally recognised, it will greatly enhance the commercial value of cotton-growing. Therefore, the seed from the gins should be returned to the growers for home consumption, or else it should be ground and sold on account of the grower. It is in this latter regard that dairy farmers can be of great assistance to the cotton-growing industry, and, by helping it, they will, incidentally, help themselves.

As before mentioned, the price of butter has fallen, and is likely to go still lower. The dairy farmer can meet this adverse situation in one of two ways. Either he may increase the number of cows per milker, or he may keep the number of cows the same and only use those of high productive value. If he adopts the first course he will make his milkers slaves to their work, and this is entirely against the general trend of labour development, a development which justly aims at better wages and better living conditions. If he adopts the second course, as he should, he has every chance of maintaining good returns, even against the lower prices for butter. Certainly, cows of high productive value cannot be readily bought at the moment, but they can be bred. Associated with such breeding, consistent herd-testing must be carried out. The present average production of butter per dairy cow per year is certainly below 150 lb. There is no reason why any dairy farmer should not improve his own herd so as to average 300 lb. to 400 lb. of butter per cow per year.

Quite obviously, if one man can manage twelve or fifteen or twenty cows, take whichever number you like, the wage he can earn is determined by the returns the cows give. If they average only 150 lb. of butter per year, the wage that can be earned is half of what could be got if the same number of cows averaged 300 lb. of butter per year.

But good cows cannot yield to their full capacity unless they get sufficient feed. Again, good cows pay to feed. To have a cow capable of giving 400 lb. of butter-fat per year, and to so feed her that she only gives 200 lb., is as bad as buying a 20 horse-power engine when your heaviest work only requires 5 horse-power.

In the foregoing an endeavour has been made to show that the dairyman can hope to meet falling butter prices only by using improved stock. Once he gets this improved stock he must prepare to feed them in the off-season, so as to obtain the greatest profit from them. For this feeding nothing could be a better concentrate than ground cotton-seed meal. This has been used at the Queensland Agricultural College for the past two years, with excellent results.

Some idea of the value of ground cotton-seed as a cattle feed may be formed by a study of the following descriptive details:—

In appearance, ground cotton seed is not attractive. Adhering to the seed there is a small amount of lint, and after grinding the meal it seems to contain a large amount of hairy fibre. The amount of this, however, is not great, nor has it any of the properties of hair. The cotton present is a vegetable fibre similar to the indigestible matter contained in all vegetable matter, and it has no bad effects on the animal. The flavour of cotton seed does not attract animals, and they may take a little time to get used to it. Once they get accustomed to it they eat it readily. Because cotton seed has a tendency to bind the animal, it should not be used in excessive quantities. Probably 5 lb. to 6 lb. per cow per day would be the greatest amount that should be used.

In order to obtain some idea of the comparative value of good cotton seed, the following grain rations have been run out:—

	No. 1.	No. 2.	Difference.
	lb.	lb.	lb.
Bran	194	162	32
Crushed Wheat	33	28	5
Crushed Maize	329	63	266
Linseed Meal .. .	244	153	91
Ground Cotton Seed ..	—	394	—

Each of these feeds is of equal value for milk production, and would be used up to 1 lb. for each 3 lb. of milk given.

Thus, 394 lb. of ground cotton seed has the same value as the sum of the quantities shown in the third column above. If we take bran at ¾d. per lb., crushed wheat at 1d. per lb., crushed maize at 1d. per lb., and linseed meal at 1½d. per lb., the value of the cotton seed works out at about 1d. per lb., or, roughly, £9 per ton of 2,000 lb.

Ground cotton seed can be used for cattle, horses, and sheep, but it cannot be safely fed to pigs.

SPECIFICATION OF LABOUR AND MATERIALS REQUIRED IN BUILDING A PISE HOUSE AND FARM BUILDINGS OF ALL KINDS IN COUNTRY DISTRICTS.

BY ARTHUR MORRY, Surveyor, Department of Agriculture and Stock.

In many country districts, especially when far removed from the railway, it is difficult, and often very expensive, to obtain usual building materials, such as bricks, cement, iron, and even sawn timber. In such cases it is useful to know how to utilise to advantage a material that can be found almost anywhere, and which costs nothing except the necessary labour to procure it. Earth can be used in several ways for walls, and if properly manipulated generally affords satisfaction. One method of using earth, adopted largely in Mexico and South American States, is that known as "Adobe" (pronounced "Doby"), which is really nothing more than sun-dried bricks, or blocks made of earth and clay and allowed to remain before use a sufficient time for them to become thoroughly hard. This material has been used in that form for hundreds of years in the countries named, and buildings still exist in good order after 200 years' exposure to the elements. There is, however, more labour in handling "Adobe" than in the more modern method of Pisé construction. In the latter case one handling is sufficient, as there is no waiting for the bricks to dry before using in the wall, Pisé being built *in situ;* drying is not therefore necessary. But even when using Pisé it is an advantage to have a few blocks of "Adobe" handy for use in difficult positions, such as corners, fireplace openings, &c. Another useful method is known as "Pug," or a mixture of chopped straw and mud, or, in some cases, long straw or grass may be used, thoroughly mixed with well-wetted earth in a hole in the ground; for mixing, a long fork or hoe is used, but if on a large scale, horse or some mechanical power should be available. No special appliances are required for this method of construction, as the material, after preparation, is simply laid on in successive layers about 12 in. or 18 in. thick, keeping them as upright and true as possible. The walls are then trimmed down by the spade or other suitable tools, and made all of one thickness and perfectly true and perpendicular. As the material is put together in a fairly wet condition, there is a certain amount of shrinkage, but it consolidates into a very hard mass and becomes very durable—warm in winter and cool in summer. The general wallwork can be done with unskilled labour, with proper supervision, but a skilled tradesman is necessary to cut out or trim up openings for doors and windows, and to keep the angles plumb. Very good and durable buildings can be erected on this system in the back country.

Another type of earth building is somewhat akin to that known as wattle and dab, but very much superior. It consists of a framework of saplings set into a sill adzed on the top side and laid on the level ground. The corner and intermediate studs are framed into the sides, the intermediate about 3 ft. apart, with heads and sills to doors and windows. Both the outside and the inside of the studs are then covered with 1½ in. mesh wire netting, which is held together and kept from spreading by wire loops, the length of which is equal to the thickness of the wall. These loops are placed at sufficient distances apart to prevent the netting from bulging. The space between the netting is then filled with very moist earth and rammed. It will be seen that the walls will be just the thickness of the saplings or studs. These walls can, if necessary, be plastered on both sides, as the wire netting forms a good key for the plaster, then whitewashed or coloured as desired.

In some situations this type of building would be very serviceable, and if a little skilled attention were paid to the roofing, which might be of bark laid symmetrically and whitewashed or coloured, a very comfortable residence would result.

The type of structure, however, to which attention is specially directed, and to which the following specification refers, is that known as Pisé, which combines all

the good qualities of the others and may be erected by any person in the bush who is handy with tools and can use the level and plumb bob.

The accompanying drawings are intended to illustrate a house of this character, and, in order that the process of building same may be thoroughly understood, the specification is written in plain language, avoiding technicalities as far as possible.

Before commencing operations, the builder should provide himself with moulds for the walls, rammers, and other necessary articles, as he cannot perform good and durable work without them. The plant required will depend on the number of men employed, and, as three is the minimum number to perform the work economically, the following will be necessary:—A horse and dray or some other means of transporting the material to the building, two wooden rammers, two plasterers' wood floats, two straight boxes or moulds, two angle boxes, some short lengths of light wood for blocking up the ends of boxes, a supply of sawn scantling of different sizes, some ⅝-in. bolts, nuts and washers, gauge rods, shovels, spades, a watering can, buckets, tank or barrel for water, and some other articles which will be necessary as the work proceeds.

After collecting the plant and fixing the site, the first thing to do is to prepare the foundations. To do this the building must be accurately set out and the correct position and thickness of all walls pegged out, the pegs being put in about 3 ft. outside the intersection of walls, so that they are not disturbed when excavating the footings. It may be well to point out that, in setting out buildings perfectly square with walls at right angles, a good-sized square is necessary, which can be easily made by anyone out of long battens or flooring boards. The correct angle is assured by measuring one side 6 ft., the other side 8 ft., with the hypotenuse or diagonal between the above points exactly 10 ft., or any multiple of the same.

The footings of all walls should not be less than 9 in. wider than the walls they carry, projecting 4½ in. on each side. In suitable ground they need not be more than 4 in. in depth, which will be obtained by taking off the top sod to that depth. If the ground slopes, the footings should be stepped; that is, they should be excavated level for short distances, then a step should be left, and another length taken out level. These footings should then be well watered before placing any material in them; when filled in, they should be well rammed and made quite level and flat on top. Before proceeding with the walls, the boxes or mould must be prepared of any convenient size and of any kind of wood that will not twist or warp, the lighter the timber the easier it is to handle. It will be found generally that 2 ft. is a convenient depth for boxes for ordinary buildings, but for large buildings 3 ft. may be a more suitable depth. Twelve inch by 1½ in. boards, with ledges on the outside, will be found convenient, and a broad ledge or brace should be placed at each end. The ledges should be about 2 ft. apart, and ½ in. iron bolts, long enough to go through the walls, with heads, nuts and washers provided for bolting the boxes together. A set of one dozen iron angle-brackets should also be provided for securing the boxes at angles, otherwise it will be difficult to keep the angles plumb and true. Care must be taken in fixing the boxes to have them perfectly level and plumb, and a little time and patience in accomplishing this will often save much annoyance, resulting from the walls out of plumb.

The door and window frames should also be prepared and ready for use when required, as they should all be built in as the work proceeds.

The next thing to do is to remove the turf from the ground and give the earth a fairly good soaking with water, so that when pressed together in the hand it will adhere and form a solid mass. It must not, however, be too wet, or it will not compress properly when rammed. All roots and timber should be taken out, also all large stones. Fill in the boxes from 6 to 12 in. high at one time, and well ram the same. The wall will then set firm and hard, and be impervious to storms.

The provision of a damp course must not be neglected, as the ground moisture will gradually rise by capillary attraction, and cause discomfort in the rooms. This will probably not be noticed for a long time after completion, but as the earth is always more or less damp, sooner or later, unless prevented by some means, its effects will be seen and felt. In brick and stone buildings special damp-proof courses are built in, just below the ground floor level; and in Pisé construction a good damp course may be formed by building in the wall, for its whole width, just above the ground line, a sheet of maltboid (1 ply), which will be thoroughly effective. This should be carried through all door and french light openings, and lapped 6 in. at joints.

All door and window openings should be boxed up carefully as near as possible to the finished sizes, so that little or no patching up will be required.

Cypress pine plugs should be built in all door and window jambs, heads and sills, as shown on detail drawings. These are necessary for securing frames and linings, and to a large extent will make subsequent plugging unnecessary.

All openings should have good Cypress pine lintels, having at least 1 ft. bearing on the walls at each end, those over verandah openings to be whole logs adzed on the underside, resting 18 in. on the wall at each end, each face of the same to have stout nails driven in a few inches apart, which will form a key for a plaster cover. The faces of these lintels may be lined with Cypress pine, or they may be covered with cement compo, or lime plaster with a small quantity of cow's hair mixed in same; the nails before mentioned will form a key to hold it to the timber, and, when floated off with a wood float and finished with the Pisé wall, will be durable and effective.

In districts where cement can be conveniently obtained, the heads and sills of ordinary openings could be made of cement concrete in the proportion of six parts gravel, containing a good proportion of sand, and one part of cement. These could be reinforced and made very strong by inserting in same a few strands of barbed wire turned over at the ends so as to prevent them drawing out.

The fireplace should be faced with brick or concrete, the hearth laid with cement, and the chimney built either of brickwork with a 9 in. flue or of concrete with a 9 in. drain pipe built in for the flue, finished on top with a flue pipe projecting about 6 in. above a bevelled cap.

All the Pisé walls—both sides—should be lightly sprinkled with water and worked over with the wood float, using screeds where any straightening is required.

The top plates should be secured in position on the walls, as shown in detail drawing.

Openings to be left in all walls for ventilation just below the ceiling line, by building in boxes specially prepared and of suitable sizes, ventilators to be not less than 2 ft. 6 in. by 1 ft. 6 in., and to be placed generally over doors and windows.

Build in woodplugs 4 in. by 2 in. and the thickness of the walls at intervals of 3 ft. for securing skirtings, dados, picture rails, architraves, &c.

CARPENTER AND JOINER.

Joists to be of 5 in. by 2 in. Cypress pine resting on 4 in. by 2 in. plates on the walls and on piers where the bearing exceeds 10 ft. Joists to be spaced 18 in. apart, centre to centre; verandah floors to be laid with a fall outwards of 1½ in. where exposed to the weather.

Provide ready for building in, and mark the correct position for all plugs, stays, and braces, also all plates, and provide and carefully fix all door and window frames as shown on detail drawing.

All door and french light frames to be 5 in. by 4 in. solid Cypress pine, with heads and weathered and sunk sills grooved for tongue of linings and fitted with stops, &c., necessary for door hanging.

If preferred, the grooving in the frames may be dispensed with in most cases, and a fillet nailed on the back of the solid frame to which the lining can be nailed.

All door, french light, and window frames to have 1¼ in. Cypress pine wrot linings, tongued into the frames or nailed securely to fillets at the back of the frames, to be finished on both sides with 4 in. by 1¼ in. plain chamfered architrave. Windows to have 1½ in. sills on the inside, with 2 in. nosing and scotia under and a 2 in. sill on the outside, laid to a bevel with returned ends, sufficiently wide to carry the architrave. French lights to have 1½ in. sills both sides, in addition to the solid 5 in. by 4 in. sill of the frame. Window frames to have mullions, as shown, with all necessary stops for casements. Four inch by 2 in. wood plugs to be built into walls every 3 ft. in height of opening to nail linings and architraves to. Ceiling joists to be of Cypress pine, round timber, not less than 7 in. in diameter, adzed flat on the top for receiving the ceiling linings; joists to be spaced not more than 3 ft. centres, and to be notched into wallplates, and extend 3 ft. over the face of wall, the ends of same to be cut off true to line for fascia board, and cut slightly back below the fascia.

Ceiling joists of verandahs to be similar to the above, trimmed into each other where necessary, and spaced not more than 3 ft. apart, centre to centre.

Rafters, collars, and braces to be 4 in. by 2 in. sawn Cypress, spaced to suit the ceiling joists, bevel cut where necessary, and securely nailed. Ridge to be 8 in. by 1¼ in., eaves fascia dressed 7 in. by 1¼ in., battens 3 in. by 1½ in., spaced so as to have not less than three battens under every sheet. Batten up valleys and hips with an extra thickness at eaves.

Lay all floors with 6 in. x 1 in. grooved-and-tongued Cypress pine flooring, well cramped up, and nailed with two nails to each joist and dressed off at completion.

Ceilings and soffits of eaves to be lined on top of ceiling joists with 6 in. by 1 in. t. and g. Cypress pine, with scotias and fillets at all angles.

Build in walls plugs for nailing skirtings, chair rails, picture rails, &c., at suitable distances apart, plugs to be of such size as to be completely covered by the timber work to which they are nailed.

Fix round inside walls of all rooms 6 in. by 1 in. chamfered skirting, scribed to the floor and to architraves.

Fix 4 in. by 1½ in. chair rail, chamfered on edge, round the walls of living room, bedrooms and kitchen, and 2 in. by 1½ in. pictures rail round the same rooms.

Build the stove recess in kitchen, as shown on drawings, with 3 in. by 2 in. studs, lined with iron on the outside, and finished as shown, with cement hearth. Two small lights to be built in recess, fitted with 1½ in. rebated frames with 16 oz. sheet glass, and hung on pivots with cords for opening same and suitable fasteners.

Frame for outside wall of sleeping verandah with 4 in. by 3 in. studs on a 4 in. by 2 in. bottom sill and capping piece, with a 6 in. by 2 in. weathered and throated sill projecting 2 in. from the face of the wall, and a 4 in. by 2 in. top plate. Studs and mullions to run through from bottom to top, and checked into head. Panels below openings to be filled in, either with 4 in. by 1 in. g. and t. Cypress pine or with fibro-cement sheeting ¼ in. thick, and secured in position with fillet on both sides.

Fix 12 in. by 1½ in. mantel shelf and jambs to kitchen fireplace, and a pine mantel and jambs to the living room.

Fix 50 ft. super of 12 in. by 1 in. shelves in kitchen, on brackets properly secured to wall plugs.

Provide and fix tank-stands, where shown, with hardwood or Cypress pine stumps, and hardwood joists, and 6 in. by 1½ in. sheeting.

French lights to be 3 ft. 6 in. by 7 ft. by 1¾ in. pine with moulded and rebated bars 1 in. thick, double hung with 4 in. butts, and fitted with two bolts on the inside, and rebated mortise locks with brass or oak furniture.

Doors in kitchen to be 1¾ in., framed and ledged and filled in with 1 in. g. t. and v.-jointed pine, hung with 4 in. butts and fitted with 6 in. rim locks with brass furniture.

Door from living room to back verandah to be 1¾ in. framed with moulded, rebated and glazed panels hung with 4 in. butts and fitted with rim lock as before.

Other doors to be 1¾ in. four panelled pine, hung as before, and fitted with 6 in. rim locks with brass furniture.

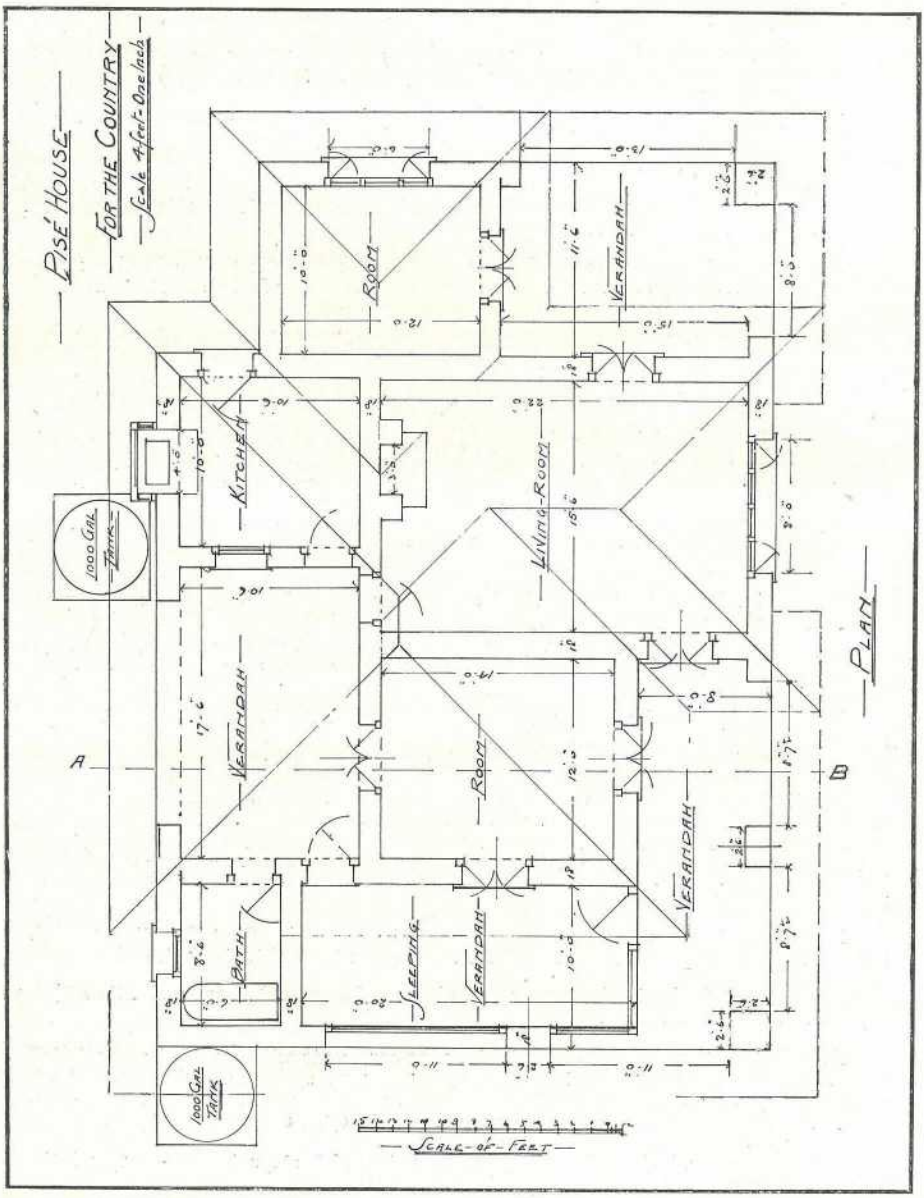
All windows throughout to have 1¾ in. pine casements with moulded and rebated bars 1 in. thick, glazed with 16 oz. sheet glass, well sprigged, puttied and back puttied, hung with 3 in. butts and fitted with bronze casement fasteners and 4 in. bolts. All casements, where possible, to be hung to open outwards.

