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Agriculture.

IMPROVING THE TYPE OF COTTON.

BY A. J. BOYD, late Editor, "Queensland Agricultural Journal."

The revival of late of the cotton-growing industry, once so thriving in this State owing to the scarcity of American cotton during the Civil War in the United States, gives rise to the question, "Does the continuous sowing of locally produced seed in any way affect the quality and quantity of the resulting crop?"

There are several products of the soil which imperatively demand that seed should be obtained from other districts if the standard of the original crop is to be maintained. The day when growers can afford to plant any sort of cotton seed has passed, and only seed of a known variety, selected either within the State or from other reliable sources, as, for instance, Egypt, or from such of the Southern States of the United States as are not infested by such pests as the boll worm, boll weevil, and cotton stainer, &c., should be planted.

It is a well-known fact that varieties of cotton become mixed and impure unless special care is taken to prevent crossing with other varieties. With all the care exercised by the Department of Agriculture to avoid the mixture of long and short staple cotton by close examination prior to ginning, it is practically impossible to avoid the admixture of different varieties, which seriously affects the price of the commodity, especially when exported to Great Britain.

If growers receiving seed of any of the varieties sent to them desire to grow the same variety another year, precautions should be taken to plant the seed in an isolated patch as far as possible from any other varieties. It should be at least 400 yards from any other cotton. Then, before any seed is gathered for after-planting, all plants which are not true to type should be carefully weeded out.

If it is desired to keep the variety up to its full productiveness, and better adapt it to local conditions, the planter may easily accomplish this by following a simple and inexpensive method of selection. Before beginning the picking, go over the patch carefully and select and mark with a white cloth the best plants—that is, the most productive, earliest in ripening, and having the largest, best formed, and most numerous bolls. Before each picking, a careful man should go over the patch and pick the seed from the selected plants. Such seed may, with advantage, be sown the next year. If this simple method of selection is carried out each year, the yield will be, doubtless, greatly increased, and as much, or more, added to the crop than would result from special fertilisation or cultivation or importation.

Our planters use seed taken from the Department's gins, where, notwithstanding the great care taken to separate the different varieties, admixture cannot be avoided unless the growers follow out the simple instructions above given. The use of good seed and its production by a regular system of selection is just as important a factor in the production of the crop as that of cultivation.

Herbert J. Webber, Physiologist in charge of the Laboratory of Plant Breeding, United States Department of Agriculture, in 1903, said, on this subject of selection: "As well might the breeder of fast trotting horses introduce dray animals into his stable, or the breeder of intelligent hunting dogs introduce ordinary mongrel curs into his kennels."

This necessity for improving the type of our cotton has not been lost sight of by the Queensland Department of Agriculture. In furtherance of this object, a series of experiments has been decided on with the object of improving the standard and quality of commercial cotton grown in Queensland. For this purpose several seed selection plots have been established in various districts. At Beaudesert there are four of these plots, which were lately visited and reported on by Mr. C. McKeon, Assistant Instructor in Agriculture, and in his report he mentioned that the long staple upland types are looking remarkably well and giving promise of a good yield. Some splendid specimens of cotton bolls are showing up splendidly, and it is expected that, as a result of the tests, some distinctly improved types will be produced.

This undertaking, I expect, will bear out what I have written concerning the method of evolving good and improved types of Queensland cotton, and the results cannot but be highly encouraging to growers, and go a lonog way towards placing the State amongst the large cotton-producing States of the world. As one of the pioneers of cotton-growing in Queensland, I am confident that once farmers come to realise the great returns from a good cotton crop, they will not easily abandon such a valuable contributor to the credit side of their account.

THE CULTIVATION OF CHICORY.

In the days when coffee-growing bid fair to become a settled industry, a few farmers in the North planted chicory and found a good local market for the prepared product. Now that coffee-growing has again been taken up in some parts of the State, under the guidance of the oldest and most successful of our coffee planters, Mr. T. A. Bromiley, of Pialba, there must arise a demand for chicory, which is largely used for mixing with ground coffee. In view of this probability, we republish a paper we compiled on the subject in April, 1915. It deals exhaustively with the whole subject, and may prove of much use to any farmer who may plant it. It reads as follows:—

CHICORY (*Cichorium Intybus*).

Chicory—or succory, as it is sometimes called—is an herbaceous perennial plant belonging to the natural order Compositæ. Its roots are strong and fleshy, penetrating to a considerable depth in loose open soil. The lower leaves resemble those of the well-known dandelion; the upper leaves are ovate (egg-shaped). The stems are alternately branched, from 2 to 6 feet high, and they become woody after the flowering period. The flowers, of which a great many are borne, are arranged along the stems, two being usually placed close together, and are of a bright sky-blue colour, rarely white. The fruits are small, one-seeded, angular nuts.

The plant is common in many parts of England on gravelly and chalky soil, in waste places, and along road sides. It is grown in many parts of the Continent of Europe, especially where small holdings are prevalent, as a forage crop, to be cut and consumed in a green state, or used for the grazing of sheep and cattle, which are very fond of it. The young leaves are often used like spinach, and in Europe the tender young roots are used as a vegetable, like carrots. The root of the chicory plant is of the order of the beet or salsify root. As a cultivated plant it has three distinct applications. Its roots, roasted and ground, are used as a substitute for, adulterant of, or addition to coffee; both roots and leaves are employed as salads; and the plant is grown as a fodder or herbage crop, which is greedily eaten by cattle.

The largest quantities of chicory were grown in Belgium and France previous to the great war of 1914. When grown for the sake of the root, the leaves should not be cut or pastured before harvesting. It is important to note that the leaves should not be fed to milch cows as they make the milk bitter.

As a farm crop, its chief advantages are its adaptability to dry, poor soils, its power of growing several large cuts of green food per annum when once established, its perennial character and easy cultivation. It is an exceedingly hardy crop.

SOIL PREPARATION.

Experience has shown (we learn from Messrs. Wilcox and Smith's Farmers' Cyclopædia of Agriculture) that chicory is adapted to any good loam soil that will produce good root crops, and that it will thrive wherever the sugar beet or mangolds do well.

Land for chicory should be deeply ploughed in the Spring, be well harrowed, and worked down to pulverise all lumps and make it compact, and again harrowed just before the seed is sown to kill all germinating weed seed.

PLANTING.

The seed may be sown at any time in fine weather in the Spring, in rows 18 to 24 inches apart if horse cultivation is intended, and from 12 to 14 inches apart if the crop is cultivated by hand. From 1 to 1½ lb. of seed is required per acre, but for use as a green crop from 10 to 12 lb. of seed are usually sown. The seed should not be covered more than three-quarters of an inch deep, and not more than one-half inch in heavy or wet soils.

CULTIVATION.

After the plants are up, they will need frequent shallow cultivation with some of the light cultivators made especially for sugar beet, to kill the weeds and preserve the soil moisture. When the plants have attained the height of 2 or 3 inches, they should be thinned out to stand from 4 to 6 inches apart. Only one plant should be left in a place.

HARVESTING.

If chicory is grown for forage, a crop of leaves can be cut in the Autumn, and afterwards two or three crops per annum will be provided. It is best cut just when the flowering shoots are extended, and before they become woody and hard, or the field can be grazed at intervals instead. The plant usually lasts (as a forage plant) in a productive state for four or five years.

In harvesting the root crop, a beet loosener may be run along the rows. This breaks the connection of the roots with the soil so that they can easily be lifted by hand. A less convenient way is to run a plough alongside the rows so as to expose the roots on one side. Special machinery has also been devised, and is procurable in the United States or in Europe (Holland, Belgium, Switzerland before the war), for pulling the roots. After removal from the ground, the tops are cut off at the base of the bottom set of leaves. The roots should not be pulled until they are ripe, and this stage is indicated by the disappearance of the milk from the roots.

If it is desired to keep the roots some time before delivery to a factory, they may be stored out of doors in piles from 4 to 5 feet wide at the bottom, and covered lightly with straw and earth. The ridges of the piles should be left open for a few days to let the warm air escape. The yield varies from 5 to 10 tons of fresh roots per acre.

PREPARATION OF THE ROOTS.

For the preparation of chicory, the older, stout, white roots are selected, and, after washing, they are sliced up and dried in a kiln. In our hot summer, however, the drying can be performed by spreading the sliced roots on a canvas framework, covering them at night to protect them from dew. In two or three days they are dry enough to bag. There are several varieties of chicory, but the sorts generally used for mixing with coffee are Magdeburg, Brunswick, and Elite, the last-mentioned variety being similar to the large-rooted Brussels or "White Loof" variety. The latter has a thick stubby root, and is the most profitable to grow for manufacture.

MARKETING.

The chicory grower can either sell the dried, sliced roots or he may roast them in a revolving iron cylinder. The loss in weight by this process is from 20 to 30 per cent. During the roasting 2 lb. of lard should be added to every cwt. of chicory to give it a lustre like that of coffee. The ground chicory looks like ground coffee, and smells like liquorice. There is a good market for it both in Brisbane and the Southern States, and now that the devastation caused by the war has practically put an end to the cultivation of many crops, such as beetroots, chicory, flax, and others—in Belgium and France—it would seem that there is a good opportunity for Queensland farmers to enter upon chicory cultivation and afterwards retain a business which cannot but be profitable.

Before the above calamitous war overtook France and Belgium, the price of Belgian chicory was £7 5s. per ton f.o.b. Antwerp; to-day Dutch chicory f.o.b. Dutch ports is quoted at £16 per ton for the dried roots. The wholesale price to retailers

of manufactured (*i.e.*, roasted and ground) chicory was £27 per ton, whilst now it is £45, and the price still rising. Here is a good opening for Queensland farmers to seize upon this industry and hold it for the future.

As to the prices for the dried root, Messrs. Harper and Co. are purchasers of good samples of dried and cured chicory roots at prices which should enable the grower to make a good profit on his crop. The seed may be obtained in Brisbane, and we understand that the price is 3s. per lb.

TREATMENT OF ALGAROBA SEED.

Some twenty years ago we published articles dealing with the Algaroba or Mesquit Bean as a fodder for stock. In April, 1900 and 1901, there were two articles on the value of the pods for this purpose, and full descriptions of the tree, its uses, and method of cultivation, written by Mr. G. B. Brooks, Instructor in Agriculture in the Rockhampton District, and at the time mentioned manager of the State Nursery, Kamerunga, near Cairns. *Inter alia* he wrote that, as in many localities in the Northern and Central districts stock has to depend almost entirely on the withered herbage as a means of existence, it would be a good thing of much interest to stockowners if something would come along to supply the necessary feed, something that would cost little or nothing by way of cultivation, and which could lay claim to a little attention from the large stockowner to the small selector.

In this respect he found the algaroba bean worthy of consideration, for, both from personal observation and information gathered from various sources, he found that the tree possesses qualities to draw it from its obscurity here in Queensland, and to give it a place among those plants having a high economic value.

Not only is it a tree that will thrive and flourish in circumstances such as described above, but it gives large crops of beans, valuable as stock feed, with a high fattening value, and, moreover, remains in bearing for some considerable time.

Another point in its favour is that it drops its pods as soon as ripe, thus doing away with any labour or expense in picking or feeding by hand. The tree of which Mr. Brooks wrote is the *Prosopis juliflora*, which grows to a height of from 30 to 40 ft. The pods are flat and from 5 to 8 in. long, and many bushels are obtained from a tree. It begins to ripen its pods at the end of November, and still continues bearing them after February and March. The timber is also very durable, and takes a polish like mahogany.

Some difficulty has been experienced by intending growers in raising seedlings, and disappointment has caused several to give up the idea of raising trees. However, the "Hawaiian Forester" (January, 1921) sets the difficulty on one side, stating that the results of a test, conducted earlier in the year, on the germination of seed of the algaroba or mesquit (*Prosopis juliflora*) when given different treatment before sowing were written up and printed in a special article which appeared in the December, 1920, "Hawaiian Forester and Agriculturist." A summary of the results obtained by the test is as follows:—

1. Algaroba seed is prepared for quick germination on passing through the alimentary system of a horse only when the seed is removed from the tough parchment-like covering.

2. Naked algaroba seed, untreated in any manner, gives the best germination results.

3. Placing the naked seed in boiling water and soaking it for 24 hours does not injure the seed, but greatly hastens germination.

4. The parchment-like seed covering greatly hinders germination.

RELATION OF LIME TO SOIL FERTILITY.

The following is the summary and conclusions of experiments conducted by Messrs. J. W. Paterson, B.Sc., Ph.D., and P. Scott, Chemist for Agriculture (Victoria), regarding the Relation of Lime to Soil Fertility:—

1. Lime tends to leave the surface soil through various channels, and fresh applications become necessary to maintain fertility.

2. Carbonate of lime is the best form of lime for the soil.

3. Burnt and slaked lime are rapidly changed to carbonate when they are applied to land.

4. The rate at which lime acts depends on its fineness of division.

5. Lime, but especially hot lime, has a good effect upon the mechanical condition of stiff clays.

6. Gypsum also coagulates clay, but it has not the beneficial action of lime in other directions.

7. Lime greatly hastens the production of nitrates.

8. It has a good effect in liberating potash and phosphoric acid, especially when the latter is combined with iron or alumina.