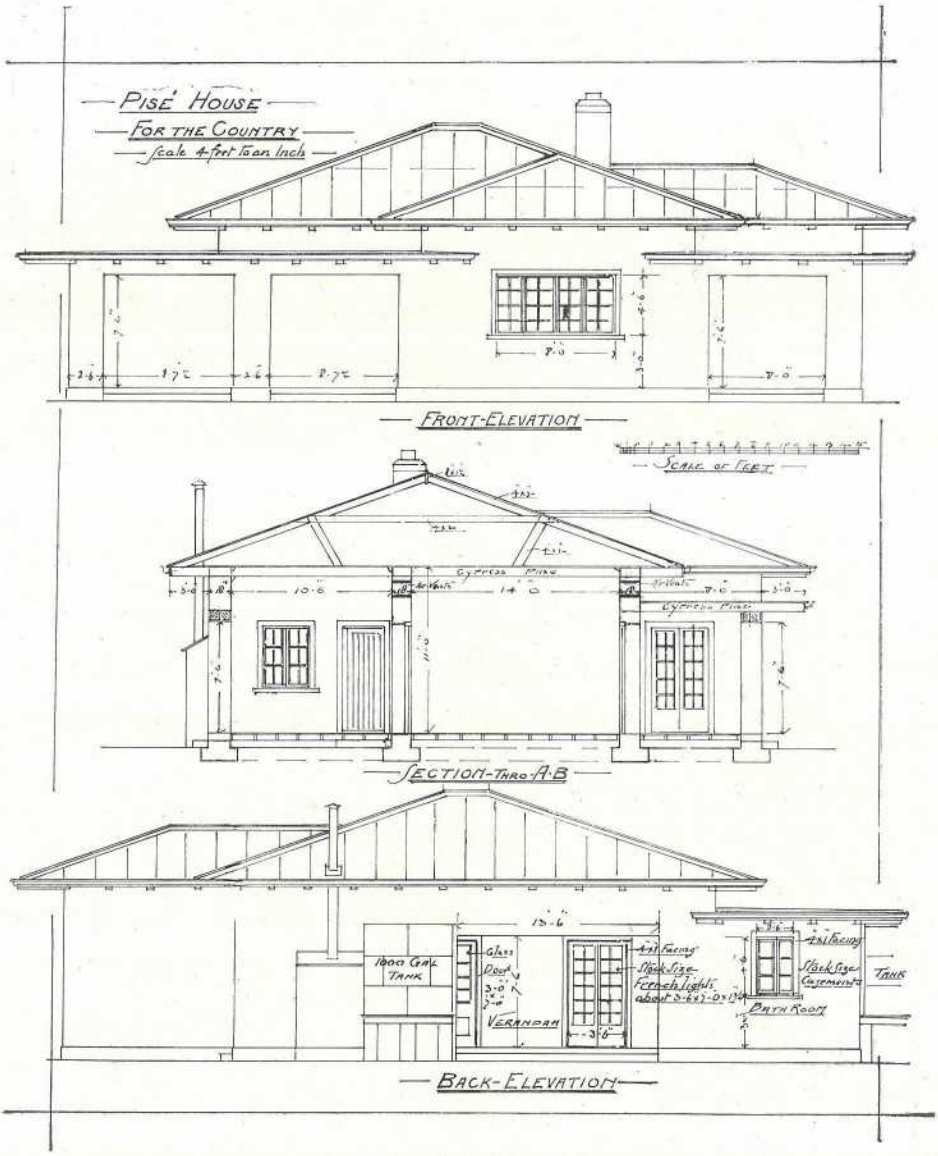
All doors and windows throughout to be fitted with stops the necessary widths and thickness required.

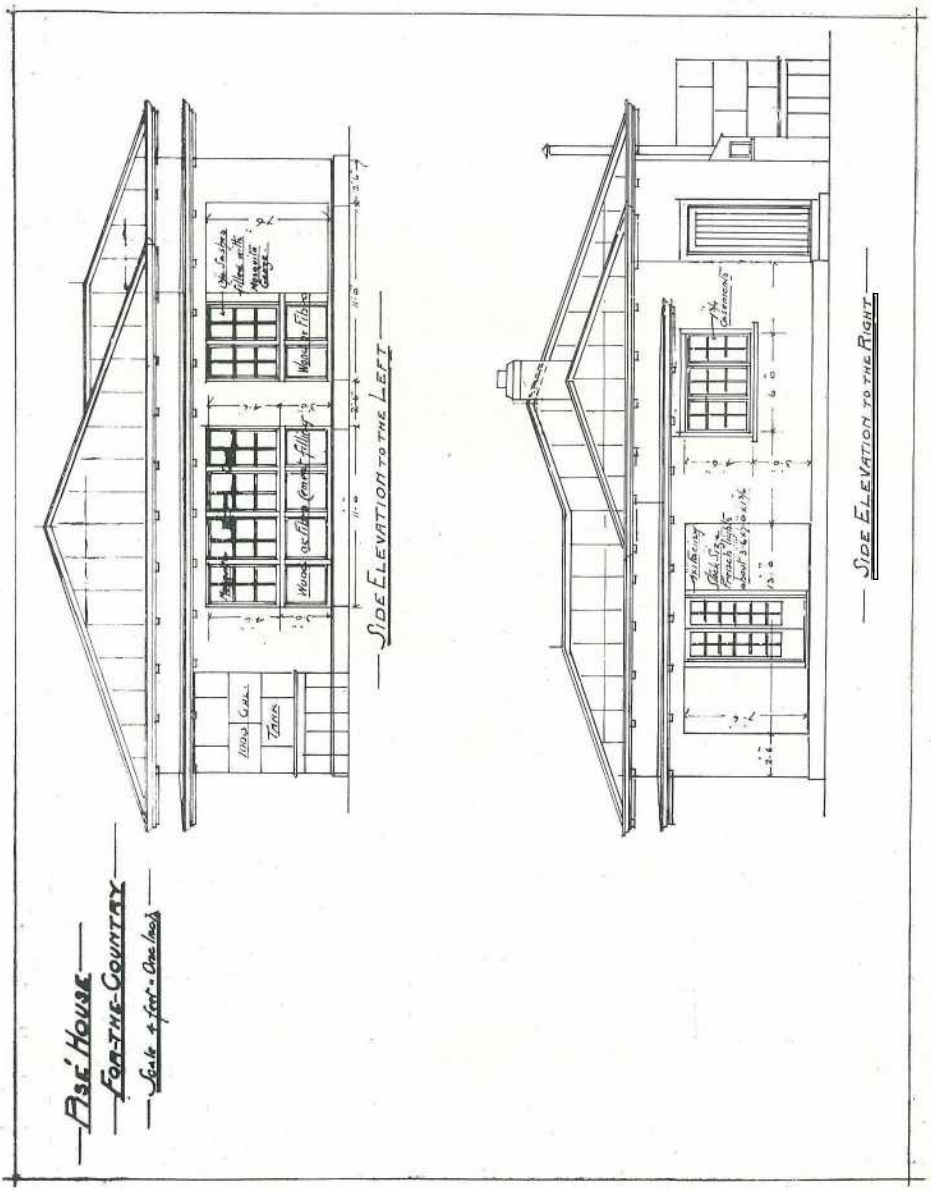
Fix bronze hooks in suitable position for fastening back french lights and doors.

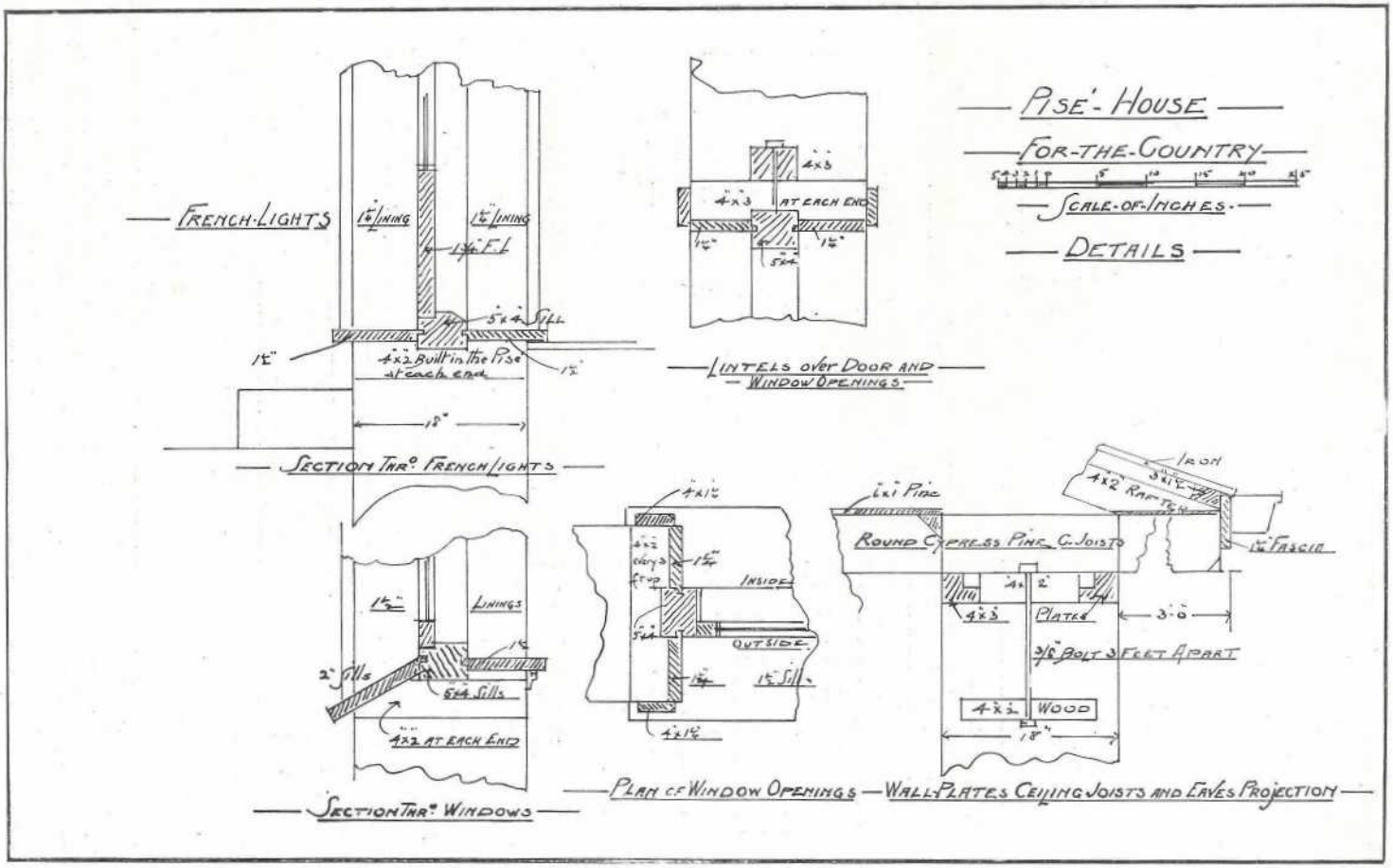
Fix in each room over door and window openings lattice work ventilators made with openings 1 in. square, 2 ft. 6 in. by 1 ft. 6 in., and provide all necessary stops and linings to same.

Finish round all doors, windows and other openings with 4 in. by 1 in. chamfered architraves on both sides.


PISÉ HOUSE
FOR THE COUNTRY
Scale 4 feet = One Inch
PLAN
ROOM
VERANDAH
KITCHEN
LIVING-ROOM
1000 GAL. TANK
BATH
SLEEPING
SCALE OF FEET
A
B


PISE' HOUSE
FOR THE COUNTRY
Scale 4 feet to an Inch
FRONT-ELEVATION
SCALE OF FEET
SECTION-THRO A-B
1000 Gal. Tank
Glass Door
Verandah
Bath Room
BACK-ELEVATION


A Sié House
For the Country
Scale 1 foot = One Inch
Side Elevation to the Left
Side Elevation to the Right


PISE'-HOUSE
FOR-THE-COUNTRY
SCALE-OF-INCHES.
DETAILS
FRENCH-LIGHTS
1½" LINING
1½" LINING
1½" F.L
5"x4" SILL
4"x2" Built in the Pise at each end
12"
SECTION THR° FRENCH LIGHTS
4"x3"
4"x3" AT EACH END
LINTELS over DOOR AND WINDOW OPENINGS
LININGS
2" Sills
5"x4" Sills
4"x2" AT EACH END
SECTION THR° WINDOWS
4"x1½"
4"x2" chgs to top
INSIDE
OUTSIDE
1½" Sill
PLAN OF WINDOW OPENINGS
IRON
3"x1½"
4"x2" RAFTERS
1"x1" Pine
ROUND CYPRESS PINE C. JOISTS
1½" FASCIA
4"x2"
4"x3"
PLATES
3'-0"
⅝" BOLTS 3 FEET APART
4"x2" WOOD
18"
WALL PLATES CEILING JOISTS AND EAVES PROJECTION

Fill in sashes on sleeping verandah with mosquito-proof wire gauze, and fix same with stops on both sides, well secured.

These sashes may be made with bars 1 in. thick, moulded on the outside, but left flush at the backs, so that the mosquito-proof gauze will pass over the bars and be secured with a stop planted on the back.

Provide and fix, where pointed out, one dozen bronze hat and coat hooks on 5 in. by 1 in. chamfered rails, and provide and fix in kitchen one dozen cup hooks.

Do all the work necessary to complete this branch in a satisfactory manner.

PLUMBER.

Roof of verandahs to be covered with 2-ply malthoid, laid as instructed by the selling agents, on close boarding provided and fixed by the carpenter, turned up against walls, properly flashed, and joints cemented as instructed by agents, to be left perfectly sound, weatherproof, and satisfactory.

Five inch by 4 in. galvanised-iron spouting to be fixed to all eaves, on brackets as required, with soldered points, stop ends and angles. Water to be conducted to the tanks with all necessary 3 in. down pipes.

Other roofs than the above to be covered with 26-gauge galvanised iron, approved brand, laid with 1½ in. corrugation at sides and 6 in. at ends. Valleys to be laid as shown, with 24-gauge plain iron; cover hips and ridges with 24-gauge 16 in. wide, lead-headed nails to be used throughout.

Provide and fix two 1,000-gallon tanks, with mosquito-proof hoppers and frog-proof overflows, fitted with cleansing plugs and lever taps.

Provide and fix a 5 ft. 6 in. galvanised-iron corrugated bath, with waste plug and chain. Connect a 2½ in. waste pipe to same, and convey it to a suitable position outside to be approved.

Provide and fix over same a shower bucket with rose and lever tap cords, pulleys and block for hoisting and lowering.

Cover the inside walls of bathroom up to a height of 5 ft. with small corrugated galvanised-iron sheeting, with roll on top.

Provide and fix a stove in kitchen, value £ net cost; fix stove piping, and carry up same above roof, flashed where necessary.

PAINTER.

Knot, stop, rub down and properly prepare all wood and iron work for painting which is usually painted, such as eaves, gutters, down pipes, fascias, outside doors, and windows. All the above woodwork to be painted three coats approved colours with approved linseed oil and white lead, ironwork to have two coats only.

Inside doors and windows, skirtings, picture rails, chair rails, &c., to have two coats of best approved varnish.

All outside walls to be twice coated with limewash containing half a pint of raw linseed oil to each gallon, and inside walls to be coated with limewash as above, but coloured by the addition of any suitable dry colours.

MIXING OF FERTILISERS.

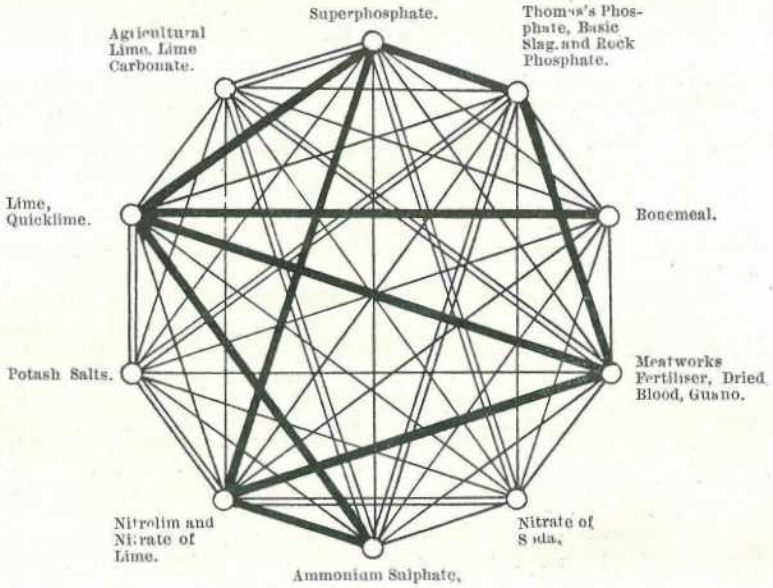
BY J. C. BRÜNNICH.

Many of the users of fertilisers prefer to make their own mixtures, specially suited to their requirements, instead of using ready-mixed complete fertilisers; but, in order to do this successfully, it is absolutely necessary to have a knowledge of what kind of fertilisers can be safely mixed.

In many cases great losses of the most valuable of all fertiliser constituents—the nitrogen or ammonia—have been caused by mixing lime or fertilisers containing lime with sulphate of ammonia, bone dust, and meatworks fertilisers, &c.

In other cases, by some chemical changes or by absorption of moisture from the air, the mixture sets very hard or becomes lumpy in the bags, and, therefore, difficult to apply.

The diagram below, originally devised by Dr. Geekens, and used for some time in our publications, has been amplified and modified to apply to local conditions.:—



All fertilisers joined by a *single line* can be safely mixed together and kept for any length of time. Fertilisers joined by a *heavy black line* should never be mixed together; those connected by a *double line* should only be mixed immediately or a short time before application.

Great care must be taken when making mixtures of fertilisers, and all lumps must be broken up and, if necessary, passed through a sieve before mixing. The various portions should be carefully and thoroughly mixed in small quantities, and the small heaps formed turned over a few times and then all mixed together. It is sometimes better to allow the mixture to remain in heaps for some time before bagging, to prevent forming lumps or setting hard in the bags.

A NEW GRASS PEST OF THE ATHERTON TABLELAND.

By ALAN P. DODD, Assistant Entomologist to the Bureau of Sugar Experiment Stations.

During the drier months of 1920, viz., July to November, the farmers of the Atherton Tableland became seriously perturbed through the ravages of a grass caterpillar that threatened to destroy a great proportion of the pasture in certain areas. Dr. J. F. Illingworth made a brief visit to the district, 29th September to 3rd October, 1920, and subsequently the writer made two short excursions to the locality, 1st to 5th March, and 10th to 13th April, 1921. Our knowledge of the pest has been obtained from these limited investigations, and is embodied in the following report. I have to thank Dr. Illingworth, who has kindly allowed me to make free use of his notes. My thanks are also due to the many farmers who have helped us in our survey, and through whom we were enabled to make as complete an examination as time permitted.

HISTORICAL AND GEOGRAPHICAL.

The moths were submitted to Dr. A. J. Turner, of Brisbane, a well-known authority of *Lepidoptera*, who determined them as *Oncopera Mitocera* Turner, a member of the family Hepialidæ, the larvæ of most of which tunnel in the trunks and roots of living trees, and are often of very large size. Dr. Turner writes, "There

are only two species of *Oncopera* (the writer has accepted Dr. Turner's spelling of the word *Oncopera*, though it is usually written as *Oncoptera*); *O. intricata* occurs commonly in Victoria and Tasmania." It is interesting to record that *O. intricata* is a well-established grass-destroyer in these States, and its habits are practically identical with our species. In the "Destructive Insects of Victoria," 1909, French calls it "the dark-green grass caterpillar," and writes that "the larva of this moth is, without doubt, the most destructive of all grass-eating grubs known to myself."

Oncopera Mitocera appears to be confined to North Queensland, and possibly to the Cairns district. Early in 1911, Mr. F. B. Dodd observed the moths flying very plentifully at dusk, on the edges of the Evelyn Scrub, near Herberton. The first record of the insect as a pest seems to be contained in a letter written by Mr. J. George Jones, of Ravenshoe, 15th September, 1919, in which he states that it was "then engaged in clearing out patches of good pasture in this district." No word of its occurrence around Yungaburra was heard until August, 1920, when the farmers suddenly discovered that a new and serious pest had appeared among them. Probably the caterpillars had been there for several years; in fact ever since the clearing of the scrub, but never in such numbers as to attract attention. The moths have been noticed in considerable force at Kuranda, and we know that the larvæ occur in the scrubs around Babinda. Thus the species is found at all heights, from sea-level to 3,500 ft. in the Cairns district.

DESCRIPTION OF THE STAGES.

The moth measures 1½ to 1⅞ in. across the outstretched wings; it is of a rather rich brown in colour, the forewings somewhat irregularly mottled with darker and lighter shades, the hindwings uniformly sooty. The wings are rather narrow, the hindwings longer than is usual and inclined to be pointed. The body is long and slender, and the head has a conspicuous clothing of woolly hairs.

The larva or caterpillar is long and slender, measuring up to 3 in. in length, of a dirty dark-green colour; the head is brown and hard. They are very active, and wriggle convulsively when handled or otherwise disturbed.

The chrysalis or pupa is of a light brown, the head darker, hard, and roughened; it measures about an inch in length; the body segments are each armed with two transverse rows of close saw-like teeth, which serve to propel it up the vertical shaft and prevent it from slipping down to the bottom.

LIFE HISTORY AND HABITS.

The moths are on the wing during the late summer; only an odd one was observed by the writer early in March, and it was obvious that the main emergence had not taken place. However, by the middle of April, though they were plentiful enough, it was evident that the main brood was over. The eggs are probably laid scattered about the ground among the grass. Each female is capable of depositing a vast number. When held tightly between the fingers they will lay strings of tiny creamy-yellow eggs.

There is little doubt that the life cycle is completed within a year. Early in October it was found that the larvæ were about two-thirds grown; by the first week of March excavating in numerous places gave full-grown and pupating larvæ, and pupæ; by the middle of April no larvæ could be found, and only a very occasional pupa, the moths then being on the wing.

The caterpillar constructs a vertical shaft or tunnel of about the diameter of an ordinary lead pencil, varying from 5 to 16 in. in depth, and lined with strong, fine silk. In the pasture lands the tunnels are covered with a mat of webbing and frass, but in the scrub, strange to say, no covering is constructed, the holes being bare and open. Thus it would seem that this protection is a habit acquired in the few years that the caterpillars have adapted themselves to the changed conditions of the open fields, from the shade and shelter of the scrub. The larvæ clean out their tunnels, placing the excrement on the surface near the opening, and this is the most easily recognised feature of the pest. The tunnel is quite straight, without cross-sections; in this the caterpillar lives, coming up at night and reaching forth to feed on the grass blades. Apparently fresh leaves are not essential, for in the scrub the surface of the ground is bare of vegetation, and here, no doubt, fallen leaves and decayed vegetable matter are consumed. It does not seem feasible that they travel through the soil; in fact, they are not hardy creatures, and when taken from their tunnels and placed in fresh soil, frequently die, though in some cases they live and construct new tubes. Although it is a generally held opinion that grass roots

are eaten, this does not seem correct, at least as regards underground roots. The grass apparently dies through the action of the caterpillar gnawing at the stock and back on to the base of the roots from the surface.

When ready to pupate, the larva becomes almost milky-white in colour. The pupa or chrysalis rests at the bottom of the tunnel, its horny head protecting it from intruders. When ready to emerge, it works its way to the surface, and projects about one-third of its length above the ground; thus, when the moths are on the wing, it is quite usual to see these empty chrysalis shells poking out of the ground.

Vast numbers of moths do not feed in the adult stage, and *Oncopera* is one of these; hence its aerial life must be comparatively short, probably about a week. The moths fly at dusk, before it has become dark; in a few minutes myriads are on the wing, in a wild, erratic, jerky, and very fast flight. The flight lasts for a few minutes, and ends as suddenly as it began. A few are attracted to lights, but not in sufficient numbers to suggest trapping. During the day they settle in a sheltered and, often, dark position; in the fields they can be captured commonly, resting on stumps of trees, or on walls of buildings, &c.

NATURE AND EXTENT OF INJURY.

There is no doubt that the species in question is a native of the scrubs, as the tunnels can be located in numbers anywhere in such situations around Yungaburra and Ravenshoe, and we have observed them in virgin land at Babinda. With the clearing of the land and its planting to grass, favourable conditions have arisen for rapid increase; and, too, its natural enemies in the scrub would not be liable to change their habits so readily and follow their host into the open. We can safely say, then, that these factors have accounted for its sudden development as a pest of serious dimensions. The principal area affected is immediately around Yungaburra, from Kulara on the north to Kureen on the south; in the older-settled portions, near Atherton and Kairi, it has not made its appearance; and southward, around Malanda, though the caterpillars were found abundantly in the scrub, none could be located in the pastures. Another area infested, though not to the same extent, is situated eastward from Ravenshoe, on the higher land toward the Beatrice River, at a height of 3,200 to 3,500 ft. above sea level.

The pest occurs throughout there areas, almost each farm being more or less affected. In the worst situations the paspalum and Rhodes grass have been killed out in small patches; as a result, the fields present a very ragged appearance instead of a luxuriant carpet of grass. In any case, where the caterpillars occur in any number the pastures are seriously depleted and, therefore, cannot carry their full complement of stock. As the pest does its chief damage during the drier parts of the year, when good grazing is most needed, this is a serious matter. Where they occur abundantly, as many as thirty larvæ can be dug up in a cubic foot of soil. Early in the year they have finished feeding, and the summer rains invigorate the grass, so that in many instances, especially in the case of paspalum, there is soon a splendid growth, but bare patches every here and there testify to the work of the scourge.

NATURAL MEANS OF CONTROL.

Our limited investigations allowed almost no breeding work, and, therefore, no parasites were discovered. Jumping spiders catch a few of the moths, and they are also frequently caught in spiders' webs.

No doubt, nightjars, that hawk over the fields at dusk, destroy many of the moths, but in the open fields of the Tableland the absence of birds which might help materially to check the ravages of the pest is very marked.

Climatic conditions must be an important factor in the increase or decrease of these caterpillars, and heavy rain, or an excessive wet season, may go far toward restricting their numbers. The month of March, 1921, was exceedingly wet, heavy and continuous rain falling. At this time the insects were either in the pupal or in the moth stage; in the latter case probably many were drowned, and their eggs destroyed. When the locality was visited in April, it was found that the coverings of the tunnels had been washed away, and often the mouth of these shafts had been covered over with silted earth; indeed, in one badly infested field, dead pupæ were found that had failed to break through the soil washed over the opening. A case was heard of where the larvæ were prevalent in a low-lying field earlier in the season; the first heavy rain flooded this land, and the caterpillars came to the surface in thousands and were washed away. Many farmers are of the opinion that the very heavy rainfall of March has given the pest a grave setback, and the writer is inclined to share their views, but it remains to be seen how serious this insect will be in the ensuing season.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR JUNE, 1921.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Prim	Holstein ...	9 Mar., 1921	1,197	3·5	46·48	
Wattle Blossom ...	Guernsey ...	24 May ,,	715	5·2	43·50	
College Gold Iron	Jersey ...	3 Mar. ,,	795	4·8	42·90	
Hedges Nattie ...	Holstein ...	26 Feb. ,,	1,017	3·5	39·34	
Charming Damsel	Ayrshire ...	12 May ,,	698	3·7	28·75	
Netherhall Queen Kate	,, ...	17 April ,,	667	3·6	26·65	
Lilia	,, ...	3 April ,,	595	3·8	25·30	
Hedges Dutchmaid	Holstein ...	26 May ,,	713	3·2	24·32	
College Evening Glow	Jersey ...	10 Nov., 1920	328	6·2	23·79	
Confidence... ...	Ayrshire ...	8 Feb., 1921	569	3·7	23·35	
Miss Fearless ...	,, ...	25 May ,,	642	3·2	22·95	
Maggie's Leda ...	Jersey ...	6 Oct., 1920	382	5·0	22·34	
Gatton Empire Lass	Guernsey ...	3 May, 1921	467	4·1	21·42	
Thornton Fairetta	Jersey ...	15 Mar. ,,	326	5·5	20·97	
Confidante ...	Ayrshire ...	12 May ,,	462	4·0	20·58	
Leda's Jessie ...	Jersey ...	14 Jan. ,,	240	7·0	20·39	
Dawn of Warragaburra	,, ...	15 Oct., 1920	329	5·2	20·01	

NOTE.—Only cows producing 20 lb. of butter, or over, for the month are included in this list. The rainfall at the College for the month of June totalled 608 points.

PROBLEMS OF COLD STORAGE.

How much of the world's food supply is now kept in cold storage is difficult to say, but it must form a very large part of the total of perishable foodstuffs. It is not surprising, therefore, that the problem of getting the atmospheric conditions in cold storage premises exactly right for the long preservation of food has attracted the attention of the scientific mind. One phase of the problem is to secure the right degree of humidity or dampness in the atmosphere. For ordinary weather readings a wet and dry bulb thermometer is used, but in cold stores it is not reliable unless it is in a constant draught. An instrument recently exhibited before the Royal Society of Great Britain has a wet and dry bulb mounted in a tube through which a tiny electric motor draws a current of air. In another dampness measurer, designed to give a reading at a distance, the dampness affects a hair, to which a pointer is hung. The principle is the same as in the old familiar "weather house" with doors, through which a man or a woman emerged according to whether the air was dry or damp. In this instrument, however, the pointer moves over a drum which is really a resistance coil, and the degree of dampness is ascertained by measuring the electrical resistance at the point where the pointer is in contact with the coil.

The Horse.

CERTIFICATES OF SOUNDNESS.

List of Stallions registered and certified as sound, in the course of the month of June :—

Name of Horse.	Owner's Name and Address.
BLOOD STALLIONS.	
Roseacre (L)	Wilson and McDouall, Calliope Station, Calliope.
TROTTERS.	
Blainwood (L)	D. Wilson, Brisbane.
Harold Beldon	H. V. Leslie, Rosewood, Kalkie.
PONIES.	
Ashton (L)	N. V. Nielsen, Targo street, Bundaberg.
Young Gaffer (L)	A. T. Noyes, Alexander road, Clayfield.
Togo	T. R. Kennedy, Gladstone.

SOMETHING NEW IN WINDMILLS.

Many attempts have been made to solve the problem of efficiently utilising the winds as a means of generating electricity. The difficulties arise from the extreme variations in the force of the wind and from the liability, even in windy regions, to periods of calm during which no power at all can be obtained. These conditions suggest that wind power should be used only as an auxiliary to some other source of energy, such as the burning of coal or oil. Now that fuel of all sorts has multiplied in price, there is all the more reason for considering the possibility of turning the wind to account. Hitherto, the usual plan has been to use a large slow-speed windmill to drive a dynamo at a high speed through gearing—a rather wasteful arrangement. During the war, however, there was in Great Britain a remarkable development in the design and construction of small high-speed dynamos on aeroplanes. These dynamos were direct-coupled to propellers, or rather "impellers," driven by the wind created by the aeroplane in flight. A British firm has devised a scheme for fitting three or more of these wind-dynamos on the swivelling top of a vertical pole, with a vane to keep them in position against the wind. Each equipment gives 60 watts, and the arrangement forms a cheap and efficient auxiliary to the ordinary country-house lighting installation. The energy produced is, of course, stored in accumulators in the usual way. The operation of the plant is entirely automatic, and it is so light and simple that it presents no obstacles in erection and maintenance.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JUNE, 1921.

There was a drop in production for the month, due to the excessive rainfall. In the second week over 5 inches of rain fell. The light breeds took unkindly to the conditions, a number moulting, and others going off for several days. During the last week the heavy section made a big improvement. Generally, the health of the birds is splendid. There were seven cases of broodiness. Two deaths were recorded, viz., Mr. Harrington's Rhode Island Red, from ovarian disorder, and Mr. Newberry's White Leghorn, inflammation of the bowels. The following are the individual records:—

Competitors.	Breed.	June.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns ...	95	319
H. C. Thomas	Do.	102	317
F. Birchall	Do.	110	313
*G. Trapp	Do.	114	347
*W. and G. W. Hindes	Do. ...	112	327
*J. M. Manson	Do.	125	315
Oakleigh Poultry Farm	Do.	112	313
*H. Fraser	Do.	119	309
*C. M. Pickering	Do.	107	306
*H. C. Towers	Do.	108	303
*Mrs. R. Hodge	Do.	105	302
*J. Newton	Do.	94	296
R. C. Cole...	Do.	91	295
W. A. Walson	Do.	72	294
O. C. Goos	Do.	87	278
*W. Becker	Do.	96	262
*T. Fanning	Do.	112	261
Bathurst Poultry Farm	Do.	105	258
*Chris. Goos	Do.	83	255
*R. C. J. Turner	Do.	67	253
Mrs. E. White	Do.	81	253
J. W. Short	Do.	78	253
W. Barron...	Do.	99	253
*E. Chester	Do.	94	251
E. Stephenson	Do.	85	243

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	June.	Total.
LIGHT BREEDS—*continued.*			
M. F. Newberry	White Leghorns... ...	80	242
*Thos. Taylor	Do.	84	233
Mrs. E. Z. Cutcliffe	Do.	97	231
H. Stacey	Do.	111	229
*E. A. Smith	Do.	82	225
*S. L. Grenier	Do.	86	225
*Mrs. L. Anderson	Do.	81	223
*Haden Poultry Farm	Do.	71	222
*Thos. Eyre	Do.	72	222
*G. Williams	Do.	84	216
*B. Chester	Do.	76	213
*W. and G. W. Hindes	Brown Leghorns... ...	60	209
Linquenda Poultry Farm	White Leghorns ...	104	195
W. M. Glover	Do.	84	178
Brampton Poultry Farm	Do.	58	162
*H. P. Clarke	Do.	97	162
HEAVY BREEDS.			
Jas. Porter	Black Orpingtons ...	136	406
T. Fanning	Do.	118	377
*T. Hindley	Do.	132	335
*J. Ferguson	Chinese Langshans ...	115	331
Rev. A. McAllister	Black Orpingtons ...	125	321
Jas. Avery	Langshans	100	320
*A. E. Walters	Black Orpingtons ...	104	311
G. Muir	Do.	103	299
Jas. Ryan	Rhode Island Reds ...	96	297
*R. Burns	Black Orpingtons ...	120	277
*E. Stephenson	Do.	105	268
*C. C. Dennis	Do.	107	271
R. Holmes	Do.	96	264
*Parisian Poultry Farm	Do.	104	263
*E. F. Dennis	Do.	108	261
W. Becker	Langshans	83	252
*J. Cornwell	Black Orpingtons ...	99	239
*E. Morris	Do.	62	237
*H. M. Chaille	Do.	82	230
G. Cumming	Do.	98	226
*Mrs. G. Kettle	Do.	106	200
J. W. Newton	Do.	78	183
*A. Shanks	Do.	87	172
*N. A. Singer	Do.	104	161
*J. E. Smith	Do.	79	144
*E. Oakes	Do.	71	133
T. C. Hart	Do.	60	92
F. Harrington	Rhode Island Reds ...	53	90
Total	...	6,511	17,613

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	60	51	48	64	62	62	347
W. and G. W. Hindes	66	42	57	67	63	32	327
J. M. Manson	45	62	57	46	61	44	315
H Fraser	60	46	54	42	57	50	309
C. M. Pickering	62	53	45	42	62	42	306
H. C. Towers	55	43	51	41	52	61	303
Mrs. R. Hodge	51	61	57	50	61	22	302
J. Newton	50	59	58	40	55	34	296
W. Becker	46	56	42	41	68	9	262
T. Fanning	50	39	48	42	35	47	261
C. Goos	45	62	9	28	35	76	255
R. C. J. Turner	46	39	35	30	53	50	253
E. Chester	41	49	39	40	39	43	251
Thos. Taylor	32	51	38	22	31	59	233
E. A. Smith	62	34	39	27	31	32	225
S. L. Grenier	36	57	20	39	38	35	225
Mrs L. Anderson	30	44	39	40	42	28	223
Haden Poultry Farm	43	30	33	41	29	46	222
T. Eyre	33	34	26	41	46	42	222
G. Williams	69	41	24	22	28	32	216
B. Chester	26	25	52	32	50	28	213
W. and G. W. Hindes	29	20	22	57	28	53	209
H. P. Clarke	56	20	26	11	19	30	162
HEAVY BREEDS.							
T. Hindley	69	50	57	47	64	48	335
J. Ferguson	59	49	44	61	57	61	331
A. E. Walters	50	61	52	57	34	57	311
R. Burns	22	31	72	24	64	64	277
E. Stephenson	51	40	47	38	40	52	268
C. C. Dennis	58	42	26	53	47	45	271
R. Holmes	32	36	41	50	68	37	264
Parisian Poultry Farm	43	42	40	70	15	53	263
E. F. Dennis	24	53	40	42	38	64	261
J. Cornwell	43	15	44	50	44	43	239
E. Morris	33	51	13	61	40	39	237
H. Chaille	22	55	32	63	47	11	230
Mrs. G. Kettle	26	48	55	10	12	49	200
A. Shanks	9	22	16	35	41	39	172
N. A. Singer	25	16	28	30	14	48	161
J. E. Smith	55	51	24	12	2	0	144
E. Oakes	0	44	19	43	14	13	133

CUTHBERT POTTS,
Principal.

The Orchard.

THE CASSABA.

The cassaba has not yet come into its own in Queensland, though climate and conditions generally are favourable to its successful cultivation. In California it is grown extensively and very profitably. Quite distinct from ordinary rock or water melons, its delicious flavour makes it a very welcome addition to the menu. It is both nutritious and sustaining. In appearance it resembles a hard, heavy, wrinkled melon, and varies in weight, from 10 lb. to 20 lb. The vine is a vigorous grower, its foliage is larger than that of the rock melon, and it is very prolific. The fruit ripens late in autumn and keeps well into winter. If stored in a cool place it will keep much longer. When the soil is not rich it should be well worked and manured. Two

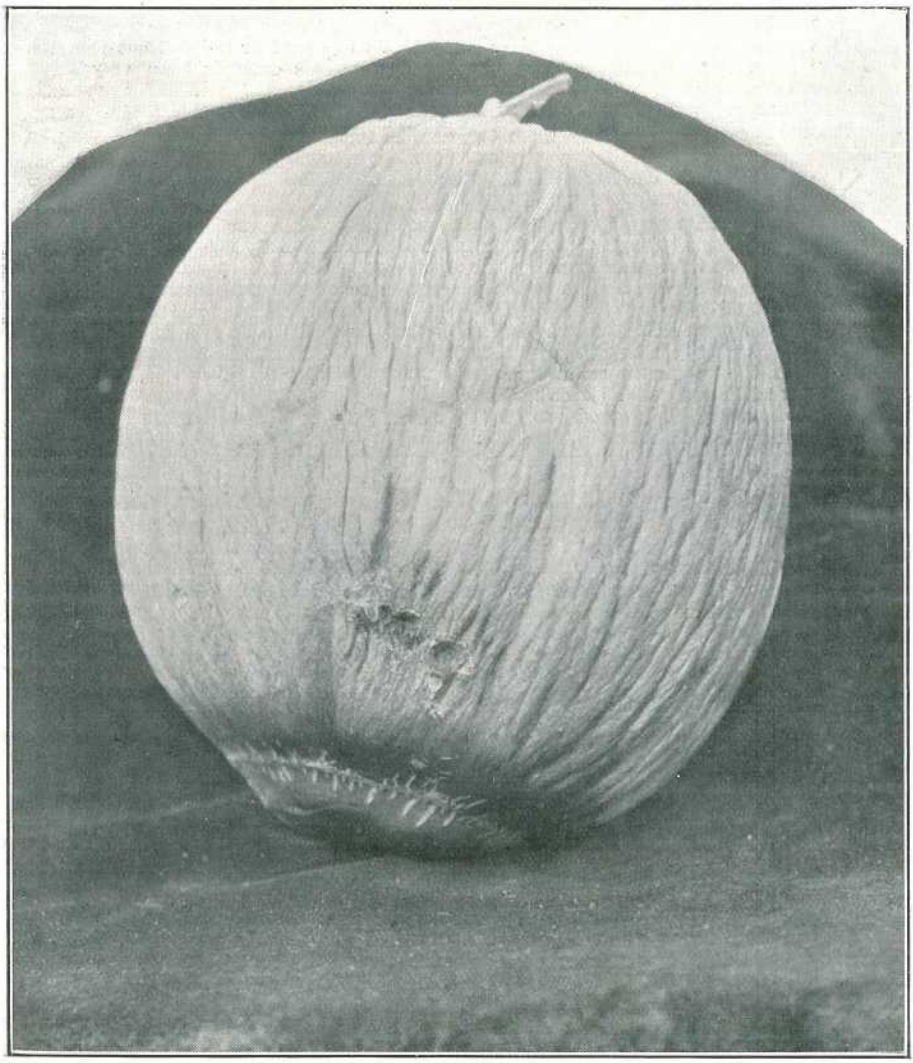


PLATE 9.—CASSABA MELON.

or three seeds should be planted in each hill 12 ft. to 13 ft. apart. The soil should be kept loose around the plant until the vine begins to run, when it should be earthed up. The fruit should be taken from the vine when it has lost its green lustre, but should not be eaten until about a week after it turns yellow. Mr. H. W. Mobsby, of this Department, who introduced the fruit to Queensland from California a few years ago, has a limited quantity of seed for distribution. A small supply will be sent to anyone interested on receipt of a stamped and addressed envelope sent care of the Editor.