9. Where required by soil, lime produces larger crops.

10. It produces root crops, which are of greater feeding value.

11. It may often be a profitable application to grass land.

12. Lime kills sorrel, docks, and other acid-loving weeds.

13. It is specially stimulating to lucerne, clovers, and leguminous plants.

14. Lime will not act if phosphates are deficient.

15. It increases the need, everywhere present, of ploughing in green manure or stubbles.

16. It facilitates this operation.

17. The surest method of determining the need for lime is to dress trial strips and await results.

In an article on "Lime for Orchards," Mr. P. J. Carmody, Chief Orchard Supervisor, dealing in a practical manner with the effect of lime on fruit and fruit trees, and advocating its use, writes:—

"When it is considered that the average crop of fruit requires more plant food for its development than an average crop of wheat, and, moreover, that the fruit demands the same soil constituents year after year, the necessity for a sweet and favourable medium for root pasturage is apparent; and as no other application is at all comparable to the influence of lime for this purpose, its frequent use is urgently required. It is a matter of common observation that the fruit-buds of trees grown on sour soils are of a weak or indefinite character, while the bark is harsh and dry in appearance and the growth more or less stunted. Under such conditions it is practically impossible to develop trees on the most profitable lines without first correcting soil acidity by the free use of lime in the same manner as requires to be adopted for other farm crops.

"In many parts of the State insufficient attention has been given to this feature of soil management in the orchards. Particularly is this the case where fruit is grown on heavy clay soils. In these soils fruit trees grow through a lengthy period, so that a considerable quantity of immature wood is produced to the detriment of subsequent crops of fruit. Measures have not hitherto been adopted to definitely determine the actual effect of lime on the different parts of the tree; but investigations in other countries show that on soils rich in lime the wood is matured earlier and the fruit-buds are more stocky and robust than is the case with trees grown on soils deficient in lime. This is very apparent to anyone acquainted with the fruit areas of many parts of Gippsland and other places in Southern Victoria, and one is struck with the unusual prominence or length of the fruit-buds, the relative distance between the nodes, and the softness of the wood in these districts when compared with the same varieties grown in fruit centres known to possess lime in abundance."

It may not, however, be correct to assign these differences solely to the effect of lime, as other soil constituents bear an important part on the character of the tree and its fruit buds, particularly potash. It is generally recognised that the trees are not so manageable nor so prolific in bearing in soils where lime is deficient, and growers who have rectified this have had excellent results, though as artificial fertilisers were subsequently applied the same year, the relative value of the lime could not be ascertained. Though lime plays an important part in the apple and pear tree, it is in the stone fruits that its value is most apparent. It is a familiar fact that in soils rich in lime, stone fruit set their crops well, and are not so prone to cut off their fruit at the period of "stoning" as is otherwise the case. Where trees are making extensive wood growth with abundant foliage, there is but little doubt that the application of lime at the rate of 7 to 8 cwt. to the acre would be of pronounced benefit.

Seed Wheat for Disposal.

AT HERMITAGE STATE FARM.

This Department has been experimenting for a number of years with several varieties of wheat as a result of crossbreeding and selection work at Roma State Farm; some have consistently given satisfactory results, very often under adverse conditions. These are now being offered to wheatgrowers, in order that they may have the opportunity of acquiring seed of varieties which have been tested and found suitable to soil and climatic conditions in the wheatgrowing districts of the State.

Orders for the undermentioned varieties (which are illustrated and described elsewhere) should be directed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Remittance must accompany order, and, in the case of cheques, should have exchange added.

The price quoted for any of the varieties offered is 11s. per bushel, f.o.b. Hermitage.

VARIETIES.—"Inglewood," "Patriot," "The Prince," "Gundi."
(*See* accompanying illustration of three of the varieties.)

In addition to the above a limited quantity of "Amby" is also available at the same price.

Inglewood.—Mid-season variety. This is derived from a cross between Bunge and Federation Wheat, and has given consistent results in the South-Western wheat areas. The plant is of medium height, and on strong soils is inclined to carry a fair amount of flag. It stools well and possesses a straw of medium strength. Heads are of medium length, slightly tapering; non-bearded. The chaff is smooth and light-brown in colour. Grain of medium size, somewhat elongated in appearance; semi-translucent.

Patriot.—Derived from a selection made after crossing Bunge and a Durum wheat. A mid-season variety, of moderate stooling habit. Straw is of medium height and somewhat tough. Flag scanty. Head tapering, non-bearded, open appearance, and of medium length. Chaff smooth and of a pale-golden colour. Grain somewhat short; full-bosomed; semi-translucent.

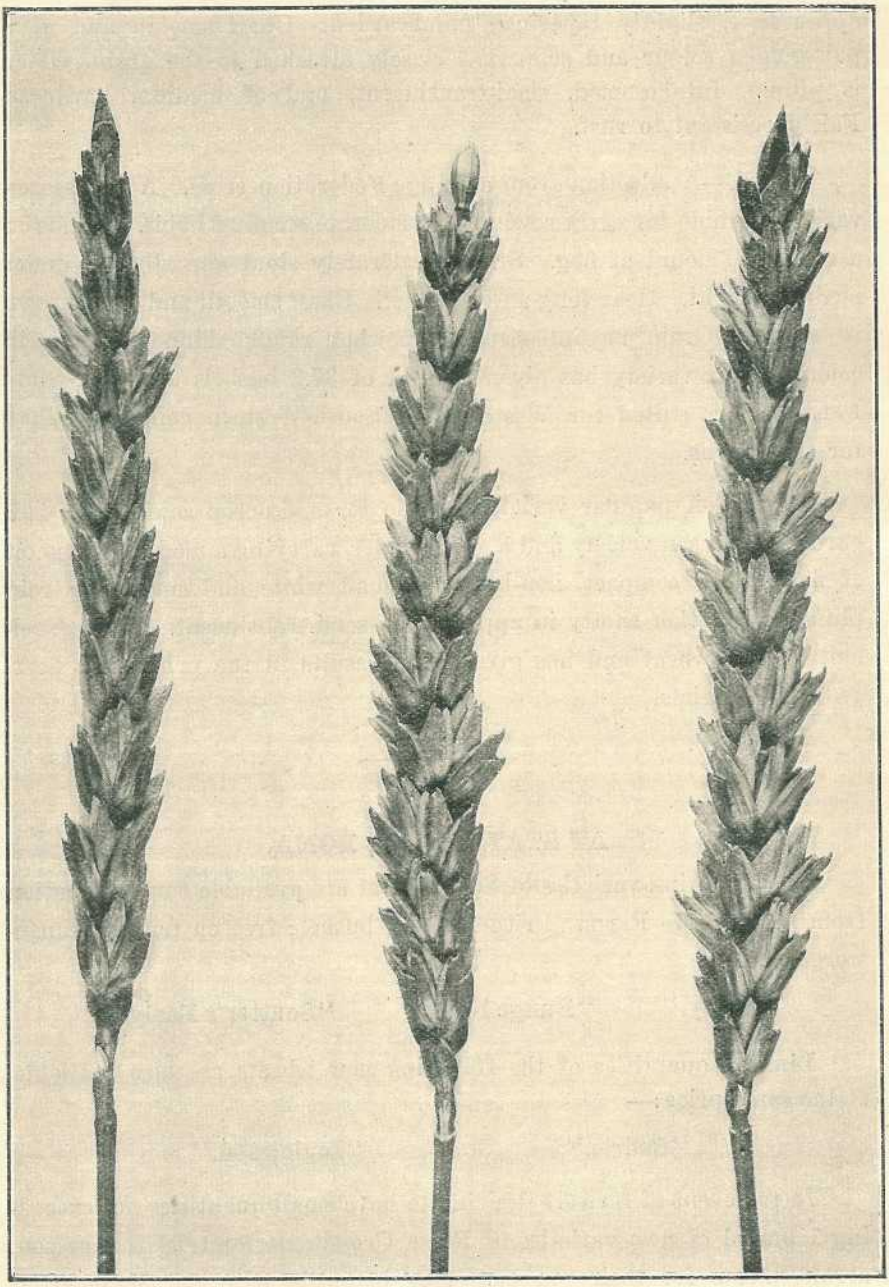


PLATE 22.—SEED WHEAT FOR DISPOSAL.

The Prince.—A selected crossbred wheat; early mid-season variety, of fairly tall-growing habit, suitable for main-crop sowing. A good stooler, and carries very little flag. Head of medium length, open appearance, slightly tapering; non-bearded. Chaff smooth and of a pale-golden colour and somewhat closely attached to the grain, which is plump, full-bosomed, semi-translucent, and of medium hardness. Fairly resistant to rust.

Gundi.—A selection from a Bunge-Federation cross. A mid-season variety suitable for early sowing, of moderate stooling habit. It carries a medium amount of flag. Straw moderately stout and slightly under medium height. Head long and compact. Chaff smooth and light-brown in colour. Grain medium-sized; somewhat rough skinned; white in colour. This variety has given a yield of 37.2 bushels at Roma State Farm. More suited for Western and South-Western conditions than for the Downs.

Amby.—A popular variety suitable for main-crop sowing. It is a hardy mid-season variety and a good stooler, carrying a moderate amount of flag. Ears compact, non-bearded; chaff white and smooth. Grain plump and rather shotty in appearance; semi-translucent. Is an excellent milling wheat and has given good results in the principal wheat-growing districts.

AT STATE FARM, ROMA.

The following varieties of Seed Wheat are available for distribution from Roma State Farm. Price 11s. per bushel; free on trucks, Bungeworgorai:—

"Amby." **"Bunge No. 1."** **"Soutter's Early."**

Limited quantities of the following new wheats are also available at the same price:—

"Cedric." **"Inglewood."**

In the event of farmers desiring to have small quantities not exceeding 1 bushel of new varieties of Roma Crossbreds for trial this season, arrangements for their purchase may be made with the Manager at the same rate—*i.e.*, 11s. per bushel, free on trucks, Bungeworgorai.

Remittance, with exchange added, should accompany order, and be sent direct to the Manager, State Farm.

DIGESTIBILITY OF FODDERS.

BY J. C. BRUNNICH and V. S. RAWSON.

[Read before the Hobart-Melbourne meeting of the Australasian Association for the Advancement of Science.]

One of the branches of agricultural chemistry which requires thorough investigation at the present time, and so far has only been attacked in isolated instances, is that of the nutrition of our farm animals. It is our desire in this paper to discuss briefly digestibility tests of certain foods used on the farm, but at the outset it should be mentioned that a short experiment carried out on one sample of each fodder can only act as a general guide, and it would be unwise to accept such figures as are given as a fixed basis without several further experiments being carried out on each special foodstuff.

We believe that the only instance of previous digestibility experiments which have been carried out in Australia were conducted by Professor Perkins on horses some years ago, and so far as we know our experiments are the first which have been carried out with sheep, which, it may be mentioned, have practically the same power of digestion as cattle. When it is considered that similar trials have been made in Germany for the last sixty years and in America since 1884, while now thousands of experiments have been conducted, thus giving reliable data for determining the digestibility of the various fodders used there, it cannot but be felt that we are much behind the times. In England, also, use has to be made of German and American figures, though within the last few years the Institute for Research in Animal Nutrition at Cambridge University has been conducting experiments on these lines under Professor T. B. Wood, F.R.S., and also at the Leeds University under Dr. Crowther similar experiments have been made. Quoting from the former in "Science and the Nation," these words may be said to apply even more to Australia, where the conditions of climate, soil, and growth are so different:—"But in our knowledge there are many gaps, some of which the staff of the Institute were attempting to fill when war interrupted their work. Perhaps the most serious need at the present time is further information as to the composition and digestibility of British fodders. This need is most felt in the case of coarse fodders, such as hay and straw, whose composition and digestibility vary greatly according to variety, cultivation, and harvesting. It is obviously most unsatisfactory that farmers should have to rely on German figures for information as to such material."

It will be of interest before discussing the results of our experiments to give a brief outline of the work which has been carried out in Germany. One of the writers visited Göttingen in 1906, where extensive work is carried out on the nutrition of farm animals under the direction of Professor Lehmann, and is a continuation of the famous Weende Experimental Station, where Henneberg and Stohmann carried out so much of the foundation work. In the Agricultural Institute of the University a large number of feeding experiments are carried out both as regards the digestibility and metabolism of fodders. The latter requires a special apparatus known as a respiration chamber, of which there are several in America and Germany, the general outline of which is as follows:—The animal is kept in a cubic iron box about 8 ft. each way, the plates of which are riveted together and are perfectly air tight. The air entering the chamber is freed from carbon dioxide and the amount carefully registered. The air, on leaving the chamber, passes over calcium chloride to absorb water; then caustic potash, which absorbs the carbon dioxide; then over copper oxide, to oxidise the methane to carbon dioxide, which is again collected as before. Thus the amount of gases given off by the animal can be calculated and at the same time, by collecting the fæces and urine, the complete fate of the food can be accounted for.