GREEN CROP MANURING.

BY ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

Under the heading of "Intensive Cultivation" I drew attention in the July number of this journal to the very important and frequently unrecognised fact—that the application of commercial fertilisers to the soil is of little value to the crop growing on such soil unless it (the soil) contains sufficient moisture to dissolve the various available plant foods present in such fertilisers, and thus enable the plants which constitute the crop to absorb by means of their root systems the plant foods which are essential to their proper development. It was further pointed out that the capacity of a soil to retain moisture during dry periods depends to a very large extent on the amount of humus or vegetable matter it contains, and systematic green-crop manuring was recommended for soils that are deficient in this constituent.

In the present number it is, therefore, deemed advisable to follow up my remarks which appeared last month with a more detailed account of green-crop manuring, and the benefits to be derived from it, as it is a matter that few fruit and vegetable growers, not to mention agriculturists generally, realise the value and importance of.

The fact that many Queensland soils, especially those that have been under cultivation for some years, are deficient in humus, is shown by the large number of soil analyses that have been made by the Agricultural Chemist, in which the organic matter or humus is low, and in which the power to absorb and retain moisture is also low. Such soils are also usually low in nitrogen, and their capacity for nitrification is poor. This means that no matter how rich a soil is in other plant foods, such as phosphoric acid, potash, or lime, if it is deficient in nitrogen and does not possess the power to retain moisture, owing to a lack of humus, it cannot produce a maximum yield of either fruit, vegetable, or farm crops of any kind. Such a soil cannot make good use of any commercial fertilisers, except in seasons of good and regular rainfall, and even then, if the nitrogen contained in such fertilisers is in the form of organic nitrogen or ammonia, it cannot be made use of by the plant or tree until such time as it has undergone the process of nitrification and been converted into nitric acid, in which form it is readily assimilated. The absence of humus, as already stated, retards nitrification, hence a soil such as described can never be made to yield a maximum return until its deficiency in humus has been made good, and its power to absorb and retain moisture has been increased.

Virgin soils, both scrub and good forest, contain, as a rule, a fair supply of humus, and this, in conjunction with their undepleted supply of plant foods, frequently enables them to produce good crops for a few years, even when given very indifferent attention, and this is due, not only to their supply of available plant food, but to the fact that their friable nature and power to absorb and retain moisture is the result of their having a good supply of humus. As this becomes depleted, the soil becomes firmer and more compact, is less easy to work, and dries out much quicker, so that its yield rapidly decreases, and in extreme cases it is said to be worn out. This unsatisfactory condition of the soil is the result of bad farming; in other words, "improper treatment," whereby it has been depleted of its supply of available plant foods and organic matter, and as no attempt has been made to make good these losses by judicious manuring and thorough cultivation, it has become unproductive.

It is absurd to say that any of our soils are already worn out, and therefore valueless, as many soils that have become unproductive can be brought into a high state of fertility by proper manuring and cultivation.

In the older countries of the world, soils that have been under cultivation for many centuries are still producing good crops; in fact, in many instances the yield is steadily increasing as the result of good farming, which means the maintenance of the soil in a state of perfect tilth and high fertility; so that what has been done and is being done there can easily be done in Queensland if we will employ the same methods as they do.

In warm climates the supply of organic matter in the soil is apt to become more rapidly exhausted than in colder climates, so that there is a greater need to

keep our soils supplied with it, either by the addition of farmyard or other bulky manures rich in organic matter or by the growing of crops suitable for green manuring. Soils rich in oxide of iron also become rapidly depleted in organic matter, and that is one of the reasons why much of our best scrub land, of volcanic origin, though extremely fertile and friable at first, soon becomes much more compact, less easy to work, and less able to withstand a dry spell. Such soils require to be given a regular supply of organic matter to maintain their fertility; in fact, all soils that tend to set hard and dry out soon need treating in a similar manner.

The necessity for green-crop manuring being thus shown, the question arises: What are the best crops to be used for this purpose? Here again the question of soil and climate has to be taken into consideration, as crops that would be very suitable in the granite belt would not be a success in the coastal districts and *vice versâ*. The various crops suitable for green manuring must, therefore, be considered according to their adaptability to the climatic conditions under which they are to be grown, and this will necessitate a brief description of the various crops and the best methods of growing them.

In the first place, the most suitable plants for green manuring are those belonging to the natural order *Leguminosæ*, which includes all the members of the pea and bean families. The suitability of these plants is due, first to the fact that many varieties are very strong growers, producing a large quantity of leaves and stems, which, when added to the soil, either by allowing them to rot on the surface or by ploughing them under, materially increase its organic contents. Further, these plants have the power of obtaining nitrogen from the atmosphere and of storing it in their roots, leaves, and stems, so that when these decay the soil is enriched by their nitrogen contents. This is a very important consideration, as nitrogen is the most expensive essential plant food contained in any fertiliser, and if the soil can be kept supplied in nitrogen by green-crop manuring, then the bill for artificial fertilisers will be considerably decreased. In the late nineties I wrote several articles for this journal descriptive of a number of leguminous plants suitable for green-crop manuring, and including, amongst others, the velvet bean, pigeon-pea, narico beans of sorts (lablabs), Mauritius beans of sorts, small Mauritius beans (*Phaseolus*), cowpeas, and peas of many kinds. Fruitgrowers, however, did not then pay much attention to green-crop manuring, with the result that, with the exception of our sugar-growers, the growing of these plants has not been continued. When visiting Buderim Mountain recently, I saw a young banana plantation, planted with the white narico bean, which had entirely covered the ground and kept down all weed growth, thus saving the owner the cost of chipping the land, and providing a good supply of humus for the soil. A photograph taken by Mr. Mobsby, of this Department, and reproduced herewith, gives a good idea of the growth and of the value of this particular bean for manurial purposes. All the other legumes mentioned did well when tested, some, however, being much more luxuriant growers than others.

The poorest grower was the Black-eyed Susan cowpea, which, though valuable as a pulse, is of little value for manure.

The velvet bean, small and large Mauritius, and all lablabs did well, as did the pigeon-pea, though the latter, being of a more woody nature, takes longer to become incorporated with the soil. Of the cowpeas tested, the black was the strongest grower, and, therefore, most suitable for manure. All these legumes are suitable for coastal districts, and, in addition to them, such crops as broad-leafed Essex rape and white mustard, grown during the winter, are of considerable value.

All the strong-growing legumes should be given plenty of room, such as 18 inches to 2 feet apart in the row, and from 4 to 6 feet apart between the rows. If the soil is in want of manure, they should be given a dressing of 1 cwt. of sulphate of potash and 4 cwt. of basic superphosphate, or finely ground island phosphate, rich in lime, as this will tend to promote a good growth, and when the green crop is turned under the manurial matter will still be in the soil ready to be made use of by the permanent crop.

The legumes mentioned can be planted in spring as soon as the soil becomes warm enough, but if the spring is a dry one they will make little growth and, further, they will prevent the working of the soil so necessary for conserving moisture. In most cases, therefore, it is better not to plant till the wet season, when they will come away rapidly and soon cover up the land, thus checking and, when their growth is strong, preventing weed growth. Planted at this time, they are not likely to exhaust the soil moisture; and the permanent crops, such as bananas, between which they are planted, will not be injured. The soils of the granite belt, where the majority of our deciduous fruits are produced, are frequently very deficient in humus and low in nitrogen, consequently green manuring is a very necessary operation. The crops most suitable for this purpose are the grey or partridge field pea, rape, mustard, and possibly *Trifolium incarnatum*, or crimson clover, which should thrive in this climate and produce a heavy crop in spring that could be ploughed under. All these crops should be sown in the autumn as soon as the fruit has been gathered; and, even though they may be trodden on during the

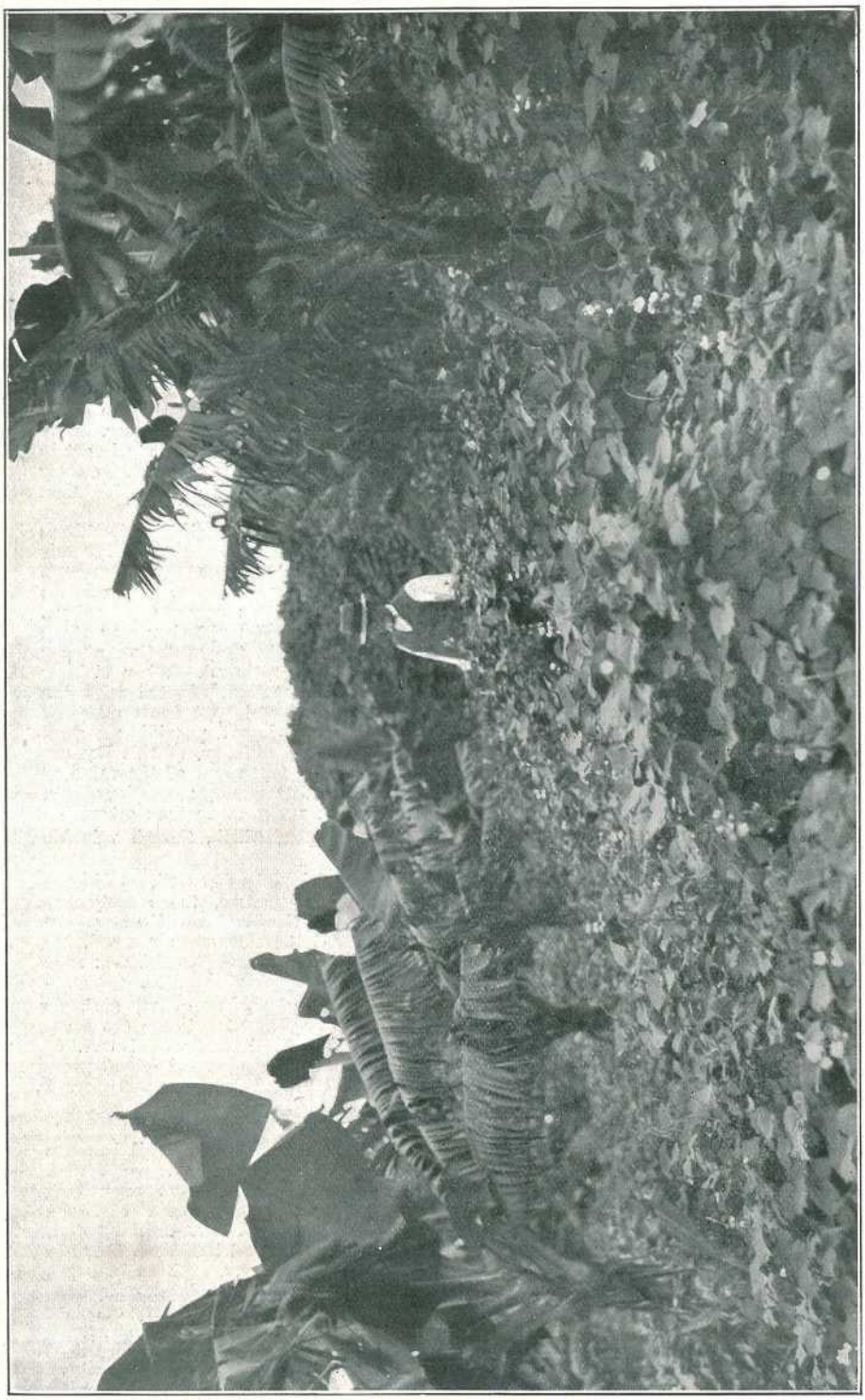


PLATE 10.—LABLAB BEAN.

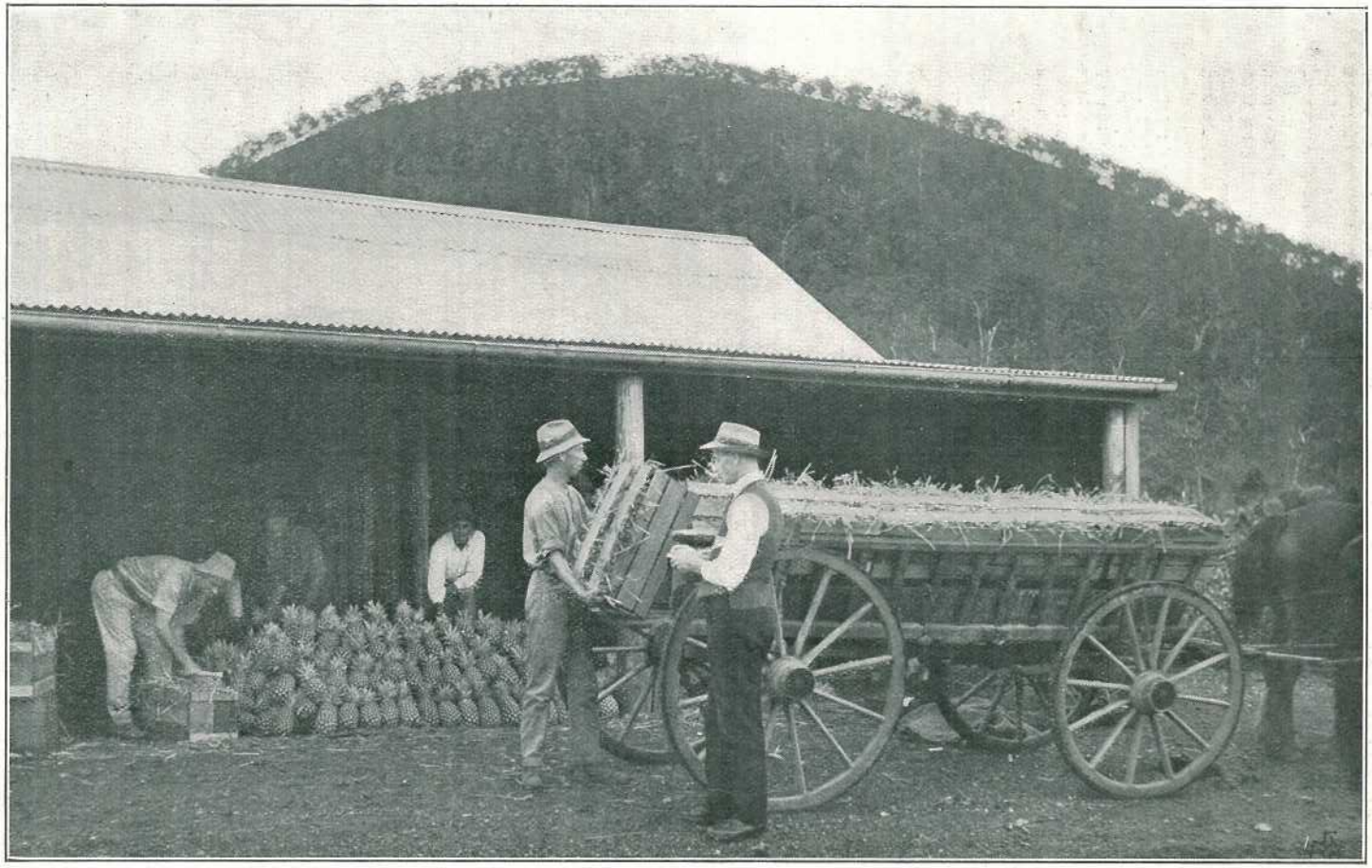


Photo. Dept. Agriculture and Stock.]

PLATE 11.—PINEAPPLE-GROWING ON BEERBURRUM.

Packing, Loading for Rail, and Tallying the Soldiers' Pineapples for Market. Grown on the "State Farm," near Railway, Instructor Burnett in charge. The pines in picture averaged about 6 lb. each in weight. Beerburrum Mountain in the background.

pruning and spraying of the orchard, they will still produce a good quantity of organic matter and nitrogen. In the case of the granite soils of this district, the application of a good dressing of island phosphate, rich in lime, will be of great benefit to the green crop, and although the soil contains sufficient potash for slow-growing plants, such as fruit trees, the addition of 1 cwt. per acre of sulphate of potash to 4 or 5 cwt. of island phosphate will materially increase the yield of the green crop, and, as the manurial matter is not likely to be washed out of the soil, it will be available for the following crop of fruit, vegetables, or other crop that may be planted. In this area, green-crop manuring, combined with the application of slowly acting phosphate manures rich in lime is, in my opinion, the cheapest and best way of maintaining the fertility of the soil.

The growing of crops for green manuring is not necessarily confined to established orchards or plantations, but it is admirably adapted for improving and renovating land that has been kept too long under one kind of crop, and has become unproductive in consequence. Land of this nature should be thoroughly prepared by deep and intense cultivation, and be planted with a strong-growing legume which has been heavily manured as previously described, and when the crop has made its maximum growth it should be ploughed into the soil, which, once the green crop has become thoroughly incorporated with it, will be in a good heart to grow any crop.

ORANGE WINE.

With the advent of the orange harvest, numerous requests reach us from correspondents for directions as to how to make orange wine. We have already given some good recipes for making this beverage, but here is one we take from the Natal "Agricultural Journal," by one who every year makes this wine, and who finds a ready sale for it at 15s. per dozen:—

Cask of Orange Wine (30 gallon cask).—1,200 oranges at 1s. per 100, 12s.; 120 lb. of sugar, £1 5s. Skin the oranges and press the juice out. Soak the pulp in water for seven days, and frequently stir and press. Add the extract to the juice, pour the mixture into the cask. Pour boiling water on the sugar until all is reduced to a syrup, when it is added to the cask, and the vacant space is filled with hot water. When the temperature is lukewarm add a little yeast, and at the expiration of three weeks fermentation should be finished. During the three weeks of fermentation liquor must be added to the cask so that it remains full, for a quantity of sediment will bubble over. When there are no more bubbles, 2 oz. of isinglass should be dissolved in some of the warmed liquor and added to the cask. The bung may now be fastened down. The tap is put in 2 inches from the bottom of the front head. At the end of a month the contents should be ready for drawing off. The cost will be 1s. 3d. per gallon, or 2½d. per reputed quart bottle, and the drink will be in great request. If the liquor is to be kept for any length of time, 1 oz. of salicylic acid should be added at the same time as the isinglass. The salicylic acid will act as a preservative, and prevent the liquor turning sour; but the best means of preserving the contents is to keep the cask full.

ANOTHER METHOD.

Gather the fruit when ripe. Peel the oranges. Put into a vessel with the head out and a tap fitted near the bottom. Pour on boiling water to cover it. Mash the pulp with your hands, and then let the mass stand till the pulp rises to the top and forms a crust in three or four days. Then draw off the fluid into another vessel, and to every gallon add one pound of sugar. Mix well and put into a cask to work for a week or ten days, and throw off any remaining lees, keeping the cask well filled, especially at the commencement. When the working has ceased, bung it down. It may be bottled after six to twelve months.

Or:—Express all the juice of the oranges in a press; strain. To every gallon of juice add 1 lb. of sugar and half-a-pint of brandy. Pour into a cask, but do not bung until it has done working. Then bung it close for three months, and draw off into another cask. When it is fine, bottle and cork well.

Another recipe, taken from "Farm, Field, and Fireside."—Take half a chest (400) of Seville oranges, pare off the rinds, and put two-thirds of them into 6 gallons of water for 24 hours. Squeeze the oranges through a sieve into a pan, and then throw them into another 6 gallons more of water; and leave them there until the next day. For every gallon of wine, put into the cask 3½lb. of loaf sugar, and the liquor strained clear from the rinds and the pulp. Repeatedly wash these, if more liquor should be required to fill up the cask, rather than add raw water. Stir the wine daily until the sugar is completely dissolved, and allow it to ferment for about five weeks. Add three bottles of brandy, stop down, and after twelve months bottle.

Horticulture.

FLOWERING TREES OF BRISBANE BOTANIC GARDENS.

COLVILLEA RACEMOSA.

NATURAL ORDER LEGUMINOSÆ.

BY E. W. BICK, Curator, Brisbane Botanic Gardens.

Derivation.—(From "Botanical Magazine," f. 3325.) This truly splendid plant, bearing the name of the late Sir Charles Colville, a former Governor of Mauritius, to whom it was dedicated by its discoverer, is probably a native of the east coast of Africa; but was only seen by Professor Bojer in 1824, in the Bay of Bombatoe, on the western coast of Madagascar, where a single specimen tree was cultivated by the inhabitants. That great naturalist obtained seeds, which he took to Mauritius, where plants were raised and did remarkably well. Its flowering season in Mauritius is April and May; this is approximately its flowering time in Brisbane also.

Description.—Tree 40 to 50 ft. high, somewhat like the *Poinciana regia*, to which it is closely allied, but with a more decided trunk and rather heavier foliage; the bark is reddish-grey, branches long and spreading, the younger ones greenish, rough, with elevated points, this being one of the noticeable differences from the Poinciana, whose branches are tipped light-green and have a pendulous or drooping habit.