An actual experiment carried out was as follows:—

NITROGEN BALANCE SHEET.

SUPPLY.

N. in food	1.00 gram

EXCRETED.

N. in urine	0.52 grams
N. in fæces	0.42 grams
Balance	0.06 grams

0.06 gram N. retained by animal equivalent to 0.375 grams of protein.

CARBON BALANCE SHEET.

SUPPLY.

Carbon in food	30.0 grams

EXCRETED.

Carbon in urine	2.6 grams
Carbon in fæces	8.3 grams
Breathed out as CO_2	6.4 grams
Breathed out as CH_4	0.2 grams
Remaining in body	12.5 grams
Carbon in 0.375 grams protein	0.198 grams Carbon
Leaving for fat production	12.302 grams Carbon

Equivalent to 16 grams fat.

The most intricate of these chambers is at Bonn, where Professor Hagemann has his animal physiology laboratory. This apparatus measures the quantity of heat radiated from the animal by its absorption in a known volume of water surrounding the chamber and is known as the Atwater Rosa calorimeter. This piece of machinery alone cost £10,000 to bring into complete operation. Mention must also be made of the station at Möckern, where Director Kellner has carried out such classical experiments as are to be found in English in his small book, "The Scientific Feeding of Animals." The appendices of this useful book contain the analyses of about 400 fodders and a large number of digestible co-efficients of the various farm foods.

Though naturally one cannot expect experiments to be carried out in Australia on so large a scale, it is surprising that so little work has been done or so little thought given to the digestibility of Australian fodders. It is hoped that the experiments which are mentioned in this paper will stimulate interest in this connection, though they can only be regarded as an introduction to further investigation of this nature. These experiments were carried out at Yeerongpilly Experimental Station with the permission of the Under Secretary for Agriculture and Stock, where stalls were erected for four wethers of the merino cross variety, and in all the digestibility of nine different foodstuffs was determined, each test being made in duplicate.

FOODSTUFFS TESTED.

Poor bush hay	Lucerne	Wheat pollard
Wheat bran	Maize	Mitchell grass
Maize and millet ensilage	Coarse blood meal	Fine blood meal

So far as could be arranged, the sheep were fed on a maintenance ration throughout the experiment, and there was little variation in their live weight during the whole of the experiments, which lasted for four months. The rations were as follows:—

1. Lucerne.
2. Lucerne; bush hay.
3. Lucerne; bush hay; pollard.
4. Lucerne; bush hay; bran.
5. Lucerne; bush hay; maize.
6. Lucerne; bush hay; maize; coarse blood.
7. Lucerne; bush hay; ensilage.
8. Bran; bush hay; ensilage.
9. Lucerne; hay; pollard, coarse D. blood.
10. Lucerne; hay; pollard; fine D. blood.
11. Mitchell grass hay.
12. Mitchell hay; lucerne.

Each of these rations was fed for a preliminary run of a week, so as to enable the influence of the previous ration to be completely exhausted, and then the fæces were collected each day for twelve days in specially made bags, fitting closely over the hind quarters of the animals. The amount of food was weighed daily, and also

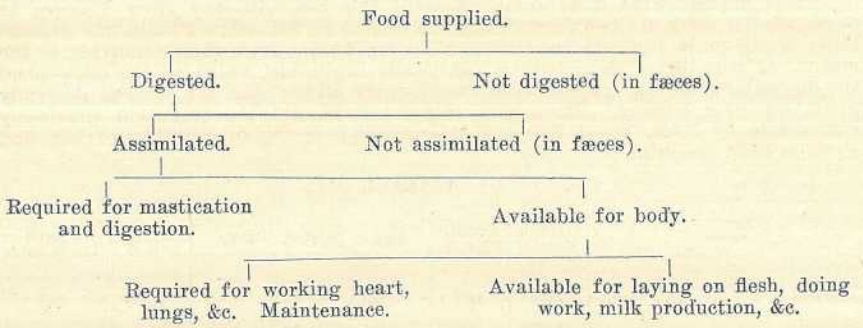
the fæces, one-fifth of the latter being taken and dried, and at the end of the period ground fine, sampled, and analysed. Knowing the amount of nutrients in the fodder fed, from an analysis, and also that in the fæces, one can estimate the amount which the animal digested. It is not considered necessary here, nor will space permit, to give a detailed outline of each experiment, which involved a very large amount of work and calculation, but mention should be made and comparisons given of data from American and German sources. The former are to be found in "Feeds and Feeding," by Henry and Morrison; the latter in the forementioned book "The Scientific Feeding of Animals."

It is also necessary to mention a few terms which will be used in determining the value of the different fodders which are based on the Kellner's standards:—

Starch Equivalent.—The starch equivalent is a convenient method of estimating the protein, fat, carbohydrates, and fibre under one standard, though there is much controversy whether another term should not be applied. Murray, of Reading, and Armsby, of Pennsylvania, are both in favour of using the term "net energy value," and though when properly understood both terms express the extent to which the feed is able either to diminish or prevent loss of stored energy from the body, or to bring about a storage of energy in new tissue. It should definitely be decided which term to apply; otherwise there is bound to be always a certain amount of confusion. The *starch value,* as here given, is the amount of starch that is equivalent to the fat-forming power of all the nutrients in the food. It may be noted—

	Starch.
1 lb. of digestible fat in oil seeds, cakes, and meals	2.41 lb.
1 lb. of digestible fat in cereals	2.12 lb.
1 lb. of digestible fat in coarse fodders	1.91 lb.
1 lb. of digestible carbohydrate and fibre	1.00 lb.
1 lb. of protein	0.94 lb.

The starch equivalent of a food is therefore determined by multiplying the percentage of digestible nutrients by these factors respectively, and, after addition, deducting the amount of energy which the animal uses up in masticating and digesting the food, which is the percentage difference of the static and dynamic value of the food. In the case of coarse fodder (hay and straw) it is advisable to deduct a certain percentage of the total crude fibre in the fodder, varying with the amount contained therein, whereas in concentrated fodders a factor is used for each food known as the "value number." The following table shows the fate of the food:—



It should be clearly understood that the amount digested is not strictly given by the "digestible co-efficient," as in the process of digestion certain nitrogenous waste products are given off with the fæces from the alimentary canal, such as bile compounds, mucus, and epithelials cells, also certain nitrogenous compounds as skotol and indol, which are the product of fermentations. The bile also contains a small percentage of fat which makes the digestible fat lower than it really is. These products vary to a certain degree, and naturally with a small percentage of total protein and fat the error is increased. The results obtained, however, are close enough to be of real value to judge the processes going on in digestion of the food tested. The chemical methods which have been instigated for the separation of digestible and indigestible constituents have only proved of value in the case of crude protein, by artificial digestion with pepsin and hydrochloric acid. At the same time it must be remembered that the process of natural digestion shows how much the animal takes up, including the loss of other material from the body, and thus gives the real increase. The term "apparent digestibility" is used at times.

The first experiment had to be conducted on a single food in order to obtain the necessary data on which to base the subsequent calculations. It was hoped to feed the sheep on bush hay alone, as well as lucerne, but they refused to eat it alone, and hence the data are based on a very closely agreement duplicate of the lucerne hay digestibility.

ANALYSIS OF LUCERNE.

—	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	80·96	15·95	1·40	38·21	25·40	12·36	..
Percentage digestible	58·00	12·82	·66	28·01	16·51	9·23	39·73
Digestible co-efficient	71·50	80·40	47·1	73·3	65·0	74·70	..
AFTER KELLNER (ANALYSIS OF LUCERNE OF SAME MOISTURE).							
Analysis	82·09	17·33	2·57	33·30	28·89	12·95	..
Percentage digestible	46·78	13·52	1·13	22·31	9·82	9·14	28·12
Digestible co-efficient	57·0	78·0	44·0	67·0	34·0	70·7	..

It will be seen from these figures that though the analysis of the German lucerne gives practically the same figures as our own, yet on examination we find that the organic matter, and especially the fibre, is much more digestible, and hence the true starch equivalent of the lucerne as analysed by Kellner is much lower than the one tested here.

POOR BUSH HAY.

—	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	Fine Protein.	Starch Equivalent.
Analysis hay	78·21	2·95	0·77	39·94	34·55	2·63	..
Percentage digestible	45·53	0·45	0·25	21·13	21·70	0·14	23·42
Digestible co-efficient	55·3	15·50	33·5	52·9	62·8	5·90	..

It is impossible to make comparisons of this hay with any from America or Germany, but there are two outstanding features to be noticed:—Firstly, the digestibility of the protein is very much lower than any figures from these countries, as the amount of true digestible protein is practically negligible, whilst on the other hand the digestibility of the crude fibre is considerably higher than the average generally given for poor pasture. These two features emphasize the statement previously referred to by T. B. Wood that the determination of the digestibility of hay and straw is most essential.

POLLARD.

—	Organic Matter.	Crude. Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	86·4	14·70	4·26	62·13	5·31	13·11	..
Digestible	66·73	11·60	3·15	49·83	2·15	10·0	68·12
Digestible co-efficient	77·30	78·90	74·1	80·2	40·5	76·90	..
AFTER HENRY.							
Analysis	85·10	17·40	4·9	56·8	6·00	..	..
Digestible	63·8	13·40	4·3	44·3	1·80	..	..
Digestible co-efficient	75·0	77·0	88·0	78·0	30·0	..	..

Compared with the analysis by Henry there is not much difference, only it will be noticed that the digestibility of the fat is much lower, whilst again we notice an increase in the digestibility of the fibre.

(TO BE CONTINUED.)

PISÉ BUILDINGS FOR FARMERS.

The increasing cost of building timber in Queensland is causing new settlers to seek information concerning the cost and method of erecting what are known as pisé houses, the material for which is the soil itself. The most informative article on this style of building we have as yet read appeared in the "Agricultural Gazette of New South Wales" in May, 1907. The whole process of building is therein described, and several illustrations show the process from the foundation to the top of the walls. We have seen these buildings 50 years old in Peru, South America. In January, 1917, we briefly described the method as follows:—

"Having taken up a selection either for farming or grazing, the settler in the old days of the 'colony' of Queensland, forty or fifty years ago, either rigged up a tent for his first home, or, if in a locality where there was plenty of splitting timber or tea-tree, he rose to the dignity of a humpy of low log walls roofed with tea-tree bark, or stripped some sheets of stringy bark and built a bark hut; later on, perhaps, he split slabs and shingles, and dwelt in a fairly comfortable house. In the primeval scrub or forest, this question of housing himself, and perhaps his family, was easily solved. But it was otherwise when the farm happened to be situated on the plains. Then it meant either continuous tent life, or, as the alternative, a galvanised iron or a sawn timber structure, both very expensive in the pre-railway days. Yet, all the time on the treeless plain, all the materials were at hand for the construction of a comfortable weather-proof house, warm in winter, cool in summer, which could be erected by the farmer himself, the only tools needed being a pick, shovel, and rammer, and half a dozen planks.

"The material for the construction of the walls, chimney, and flooring was the soil itself. All that the settler need do is to dig out the soil and shovel it into rough wooden moulds, ramming it down solid in layers of 4 or 6 in. When the mould or box is full and well rammed, it is taken to pieces and erected on another portion of the building, and the work proceeds until the walls and partitions are completed. Any inexperienced man can thus construct a comfortable dwelling, as the actual pisé work presents so little difficulty that it can be done by anyone who has sufficient strength to shovel earth and wield a rammer, and is careful to see that the moulds or boxes into which the soil is shovelled are kept plumb and in straight lines. The services of a carpenter, unless the settler has some knowledge of that trade, will be found necessary to make doors and window-frames and construct the roof, and see that these are set correctly and in their proper places.

"The whole process is well described in the 'Agricultural Gazette of New South Wales' by Mr. G. L. Sutton, Cowra Experimental Farm, 2nd May, 1907.

"In some of the South American States there are numbers of such buildings constructed either of rammed soil or of adobé or sun-dried bricks (for which material like clay can be used, which is unsuitable for pisé work). For the latter, almost any soil containing a fair amount of loam is suitable; but a pipeclay loam, with which gravel is intermixed, is best. Soil which cakes after a heavy rain, or which, if ploughed or dug when dry, turns up in hard clods, is very suitable. Any vegetation growing on the surface of the earth selected must be removed, as also should any roots, bits of stick, or vegetable matter likely to decay. The earth is best used as it is dug, and, if too dry, should be brought to the correct moist condition by watering it about two days before it is to be used. The earth should be just moist enough to be crumbly, and yet adhesive enough to retain the impression of the fingers when pressed in the hand.

"We have culled the above preliminary notes on pisé building from Mr. Sutton's exhaustive description in the abovenamed 'Gazette.' It is stated that pisé buildings are much cooler than buildings constructed with solid brick walls. Some idea may be formed of the durability of pisé by the fact that there is at present, at North Logan, a stable built of pisé which has been in constant use for over sixty years, and which is to-day in good order, notwithstanding the fact that the external walls are unprotected from the weather. Pisé buildings are said to have a life of 150 years.

"It is, however, advisable to protect the walls from moisture, especially from rain, which should be guarded against by surrounding the building with verandas or by overhanging eaves. Pisé buildings not so protected are, however, very common."

TOBACCO-GROWING AT BOWEN.

In our April issue it was stated that the tobacco industry at Bowen was mostly in the hands of Chinese. This is obviously a mistake, as it is at Texas and Inglewood that the Chinese tobacco farmer is mostly in evidence, whereas at Bowen the cultivation of this crop is carried on by white farmers.

Pastoral.

USING RAM LAMBS.

On this subject the Brisbane "United Graziers' Journal" (31st March) writes:—

"When ram lambs are put to a large number of ewes their powers of procreation decline, and they are of little service the following and subsequent years. Notwithstanding the necessity of early returns in these times, says an English authority, the system occasionally advocated of tupping ewe lambs cannot be recommended. Every practical flock master knows that this practice means an arrestment of growth in the sheep and a large percentage of mortality during the lambing season. This is a very serious matter, because stock ewes are usually kept for three or four years, and when they are disposed of at draft sales they, as a rule, realise very unremunerative prices by reason of their stunted growth. It is a mistake to suppose that they will overcome the check which immature maternity has given them, because it occurs just at the time when sheep really put on most of their growth and they will never reach the same standard of size and vigour as sheep that are put to the ram the first time as shearlings."

BLOW-FLY DEMONSTRATION.

The demonstration in connection with the blow-fly pest which was in our April issue announced to take place at Dalmally, near Roma, during the second week in April, has been postponed until 13th May. In addition to a large number of Queensland pastoralists, it is expected that there will be others from New South Wales and Victoria. Dr. Harvey Johnston will be in charge of the demonstration, and will deliver an address on the subject.

THE SUGAR SEASON.

CRUSHING DATES.

The "Queensland Sugar Journal," 8th April, publishes the following information concerning the probable dates when the sugar mills will commence crushing:—

Alberton Sugar Mill, *viâ* Yatala.—Towards end of August.

Australian Sugar Company, Limited, Mourilyan Mill, Mourilyan.—First week in June.

Babinda Central Sugar Mill, Babinda.—Somewhere about the third or fourth week in May.

Cattle Creek Sugar Company, Finch Hatton, Mackay.—About middle of July.

Childers Mill, Childers.—22nd June.

Doolbi Mill, Isis.—Probably be some time in August.

Eagleby Mill, *viâ* Beenleigh.—First week in September.

Fairymead Sugar Company, Limited, Bundaberg.—Towards end of July.

Farleigh Estate Sugar Company, Mackay.—About middle of July.

Gibson and Howes, Limited, Bingera Plantation.—Early in July.

Goondi Mill, Innisfail.—1st June.

Hambledon Mill, *viâ* Cairns.—1st June.

Homebush Mill, Mackay.—1st June.

Inkerman Mill, Ayr.—About 1st July.

Macknade Mill, *via* Halifax.—1st June.

Marian Central Mill Company, Mackay.—About middle of July.

Maryborough Sugar Factory.—Every likelihood of first week of August.

Mulgrave Central Mill Company, Limited, Gordonvale.—1st June.

North Eton Central Mill, North Eton, Mackay.—About the beginning or middle of July.

Pioneer Mill, Ayr.—About 1st July.

Pleystowe Central Mill Company, Mackay.—About mid-July.

South Johnstone Central Sugar Mill, Basilisk, *viâ* Innisfail.—26th May.

Victoria Mill, Ingham.—1st June.

W. Heck, Pimpama Island.—First week in August.

Dairying.

DAIRYING AT ROMA.

The dairying industry is thriving in the Roma district, and has developed out of all proportion to the number of years it has been established. Suppliers from July to March have been paid £50,000. This is more than the amount paid for any two previous years. For the past eight months the cream supplied to the local factory amounted, in one case alone, to £1,000, and many other farmers have received £500.—Exchange.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

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

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar.	No. of Years' Records.	Mar., 1921.	Mar., 1920.		Mar.	No. of Years' Records.	Mar., 1921.	Mar., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	8·26	20	26·25	1·02					
Cairns	17·86	39	32·21	6·96	Nambour	9·70	25	13·70	6·10
Cardwell	16·37	49	18·38	5·68	Nanango	3·37	39	6·28	1·28
Cooktown	14·75	45	25·48	3·52	Rockhampton ...	5·10	34	3·84	1·61
Herberton	8·03	34	21·13	1·86	Woodford	8·20	34	12·16	1·85
Ingham	16·28	29	15·26	8·09					
Innisfail	25·20	40	62·62	8·01					
Mossman	18·13	13	32·78	9·07	*Darling Downs.*				
Townsville	7·99	50	2·93	1·86					
					Dalby	2·80	51	1·18	0·62
					Emu Vale	2·77	25	0·61	1·90
Central Coast.					Jimbour	2·67	33	2·15	0·74
					Miles	2·80	36	2·10	0·45
Ayr	7·40	34	6·48	1·55	Stanthorpe ...	2·82	48	1·77	2·03
Bowen	5·87	50	11·71	0·61	Toowoomba ...	3·93	49	5·15	1·25
Charters Towers ...	3·60	39	5·44	1·17	Warwick	2·92	34	0·82	1·49
Mackay	12·30	50	28·58	2·45					
Proserpine	11·94	18	26·87	5·75					
St. Lawrence ...	6·10	50	4·50	0·25	*Maranoa.*				
South Coast.					Roma	2·85	47	3·01	0·29
Biggenden	4·33	22	4·08	1·55	*State Farms, &c.*				
Bundaberg	5·61	38	3·31	1·72					
Brisbane	5·89	79	7·86	1·80	Bungeworgorai ...	1·67	7	2·78	0·59
Childers	5·22	26	4·45	2·18	Gatton College ...	3·55	22	3·64	1·88
Crohamhurst ...	12·30	25	14·04	4·15	Gindie	2·98	22	1·06	2·06
Esk	4·92	34	5·44	2·31	Hermitage ...	2·77	15	6·29	1·34
Gayndah	3·29	50	4·29	2·32	Kairi	4·68	7	31·17	1·58
Gympie	6·33	51	6·73	2·31	Sugar Experiment				
Glasshouse M'tains	9·43	13	14·60	2·52	Station, Mackay	11·33	24	26·31	2·04
Kilkivan	4·07	42	4·70	0·52	Warren	3·08	7	2·11	5·95
Maryborough ...	6·44	50	5·10	2·24					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Poultry.

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

The seventeenth egg-laying competition at Gatton terminated on 31st March. Heavy moults were prevalent from the 10th of the month, due to a sudden change in weather, a week of continuous rain following after a term of hot weather. The birds returned bear sealed rings with numbers of eggs laid, of 2 oz. or more, for 360 days. The following identification rings were attached to all birds competing in the single tests:—A., green; B., red; C., yellow; D., blue; E., grey; F., white. There were two deaths during the month, viz.: Messrs. C. M. Pickering and G Flugge each lost a bird, the cause of death being paralysis in both cases. The following are the individual records:—

Competitors.	Breed.	March.	Total.
	LIGHT BREEDS.		
*G. Trapp	White Leghorns ...	99	1,517
*J. M. Manson	Do.	126	1,489
*Haden Poultry Farm	Do.	97	1,469
*O. W. J. Whitman	Do.	71	1,459
Mrs. R. Hodge	Do.	108	1,431
*J. Newton	Do.	75	1,427
*Quinn's Post Poultry Farm	Do.	75	1,412
*L. G. Innes	Do.	74	1,406
Geo. Lawson	Do.	85	1,404
*E. A. Smith	Do.	94	1,395
*W. and G. W. Hindes	Do.	124	1,392
*Dr. E. C. Jennings	Do.	65	1,384
*N. A. Singer	Do.	69	1,383
*J. J. Davies	Do.	63	1,382
*T. Fanning	Do.	83	1,379
*W. Becker	Do.	50	1,372
*H. Fraser	Do.	88	1,341
*G. Williams	Do.	62	1,321
*J. H. Jones	Do.	60	1,319
*Mrs. L. Anderson	Do.	78	1,311
*Thos. Taylor	Do.	68	1,311
S. L. Grenier	Do.	91	1,306
*B. Chester	Do.	83	1,302
*Mrs. L. Henderson	Do.	65	1,282
Thos. Eyre	Do.	90	1,276
*S. McPherson	Do.	75	1,270
E. Chester	Do.	83	1,230
S. Chapman	Do.	103	1,221
Avondale Poultry Farm	Do.	80	1,219
R. C. J. Turner	Do.	102	1,199
*Range Poultry Farm	Do.	40	1,198
H. A. Mason	Do.	91	1,183
W. Morrissey	Do.	84	1,175
H. P. Clarke	Do.	38	1,168
C. Langbecker	Do.	72	1,167
S. W. Rooney	Do.	34	1,161
C. M. Pickering	Do.	76	1,139
W. D. Evans	Do.	104	1,125
C. H. Towers	Do.	84	1,099
C. A. Goos	Do.	42	1,081
A. J. Andersson	Do.	73	1,050
Miss E. M. Ellis	Do. ...	Withdrawn	583

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
HEAVY BREEDS.			
*A. Shanks	Black Orpingtons ...	124	1,476
*R. Burns	Do.	90	1,444
*E. F. Dennis	Do.	52	1,337
*E. Morris	Do.	87	1,364
*R. Holmes	Do.	72	1,355
*J. Cornwell	Do.	106	1,333
*A. Gaydon	Do.	75	1,322
H. M. Chaille	Do.	101	1,308
*D. Fulton	Do.	70	1,307
*A. E. Walters	Do.	91	1,255
Mrs. G. H. Kettle	Do.	82	1,243
Parisian Poultry Farm	Do.	90	1,238
*W. Smith	Do.	39	1 231
J. E. Smith	Do.	78	1,207
*E. Oakes	Do.	50	1,206
G. Muir	Do.	78	1,188
*R. B. Sparrow	Do.	43	1,185
R. C. Cole	Do.	98	1,184
*T. Hindley	Do.	48	1,176
*J. E. Ferguson	Chinese Langshans ...	83	1,109
*E. Stephenson	Black Orpingtons ...	75	1,096
*Nobby Poultry Farm	Do.	66	1,042
G. Flugge	Do.	83	1,026
Total	...	5,005	84,410

* Indicates that the pen is being single tested

DETAILS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	263	256	265	235	262	236	1,517
J. M. Manson	226	258	264	260	246	235	1,489
Haden Poultry Farm	273	200	250	268	238	240	1,469
O. W. J. Whitman	243	230	270	239	206	271	1,459
J. Newton	270	239	254	174	243	247	1,427
Quinn's Post Poultry Farm ..	264	242	238	196	223	249	1,412
L. G. Innes	174	231	233	265	269	234	1,406
E. A. Smith	228	198	259	229	240	241	1,395
W. and G. W. Hindes	220	242	209	249	239	233	1,392
Dr. E. C. Jennings	165	279	201	215	249	275	1,384
N. A. Singer	251	191	234	285	222	200	1,383
J. J. Davies	258	234	233	197	250	210	1,382
T. Fanning	139	233	224	253	272	258	1,379
W. Becker	244	243	243	227	193	222	1,372
H. Fraser	156	236	240	247	242	220	1,341
G. Williams	198	235	233	218	252	185	1,321
J. H. Jones	218	224	235	242	212	188	1,319
Mrs. L. Anderson	263	247	236	190	169	206	1,311
Thos. Taylor	255	215	195	234	221	191	1,311
B. Chester	237	190	246	200	227	202	1,302
Mrs. Henderson	202	223	221	192	226	218	1,282
S. McPherson	261	265	91	138	269	246	1,270
Range Poultry Farm	147	188	221	235	180	227	1,198
S. W. Rooney	168	186	226	174	195	212	1,161

RESULTS OF SINGLE PEN TESTS—*continued.*

——	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
A. Shanks	215	266	235	296	202	262	1,476
R. Burns	244	224	277	215	247	237	1,444
E. F. Dennis	260	216	194	268	216	233	1,377
E. Morris	237	230	227	197	246	227	1,364
R. Holmes	216	225	211	222	258	223	1,355
J. Cornwell	215	247	238	157	219	257	1,333
A. Gaydon	195	282	206	194	184	261	1,322
D. Fulton	228	232	209	254	92	292	1,307
A. E. Walters	199	209	194	228	184	241	1,255
W. Smith	110	246	236	235	219	195	1,231
E. Oakes	180	243	178	103	241	260	1,206
R. B. Sparrow	217	140	216	187	176	249	1,185
T. Hindley	207	248	205	174	161	181	1,176
J. E. Ferguson	151	188	141	192	234	203	1,109
E. Stephenson	213	175	209	188	166	145	1,096
Nobby Poultry Farm	199	281	86	279	177	20	1,042

CUTHBERT POTTS,
Principal.

AERIAL FOREST RECONNAISSANCE.