Leaves dipinnate, with from twenty to thirty pairs, oblong-oval in their circumference, 2 to 3 ft. long; pinnæ opposite, from 4 to 6 in. long, with twenty to thirty pairs of horizontal leaflets, ½ in. long, shorter at the base and at the extremity of the pinnæ, rather unequal, on very short petioles, slightly pubescent. The common petiole is swollen at the base, channelled above, also pubescent; this latter provides the whole petiole with a dull-brownish tint, contrasting with the bright green of that of the *Poinciana regia;* the leaflets also being slightly larger gives the heavier appearance.

Flowers bright orange-red, racemose; racemes from four to sixteen in a large terminal panicle from 12 to 18 in. long, borne on extreme end of branches. The buds are obliquely globose, velvety red; calyx greenish within, including the wings and keel; this latter is small, convolute, almost covered by the wings, and is of a yellowish colour, marked with veins. The ten free stamens are also of a yellowish colour.

Pod from 7 to 9 in. in length, from 2 to 2½ in. in breadth, carrying from six to nine seeds, the whole resembling the *Poinciana regia* pod, but on a much smaller scale.

The great weight of the racemes of flower, being on extremities, bend the branches down during the flowering season. This gives them a graceful appearance, and its striking colour attracts universal attention.

A fine specimen, near the Botanic Museum building, flowered recently and brought the remark from a visitor, Professor E. H. Wilson, Arnold Arboretum, Harvard University, U.S.A., "that is was worth coming all the way from America to see."

Propagation.—Unfortunately, unlike the *Poinciana regia* that flowers in summer, the *Colvillea*, flowering as it does in late autumn, does not produce seed owing to the cold weather intervening. Two years ago a number of pods set, but unfortunately fell off while immature. The difficulty of obtaining seed accounts for the rarity of the tree in Queensland. There are two good specimens in the Botanic Gardens, a medium-sized one in Edward street, at the corner of Margaret street, in front of the Harbours and Rivers Department building, and a small one in Bowen Park. We

PLATE 12.—COLVILLEA RACEMOSA.
Flowers bright orange-red. The branch figured was about 3 ft. 6 in. long.

are endeavouring to get seeds from abroad with the hope of raising a few plants for distribution to our Northern botanic gardens, such as Rockhampton and Townsville, where, if the tree grows, it should set seed readily, thus ensuring a supply for local gardens.

Professor M. Bojer, who named *Colvillea racemosa*, was Professor of Botany at the Royal College of St. Louis, Mauritius. He published a "Flora of the Mauritius" in 1837. It was during a visit to Madagascar that he discovered and named both *Colvillea racemosa* and *Poinciana regia*.

HORTICULTURAL NOTES.

This has been rather an exceptional season, and winter's cold is not yet in evidence. Showery weather continuing through June and July has given a remarkable growth of vegetation for this time of the year. Grass is needing more attention than usual, and weeds are troublesome. The cold necessary for the checking of insect pests and the growth of winter annuals is late in coming. This has particularly affected the growth of sweet peas, stocks, and phlox, besides others, more especially on undrained soils or low-lying situations, by making the soil sour. This can be improved to some extent by keeping the surface well stirred and not allowing it to cake.

The pruning of shrubs and creepers should now receive attention. Prune hard *Lagerstræmias* (Brugmansia and Poinsettia), the latter after they have dropped their red bracts. Hibiscus and ligustrums can be pruned lightly, but this depends to some extent on the room available and the size of plant desired. Acalyphas also may be pruned, remembering that if they are pruned hard it induces a lot of strong growth that is not always as nicely coloured as that not quite so robust. Wistarias also are much improved by pruning, more flower being obtained. This applies, too, to *Antigonon leptopus*, better and more abundant blooms being obtained if most of the small growth is removed and the main stems and laterals are tied in the direction desired.

Cuttings of shrubs and climbers may now be planted; get good medium wood. If hedges are required, now is a good time to plant. The small red acalypha, *A. compacta*, is very suitable for small garden hedges; put the cuttings in permanent position about 18 in. apart.

Bulbs of hippeastrum, crinum, and plants of agapanthus and clivias may be lifted and replanted if necessary.

Plant cuttings of begonias, coleus, and iresine; coleus seed, also aster and other summer-flowering annuals such as amaranthus, cockscombs, celosia, cosmos, annual chrysanthemum, coreopsis, calliopsis, marigold, and portulacca.

PNEUMATIC GRAIN UNLOADERS.

Pneumatic plants for discharging grain from ships have come largely into use during recent years on account of the saving in manual labour for handling and trimming, and also because of the comparative absence of dust. During the war a number of self-contained floating grain plants were supplied by a British firm to the French Government to handle the increased imports of grain necessary owing to the reduction of agriculture in France. The same firm recently constructed a similar floating plant with the large capacity of 180 tons per hour. It is a combination of pneumatic and band conveyors for simultaneously discharging from a grain ship through spouts to lighters and by means of the band conveyor across the deck of the ship to bands below the quay. The plant is erected on a pontoon which is brought alongside the ship to be emptied. Although designed for 180 tons per hour, this equipment proved able, on a recent test, to discharge at the rate of 200 tons per hour, the highest capacity being 216 tons per hour for two consecutive hours.

Tropical Industries.

THE CANE CROP.

FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report (8th July, 1921) from the Southern Field Assistant, Mr. J. C. Murray:—

In the course of the month the districts of Bingera, Gin Gin, and Childers have been visited; also Goodwood and Dallarnil. At Bingera, the cane looks promising. The plant and ratoon crops are both well grown and healthy. Young autumn plant cane has struck strongly. Cane pests appear to be well under control, especially the moth-borer. The fact is due, probably, to the large numbers of ants found in the canefields, which are, apparently, their most effective natural enemy. Grubs are also well under control. This may be due to the fact that they are living on organic matter in the soil and leaving the cane roots alone (although not many grubs are found) or that bacterial agencies are destroying them. The cane this year is very suitable in most cases for plants. There are occasional blocks, however, which display unhealthy characteristics. These should be avoided by the farmer as far as planting is involved, and only cane displaying the best appearance should be selected. The leaf-hopper is everywhere present, although apparently well under control.

The darker soil could be limed. More green manuring is essential, especially before using chemical fertilisers. In ploughing-in green crops, the growers should get to work before the seed ripens and when they have the greatest mass of green crops on the field. This restores to the soil the maximum amount of nitrogen and humus the crop can supply.

At Gin Gin the cane crops are excellent. Since the hurricane the cane has made wonderful growth. The growers are greatly heartened, and speak confidently of this season and the likelihood of a good one in 1922.

No disease of consequence is apparent. The effect of the drought is still noticeable in the leaf of the older crops, but this must not be confused by the grower with striped-leaf disease. Pests are also well under control, either by active farming or natural enemies. The moth-borer is attacking the cane in places, but is here again checked by the ants. Taking the district as it is now, the briefest mention need be made of cane pests.

The two most satisfactory varieties are D. 1135 and M. 1900. Both will cut heavily this year, and, judging by the sugar content at Show time, should yield a high percentage of c.c.s.

Farmers, at the time of visiting, were busy breaking up land prior to the spring planting. Should the winter be as mild as anticipated, they ought to be able to plant by the end of July.

At Childers the cane has made heavy growth in the last three months, and some of the twenty-months-old D. 1155 will cut 60 tons to the acre. The cultivation is very good here this year, and the farms are free of weeds. The autumn plant crop has struck well, even misses supplied as late as June coming up vigorously.

D. 1135 and M. 1900 Seedling are the principal canes grown. Others that present a good appearance are H.Q. 77, M. 87, Q. 813, Rappoe, Striped Singapore, and H.Q. 285. Of the newly distributed varieties, E.K. 1, E.K. 28, and Shahjahanpur No. 10 have struck well and are growing vigorously, and are absolutely free from disease. Growers want to bear in mind that the Experiment Stations will not send out cane that is diseased or unsuitable for planting.

Q. 813, another station cane, is doing well, and should be grown by farmers. This variety is a highly resistant cane to disease, and suitable to follow up unsatisfactory crops of D. 1135.

Very little trouble is being caused by cane diseases. An occasional trace of striped leaf disease is evident; also gumming, but there is nothing of an extensive nature.

Peculiarly enough, D. 1135, while a good drought-resister and resistant to grub attack up to a certain point, is a susceptible variety as far as sugarcane diseases are concerned.

This might be on account of the degeneracy of the cane caused by years of careless selection of plants and neglect to change from one soil to another in obtaining supplies of cane for planting.

It should be impressed upon the grower that, whatever cane he prefers to plant, it is essential to select the best type of that variety.

Cane pests are well under control this year. Grubs have destroyed small patches of cane, but the damage is nowhere extensive. Other insect parasites, such as leaf hopper and borer, are doing very little damage. It is worth mentioning that what is thought to be the Muscardine fungus is attacking the grub and causing a high percentage of mortality in the infected areas. A bacterial disease is also in evidence, but the percentages of deaths and the character of the attack could not be observed.

While in the Childers district, a visit was made to Goodwood Plantation, and also to Dallarnil. Very little cane is grown at the latter place, but the soil is suitable if the rain favours the grower. However, several farmers are making efforts to raise crops of sugarcane, and, judging by the appearance of some fields, they have every reason to feel satisfied.

Varieties such as D. 1135, Rappoe, and Striped Singapore are doing well.

Goodwood presents a fine appearance at the present time; in fact, the cane here is equally as good as at Childers. Noxious weeds are not present in any serious growth, while very little trouble is being caused by pests. The land is remarkably free, apparently, from these.

Of the different varieties growing, those displaying the best characteristics include Petit Senneville (a Mauritius variety), Clark's Seedling, D. 1135, H.Q. 77, Black Innis, and M. 1900 Seedling. Green manures could be profitably applied by growers.

The General Superintendent of the Bureau of Sugar Experiment Stations, Mr. Easterby, states, in the course of a report dated 6th July, 1921, on a recent visit to the Mackay and Bundaberg sugar districts, that since his previous visit the cane had made good progress in each locality, but the Mackay cane was flowering or "arrowing" very largely, and hence little more growth could be hoped for. Not much flowering was observable in the Bundaberg district where the cane, due to the favourable weather conditions, is still making progress.

At Mackay heavy rain fell, ranging from 5½ to 11 inches, in different parts of the district. Unfortunately, this was accompanied by a severe gale, which laid a good deal of the high cane over, and in some instances flattened it considerably. The weather at Mackay has, in common with most other districts, been very much warmer during the past three months than for the corresponding period of 1920. Some of the mills intended to start crushing in July, while the remainder will start early in August.

The Annual Field Day of the Mackay Experiment Station was held on Saturday, 2nd July, and it proved a very great success. About 250 farmers attended, and these were shown over the station grounds, and the various experiments in cultivation and fertilising were explained. The merits and demerits of a large number of varieties imported from different parts of the world were discussed and arrangements made for supplying cane farmers with free parcels of the best kinds. After luncheon, the General Superintendent delivered an address upon the necessity for increasing our sugar production, and the best methods of achieving this were fully set forth. The demonstration of improved farm implements, owing to the wet nature of the ground from the heavy rain, had to be reluctantly abandoned, but one or two of the lighter tillage implements were shown in action. Farmers were intensely interested in the day's proceedings, and acknowledged having spent a pleasant and instructive time.

At Bundaberg, two of the mills had already started crushing operations.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 14th July, 1921:—

BABINDA.—In last month's notes I omitted to mention that among the varieties grown in the district, D. 1135 has to be included. This cane has mostly been grown in grubby areas, and so far has proved its value, showing up remarkably green and healthy in comparison to other varieties that are more badly affected by the ravages of grubs. A larger area of this useful cane is sure to be planted if the grubs continue to do damage.

On the newer portions of this district visited, some magnificent Badila cane was found on the block formerly known as the Q. N. Bank Estate, situated on the south side of the Russell River. A block of 37 acres of plant cane growing there will cut between 50 and 60 tons to the acre. Some of the first ratoons on this block are also very forward. This particular part of the area carries a rich deep alluvial soil formerly under dense tropical scrub. In visiting this district one cannot help noticing how very much it has grown lately. Large areas of land are being grubbed and ploughed in every direction, and the general air of prosperity is very marked. New homes are being erected everywhere.

CAIRNS DISTRICT.—In this district, Freshwater now comprises the areas formerly known as Redlynch and Smithfield, and consists of deep, rich, dark-red volcanic soils and magnificent alluvial flats adjacent to the Barron River and Freshwater Creek. Most of it has not been under crop for a number of years, and in the interval has been growing heavy crops of lantana, blady grass, or burrs. When cleared and ploughed, its possibilities for canegrowing become evident.

On the northern side of the Barron large areas are now being prepared for cane. A great deal of work has been done in building a temporary low-level bridge over the river, and supplementing the mill supply of rails by about a mile of private tramline composed of 3 in. by 3 in. wooden (Pender) rails. Large areas are being planted. Further up Freshwater Creek the same evidences of activity are to be observed in all directions, and 1922 should mark a great increase in prosperity for this rich area.

Redlynch and Freshwater are now very busy places, and old residents begin to think that at last the rich lands of this locality will be able to show what they are capable of producing in the way of sugarcane. Very few grubs were noticed in this particular part of the area, and the cane seed (practically all Badila) looks very green and healthy.

ALCOMBA AND GORDONVALE.—These districts are now in full swing harvesting their crops. Badila composes about 90 per cent. of the cane grown, with about 4 per cent. each of D. 1135 and H.Q. 426; whilst the Gorus 24, 24 A, and 24 B, and 1900 Seedling account for the other 2 per cent. Quite a number of growers who have suffered from grubs this year expressed their intention of planting a larger area of D. 1135 this planting, as they are satisfied that it stands up to the grubs better than any of the other areas.

Some of the cane now being harvested is being sent in to the mill in anything but a clean state, trash and tops being very noticeable.

Owing to the floods earlier in the year, and, later on, to the grubs, the tonnage of the two local mills will be considerably below the original estimates. The shortage from these causes will probably be in the vicinity of 45,000 tons for the two mills. Grubs have caused damage to farms previously free from them. It is considered by some farmers that, had the beetle and grub fund been kept in constant operation all over the district, damage this season would, probably, not have been so severe. In support of this assumption, Mr. Scanlon, near White Rock, tells me that he picked up all the grubs on one block after each successive ploughing. This and the adjoining area were all planted with Badila at about the same time, but whilst all of it shows the presence of grubs, this particular block did not fall down until much later than the others, and has most certainly suffered far less. Apart from the damaged stuff, some splendid fields of cane are to be seen all over the district, and some very heavy yields per acre will be cut this season. At time of writing, several days' rain had been experienced. This fall will help the recently planted cane along nicely, and also keep the grubby cane alive. Quite a large number of tractors are in use in this district, and are credited with doing very good work. Liming, green manuring, and artificial fertilising are being very freely carried out.

MOSSMAN DISTRICT.—When this district was visited, wet conditions prevailed. The rain ceased before the commencement of the crushing. The cane generally looks very green, but might be more advanced.

The cane grown, and the proportion of the same to the total crop to be harvested should, approximately, be as follows:—

Badila	19 per cent.
H.Q. 426	22 per cent.
D. 1135	42 per cent.
Others	17 per cent.
	100 per cent.

By these figures it will be seen that D. 1135 is the most popular variety of cane grown, and some good crops are often harvested here. The crops listed as under were cut on one particular block in the vicinity of the mills:—

Standover Plant	56 tons per acre
1st Ratoons	31 tons per acre
2nd Ratoons	27 tons per acre
3rd Ratoons	25 tons per acre
4th Ratoons	20 tons per acre

while the crop now being harvested promises a 25-ton yield.

Badila and H.Q. 426 are not doing too well, on the whole, although in some places good crops of these varieties are standing.

Of the Gorus, some very fair 24 B may be seen. Of other varieties, Messrs. Crees Bros. planted some twenty new kinds last year upon medium-quality land liable to flood. During the early part of the year flood waters considerably damaged this block, several varieties being quite spoilt. Of the varieties that suffered least, M.Q. 1 and M.Q. 5 (Mowbray seedlings) are doing by far the best, showing a good length of cane, a fair number of sticks, and a splendid green top. H.Q. 903 has also grown very well here, but Q. 813 and Q. 855 have not done so well. All through the district grubs are to be found in places, but cannot be classed as bad, on an average of the whole crop.

Soils consist mainly of a greyish to brown alluvial, varying considerably in depth and covering in most places a stiffish clayey subsoil, and in others a sandy subsoil. A very strong acid reaction is noticed in the soil samples taken. This is due to the continued growth of cane upon the same land, and also helped by the use of artificial fertilisers, such as sulphate of ammonia. Meatworks manure and sulphate of ammonia are at present the principal manures in use in this area. The use of lime would be of much advantage to these soils, but, unfortunately, its cost has so far made its general use prohibitive. Green manuring in the shape of Mauritius beans and cowpeas is giving very good results.

Taking the district as a whole, a large area of very fair land is still available for growing cane, and, as the mill has suffered from a shortage for a number of years, it is a great pity that this land is not being utilised.

After finishing the Mossman district proper, a day was spent at the 7-Mile on "Mowbray." Some very good deep alluvial soil is found adjacent to the river and creeks. Very heavy crops of 24 B and Badila were observed. On Mr. Robin's farm some of the local seedlings are showing very good growth, notably No. 1 Mowbray Seedling, which, although planted at the end of last November, carried some 8 ft. of cane, and should easily cut a 40-ton crop.

CANE ARROWING.

BY H. T. EASTERBY, General Superintendent, Sugar Bureau.

The condition which produces what, after all, is but the natural functioning of the cane plant—namely, arrowing, flowering, tasselling, or spearing, as it is variously termed—is not yet generally understood, but it is mostly attributed to climatic factors. On very poor soils, arrowing is frequently common, but this does not apply to the large percentage of arrowing which is taking place this year. In the hotter cane areas, such as Java, Cuba, Hawaii, and North Queensland, arrowing is more or less universal, and as a large production of sugar takes place in these countries, arrowing is accepted as the common thing, and little or no comment is made on the matter. In Mackay and the Southern cane areas the arrows usually take a much longer time to mature, *i.e.*, to become "fluffy" and blow away with the wind, and this is a good point in one way, as it takes the cane longer to mature, but it is a great obstacle in trying to raise seed from the arrow. For many years, endeavours were made at the Mackay Sugar Experiment Station to raise seed from cane, but the arows took too long to ripen, and the arrows from the different varieties of cane did not all ripen at the one time, so that cross-fertilisation could not take place. About Cairns, where the arrows mature quickly, seedling work has been carried out with great success.

Experiments carried out in Hawaii many years ago showed that arrowed cane did not lose its sugar content, provided it was crushed as rapidly as possible. It has been further argued that arrowed cane did not make good plants, but experiments carried out at the Sugar Experiment Station at Mackay, using arrowed and non-arrowed plants of the same variety and age, actually gave a slight yield in favour of the arrowed plants in both the plant and first ratoon crops. As more sugar is extracted in the Ingham-Mourilyan district (where arrowing is usual) from a lower

tonnage of cane than anywhere else in Queensland, except the Lower Burdekin, the arrowing conditions need not be greatly feared. If there should be any decrease in the average sugar contents of the cane this year, it is far more likely to be due to the great amount of rain experienced so late in the season than to arrowing conditions.

Noel Deerr, in his work on "Cane Sugar," says:—

"Arrowing marks the end of the vegetative period of the growing cane. It has been thought that arrowing had an influence on the sugar content of the cane; definite experiments by Harrison and by Prinsen Geerligs have shown that this belief is unfounded. After the cane has arrowed, no further formation of sugar takes place, but an elaboration of that already formed obtains, with an increase in the cane-sugar content and in the purity; eventually, however, the cane dies down, and then a breaking down of the cane sugar occurs. The time to which cane can be left standing after arrowing is very variable, and is dependent on variety and climate. In the Hawaiian Islands, cane may remain as long as six months after arrowing, before deterioration sets in."

THE ALGAROBA TREE IN CENTRAL QUEENSLAND.

By G. B. BROOKS, Instructor in Agriculture.

The contribution appearing in the June issue of the Journal, by Mr. C. T. White, F.L.S., Government Botanist, on the Algaroba Bean, will no doubt be an incentive for many to plant this useful tree.

The writer, as far back as 1900, pointed out its value as a fodder through the medium of the Journal. The results following that article were rather surprising, for in a very short time over 300 applications for seed came to hand. Although those requests were complied with, the results accruing from the seed distributed have been disappointing. So far, I have not seen any trees in the districts adjacent to the coast that have been raised from seed sent out at that time. From reports received, the failures in most instances were due to the difficulties experienced in germinating the seed. Quite a number stated that their plants died when transplanted.

As a result of a later distribution of Algaroba seed, trees are to be found in several localities throughout Central Queensland. Mr. E. Brotherton, Gladstone, has a tree in bearing, seeds of which have been advertised for sale in the Journal. There are several trees growing on the property of Mr. Hugo Tooker, Cawarral, Yeppoon Line, one of which bore its first crop last season. Mr. M. E. Huntly, Mount Larcom, has also two trees about seven years old. They have produced two heavy crops of beans.

Some nine months ago, Mr. Huntly very kindly supplied me with a quantity of seed, which I distributed, with instructions to soak in boiling water before planting. From information received, seed treated in this manner gave good germination, while untreated seed had so far given negative results.

Judging by the rapid growth made by the trees in the districts mentioned, together with their heavy cropping qualities when in bearing, conditions in Central Queensland are eminently favourable for the raising of the Algaroba Bean.

BANANA PLANT FIBRE.

The commercial possibilities of banana plant fibre has engaged the attention of planters and others interested from time to time, and some Tweed River growers have had under consideration the formation of a syndicate to thoroughly explore those possibilities.

A number of banana-fibre products have been submitted to our inspection, and as samples they appeared to be all that could be desired. A textile product woven from processed fibre had a fine silky appearance, and its value as a possible substitute

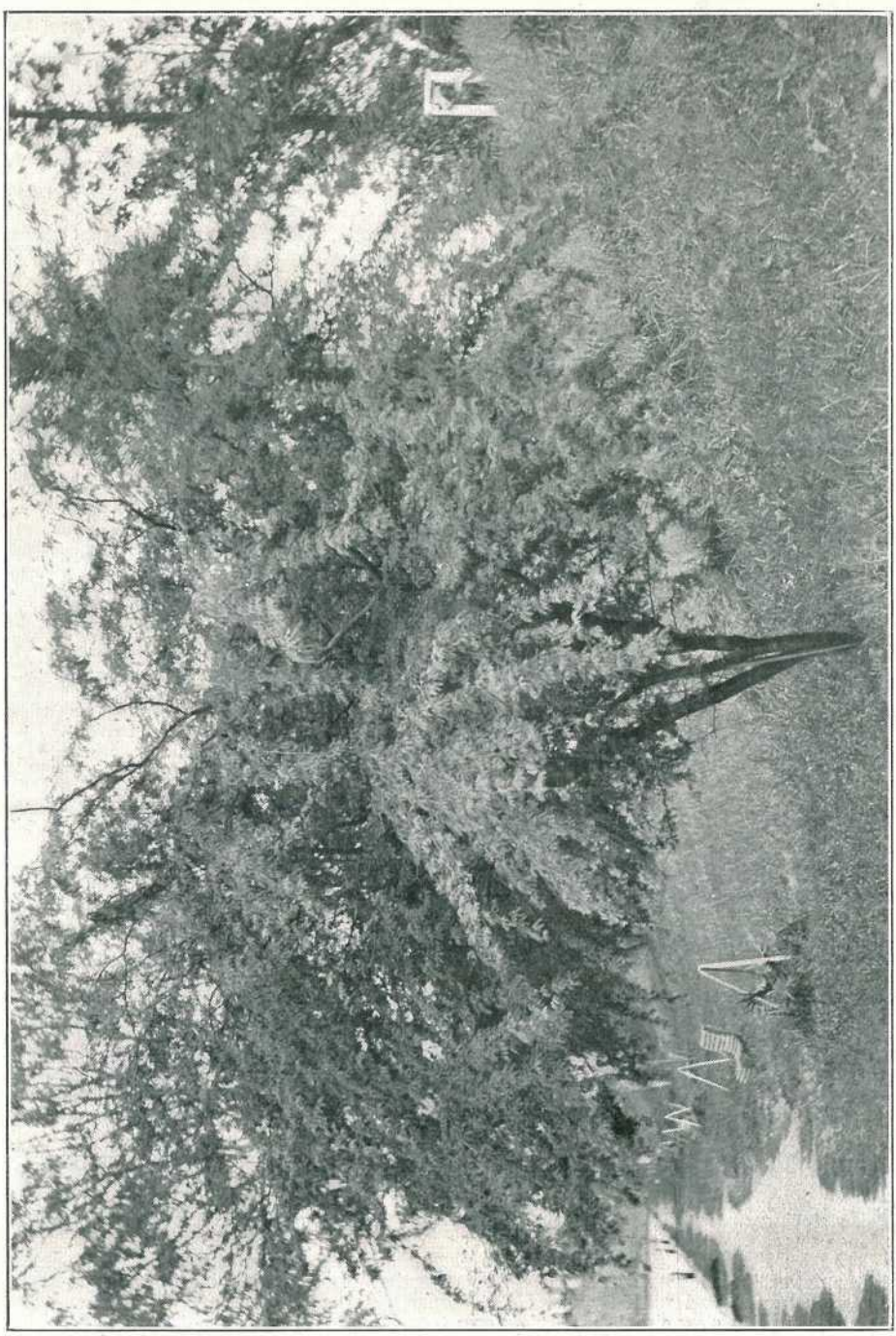


Photo. Dept. Agriculture and Stock.]

PLATE 13.—ALGAROBA BEAN, BOTANIC GARDENS, BRISBANE.

for panama hat material was suggested. Another possibility is the production of vegetable silk from the residue of the treated material after the fibre has been extracted.

The question of the value of fibre from the stem of the banana is a recurring one, and should be approached with all due caution. In the West Indies many years ago, Sir D. Morris, D.Sc., D.C.L., F.L.S., Director of Public Gardens and Plantations, Jamaica, devoted close attention to it. One of his successors, William Fawcett, B.Sc., F.L.S., in his work, "The Banana: Its Cultivation, Distribution, and Commercial Uses" (1913), p. 151, says—

"The stem (banana) yields less than 1½ per cent. of its weight; that is, about 1½ lb. per ordinary stem as cut. . . . To obtain 1 ton of fibre it would therefore be necessary to handle nearly 100 tons of fresh stems, which must be dealt with as soon as cut, on the spot. . . . It is considered that the value, as manure, of the chopped stem is perhaps two or three times the value of the fibre. No reasonable person would wish to export fibre to the detriment of his land. . . . The banana and plantain are grown primarily for the fruit, and not for fibre.

"In 1905, when the subject was under discussion, Sir D. Morris sent the following communication to the Jamaica Agricultural Society (Jour. Jam. Ag. Soc., X. 2, 1906):—'I enclose a summary of the facts obtained as the result of experiments during the last twenty years. They are as follow:—A banana stem just after fruiting, if cut, as usual with the country people, about 2 ft. above ground, and denuded of its foliage, weighed 108 lb.; this being divided into three lengths of 2½ ft. each, and split longitudinally into several pieces, was prepared by beating and washing by hand, and yielded 25 oz. of clean marketable fibre, which is at the rate of 1.44 per cent. of the gross weight. The fibre of the lower portion of the stem, as also the fibre in the petioles of the leaves, was not extracted.

"'A smaller banana, cut under similar circumstances . . . weighed 41 lb. This was divided into two lengths of 2½ ft. each, and, after being split longitudinally into several pieces, was prepared by hand, and yielded 6¾ oz. of clean fibre, or at the rate of 1.02 per cent. on the gross weight.

"'At the Hope Plantation, similar experiments were conducted with banana stems, which yielded very much the same results. Two banana stems, cut after fruiting at 2 ft. from the ground, and denuded of their leaves, weighed 147 lb. These yielded 33 oz. of clean fibre, or at the rate of 1.44 per cent. on the gross weight.

"'From ordinary stems of banana, cut after fruiting at about 1½ to 2 ft. above ground, a settler might prepare about 1½ lb. of clean fibre; but if the stems are large, and the whole of the length is used as well as the petioles of the leaves, the amount of the fibre might be increased to 2½ lb., if not 3 lb., per stem. . . .

"'It must be borne in mind that to obtain 1 ton of banana fibre it will be necessary to handle nearly 100 tons of fresh stems. These cannot be carried to a central place for treatment, as the cost of the fibre would be increased beyond its market value. The stems will be required to be dealt with on the spot. . . .'"

SUCCESSFUL BRITISH TRACTORS.

The merits of the British-made tractor for agricultural purposes were conclusively demonstrated during a trial on a rubber estate in the Far East. All conditions were against success. The soil consisted of heavy sand or of sand mixed with clay, and rain had fallen heavily prior to the trial. Nevertheless, the driver was able to turn and manœuvre with the greatest ease. Further, the tractor showed its hauling powers by pulling two large trucks, weighing about 11 tons, up hill.

STORING APPLES IN GAS.

In storing apples there is a very interesting alternative to cold storage, known as "gas storage." The apples are placed in an airtight chamber filled with the gas produced by the respiration of the apples themselves. An electrical instrument is used to determine whether at any time the proportion of carbon dioxide in this gas becomes excessive, and when that condition occurs air is admitted to dilute the gas. The air is kept in slow circulation by its own temperature variations, and means are taken to remove excess of moisture. It is stated that this system doubles the time during which apples can be kept in good condition, and that the cost of working is very much below that of any kind of cold storage. The merits of the system are being closely studied by the British Investigation Board.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

BY C. T. WHITE, F.L.S., Government Botanist.

No. 22.

INDIAN HELIOTROPE (*HELIOTROPIUM INDICUM*, Linn.).

Description.—An annual herbaceous weed. 1-3 ft. high, more or less hairy or the older parts glabrous. Leaves ovate, oblique at the base, blade 1½-3 in. long tapering into a leaf-stalk of ½-1½ in., the leaf-stalk and often the main nerves sprinkled with longish white hairs. Flowering spikes terminal or placed opposite the insertion of a leaf, up to 1 ft. long, the upper part coiled or curved. Flowers numerous, closely packed on one side of the spike, white or bluish. Fruit, consisting of 4 small beaked nutlets, arranged in the form of a mitre, at first separating into pairs and later singly. Single nutlets (''seeds'') 1½-2 lines long.

Distribution.—It is a common plant over the tropics of the world. In Australia it would seem to have been introduced. In his ''Second Census of Australian Plants,'' Baron von Mueller records it for Queensland and the Northern Territory. Of late years it has become very abundant about Rockhampton, and has the appearance of having been introduced there. It has also recently put in an appearance about Bowen, and, according to a correspondent (Rev. N. Michael), it appears to have been accidentally introduced there.

Botanical Name.—Heliotropium, from the Greek *helios*, the sun, and *trope*, a turning, from the belief that the flowers are always turned towards the sun; *indicum*, Latin, meaning Indian.

Uses.—W. Dymock, in his ''Vegetable Materia Medica of India,'' states:—''The plant appears to be generally used as a vulnerary in different parts of the world. Of its medicinal properties, Ainslie states:—'The juice of the leaves of this plant, which is a little bitter, the native practitioners apply to painful gumboils and to repel pimples on the face; it is also prescribed as an external application to that species of ophthalmia in which the tarsus is inflamed or excoriated.' '' In Bombay the plant is used as a local application to boils, sores, and the stings of insects and reptiles.

Eradication.—So far it has not asserted itself as a particularly aggressive weed, and eradication by hand-pulling or hoe-chipping should not be difficult. As the plant is an annual, this should be attempted, if possible, before it has had time to ripen any seeds.

NOTES ON SOME NORTH QUEENSLAND WEEDS, ETC.

Writing to the Government Botanist, the Northern Instructor in Agriculture (Mr. N. A. R. Pollock) supplies the following interesting notes about some Northern plants:—

Leucas zeylanica is plentiful in parts of North Queensland; it is eaten greedily by all kinds of stock, and is not looked upon in any way as a pest.

Hyptis suaveolens, or Bell Weed, is a bad pest, and spreads freely. It grows in parts in dense masses to over 6 ft. in height. Nothing seems to touch it except cockatoos, which feed freely on the ripe seeds. The story is that a Chinaman in Cooktown brought it out and grew some in his garden for medicinal purposes. It is such a pest here that its introduction elsewhere needs guarding against.

Both the above plants were figured and described in this Journal for September, 1919.

Rhynchosia australis.—I find stock relish this leguminous vine when it is fairly dry, and I have noticed a cow with about 20 ft. of vine trailing after her and gradually chewing it up until none remained. Legumes in a wild state that stock eat should make available additions to our pastures.

Stylosanthes mucronata, the ''Wild Lucerne'' of the Townsville district. I have this plant under trial in all my districts as far out as Burketown, where it is reported to be doing well. It is proving of immense value on the North Queensland coast, as a mixture in pasturage, but, unfortunately, appears to be of annual habit; a perennial would be worth a good deal more. A figure of this plant will be found in this Journal for August, 1913.

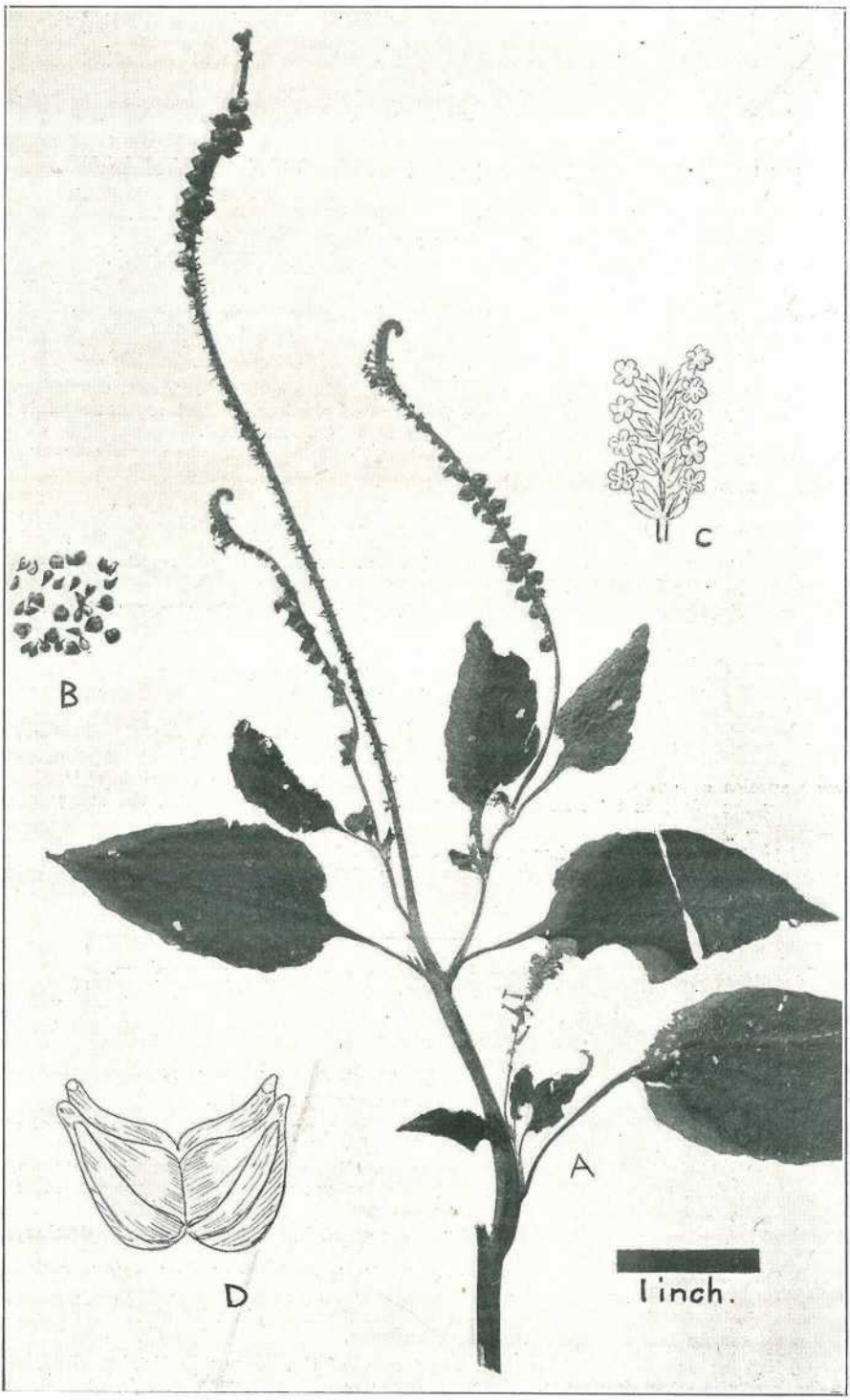


PLATE 14.—INDIAN HELIOTROPE (*Heliotropium indicum*)

A. Shoot bearing leaves and seeding spikes. B. Nutlets ("seeds").
C. Portion of flowering spike (slightly enlarged). D. Group of four nutlets or "seeds," much enlarged. (A and B reduced to scale).

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 5.

BLUE BERRY ASH (*ELÆOCARPUS OBOVATUS*).

Common Name.—Blue Berry Ash.

Derivation.—Gk. *elaia*, the olive tree; *karpos*, fruit; obovate from Lat. *obovatus*, reversed egg-shaped (in allusion to the shape of the leaf).

Description.—A tree attaining 120 ft. in height and a barrel diameter of over 3 ft. Barrel often widely flanged at the base. Bark grey, slightly rough but not scaly; when cut, brown, yellow towards sapwood, ¾ in. thick on a tree with a barrel diameter of 3 ft. Surface of sapwood pale yellow; sapwood white when cut. After several hours' exposure, the inner surface of the bark and the surface of the sapwood sometimes turn a greenish black colour. Leaf stalks ⅛-½ in. long. Leaves alternate, elliptical or narrowly elliptical, often broader towards the apex, rounded or with a blunt point at the apex, mostly gradually narrowed into the stalk, margins often toothed, teeth often distant; leaf blade measurement 2 to 3½ in. in length, twice to thrice as long as broad. Flowers in rather narrow racemes springing from the forks of the leaves or from the scars of fallen leaves, the racemes about as long as the leaves. Stalks of individual flowers from $\frac{1}{10}$ to ⅛ in. long. Individual flowers about ⅛ in. long. The outer part of the flower, the calyx, is composed of 5 pointed lobes about the length of the flower. Inserted on the inside of and between the calyx lobes, and about as long as them, are the 5 petals, each of which is split into 6 or 7 narrow teeth at the apex. On the inside of the petals, and shorter than them, are the bristle-like stamens, over 15 in number, surrounding the central, small, egg-shaped ovary. Fruit oval or globular, blue, about ½ in. long, outer part almost succulent, surrounding a rough tuberculate stone which mostly contains a single seed.

Flowering Period.—September.

Distribution.—Confined to Australia. Coastal scrubs of Queensland from the Southern border to Mount Perry (west of Bundaberg and about 60 miles from the coast). New South Wales as far south as Port Jackson (C. Moore).

Uses.—The timber should be useful for indoor work such as fittings and cabinet-making.

References.—*Elæocarpus obovatus*, G. Don, in "General History of the Dichlamydeous Plants." Vol. I., p. 55; Bentham, "Flora Australiensis," Vol. I., p. 281; F. M. Bailey, "Queensland Flora." Part I., p. 163.

Photo. by the Authors.]

PLATE 15.—BLUE BERRY ASH (*Elæocarpus obovatus*).
Ranges eastward of Emu Vale, Killarney District.

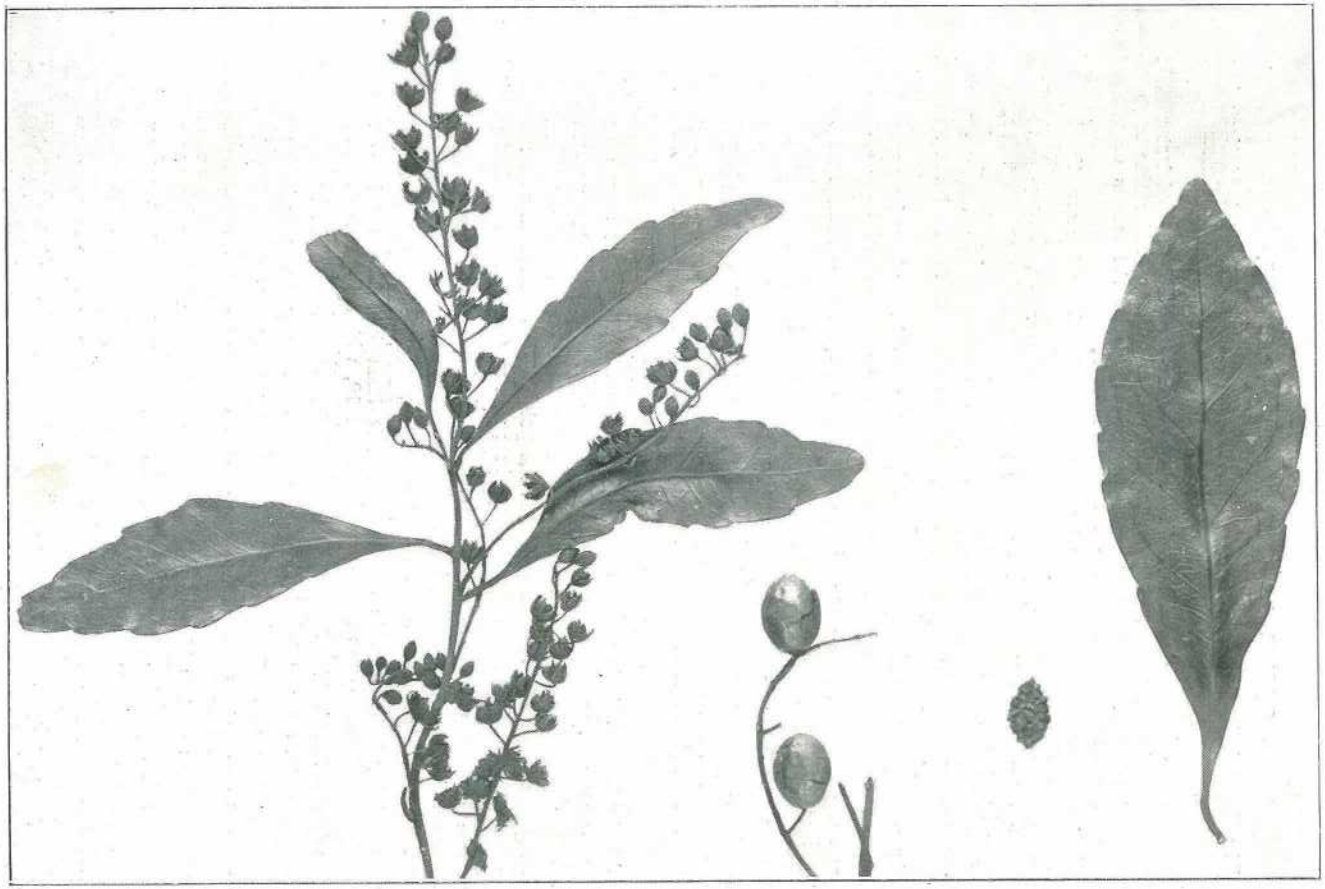


Photo. by Dept. of Agriculture and Stock.]