In an interesting article on the Survey of Forests from the air, by J. M. Swaine, Chief, Division of Forest Insects, which appeared in the January-February number of the "Agricultural Gazette" of Canada, an account is given of an experiment in aerial forest reconnaissance which was conducted last summer over the country north and west of Lake Timiskaming in Northern Ontario. The results of this experiment were very satisfactory, not only as regards the mapping out the main timber types such as conifers, hardwoods and mixed forests, recent burns and clearings in approximately 1,800 square miles of the regions surveyed from an altitude of 3,500 feet, whence it was possible to distinguish the more conspicuous species of trees and to secure a comprehensive knowledge of the forest conditions on a large area in a very short time, but, furthermore, with respect to the study by officers of the Division of Forest Insects of the Entomological Branch, of an extensive spruce bud worm outbreak spreading through the northern pulp-wood forests from Northern Quebec across the interprovincial boundary into Ontario. A strip of country, more than 100 miles long and 25 miles wide had been freshly infested during the last two summers, and the injury was spreading westward.

It was very important to determine the area covered by the outbreak last summer, and to obtain definite data upon the rate and direction in which the injury was spreading. A ground party attempted to obtain this information, but it was impossible to cover the whole area in that manner before winter, and to obtain it by a ground survey it would have taken two men at least eight months, whilst by the use of a Curtiss flying boat only three weeks were spent in the aerial survey. Much of the Temagami country carries strips of hardwoods with pine along the water-courses, and since the latter offers the only available route for a rapid survey, it is evident that a ground party must have difficulty even in locating the spruce and balsam stands. To this is added the drawback that the party cannot foretell how far or in which direction it must travel to reach the boundaries of these or of the infestation.

The possibilities of an aerial survey appealed strongly to the chiefs of the Forest Division, and the results were even beyond their expectations. The Air Board furnished a Curtiss flying boat, type F3, with a wing spread of 78 ft., and equipped with a 360 h.p. Liberty engine, which carried two observers and a pilot and three passengers. The trip from Ottawa to Haileybury, covering 336 miles, was made in five hours flying time.

There are still vast forests in Queensland and the Northern Territory which could easily be reached and mapped out in a similar manner if only the aeroplane were made available.

The Orchard.

THE CAPRIFICATION OF FIGS.

During the months of February and March last, a fair quantity of figs was placed on the market, and met with a ready sale at good prices. The fruit, however, was not notable for size, being much smaller than the Smyrna. We have not yet heard of any grower who is acquainted with the methods of cultivation and treatment of this fruit as carried out at Smyrna, where the two best varieties of figs are grown. Smyrna is a district and city of the Province of Aidan, in Asia Minor, south of Constantinople, and situated on the Mediterranean Sea, in about the same latitude as Sydney, New South Wales. There are two varieties of the famous Smyrna fig known in the trade as "Sari lop" (the dried fig) and the "Bardajik," usually eaten in a fresh state. The peculiarity of these figs is, that their skins under favourable conditions, dry tender, which is not the case with other varieties, and, as a dried fig cannot be peeled, its skin influences its quality and value considerably.

The "Sari lop" is a large fig, hence the great demand for it in foreign markets, but the "Bardajik," though smaller, makes a sweeter and finer flavoured dried fig. This latter is called "Sheker Injir" (sweet fig) in its dried state.

The fig grows very easily from cuttings, grafting, or seed. Preference is given here to cuttings, which are planted out where they are to grow into trees. The cuttings strike root very easily. The custom is to put the cuttings in the ground at an angle of about 45 in., buried right up to the top with only the leaf bud appearing above the soil; and, for protection in frosty weather, the bud also is covered temporarily with an inch or two of soil. Cuttings bear fruit in three or four years. Off-shoots or suckers are sometimes used; these are cut off the parent tree with a few small roots attached.

For the fig to reach full-sized maturity caprification must be resorted to, which is carried out by a very small fly.

This fly coming from the edible fig deposits its eggs in the seed of the fruit of the wild fig-tree, which bears an autumn fig called "Bogha," and passes thence to a fig appearing in the spring on the same tree called the "ilex," commonly and erroneously known as the "male" fig.

The edible fig-tree bears fruit later than the second crop of the wild fig-tree, and the fly passes on to that in turn and then back to the "Bogha" fig.

In order to control the caprification, it is found desirable that the wild tree should be planted apart from the edible fig-tree. Over caprification is apt to spoil the fig, which drops off prematurely as a result.

This fly is considered esesntial to the successful growing of the Smyrna fig, but so far it has not been exactly decided whether for cross fertilisation from the wild fig or merely from one fig to the other of the same variety.

Five to twenty "ilex" figs are hung in strings when ripe on each edible tree, according to size, and there left until the fig season is over.

The wild fig-tree is more subject to frost. Though leafless during the winter, the "Bogha" fig, then on the tree, continues growing, and it is supposed that the necessary movement of the sap renders the tree more tender than the others of the genus which are then in a dormant state.

All the Smyrna varieties grow anywhere in this district within a certain distance from the sea (about 100 miles) and prefer calcareous soil, but all figs become sweeter growing on hillsides with a southerly aspect. Too much moisture spoils the quality of the fig, though the crop may be greater and the size of the fruit larger. Young trees always produce the finest fruit.

When the fig, either the "Sari lop" or "Barkajik," reaches maturity it requires dry weather to make it white and mellow. At this season, August and September, the prevalent winds are from the north and east, and, being dry, they are well adapted to the requirements of the fig.

The dried fig is a product of the Meander Valley, where the climatic conditions allow it to dry properly. This is attributed to the conformation of the valley, which is protected by hills from the sea breezes. The soil, which also plays so important a part in the cultivation of the fig, is calcareous here; there are also iron mines in the neighbouring hills, and it is claimed by one authority that ferruginous detritus helps to make this district the garden of the fig. The best districts in the Meander Valley are Inovassi (between Karabounar and Baladjik) and Ortaxe. The lastnamed district produces a fig superior in size, richness of pulp, and thinness of skin. In Strabo's time the figs of Antioch, which town possessed a large tract of country on both sides of the Meander, were noted as the dry figs of Antioch, and the tree on which this variety grows is called "Trephyllus."

Ortaxe is close to Antioch.

All attempts to produce it successfully elsewhere than in the Meander Valley having failed, the dry fig has come to be looked upon as a peculiarity of this district. Valleys in the neighbourhood apparently identical have been tried without success.

The fig is allowed to remain on the tree until it begins to drop off, when the crop is gathered by hand or knocked off by sticks. The partially dried fruit is spread on mats to dry in the sun for three or four days, and is then sent to market.

The operator, in "working" the figs for packing, dips his fingers into brine to prevent them from becoming sticky. The salt, besides destroying the worm to which the dried fig is subject and acting as a preservative, is supposed to help in the sugaring process. Some recommend immersion in boiling brine as a means of sterilisation. The figs are put in baskets or perforated metal drums and immersed about five minutes in the boiling brine. It is contended, however, by others that this process alters the taste of the fig and spoils those of the finer quality.

The figs when ready are shipped in small boxes or bags.

For home consumption dried figs are sometimes baked to a light-brown colour; baking gives them a pleasant flavour. Sometimes the figs are stuffed with walnuts or other nuts and spice, then sprinkled with sesame seed before baking.

No. 319 Bulletin of the College of Agriculture, Agricultural Experiment Station, Berkeley, California, has an interesting and educational article by I. J. Condit, on "Capri Figs and Caprification" (writes an Exchange).

"The capri or wild fig is the natural habitat of the fig wasp known scientifically as *Blastophaga grossorum*, which is now used extensively in California and to a lesser degree in the Commonwealth for consummating the process known as caprification of figs. A tree containing the fig wasp is growing in the Government Orchard at Hackney, and is a source of interest to some of the students who attend the practical lectures given there by Mr. George Quinn, Horticultural Instructor to the Department of Agriculture. The superior quality of dried Smyrna figs has been long recognised by connoisseurs, but the reason for their superiority was not disclosed until it was discovered that the native growers of Smyrna made a practice in the spring of the year of suspending the wild fruits of the capri fig in the Smyrna trees. From these capri figs there issued hundreds of the minute wasps already named, which entered the eye of the Smyrna fig and caused the fruit to set. Where this operation was neglected, the small Smyrna figs soon turned yellow and dropped off. On account of the very rapid growth of the fig industry in California, and the recent large plantings there of Smyrna figs, there is a keen demand, according to Mr. Condit, for practical information about varieties of capri figs, cost of caprification, and methods of distributing the figs in the orchard. It is the purpose of this publication to present the latest and most reliable information on the points mentioned, as well as on others of prime importance to the fig-grower. The bulletin is appropriately illustrated and ought to meet the needs of the fig-grower."

PROLIFIC LEMON TREES.

In a previous Journal we have drawn the attention of lemon-growers to the very successful work of Mr. H. W. Lambert at Paddington, in the suburbs of Brisbane. We have just received a branch of eleven well-grown fruits from him, which are large and very juicy. There are eleven fruits on the portion of the branch here reproduced, and they contain more juice than those of the Lisbon lemon. The tree from which this sample was taken bears a very heavy crop, and markets profitably.

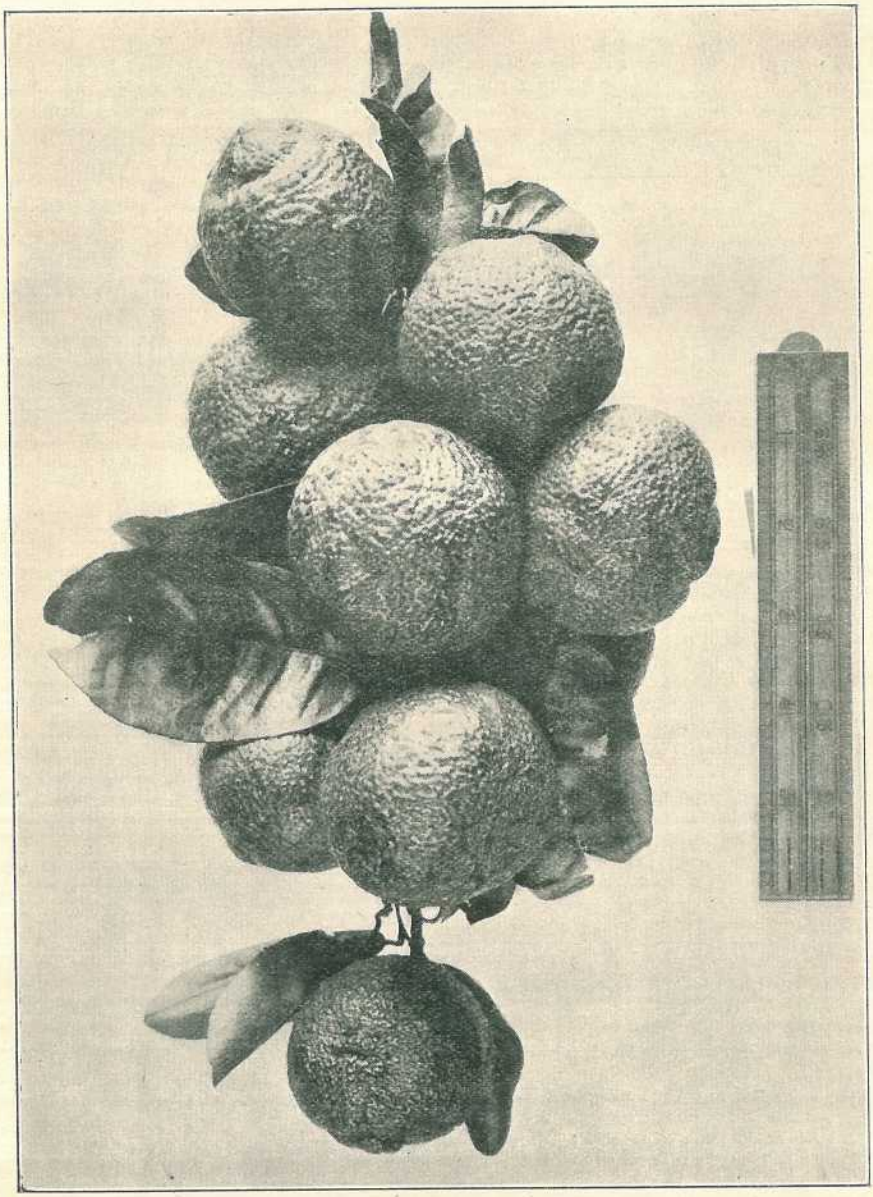


PLATE 23.—A PROLIFIC LEMON.

SPECIAL INTERSTATE FRUIT TRAINS.

For the week ending 9th April, three special fruit trains were dispatched by the Southern Queensland Fruitgrowers' Society, Limited, carrying the following fruit cargoes for the South, clearing at Wallangarra. Consignments would have been still larger had it not been for the heavy rains resulting in almost impassable roads, which prevented many growers from reaching the railway stations in time for dispatch.