PLATE 16.—BLUE BERRY ASH (*Elæocarpus obovatus*). NATURAL SIZE.
Reading from left to right—Flowering branchlet, fruiting branchlet, seed, and leaf.

Entomology.

GRUBS IN THE CAIRNS DISTRICT.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon cane grub investigations from the Entomologist, Mr. Edmund Jarvis:—

When given charge of this entomological laboratory on the 19th of last month, I naturally endeavoured in the first place to review the cane-grub situation from an economic standpoint, and to summarise as far as possible the results of various activities of this station during the years 1918 to 1921.

Although climatic conditions have been very favourable to the growth of cane, the outlook is anything but encouraging, grubs having appeared in numbers this season at Mulgrave, Highleigh, Hambledon, and elsewhere, on river-flats and places which have for many years past been free from attack; while at Greenhills, that stronghold of the "grub pest," about 300 acres of cane are badly affected.

Such widely spread injury, occurring as it does at a time when the beetles during the last three years have not been collected, and had a chance to breed and multiply a hundredfold, must appear significant.

As a matter of fact, economic entomologists the world over have long recognised the importance of systematically collecting the grubs of many injurious species of root-eating scarabaeidæ.

For instance, in a recent Bulletin (1918) issued by one of the sugar experiment stations of Porto Rico, we read:—"The most successful method of controlling the white grub that has yet been found is that of collecting the grubs and beetles. The method is rather expensive, but it is the only sure way of keeping the pest from increasing." Again, our State Entomologist, Mr. H. Tryon, at a meeting of the Australian Sugar Producers' Association, in Maryborough (1911), stated that "these measures had in the past accomplished very great results. It was only when these measures had been neglected that the grubs had increased to a disastrous extent."

HOW TO USE ARSENIC.

At Gordonvale, during the years 1915-16, I studied the effect upon cane-grubs of several deadly poisons administered in various ways, and, after demonstrating the extreme resistance of our cane-grubs to stomach poisons, ultimately found that the only way to secure a high percentage of mortality was to induce them to devour some palatable bait liberally treated with the poison in concentrated form.

Paris green and white arsenic gave the best results, the former arsenical proving the more deadly of the two (see Bulletin No. 4). A field experiment along these lines was conducted by the writer in February, 1917, when a bait consisting of cow-pea foliage dusted with the above arsenicals at rate of 24 lb. to the acre was turned into the soil against the stools, the results being decidedly encouraging (see "Australian Sugar Journal," vol. IX., p. 230). Later, in 1919, when the cane on our Meringa experiment plots was harvested, it transpired that the highest yield (29.400 tons per acre) was obtained from Block 10, which was treated with white arsenic at rate of 10 lb. per acre, dusted on wet Mauritius beans and ploughed in; while the lowest yield (16.658 tons per acre) was derived from an application of sodium arsenate, sprayed in drills at rate of 10 lb. per acre. The above results appear to justify conclusions arrived at in 1915-16, and to indicate that arsenic, to be effective, should be administered as far as possible in a concentrated form; moreover, heavy rain tends to wash the minute particles of arsenic downwards, thereby causing additional and far greater soil adulteration. When laying out future experiment plots of this kind, it is proposed to institute a number of methods of administering arsenic that have not hitherto been tried in the field. Other forms of control will be reviewed in future monthly reports.

LOCALITIES VISITED.

On 30th May a visit was made to Hambleton Plantation, where, owing to the courtesy of Mr. F. C. P. Curlewis, I was able to have a look at some of the cane farms and note degrees of grub infestation. It was interesting to find that D.1135, which at first had appeared likely to resist attack in that locality, was finally succumbing in several places, and fast turning yellow. A block of this variety, planted June, 1920, had shown the first indication of grubs the following April, and is not expected to cut over 20 tons. A late block of the same variety, planted in September, went down in March; and 8 acres of Clark's seedling, planted at the same time, collapsed during May, and might cut 5 tons, although in January (about five months after planting) it had every appearance of being a 30-ton crop.

Mr. Curlewis directed my attention to one of those problems so full of interest to the entomologist, the solution of which might at any time throw considerable light on the question of cane-grub control. This was a 15-acre block of H.Q.426, June planting, that was stunted, and for the most part badly grub-eaten—having dropped from an anticipated yield of 30 to about 15 tons—while right alongside it, on similar soil, stood a small block of D.1135, planted the same month, but apparently free from grubs, the sticks being 7 to 9 ft. high, and promising about a 25-ton crop.

Aloomba was visited on the 3rd, and Woree on the 21st instant, when inquiries were made at both places into the reported occurrence in injurious numbers of the beetle borer of cane (*Rhabdocnemis obscurus*, Boisd). In each case, however, these alarms were proved to have been groundless.

CAIRNS SHOW EXHIBIT.

On the 8th instant we exhibited, at Woree, a small collection of insects, &c., comprising eggs, larvæ, pupæ, and adults of our various cane-beetles, together with a number of the parasitic and predaceous enemies, such as digger wasps and robber flies, that help to control the ravages of the grub pest. This display afforded opportunity for getting into touch with canegrowers, and led to much instructive discussion relative to the cane-grub problem.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JUNE, 1921 AND 1920 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of Years' Records.	June, 1921.	June, 1920.		June.	No. of Years' Records.	June, 1921.	June, 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	1·53	20	2·95	0·32	Nambour	3·21	25	8·59	3·94
Cairns	2·72	39	8·12	1·75	Nanango	1·91	39	7·68	3·12
Cardwell	2·06	49	2·77	3·13	Rockhampton ...	1·92	34	7·07	0·59
Cooktown	2·00	45	4·13	1·19	Woodford	2·51	34	8·36	2·51
Herberton	0·96	34	2·68	0·94					
Ingham	2·37	29	4·94	3·94					
Innisfail	6·96	40	10·25	4·22					
Mossman	2·20	13	6·41	2·80	*Darling Downs.*				
Townsville	1·28	50	0·58	1·02					
					Dalby	1·60	51	5·57	2·12
Central Coast.					Emu Vale	1·31	25	4·75	1·61
					Jimbour	1·55	33	7·03	1·80
Ayr	1·33	34	0·36	1·91	Miles	1·85	36	4·28	1·43
Bowen	1·62	50	0·69	1·24	Stanthorpe ...	1·80	48	5·81	4·61
Charters Towers ...	1·35	39	0·33	0·75	Toowoomba ...	2·28	49	6·76	2·72
Mackay	2·70	50	2·93	3·07	Warwick	1·58	34	5·54	2·28
Proserpine	3·62	18	6·18	3·19					
St. Lawrence ...	2·45	50	2·90	2·88	*Maranoa.*				
South Coast.					Roma	1·64	47	3·80	2·26
Biggenden	1·76	22	3·93	2·27					
Bundaberg	2·67	38	4·48	2·67	*State Farms, &c.*				
Brisbane	2·65	79	7·98	3·24					
Childers	2·13	26	3·86	2·97	Bungeworgorai ...	1·38	7	3·76	3·19
Crohamhurst ...	4·13	25	11·05	3·83	Gatton College ...	1·55	22	6·08	2·18
Esk	1·93	34	6·29	2·35	Gindie	1·44	22	3·97	1·40
Gayndah	1·77	50	6·56	1·96	Hermitage ...	1·75	15	5·17	2·15
Gympie	2·45	51	5·57	3·12	Kairi	0·79	7	4·45	0·72
Glasshouse M'tains	3·55	13	11·15	4·73	Sugar Experiment Station, Mackay	2·34	24	3·06	3·40
Kilkivan	1·90	42	9·03	2·19	Warren	1·15	7	7·17	1·23
Maryborough ...	2·79	50	3·25	3·44					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for June this year, and for the same period of 1920 having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND, State Meteorologist.

Science.

DEHYDRATION.

On Tuesday, 5th July, Mr. T. H. Morton, A.M.I.M.E., F.R.G.S., who has had a wide experience of commercial dehydration in the United States of America, and was during the War, supervising engineer in connection with dehydrating plants operated by the Board of Agriculture in England, lectured before a large gathering of members of the Brisbane Chamber of Commerce.

The points made, *inter alia*, by the lecturer were:—

Dehydration is a comparatively modern term, adopted with the evident intention of indicating the use of ultra-modern scientific methods and machinery. The term covers, particularly, the removal of moisture content from the treated product sufficiently to ensure preservation, without damaging the vegetable cells and their moisture ducts, thus enabling their restoration, by soaking, to their original state of freshness.

The art of drying foodstuffs is very ancient, and within comparatively recent years has developed into a science.

The necessity for some suitable apparatus to bring drying more directly under the control of the operator than is possible in the open air, led to the development of various contrivances and processes.

The type of drier giving the best results and, in the lecturer's opinion, one destined to be more generally used in dehydrating fruit, vegetables, and fish, is a special form of tunnel drier.

In earlier tunnel systems a strong current of heated air was drawn or forced from end to end of a tunnel-shaped chamber, along which woven wire trays were slid from end to end on special supporting strips, attached to the sides of the tunnel or conveyed on trucks; the air currents thus flowed longitudinally between the trays in their passage from end to end. One great disadvantage of this system was that the product usually had to finish at the hottest end of the apparatus, and was thus exposed to the risk of scorching or overheating.

An improved type of tunnel system eliminated this disadvantage, by a novel arrangement for circulating the heated air of any desired humidity across the path of progress of the product in its journey through the system from end to end. From this type has been developed the powerful dehydrators constructed and operated by the British Government, and the first high-power, scientifically designed commercial fruit and vegetable dehydrator constructed in Australia.

The factory recently erected at Kendenup (W.A.) by the lecturer, for the De Garis Development Company, showed on its test that the plant exceeded the estimated output and the most sanguine expectations of those directly concerned.

The modern industrial plant erected at Kendenup was completed in fifty-four days, from the laying of the first brick to the delivery of dried fruit, and, in the lecturer's opinion, though not the largest, is the most effective dehydrator in existence.

Queensland, in the lecturer's opinion, offers one of the greatest fields in the world for successful dehydration, on account of the great variety of its fruits and vegetables.

Queensland is importing large quantities of dried fruits and vegetables, while thousands of tons of her own luscious products are being either wholly wasted or sold below cost.

Dehydration on scientific principles will go a long way to solve the recurring market glut problem.

The drying of pineapples is as practicable as drying lemons, and the product will certainly prove profitable.

Dehydrated pineapples can undoubtedly be reconditioned.

Dried fruits, according to housewives, make better jam than fresh fruit.

Large quantities of dried bananas found a ready market in England during the War, and are still in regular demand.

The lecturer was hopeful in respect to the processing of strawberries, but, so far, he had not recommended their treatment on account of their high water content.

There is no need for fear or pessimism in regard to the Australian fruit industry. In the lecturer's opinion the outlook is brighter than ever through the improvement of dehydrating processes.

Modern commercial dehydration will probably never supersede canning, but it has come to stay.

Explaining the working of a dehydrator, the lecturer said that the process includes cleaning, peeling, slicing, or cubing, and placing on conveyors for transit through the dehydrating chambers, where nothing is removed from the product but water. This is done without destroying the cellular structure or affecting the flavour or food value of the product. Currents of clean pure air, at pre-arranged temperatures, are fanned over the fruit, and the resulting product is ready for the storage room and shipment.

The chairman of the Chamber (Mr. Myers King), who presided, referred to the marketing problems that confronted the fruitgrower, and regarded dehydration as something that would immensely aid their solution. By the employment of the process, transport charges would be reduced by seven-eights. When prohibition was mooted in the United States, the grapegrowers of California collected a large sum of money to oppose the proposal, but American growers are now getting as much again for dried grapes as they were when the freshly picked product was sold for winemaking purposes.

The lecturer submitted for inspection a large number of samples of various fruits and vegetables that had been subjected to the process, the commercial possibilities of which were generally and favourably commented upon.

CONCRETE FLOORS.

Mr. Arthur Morry, surveyor, Department of Agriculture and Stock, supplies the following specification for laying a floor for cow bails with Portland cement concrete, in response to an inquirer:—

The ground to be carefully excavated to a regular surface with a fall of not more than three inches from the front of the bails to the back, any inequalities to be filled up with hard materials and well rammed with a wood or iron rammer.

Before starting to lay the concrete, fix wood screeds at top and bottom of the shed, the bottom screed to be three inches lower than the top one; these screeds to be fixed four inches above the ground line, so that when the concrete is laid, rammed, and ruled off, it will be of a regular thickness of four inches throughout. For ruling off use a long straight edge, with bottom edge shot perfectly true with the plane.

Concrete to be composed of approved Portland cement in the proportion of one cask or three bags to one cubic yard of clean river or creek gravel, with all stones more than one inch in size taken out, or, failing gravel, four parts of broken stone which will pass through one and a-half inch mesh, and two parts sand to one part of cement. This makes a concrete technically known as 4—2—1, but it must be understood that one cubic yard, or twenty-seven feet cube, of dry materials will not make one cubic yard of finished concrete, because the finer materials, such as sand and cement, go to fill up the spaces left in the larger material, such as stone. The shrinkage in finished concrete when rammed is from 23 to 27 per cent. of the dry materials, so that about thirty-one feet of gravel and cement is required for one yard cube of finished concrete.

The most convenient method of measurement is to make a box 3 ft. x 3 ft. x 1 ft. without top or bottom, fill it with gravel or stones and sand, and add one bag of cement; this will give a good mixture. Turn it over twice dry and twice when wet, then place it in position four inches in thickness between the screeds, level off with the straight edge, and well ram until the water comes to the surface. Take care that no holes are left on the surface in which the water can lodge. Do not lay on a coat of cement for finishing, as this very often comes off after a time, but endeavour to get a good face with the rammer. If this is not satisfactory, make a grout of water with equal parts of sand and cement, and stir up well until it is quite thick—too thick to flow. Pour this out on to the floor, and brush it over with a stiff broom, taking care not to leave any lumps or inequalities. This will make a good and durable floor.

The open drain should be made with the same material, with 6 in. x 2 in. curb of hardwood on each side, and it is better finished with the trowel for a smooth face.

One cubic yard of concrete or twenty-seven cubic feet will be sufficient for every eight superficial yards of floor four inches thick. This will require three bags of cement and thirty-one cube feet of dry materials for each cube yard.

What is called ash concrete is sometimes used for the above purpose. It is practically the same mix as the above, *i.e.*, six parts of ashes, with most of the dust taken out, to one part of cement, but it is necessary to make it durable to finish the surface with a ¾-inch compo. of one cement and one and a-half sand, worked up with the wood float or the steel trowel. Wood ashes are to be avoided, as they contain a percentage of potash which is injurious to the cement.

The most durable floors are made as first described.

General Notes.

SEPTEMBER SHOW DATES.

Zillmere A. H. and I. Society: 10th September.
Gympie A. M. and P. Society: 14th and 15th September.
A. and P. Society of Southern Queensland, Beenleigh: 15th and 16th September.
Sherwood Progress Association: 17th September.
Mary Valley P. A. and I. Society, Imbil: 21st and 22nd September.
Rocklea A. and I. Association: 24th September.
Southport A. H. and I. Society: 26th September.
Toombul A. H. and I. Association: 30th September.

PUBLICATIONS RECEIVED.

The Journal of the Ministry of Agriculture (United Kingdom), June.—Professor R. C. Punnett, F.R.S. (University of Cambridge) discusses further the results of research in animal breeding. The third of a series of important articles deals entirely with poultry and rabbits, giving particulars of a most extensive series of experiments undertaken to investigate the inheritance of weight. "The Progress of Milk Recording" and the "Need for a more General Use of Improved Varieties of Seed" are discussed editorially. Other of the more important features include a paper on "The Control of Farm Management and some Fundamental Principles of Agricultural Costing," by C. S. Orwin, M.A. (Institute of Research in Agricultural Economics, Oxford); "Simple Cost Accounts for Farmers," by Sir A. Daniel Hall, K.C.B., F.R.S. (Chief Scientific Adviser); and "The Marketing of Fruit," by H. V. Taylor, A.R.C.S., B.Sc. (Deputy Controller of Horticulture).

The Tropical Agriculturist (Ceylon) for May, features a paper by Sir Arrold Theiler, K.C.M.G. (Director of Veterinary Education and Research, South Africa), reprinted from the "Journal of Agriculture, Union of South Africa," Vol II., No. 2, on "Diseases, Ticks, and Their Eradication."

The Agricultural Gazette of New South Wales for July has its customary budget of valuable information. Among its main features is the continuation of a paper on "Producing Lucerne Hay under Irrigation Conditions," and describing methods and detailing experiences at the Yanco Experimental Farm, by F. G. Chomley and F. Chaffey. Other notable features are "Reports of Farmers' Experimental Plots;" a "Description of Elephant Grass, or Napier's Fodder," by E. Breakwell, B.A., B.Sc. (Agrostologist); a continuation of a discussion on "The Feeding of Sheep in Times of Drought;" an article on "The Modern Cheesecuring Room," an interesting competitive comparison by A. T. R. Brown (Assistant Dairy Instructor); "A New Method of Determining Yields of Experiment Plots," by H. Wenholz, B.Sc. (Agr.); and a further contribution on "The Cause of Black Disease and its Methods of Transmission," by Sydney Dodd, D.V.Sc., F.R.C.V.S. (University of Sydney).

Annual Report of The Acting Administrator of The Northern Territory of Australia, 1920.—This report contains much valuable information on conditions in the Territory. On its pastoral possibilities Mr. F. A. C. Bishop, Chief Inspector of Stock, is quoted as follows: "We have approximately 335,116,800 acres of land carrying less than three-quarters of a million head of stock, when the carrying

capacity of stock in the Territory to-day, if conservation of water was on hand on all areas, should be at least four million head of cattle, and, as the country is essentially a cattle country, no time should be lost in recognising the true facts.'' The report goes on, ''Other authorities have expressed similar views. Here is a certain and safe avenue of development that no time should be lost in exploiting. The great obstacles that have confronted the pastoralists were (*a*) absence of railway communication; (*b*) absence of permanent surface water; (*c*) absence of permanently watered stock routes and camping reserves; (*d*) absence of roads for wheeled traffic; (*e*) inadquate mail services; (*f*) absence of telegraph and telephone lines; (*g*) absence of concerted effort to destroy dingoes and other pests.''

The International Review of the Science and Practice of Agriculture (Rome) for March has an original article on ''Organisation of Agricultural Bookkeeping in Denmark,'' by O. H. Larsen (Professor of Rural Economy). In Denmark, the necessity of giving close attention to farm accounts is widely recognised. Efforts are made to ascertain: (1) Amount of capital invested and manner in which it is allotted to the various agricultural enterprises; (2) comprehensive budget of gross profits, working expenses, net profits and interest on capital employed; (3) book-keeping of the various branches of the industry, showing cost of production, general and working expenses; (4) household expenses; (5) income of farmer and revenue yielded by the enterprise itself.

Among the abstracts is a mass of general agricultural intelligence from world-wide sources.

South African Gardening and Country Life, June, has among its leading features a paper on ''Roses and Rose Growing,'' by A. W. Hazell, whose magnificent rosary at Rondebosch is well known to a large number of ex-members of the A.I.F.

Journal of the Department of Agriculture, Union of South Africa (June).—J. du P. Oosthuizen, M.Sc. (Tobacco and Cotton Experiment Station, Transvaal) deals exhaustively with ''The Improvement of Cotton by Seed Selection,'' and remarks on South Africa's second effort to become a real cotton-producing country. As in Queensland, a first attempt was made as a consequence of the world shortage brought about by the American Civil War, and similar conditions afterwards operated to destroy what promised to become a staple industry.

The Twentieth Annual Report of The Bureau of Agriculture, Government of the Philippine Islands (1921), is a finely and profusely illustrated production, containing much valuable information on tropical products.

The Scientific Australian (Melbourne), 11th June, has an interesting note on ''Prickly-pear—Profitable Uses Suggested,'' in the course of which is described the result of experiments made by Lieut.-Colonel L. W. Bickle, F.R.C.S., now of Sydney, and formerly of Adelaide. ''He claimed that, by a comparatively cheap process, a new human and stock food could be made from prickly-pear.'' Other prickly-pear products include a chaff of ''higher nutritive value than wheaten hay,'' a meal capable of being made into an excellent oil cake, a fibre capable of conversion into pulp felt, or possibly a coarse paper. All these are made by a dry process. His researches also showed the possibility of medicinal uses in chest cases. ''The yield is from 12½ per cent. to 17½ per cent. of the dry products from the green slab or leaf.'' Tables of analyses are quoted to support the Colonel's claim.

VEGETATION DISEASES AND INSECT PESTS.

A chart of vegetation diseases and insect pests, illustrated in colours, is on sale at the Department of Agriculture and Stock, Brisbane, at the nominal price of 2s. 6d. The chart is suitable for framing, and should be a useful adornment for the walls of schools and meeting places of public bodies.

Answers to Correspondents.

THE FOOD AND MEDICINAL VALUE OF FRUIT.

Inquiries having been received by the Department respecting the value of various fruits as food, and also medicinally, the matter has been referred to the Director of Fruit Culture, who reports as follows:—

All fruits are of great value, not only as food, but in many cases on account of their medicinal properties.

In brief, fruit may be said to be Nature's greatest remedy. Taken as a whole, fruits tend to purify the blood, and thus keep the body in a healthy state, but individual fruits have specific medicinal qualities. For instance, grapes are valuable in the convalescent stage of many diseases, as they supply nourishment in a readily available form, and act as a cooling medium that has the effect of counteracting any slight feverish tendencies.

All fruits of the citrus family are valuable medicinally, as they act as a febrifuge in the case of mild fevers, and also as a cooling agent when used as a beverage. They have also strong anti-scorbutic properties, and are therefore very valuable in cases of scurvy, barcoo rot, and other diseases due to impure blood.

Apples are extremely valuable as a food, being easily digested, and therefore suitable for everyone. They are also valuable for their corrective properties, in that they act as an antacid, and are frequently very beneficial in cases of rheumatism and similar diseases.

Bananas are valuable as a food, both in the green and ripe stage. In the former they can be used as a vegetable, or dried and ground into flour, and in the latter they can be used either as a fresh fruit or dried and used when required. As a food, their value is high, owing to their being rich in starch and fruit sugars, both of which are valuable food products. Medicinally, bananas have no very great effect other than that possessed by all fruits—namely, that of tending to keep the body generally healthy.

The food value of pineapples consists mainly in the fruit sugar-content in the juice, but medicinally the juice is very valuable as a remedy in cases of throat affections, and it also acts as a good blood purifier.

All commercial fruits are valuable adjuncts to our daily food, and, did we depend more on their use and less on that of proprietary medicines, it would be better for the health of the community generally.

RED NATAL GRASS.

INQUIRER (Loganholm).—Your inquiry was referred to the Government Botanist, Mr. C. T. White, F.L.S., who advises as follows:—"The botanical name of Red Natal Grass is *Tricholaena rosea*. It is a native of the warmer parts of Africa, Madagascar, and Southern Arabia. It was not introduced into Queensland by this Department but by the Acclimatisation Society, who received seeds from Dr. Schomburgh, Director of the Botanic Gardens, Adelaide, South Australia, in 1876, some years before the Department of Agriculture and Stock was formed. For some years afterwards it was grown as an ornamental species, the pretty seed heads being in demand for floral work. As a fodder, reports are somewhat conflicting. However, it is quite a useful grass either for hay or grazing, an objection to it for the latter purpose being that as it has a very slender hold of the ground, stock pull it out by the roots when feeding on it. It is a pest in cultivation areas, but in small patches can be forked out. It will not stand heavy grazing, and for this reason is rarely seen to any extent in places where stock have access, it being most plentiful in cultivation paddocks, railway embankments, &c., so that turning stock on to it will generally eradicate it, not only because they tear up the old plants by the root, but also because they are very fond of the young plants, and in eating them tear them out of the ground which, of course, means their extermination."

The Markets.

PRODUCTION, PROSPECTS, AND PRICES.

The following survey is an abridgment of departmental summaries of conditions, prospects, and prices for the month ended 20th July, 1921:—

AGRICULTURE.

Early in July fairly heavy rains were reported from the whole of Southern Queensland. Freshes occurred in many rivers and creeks. In the Goondiwindi district a large area was again flooded. Heavy rains in maize-growing districts caused a suspension of harvesting operations. Considerable quantities of grain were destroyed. Heavy losses of potatoes also followed on excessive moisture. Haymaking was also retarded by the unfavourable weather. Many lucerne cuts were destroyed by untimely showers. Downs farmers were very active with planting preparations for winter cereals. Provided good growing weather continues the crop future is hopeful enough, but should a dry spring follow, ample yields may not be anticipated. The season generally continues exceptionally mild. Grass and herbage have splendidly responded to the favourable condition for good growth.

The maize market during the first week of July was not altogether favourable to the farmer and supplies were held back. As the week advanced, figures improved and competition became brisker: 4s. 0½d. was the top limit for the period. Lucerne chaff was in full supply to a dull demand with a range from 4s. 5d. to 8s. Heavy consignments of oaten chaff were received from the Border, but local lots were light. The best price was 7s. 9d. A large number of offerings were passed in. Mixed chaff was scarce and sold up to 6s. 10d. Offers from 3s. 9d. to 6s. 3d. were refused. Sweet potatoes were scarce and were quitted at from 2s. 7d. to 3s. 6d. Pumpkins, in light supply, brought 3s. Broom millet prices improved, prime hurl selling at £28 and an inferior quality at £20.

Weather Bureau advices showed the second week was dull and showery over a wide region. Farmers were anxiously awaiting a break. Field operations generally were at a standstill.

Country show reports were very favourable, a high order of excellence in respect to exhibits being attained. Sub-district displays were generally of a high standard. The number of exhibitors was not, however, nearly as large as it might be, and the interest of farmers in their local show as competitors needs, apparently, a general quickening.

Excellent reports continued to come in from the wheat areas, but it was generally recognised that seasonable temperatures are required to check tendency to rankness. Maize was marketed fairly heavily. Some lines were on the soft side. Prices remained at approximately the previous week's level. Lucerne chaff was plentiful, but the demand was listless. A large number of lines were passed in up to 7s. 9d. Sales were effected at 5s. to 9s. Weighty parcels of oaten chaff were received. Border lines sold up to 8s. and local lines to 7s. 4d. Fair samples of mixed chaff were submitted and quitted at from 4s. to 7s. 3d. Potatoes met an improved market; prices, 5s. 3d. to 8s. 7d. Sweet potatoes were still scarce and topped at 3s. 9d. Very little wheat was offered at rates from 6s. 5d. to 7s. 1d. Barley was very scarce, only one line at 4s. 10d. meeting the demand. Broom millet sold at from £21 to £27.

There was little change in the weather conditions for the week ended 20th July. The Darling Downs and other agricultural areas were looking exceptionally well for the time of the year. Early-sown wheat required frost benefit. It is expected that a fair proportion of this year's crop will be sown late, as growers have found that

dependence may be placed on quick maturing varieties. In the South Coast region arrowroot was ready for harvesting. Operations were delayed by the soddeness of the soil. Arrowroot mills were being put in order. The present price of the finished product is, however, causing disappointment to growers. The maize market improved to a slight extent. Supplies were plentiful, and 4s. 2½d. the favourable limit. Lucerne chaff was again in full supply on a lifeless market. Prime went to 8s. per cwt. The other extreme was 4s. 3d. Trans-Border oaten chaff was again in heavy supply. Local lines were scarce. The best price was 9s. per cwt. Mixed chaff was not so plentiful and sold to 7s. 1d. Sweet potatoes were not on large offer, and only a small quantity of pumpkins was received, 3s. 9d. per cwt. being the top price. Heavy supplies and improved samples of potatoes came in and quitted at from 5s. 6d. to 8s. 1d. Skinless barley found no acceptance. The price for prime broom millet was unaltered. Other qualities showed a decline.

DAIRY PRODUCTS.

Statistices for the dairy industry for four weeks ended 20th July include the following:—

PRODUCTION.—Quantity submitted for examination for cold storage:—Butter, 32,677 boxes (each, 56 lb.); cheese, 330 crates (each, 142 lb.).

This production may be viewed as surplus over and above local requirements and available for export.

SHIPMENTS INTERSTATE.—Butter, 10,718 boxes; cheese, 231 crates.

SHIPMENTS OVERSEA.—Butter, 30,103 boxes.

IN COLD STORAGE on 20th July, 1920.—Butter, 12,387 boxes (approx.); cheese, 489 crates (approx.).

FRUIT.

Excessive rainfall in the orchard areas has either retarded or caused the suspension of seasonal field operations. An exceptionally early spring seems probable as a consequence of an unusually mild and wet winter, and the possibility of late frosts to follow is not a particularly bright anticipation. Many trees and plants are still in vigourous growth; bananas and pines in particular continue to produce good fruits. Vegetables are plentiful on a fairly favourable market. Strawberries are also plentiful and a large quantity is going into preserves. In the course of the week ended 20th July shipments of canned pines were consigned to the United Kingdom. The fruit was packed in accordance with a special arrangement entered into between the Queensland Government and the Federal authorities. Recent examinations of the pack have shown it to be in excellent condition, and the consignment is in all respects equal to that put up by outside competitors. Trial consignments of canned pines, strawberry and other jams, have also been despatched to Asiatic and American markets.

SUGAR.

Harvesting is proceeding smoothly and all mills north of Townsville are now operating. At Mossman showery weather delayed the commencement of cutting, but crushing is now in full swing.

FAT STOCK.

Report for week ended 20th July:—CATTLE: 1,060 yarded, including a train load of cows from Longreach and a train load of bullocks from the same trucking centre. The market opened firm and continued so throughout for prime quality. Some cows were only in medium condition and for these the market was irregular. Prime bullock beef was worth from 28s. to 30s., with odd pens of choice quality to 32s. Prime cows quitted at from 20s. to 25s.

SHEEP.—6,600 were penned. Two train loads were trucked in from Longreach and Aramac respectively. Most of the sheep were from medium to good trade mutton. The percentage of really prime sheep was small. The market opened firm and remained so throughout. Good trade wether mutton was worth 4½d. to 5d. per lb., and prime quality to 5½d. Ewe mutton sold from 4d. to 4½d.

Farm and Garden Notes for September.

FIELD.—Spring has now arrived, and with it there will be the usual trouble with weeds, especially on carelessly prepared ground. Therefore, the cultivator and the horse and hand hoe must be kept vigorously at work to check the weed pests and save the growing crops as well as much future labour. Attend to earthing up any crop which may require it. There may possibly occur drying winds, dry weather, and even very late frosts, which have not been unknown in parts of this State even as late as September. Still, good showers may be looked for in October, and much useful work may be done during the present month which will go far to afford a fair prospect of a good return for labour.

The following crops may be sown:—Cotton, maize, for early crop, sweet corn, sorghums, broom millet, cowpea, red and white French millet, giant panicum (liberty millet), Sudan grass, cow cane, Rhodes grass, and paspalum, tobacco, pumpkins, and melons. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, chicory, and ginger. Plant out coffee. Sow cotton—Sea Island near the coast, and Uplands generally. Sow maize, sorghum, imphee, mazzagua, Indian cane, prairie grass, Rhodes grass and paspalum, panicum, tobacco, pumpkins, and melons, including the Cassaba melon. Sugar-cane planting should be vigorously carried on. Plant sweet potatoes, yams, peanuts, arrowroot, tumeric, chicory, ginger, and canaigre, the latter a tuber yielding a valuable tanning substance. Plant out coffee.

KITCHEN GARDEN.—Now is the time when the kitchen garden will richly repay all the labour bestowed upon it, for it is the month for sowing many kinds of vegetables. If the soil is not naturally rich, make it so by a liberal application of stable manure and compost. Manure for the garden during summer should be in the liquid form for preference. Failing a sufficient supply of these, artificials may be used with good results. Dig or plough the ground deeply, and afterwards keep the surface in good tilth about the crops. Water early in the morning or late in the evening, and in the latter case stir the soil early next day to prevent caking. Mulching with straw, leaves, or litter will be of great benefit as the season becomes hotter. It is a good thing to apply a little salt to newly dug beds. What the action of salt is, is not exactly known, but when it is applied as a top dressing it tends to check rank growth. A little is excellent for cabbages, and especially for asparagus, but too much renders the soil sterile, and causes hardpan to form. All kinds of beans may be sown in any district. Sow French beans in drills 2 ft. apart and 9 in. between the plants, and runner beans 4 ft. between the rows and 1 ft. 6 in. between the plants. Sow cucumbers, melons, marrows, and squashes. If these are troubled with red beetle, dust the bushes with fine wood ash, or spray with Bordeaux mixture. The latter also prevents injury from fungus. Set out egg plants in rows 3 ft. each way. Tomatoes should be ready to plant out. Train to a single stem by keeping all laterals pinched off. Plant out rosellas, sow mustard, cress, lettuce, carrots, shallots, cabbage, and radishes. Good results can be expected from any of these, providing the ground is kept in good tilth and water and manure supplied.

Orchard Notes for September.

THE COAST DISTRICTS.

September is a busy month for the fruitgrowers in the coastal districts of this State, as the returns to be obtained from the orchards, vineyards, and plantations depend very largely on the trees, vines, and other fruits getting a good start now.

In the case of citrus orchards—especially in the Southern half of the State—it is certainly the most important month in the year, as the crop of fruit to be harvested during the following autumn and winter depends not only on the trees blossoming well but, what is of much more importance, that the blossoms mature properly and set a good crop of fruit.

This can only be brought about by keeping the trees healthy and in vigorous growth, as if the trees are not in this condition they do not possess the necessary strength to set their fruit, even though they may blossom profusely. The maintenance of the trees in a state of vigorous growth demands—first, that there is an adequate supply of moisture in the soil for the requirements of the tree; and, secondly, that there is an adequate supply of the essential plant-foods available in the soil.

With respect to the supply of moisture in the soil, this can only be secured by deep and systematic cultivation, excepting in seasons of good rainfall or where there is a supply of water for irrigation. As a rule, September is a more or less dry month, and when it is dry there is little chance of securing a good crop of fruit from a neglected orchard.

If the advice that was given in the Notes for August regarding the conservation of moisture in the soil has been carried out, all that is necessary is to keep the soil stirred frequently, so as to prevent the loss of moisture by surface evaporation. If the advice has been ignored, then no time should be lost, but the soil should be brought into a state of good tilth as quickly as possible.

Where there is a supply of water available for irrigation, the trees should receive a thorough soaking if they require it. Don't wait till the trees show signs of distress, but see that they are supplied with an adequate supply of moisture during the flowering and setting periods.

It is probable that one of the chief causes why navel oranges are frequently shy bearers in the coastal districts is that the trees, though they produce a heavy crop of blossoms, are unable to set their fruit, owing to a lack of sufficient moisture in the soil at that time, as during seasons when there is a good rainfall and the trees are in vigorous growth or where they are grown by irrigation, as a rule they bear much better crops. The importance of maintaining a good supply of moisture in the soil is thus recognised in the case of this particular variety of citrus fruit.

When the trees show the want of sufficient plant-food—a condition that is easily known by the colour of the foliage and their weakly growth, the orchard should be manured with a quick-acting, complete manure; such as a mixture of superphosphate, sulphate of ammonia, and sulphate of potash, the plant-foods in which are soluble in the water contained in the soil and are thus readily taken up by the feeding roots.

Although the above has been written mainly in respect to citrus orchards, it applies equally well to those in which other fruit trees are grown. Where the land has been prepared for bananas, planting should take place during the month. If the plantation is to be made on old land, then the soil should have been deeply ploughed and subsoiled and brought into a state of perfect tilth prior to planting. It should also receive a good dressing of a complete manure, so as to provide an ample supply of available plant-food. In the case of new land, which has, as a rule, been scrub that has been recently fallen and burnt off, the first operation is to dig the holes for the suckers at about 12 ft. apart each way. Good holes should be dug and they should be deep enough to permit the top of the bulb or corm of the sucker to be 6 in. below the surface of the ground.

Take great care in the selection of the suckers, and see that they are free from beetle borers or other diseases.

As a precaution it is advisable to cut off all old roots and to dip the corms for two hours in a solution of corrosive sublimate, made by dissolving 1 oz. of this substance in 6 gallons of water.

In old banana plantations keep the ground well worked and free from weeds and remove all superfluous suckers.

Where necessary, manure—using a complete fertiliser rich in potash, nitrogen, and phosphoric acid, such as a mixture of meatworks manure and sulphate of potash, 4 of the former to 1 of the latter.

Pineapples can also be planted now. The ground should be thoroughly prepared —viz., brought into a state of perfect tilth to a depth of at least 1 ft., more if possible—not scratched, as frequently happens; and when the soil requires feeding, it should be manured with a complete manure, which should, however, contain no superphosphate.

Old plantations should be kept in a good state of tilth and be manured with a complete fertiliser in which the phosphoric acid is in the form of bones, basic phosphate, or finely ground phosphatic rock, but on no account as superphosphate.

The pruning of custard apples should be carried out during the month, leaving the work, however, as late in the season as possible, as it is not advisable to encourage an early growth, which often means a production of infertile flowers. If the weather conditions are favourable, passion vines can also be pruned now, as if cut hard back they will make new growth that will bear an autumn crop of fruit instead of one ripening during the summer.

Grape vines will require careful attention from the time the buds start, and they should be regularly and systematically sprayed from then till the time the fruit is ready to colour with bordeaux mixture, in order to prevent loss by downy mildew or anthracnose.

Where leaf-eating beetles, caterpillars, or other insects are present, the trees or plants on which they are feeding should be sprayed with arsenate of lead. All fruit-fly infested fruit must be gathered and destroyed and on no account be allowed to lie about on the ground, as, if the fly is allowed to breed unchecked at this time of the year, there is very little chance of keeping it in check later in the season.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Where not already completed, the winter spraying with lime-sulphur should be finished as early in the month as possible. Black aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop. Woolly aphis should also be systematically fought wherever present, as once the trees are in leaf it is much more difficult to treat.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbour for many serious pests, such as the Rutherglen bug.

Grape vines should be swabbed with the sulphuric acid solution, mentioned in the Notes for August, when the buds begin to swell and just before they burst, as a protection against black spot and downy mildew.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit-fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6 39	5·3	6·30	5·18
2	6·14	5·16	6·31	5 0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6 39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5 20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6 26	5 21
8	6·17	5·11	6·34	5 0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5 6	6·24	5 23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5 23
12	6·19	5·8	6·35	4·59	6·39	5·7	6 22	5·24
13	6·20	5·8	6·35	4·59	6·38	5 8	6·21	5 24
14	6·20	5·7	6 36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·9	6·38	5 9	6 19	5 25
16	6·22	5 6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6 37	5 0	6 37	5·10	6 17	5·26
18	6·23	5·5	6·37	5 0	6 37	5·11	6 16	5 27
19	6·23	5·4	6·37	5 0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5 0	6 36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6 36	5·12	5·14	5·28
22	6·25	5·3	6 38	5·1	6·35	5·13	6 13	5·28
23	6·26	5·3	6·38	5·1	6 35	5·13	6·12	5·29
24	6·26	5·2	6 38	5·1	6·35	5·14	6 11	5·29
25	6·27	5·2	6·39	5 1	6·34	5·14	6·10	5 29
26	6·28	5·2	6·39	5·2	6 34	5·15	6 9	5·20
27	6 28	5·1	6·39	5·2	6·33	5·15	6 8	5·30
28	6 29	5·1	6 39	5 2	6 33	5·16	6·7	5·31
29	6·29	5·1	6·39	5 2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6 32	5·17	6·5	5·32
31	6·31	5·0	6 39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
8 May.	●	New Moon	7	2	a.m.
15 „	☾	First Quarter	1	25	a.m.
22 „	○	Full Moon	6	15	a.m.
30 „	☽	Last Quarter	7	45	a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4	14	p.m.
13 „	☾	First Quarter	7	0	a.m.
20 „	○	Full Moon	7	41	p.m.
28 „	☽	Last Quarter	11	17	p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11	36	p.m.
12 „	☾	First Quarter	2	16	p.m.
20 „	○	Full Moon	10	8	a.m.
28 „	☽	Last Quarter	12	20	p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6	17	a.m.
11 „	☾	First Quarter	12	14	a.m.
19 „	○	Full Moon	1	28	a.m.
26 „	☽	Last Quarter	10	51	p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.