Three hundred and seventeen and a-half tons were destined for Melbourne, and 117½ tons for Sydney. The description and quantities of the fruits sent South for Sydney were 8,281 cases, of which 6,354 were bananas, 1,579 pineapples, 343 cases of citrus fruit, and 6 cases chocos. For Melbourne there were 4,352 cases of bananas, 721 cases of pineapples, and 281 cases of citrus fruits.

District tonnage sent was: North Coast to Melbourne, 152¾ tons, and 36¼ tons to Sydney; total, 189 tons (Landsborough transhipping 55¼ tons); Dayboro line to Melbourne, 12½ tons; Currumbin to Melbourne, 35 tons, and 3½ tons to Sydney (total, 38½ tons); Tweed Heads to Sydney, 75¾ tons.

Mr. W. Ellison, manager of the South Queensland Fruitgrowers' Society, lately reported that for the month of February the special trains chartered by the society carried a total of 1,753¾ tons of fruit—1,074 tons went to Melbourne and 679 tons to Sydney. In all, 46,500 cases were carried—28,400 bananas, 17,836 pines. The balance was made up of tomatoes, passions, &c. The loading for the past seven months was 7,925 tons, compared with 5,447 tons for the same period last year. For the two weeks ending 5th March, 1921, special trains carried a total of 1,085 tons of bananas, pines, &c., 645 tons being sent to Melbourne and 439 tons to Sydney. In addition to the above, fruit has also been attached from Stanthorpe.

WEEDICIDE.

A correspondent of "Land," Sydney, asks for information as to a good chemical for the destruction of weeds on a plot of ground 40 feet by 100 feet, and also wants to know whether any such application of a remedy would be injurious to trees, plants, and vegetables in three or four months' time. We ("Q.A.J.") do not know the virtues of all the forms of Weedicides, but the following useful reply was given by the journal named, and we commend it to the notice of Queensland gardeners:—

"As your piece of ground is not a large one, we would recommend 'Weedicite,' 1 gallon to 100 gallons of water. This quantity is sufficient to kill every surface plant on an area of 400 square yards. It will not injure trees, but do not allow the mixture to go on flower beds, as it rapidly destroys all vegetable life with which it comes into contact. Another remedy is arsenate of soda, 1 lb. to 2 gallons of water. A watering can is a good medium for spraying the poison. It is as injurious to plants as 'Weedicite,' and it must not be allowed to go on trees. If the grass and weeds are killed, you should allow three or four months before planting."

GAS POWER FROM WASTE WOOD.

"The progress which has been made by British firms in the construction of suction gas plants for utilising waste wood is of special interest to many countries overseas, where there are large quantities of this material available. These plants distil the wood and produce gas which is of excellent quality for use in gas engines. This method of utilisation is much more economical for power-producing purposes than burning under a boiler. A recent example of a large installation on these lines is afforded by a mine in a British dominion, where a British firm has supplied four suction gas plants capable of yielding a total output of 1,400 horse power. The fuel used is in the form of logs up to 2 feet long and a foot in diameter; and the gas is applied to the driving of four horizontal gas engines. Three of the engines drive electric generators, and the fourth is coupled to an air compressor for operating pneumatic drills and hammers in the mine."—"Industrial Publicity," London.

[There are vast quantities of waste wood in our forests all over Queensland, waste timber which will never be used for any purpose. From the above paragraph it would seem that such wood can be turned to very good account.—Ed. "Q.A.J."]

Tropical Industries.

THE SOUTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

During the month, cane areas have been inspected at Mount Bauple, Cooroy, Nambour, and Beenleigh.

MOUNT BAUPLE.—The prospects here are better than they have been for some years. The cane crops are growing strongly, and by cutting time, on present appearances, should yield both weight and density. This is more especially the case with the plant crop of last year, as cane planted previously to 1920 received a very severe check with drought; so much so that it is surprising to find the ratoons doing as well as they are. A certain amount of disease is noticeable in the field this year, although not to any great extent. The variety known as D. 1135 is, perhaps, the worst inspected, this cane being checked in places by a condition commonly known as "red rot." The disease is distinguished by a rust coming on the leaf, and by a cracked and attenuated stem. Fungoid parasites make their appearances near the ground, and the root system, on examination, is parched and bound. Fortunately, only small areas are attacked, and if farmers plough out the diseased cane and let the land rest for twelve or eighteen months, the disease will probably disappear. Lime would be beneficial before replanting.

Regarding varieties, those at present doing well are M. 1900, D. 1135, H.Q. 813, H.Q. 222, D. 113, and Badila. There are a number of other canes being planted, having recently been obtained from Bundaberg Sugar Experiment Station. There are some good varieties among these, including Shah. No. 10, N.G. 81, Q. 1018, Q. 97, and E. K1. Practically no trouble is being experienced just now with cane pests. Borers are attacking the cane in isolated patches, but not sufficiently as to cause alarm. The Mount Bauple area generally looks very green, the pasture being in good condition. Live stock are doing well.

COOROY.—Very little cane is grown at Cooroy, although some farmers are seriously thinking of planting on a larger scale than hitherto. The country is so suitable for dairying and fruit raising that it is questionable whether anything else would pay as well. Transport is also a serious problem as far as sugar-cane is concerned. Of the few farmers who have a little planted, it can be said that they have worked hard, and the cane is growing well. The land, however, is inclined to acidity, and better results could be obtained with liming. D. 1135 is the principal variety grown. Frosts are occasionally severe between May and September.

NAMBOUR.—Owing to continuous heavy rains, not a great deal was seen of the Nambour district during this visit. The crop is, however, going to be a good one. Both the plant and ratoon crops are looking well, and will probably put on a couple of feet of cane yet before the season closes. As far as could be observed, the cutting season will begin fairly early.

No new varieties were noticeable since last visiting Nambour. On present appearances 1900 Seedling, D. 1135, H.Q. 285, and H.Q. 813 seem to be making the most satisfactory growth. There are three important items that the growers could give more attention to in this district, and they are, liming, green manuring, and draining. By paying attention to these matters, the growers would increase their tonnages considerably.

BEENLEIGH.—Much of the country in this fertile district is devoted to pursuits other than cane growing, but there are still a number of farmers who grow cane, though they are not entirely dependent on it. Most of the land around Beenleigh would produce sugar, although it is not ideal owing to the likelihood of frosts, which sometimes occur with considerable severity between May and October.

However, the different varieties of cane that are being raised at present look well, and there should be a fair quantity for milling next season. Probably the best grown of these, and the most promising, is the H.Q.813. One grower, Mr. Rowe, has a particularly fine planting of this cane, and growers would be well advised to give it a fair trial. Other varieties, such as 1900 Seedling and D. 1135, are making good headway. The soil requires lime and green manures; also a little more drainage on the river farms would be beneficial. The cane is practically free from injurious pests. Occasionally grubs are in evidence, but so far have done no damage. River transport is at present difficult owing to the tremendous masses of water lilies.

BUNDABERG (WOONGARRA AND BAROLIN).—The prospects for a good season look better in the Bundaberg district than they have done for some time. The cane is growing satisfactorily, and farmers are confident that they will get a fair return this year. The season has been a good one since the New Year, and the soil is in a suitable condition. With the disappearance of the old drought-stricken cane that was on many of the fields prior to last planting, a considerable slackening off is noticeable in cane pest attack, although it would still be as well for the farmers not to have any useless cane stand on the land for horse feed, &c., as this precedure encourages borers, and forms feeding grounds for the cane grub. There is no doubt that a great deal of the soil in the Woongarra and Barolin areas would be benefited by the greater use of vegetable manures, either cow pea or Mauritius beans.

Since last reporting on the above areas, the different varieties distributed by the Experiment Stations have made good growth. At present the five most suitable varieties of the older canes appear to be D. 1135, 1900 Seedling, H.Q. 285, Badila, and Clark's Seedling, H.Q. 285 looks particularly well and growers ought to plant more of this cane. It is an early maturing variety of good sugar content.

THE NORTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Northern Field Assistant, Mr. E. H. Osborn:—

The Ayr District, comprising the Haughton Mill, Pioneer, Kalamia, and Inkerman was visited recently, and the following notes were taken:—Everywhere land is being prepared to plant from April onwards. Tractors, mostly Mogill and Titan, are in use, but the heavy cost of fuel makes their use very expensive now, and in consequence horses are doing most of the work.

The bulk of the soil here consists of heavy, dark, deep loam upon and adjacent to the river bank and creeks; and a somewhat similar class of lighter soil, but more shallow upon the higher grounds. All of it is, I think, capable of growing first-class crops of high density cane if only an average rainfall, evenly distributed, eventuates. No rocks or gravel are to be seen. As regards lime, I understand that good lime can be obtained from the Reed River at a reasonable cost. Green manuring has not been gone in for much, as several farmers tried to procure same and failed. Mrs. Hayward, near Inkerman, has a very nice block of first ratoons—half Badila and half Clark's Seedling—as the result of a heavy application of filter press manure obtained from Inkerman. The cane looks remarkably green and healthy now.

Very little irrigation is carried on at the Haughton, although the cane looks very well without it. Probably this is accounted for by the extra rain that this district always gets. For instance, in three days in March, 14.45 inches fell there, whilst up to the 27th of March under 6 inches was the total for Ayr.

At Pioneer and Kalamia, irrigation is usual; whilst at Inkerman, although plenty of plants are being used with good results, the majority of growers are awaiting the completion of the irrigation scheme. This will increase the Inkerman supply very materially.

Taking the general outlook from a cane point of view, the cane, although very green and well stooled out, is backward owing to the dry spell in February. As one grower remarked, "It is a bit over the odds to have to think of watering in our wet season (February and March)." Unless a fall occurs very soon a lot of the farmers talk of watering again.

The varieties of cane most grown here are Badila (about 40 per cent. of crop), the Gorns, 24, 24a, 24b, Clark's Seedling, B.208, Q.813, Q.855. Of the last two, Q.813 is most popular, on account of its better striking qualities. Very little ratooning is done beyond the first, except on the best of the soils, as it is said not to be too payable. On some of the better soils second and third ratoons have been more successful. The mills expect to start crushing early in July; and, although it is hard to get an accurate estimate of the total tonnage, it should probably be in the vicinity of 240,000 tons, *i.e.*:—

Haughton	25,000 tons
Pioneer	70,000 tons
Kalamia	65,000 tons
Inkerman	80,000 tons
	240,000 tons

This amount will, of course, depend upon the weather in the near future, to a certain extent.

This district has so far been very free from disease or insect pests, although a few grubs were in evidence at the Haughton last year.

Mr. Wright, a grower there who suffered a little from them, replanted and used about 40 lb. of arsenic to the acre with his cane plants. He used it after the plants had been slightly covered with soil, and then added the balance of soil covering. The results of this experiment will be instructive.

In conclusion, I would like to thank the various gentlemen who gave me all the information at their command, and in fact helped me in every way that they could. Such assistance is much appreciated.

OF INTEREST TO TOBACCO-GROWERS.

Tobacco growers in Queensland who no longer have the advantage of the valuable instruction given by the late Mr. Neville, who, for several years directed the industry, both in the south and far north of Queensland, will doubtless find some information which will be of advantage to them in the following article by W. H. Scherffius, M.S., Chief of the Division of Tobacco and Cotton, Ceylon, taken from the February, 1921, issue of the "Tropical Agriculturist," Peradeniya, Ceylon:—

FACTORS THAT AFFECT THE GROWTH, REPRODUCTION, AND MATURITY OF TOBACCO.

The various factors that affect the development of a crop of tobacco are numerous. Probably the most important are light, temperature, moisture, chemical changes, and fertility of soil.

Light.—I have purposely mentioned light first, as too frequently we attach more importance to the other factors mentioned and leave light out of consideration. A number of investigators have given special attention to this phase of plant life, and their results have indicated that light plays a most important part in the growth and reproduction of plants. This topic might be viewed from three directions, namely: (1) Intensity of the light; (2) the quality—that is, the wave lengths of the radiation; and (3) the duration.

As regards intensity of the light, there seems to be an optimum amount suited for each plant species, and that optimum may be more or less than the full intensity of the sun's light on a clear day in a particular quarter of the globe. Within certain limits a reduction of the intensity of the light has a tendency to lengthen the axis and branches and also to increase the superficial area of leaf surface of a good many species of plants.

The effects produced by different spectrum rays are very marked, though nothing very decisive can be stated at present. Under the influence of red rays of light certain species of plants show an abnormal elongation of the axis, while under green and blue rays the length of the axis is markedly reduced. Some plants show the greatest growth under white light.

The duration of daily exposure to light seems to have an important bearing on the period of vegetative growth of certain species, the lengthening of the daylight period, showing a considerable shortening of the period of vegetative growth, larger seeds produced, and an increase in the flavour and aroma. The exclusion of light prevents the development and functioning of the seed-forming agents, or sexual reproduction; on the other hand, the length of the seasonal daylight, or if supplemented by artificial light, is a dominant factor in developing the staminate and pistillata reproductive organs, and, therefore, the existance of the species.

Only moderate shortening or lengthening of the daylight period tends to retard or accelerate, as the case may be, the sexual reproduction. If the daylight period is too short for production of seed the plant tends to gigantism or indefinite vegetative development; while under the influence of the correct length of daylight for a particular species an abundant flowering and fruiting may be expected. Thus certain varieties may act as late or early maturing, depending on the amount of daylight they may be exposed to as compared to the optimum requirements of that species or variety.

Annuals, biennials, and perennials may also be the results of seasonal range of daylight, as many species are, in a measure, governed by length of daylight rather than the retarding influence of winter. Therefore, certain annuals may complete

two cycles of reproduction in a single season by subjecting the plants to a suitable length of daylight or artificial light. Similarly, under certain reduced light exposures, some annuals behave like non-flowering perennials.

Apparently the rate of growth is directly proportionate to the length of daily light exposure.

From the above one would conclude that the proper time for seeding in order to get the correct amount of sunlight is important, and that the seasonal range of daylight is an important factor in controlling the natural distribution of plants.

Temperature and Moisture.—The various factors mentioned previously are so vitally dependent one upon the other that it is important to bear in mind that one of these factors, such as temperature, will not give results approaching perfection without the other conditions being favourable to the production of the crop. Tobacco is a plant which is very sensitive to its surroundings, and we must not expect a good development if the conditions under which we compel the plant to grow are unfavourable. To obtain the fullest development in growth the plant requires a humid atmosphere and a fairly high temperature, though in my opinion it attains its greatest perfection in temperate zone heat. It has, however, been very clearly demonstrated that certain varieties or types of tobacco will make good development under the influence of high temperature, while others show poor development. A notable example of this is found in the White Burley types. They seem to reach the highest degree of perfection in the Blue Grass Region of Kentucky; there is, however, another factor which plays a vital part in this connection which will be mentioned later. White Barley tobacco, when planted in this country, with occasional expections, seems to become somewhat dwarfed, and the different individuals show a lack of uniformity in their growth, and not infrequently the leaves show a parched or dried condition during the growing period. It seems to thrive best in rather a humid atmosphere and with a moderate temperature.

Cigar wrapper tobacco, which is probably the most highly specialised type grown, seems to thrive best and reach the highest degree of perfection in growth, flavour, and aroma, in a high temperature with a fair amount of humidity. During the curing or drying stage, to obtain the best results, the tobacco planter must use his best judgment in this process, as the method of handling his crop depends largely on the type of tobacco he is attempting to produce. For example, in the production of cigar wrappers the curing process is an alternating one, in which the tobacco should partially dry during the day and at night it should absorb a certain amount of moisture; this process is called "running"—*i.e.*, the cured portion of the tobacco gradually changes from a yellow or green colour to a light mahogany brown. In the production of so-called Virginian tobacco the process is somewhat different; to secure the greatest amount of light-coloured leaf the planter must for the first few days during the yellowing process prevent curing, by keeping the atmosphere humid, till the tobacco is properly yellow; then the curing process is commenced and is continued constantly to prevent "running" till the tobacco is thoroughly dried. The relative amount of humidity and heat necessary both during the yellowing period and the curing period are highly important, as the results obtained depend largely on these factors.

The ageing or fermenting process should not be attempted by the farmer where a warehouse is available, as it is purely a warehouse operation, and can only be done properly where large quantities of tobacco are brought together and where suitable buildings are available.

Chemical Changes.—During the growing period there are certain plant foods which become water soluble and are drawn into the plant by means of fine root hairs on the plant. These plant foods—nitrogen, potash, and phosphorus, in addition to certain other minerals such as lime, magnesium, sulphur, iron, and carbon—are essential in building up the cell structure of the plant. During the growth, curing, and fermentation of a crop of tobacco there are complex chemical changes constantly going on; starches are converted to sugar, alkaloidal poisons are built up and broken down, nitrogen is probably used up in this process and again liberated in the fermentation process. This continuous chemical change is illustrated by the varying amounts of nicotine found in tobacco at different stages. Generally speaking, as a plant develops, there is a gradual increase in the nicotine. Seedlings at transplanting time will show approximately .25 per cent. of nicotine, and at full maturity the plant may show 4 per cent. of nicotine; if allowed to stand longer in the field and become over-ripe it will show a slight falling in the nicotine content. Likewise, during the fermentation process, there is a reduction in the nicotine content.

If one follows these changes, we see starch form and disappear, sugar form and disappear, nitrates and nicotine increase and again decrease. Citric, oxalic, and

malic acids are present in the growing plants, and these partially disappear in the cured leaf. Butyric and acetic acids are present in fermented leaf. During the fermentation process gases are formed by the breaking down of certain compounds; ammonia is one of these gases, which is easily detected by the odour in the fermenting room. Thus it is apparent that after a crop of tobacco reaches the curing-shed it is highly important that the curing and fermenting be carried out with the greatest care in order that the best qualities may be obtained.

Fertility of Soil.—The question of the fertility of the soil is one which, though often discussed, is of such importance that I feel justified in making a few comments on it before closing. I would first like to impress the fact that the quantity of plant food in the agricultural zone of the soil is a definite quantity, and every crop grown on that soil takes away a portion of that definite quantity. So it becomes a simple matter of reasoning, that if one continues to draw on that stock of plant food without replacing it by means of fertilisers or by growing deep-rooted manuring crops, he must expect in a few years to see a falling off in yields. Again, constant cropping without ploughing under manuring crops will reduce the humus or decaying vegetable matter in the soil to such an extent that, although there may be sufficient nitrogen, potash, and phosphorus to produce crops, the soil may be lifeless. This decaying vegetable matter acts like a sponge in holding moisture in the soil and also provides a habitat for the soil bacteria, which is so essential to plant life.

Tobacco, which is sometimes spoken of as a potash plant, requires a fair amount of plant food; therefore, if a soil is not giving good yields, for lack of plant food, it is probably advisable to apply a complete fertiliser carrying, say, 4 per cent. of potash, 3 per cent. of nitrogen, and 8 or 10 per cent. phosphoric oxide. I would, however, advise caution in the use of nitrogen, especially in attempting to produce yellow tobacco. Nitrogen has a tendency to produce a stronger, heavier, and darker tobacco. Potash should not be used for tobacco in the form of a chloride, as chlorine is generally conceded to be injurious to the burning quality of tobacco. Phosphoric oxide seem to give an earlier maturity and a lighter-coloured leaf. Previously we mentioned the Blue Grass Region of Kentucky as the favourite home of the White Burley tobacco. Underlying this area is a stratum of limestone, and the surface soil contains decomposed limestone, and incidentally this soil shows a high percentage of available phosphoric oxide. It is probably the phosphorus or the combination of phosphorus and lime together with a temperate heat that makes this section ideal for the production of this particular type of tobacco.

RICE-GROWING.

By A. J. BOYD.

Having seen rice growing in Java and some other tropical countries, it struck me that the soils and climate of Queensland would be just as suitable for the successful cultivation of this cereal in Queensland. I therefore obtained some "paddy" (rice seed) and sowed it on my sugar plantation Ormeau, at Pimpama, in 1869. It throve splendidly. The seed was one of the Japan varieties. Since that time, from the seed thus raised and distributed, other settlers took the matter up, and it was not long before about 300 acres were under the crop. In 1901 Mr. F. W. Peek, of Loganholme, wrote in the December issue of the "Q. A. Journal," an exhaustive account of the initiation, rise, and progress of the rice industry, giving full directions for sowing, cultivating, harvesting, and threshing out the grain, milling the rice, and preparing the crop for market. In the year mentioned the Brisbane "Observer" wrote as follows concerning a sample of rice grown on Pimpama Island:—"The rice resembles Patna rice in shape of grain, but is of darker colour. Qualified experts, to whom it was shown, said it was the first really high-grade rice they had seen grown in this State, and as it could be marketed (in 1869) at from £18 to £18 10s., it commanded a ready sale. The commonest quality of imported rice, Rangoon, was then selling at £19, duty paid, while for Japan rice £24, duty paid, was asked by the distributing houses. There is no more trouble in sowing and harvesting a rice crop (Upland Rice) than in the case of a wheat crop."

Like every other cereal or vegetable, rice, to ensure good results, must have a certain amount of attention and care in preparing the land, although the question of drainage does not enter so largely into consideration for this crop as for other cereals. Stagnant water should be avoided as detrimental. I do not here deal with swamp rice, which is raised in seed beds, planted out in wet land, and inundated at

intervals almost up to the ear. Such rice can only be profitably grown in countries like Java, China, and other countries where there is an abundance of cheap coloured labour. The so-called Upland rice is raised without transplanting, and with no more irrigation than is required for wheat, barley, or oats. The variety successfully grown in the Logan district and at Cairns in the far North was the "White Java," which gives a length of straw of from 4 to 6 feet, with a good flag, besides a grain of good length, fairly plump, and the variety is also free from disease or rust.

"In preparing the land," said Mr. Peek in his paper on rice-growing, "ordinary methods only need be adopted—that is, to first plough, leaving the soil to lie for a week or so to aerate and sweeten. Then, cross-plough and harrow, bringing the soil to as fine a tilth as possible. The best time for planting in Southern Queensland (south of Rockhampton) is at the end of September or the beginning of October, when we get the first rains. In cultivating for rice on hillsides or sloping land with a natural rapid drainage, it would be advantageous to slightly terrace the land cross-ways to the fall of the hill, leaving an open catchment drain on the higher side, and blocked at each end to conserve the rain water, because even so-called Upland rice must have a certain amount of moisture, and by the construction of the above drain, or dam, so to speak, the gradual percolation of the conserved water will have the desired effect of helping to supply the necessary moisture, which would be about 20 to 30 inches of rainfall spread over the period of growth. This amount of rainfall has produced very good crops of grain. Now, about sowing the seed: We have to be determined in the matter by our requirements—if for cropping for grain, or for fodder purposes only. There are three systems: Broadcast, chiefly for fodder purposes; planting in drills; and transplanting from nursery beds. In the first instance—*i.e.*, sowing broadcast—it will take a bushel (60 lb. of paddy) to the acre, the seed being harrowed and treated in the same manner as for oats or wheat in the after cultivation. But the plan most generally adopted, and by far the best, is planting the rice in drills 2 feet 6 inches or 3 feet apart, and about 10 to 12 inches between the plants, which may be done successfully with an automatic seeder. By this method, about 35 to 40 lb. of seed to the acre are required. It ensures the crop being more even and not so patchy as when sown broadcast, and allows a better chance of going through the crop with hoe or cultivator to remove any weeds that may have made their appearance before the rice has got fairly started.

We need not describe the methods adopted to raise a crop of swamp rice, as it is very unlikely that this variety of cereal will ever find favour in a White Australia. One might as well try to transplant a field of oats or wheat and expect to get a profit.

The usual method pursued in harvesting rice is to cut with the ordinary sickle or reaping-hook, although where large areas are planted it is thought that the latest wheat-harvesting machinery could be used effectively.

The time for harvesting is whilst the stalks have still a bronze-green appearance, and the heads have turned a golden brown about half-way down and appear what a wheat farmer, or an inexperienced person, would call three parts ripe.

As many as thirty or forty heads have been produced from a single grain planted, the product weighing from 10 to 14 oz. By cutting rice at this stage, the loss by shedding is not so great as with over-ripe grain. Rice is never left stooked in the field, but is treated as quickly as possible.

After threshing, a great deal of nutriment remains in the stalk, which makes excellent stock food and also good ensilage.

The market for rice in Australia is a growing one, and it will take years before the supply overtakes the demand. Our farmers need not fear to grow this crop and invest in the industry, which will return a fair amount of profit for the labour and outlay required to produce an article which only requires care in selecting and planting the varieties to suit the market requirements.

The machinery needed for hulling and polishing the grain is comparatively inexpensive.

Messrs. Whitmore and Binyon, Limited, Mark Lane, London, are makers of rice mills ranging in hourly output of hulled and pearled rice from 7½ cwt. to 20 tons per hour.

Some years ago, Mr. W. Heck, a sugar planter on Pimpama Island, imported a little rice mill, capable of treating half a ton of dressed rice per day, as an adjunct to his sugar mill. With this machine he turned out a finished, polished product which was pronounced by Brisbane merchants to be equal to any imported rice of the same variety, and very little different to the best Japanese rice.

The rice crop in 1898 in Queensland covered 863 acres, and averaged 44.19 bushels per acre, the total yield amounting to 38,133 bushels of 60 lb. To-day it is one of the neglected industries, yet we import annually over 2,000 tons, for which we pay—for Patna and Japanese rice, £60 per ton. Chinese rice is imported in mats containing from 49 to 50 lb. each, for which importers pay from 18s. 6d. to 20s. per mat, or about £37 to £40 per ton.

As the cultivation of rice is practically the same as that for wheat, any wheat-grower can calculate for himself the cost of production and harvesting of paddy, and can thus judge whether it is a crop which will return him more than, or at least as much as, wheat or maize. Of course, the cost of threshing, hulling, and polishing must be taken into consideration. We understand that early in this year nine bales of paddy (rice for seeding purposes) were received from Japan for shipment to intending growers in the Cairns district.

SISAL HEMP IN JAMAICA.

A few years ago sisal hemp was produced to some extent in Queensland, and it proved a very profitable crop, but, eventually, the increase in wages, the higher cost of machinery, and the rise in freights, coupled with the hopeless competition with cheap coloured labour countries, the industry declined to a vanishing point. The East African sisal industry has suffered enormously through the abnormal conditions resulting from exchange difficulties. The results of trading during 1920 must have been to growers, shippers, and merchants most unsatisfactory. While prices for the first six months of the year were satisfactory, the subsequent drop during the rest of the year, combined with the heavy allowances for damaged hemp, and also for tow being shipped, instead of hemp, must have caused serious losses. British-grown sisal, best quality, is quoted by Messrs. Landauer and Co. at £51 to £52 per ton, and No. 2 at £46 to £48. Yet German sisal, which leaves much to be desired in quality, colour, and selection, is valued at from £53 to £54 for No. 1, and £47 to £48 for No. 2. Tow is quoted at £30 to £32, according to quality.

The Director of Agriculture, Jamaica, Mr. H. H. Cousins, made the following report in November last on the result of testing the second crop of fibre from the experimental 1,000 plants at Lititz of the sisal of the 1915 planting, cut in November last:—

TESTS OF FIBRE YIELDS AT LITITZ.

	Cut Nov., 1919.	Cut Nov., 1920.
Average number of leaves fit to be cut per plant	32	30
Average yield of leaves in lb. per plant ..	19	18
Average weight of single leaf	9.6 oz.	9.7 oz
Recovery of fibre (by hand) per cent.	3.4	3.93
Fibre per 1,000 plants, lb.	646	759
Yield per acre of fibre (6 x 5) at normal distance of 6 feet x 5 feet	938	1,029
Total	2 cuttings, 1,967 lb.	

These results are quite encouraging, as the drought at Lititz in 1920 has been very severe and the experimental site is considered to be the most infertile area on the whole of the Lititz Savannah.

While the leaves average slightly more in weight than last year, the percentage af fibre has increased from 3.4 to 3.93 and the gross return of fibre is now indicated to be at the rate of 1,079 lb. of fibre per acre, as against 938 lb. per acre for 1919 for the first crop.

In less than a year we have thus obtained from this test area 1,967 lb. of fibre per acre worth about £40 in London to-day. We should get four crops before the plants are exhausted so as to get about 4,000 lb. of fibre per acre before replanting becomes necessary.

It is therefore evident that the growing of sisal for fibre at Lititz should be a profitable undertaking.—"Journal of the Jamaica Agricultural Society," January, 1921.

Botany.

A WILD COTTON.*

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

Writing under date 10th December, 1920, to the Minister for Agriculture (Hon. W. N. Gillies), Mr. F. Pether stated:—"I enclose for your inspection a sample of wild cotton found by me growing on poor sandstone hills near the Mayne River. The cotton bush only grows a foot high, but the whole of it is nearly all cotton and is easily stripped from the stem, which bears only a few soft leaves."

The sample sent was a very small one and insufficient for botanical identification other than it showed it to come from some plant of the family Chenopodiaceæ or Salsolaceæ, a family containing the Salt Bushes and Goosefoots.

Mr. Daniel Jones, who examined the specimen, reported that "It was the first example of a native fibre approaching true cotton he had seen, but that, owing to its short staple, its commercial value would not be much, although it might be used as a substitute for kapok." It is not likely, however, that it would pay to collect for this purpose, as kapoks are available from a number of more readily available sources.

Later (14th January, 1921), Mr. Pether forwarded complete specimens of the plant, with the following accompanying notes:—"The sample now being forwarded is what I pulled from the ground just as it was growing. As you will see, the root was broken in the pulling. The fibre forms in the shape of a flower with a tiny seed in the centre. The sample which I have now forwarded was just on the turn of ripening. The tip of the plant was green. The cotton ripens from the bottom of the stem upwards and falls away as it ripens. I first discovered the plant in September, 1920, after there had been good winter rain. As far as my knowledge of the plant goes, I should think it would reach maturity in three months, but so long as the ground kept moist, it would keep green, as it appears to grow and ripen much the same as the natural grasses. It grows where the natural grasses would not grow, the land being too poor for them. The nature of the land on which it grows is nearly sandstone rock, or perhaps better described as sand which has crumbled with age from a sandstone rocky hill. This sandy soil also bears a small quantity of ironstone. There is no doubt about the plant being hardy, and I should think very little rain would keep it going. I have only been to the cotton patch once or twice. It was then ripe, and had mostly all fallen from the stalk, but still having a small quantity hanging from the plant, the fibre lying on the ground in heaps. The country in the vicinity of which this plant is growing is very poor sandstone country, and this one patch of cotton is the only one that I know of. I have also shown it to old hands, but no one has ever seen the plant growing. I showed it to Mr. Murray, manager of Brighton Downs Station, on the Diamantina, who is a very old identity here, and who has been all over this country; but he had not seen it before; therefore, I think this is probably the only patch where it grows in the district. The locality is roughly about twenty-six miles east of the junction of the Mayne and Diamantina Rivers."

On examination, the specimen proved to be a species of *Bassia*, and one apparently new to science. Strange to say, the nearest ally of Mr. Pether's plant is *Bassia carnosa*, a species only known to occur in a few coastal localities in Western Australia. The Queensland plant very closely resembles the Western Australian one, but the cotton surrounding the seed is considerably longer. A description and illustration is given herewith.

BASSIA LANUGINOSA, sp. nov.

Fruticulus erectus ca. 30 cm. altus; ramis dense lanuginosis; foliis sericeo-tomentosis sessilibus linearibus ca. 2.5 cm. longis 2 mm. latis vel superioribus subovatis ca. .9—1.1 cm. longis et 3.5 mm. latis; floribus axillaribus solitariis pilis albis longis obsitis, stigmatibus 2; perianthio fructifero depresso, pericarpio depresso-ovoideo membranaceo pilis paucis longis obsitis.

A small undershrub about a foot high with numerous erect simple stems arising from a hard branching woody base. Stems covered with a dense, long, floccose

* As this article describes a new plant, it is necessarily somewhat technical. A brief Latin diagnosis is included in accordance with the International rules of botanical nomenclature.

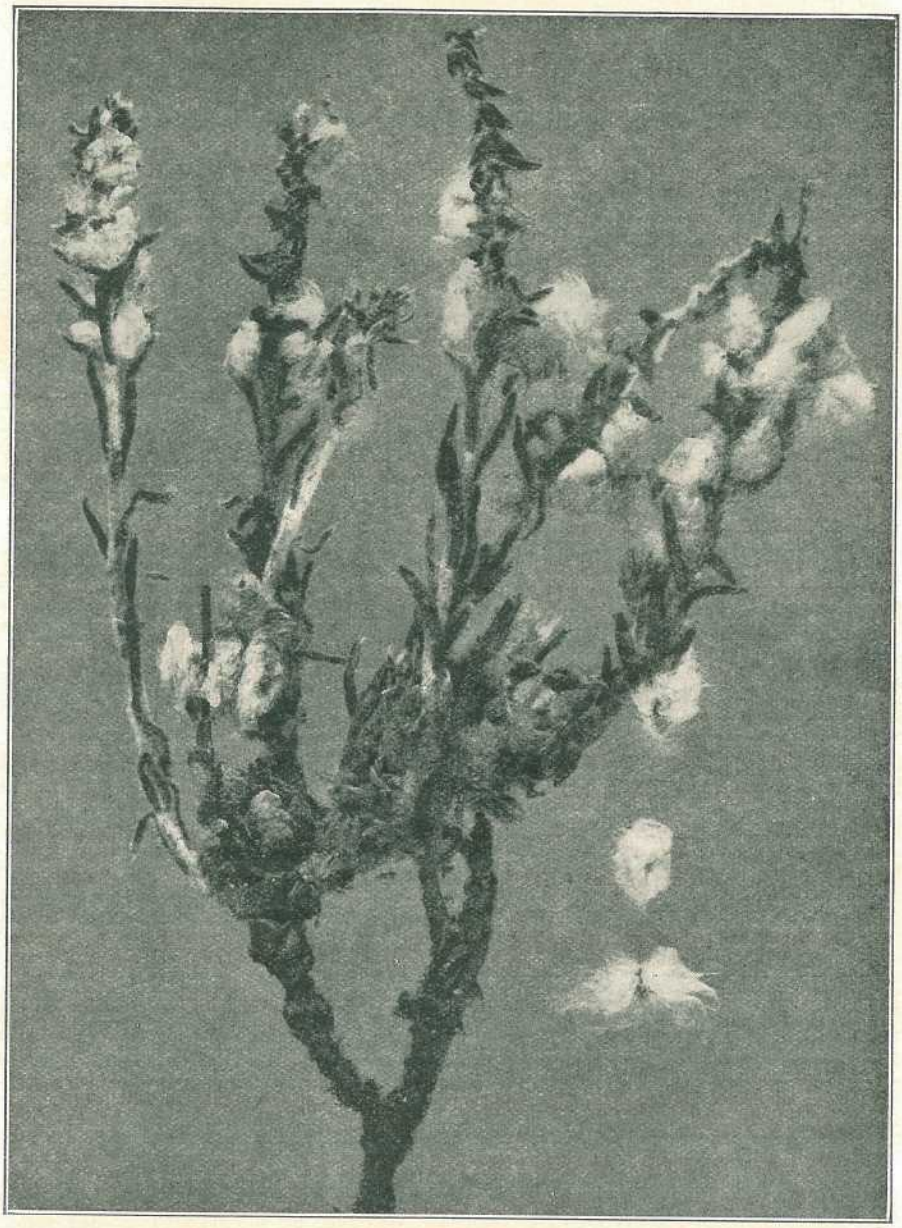


PLATE 24.—A "WILD COTTON," (*Bassia lanuginosa*). Slightly reduced.

tomentum. Leaves sessile, linear or the uppermost ones more or less ovate, lower ones about 1 inch (2.5 cm.) long, about 1 line (2 mm.) broad, uppermost ones 4 to 5 lines long (.9—1.1) and 1½ to 2 lines (3-5 mm.) broad, densely covered with long silky or cottony hairs. Flowers sessile and solitary in each axil, but crowded along the upper part of the stem, densely enveloped in long white silky-woolly hairs. Fruiting perianth depressed; about 2 lines in diameter without the wool, but over 1 inch in diameter with the wool teased out, the 5 lobes closing over the fruit and surrounded by a slightly raised horizontal ridge, but without appendages of any sort. Stamens 5, styles 2, united to about the middle. Pericarp, about 1 line in diameter, depressed-ovoid, membranous with a few long hairs.

Habitat.—Sandstone country about twenty-six miles east of the junction of the Mayne and Diamantina Rivers, Western Queensland, *Frank Pether.*

The nearest ally of this new species is *Bassia carnosa*, a Western Australian species, from which it can be distinguished as follows:—

Leaves at length glabrous; flowers in terminal leafy spikes; fruiting perianth 1 line in diameter without the wool, including the wool about 3 lines .....*B. carnosa.*

Leaves never glabrous, flowers not collected in definite terminal spikes, but occupying the whole of the upper part of the stem, sometimes almost the entire stem, fruiting perianth 2 lines in diameter without the wool, about 1 inch, including the wool teased out.....*B. lanuginosa.*

Notes on the Genus Bassia.—The genus Bassia comprised about 40 species, found in Southern Europe, Northern Africa, and temperate Asia, but finding its greatest development in the drier parts of Australia. The fruits of many are more or less spiny and covered with down or short woolly hairs. The genus was founded by the Italian botanist Allioni in 1776 on *B. muricata*, a Southern European species. In the ''Flora Australiensis'' the genus is divided into three smaller ones, *e.g.*, *Chenolea*, *Aniscantha*, and *Sicerolaena.*

These are separated by only small differences, and none have priority over Bassia as a name. In 1771 the German botanist Koenig established a genus called *Bassia* on an East Indian tree, and in many works Koenig's genus stands for a number of tropical trees of the family Sapotaceæ. Most modern writers, however, now generally accept Allioni's genus as having priority, and the Sapotaceous one was changed by Baron von Mueller to *Illipe*, which latter name is now generally held.

These notes are necessary to explain the departure from the nomenclature in the ''Flora Australiensis'' and Bailey's ''Queensland Flora.''

TO MAKE CHARCOAL.

In the early days of the Chiltern goldfield, Victoria, there was a great demand for charcoal by the smiths, who had hundreds of miners' picks to sharpen. The only supply at first was obtained from charred logs, but several Italians went into the business, amongst them being men who had been charcoal-burners in their own country. Their mode of procedure was as follows:—

The principal timber trees were stringy-bark, and these men felled the trees and stripped off sheets of bark, which sold for 2s. 6d. per sheet for roofing the houses of the incipient township. They then split up the logs into lengths of from 3 to 6 feet. A stout post was placed upright on the site selected for a charcoal kiln, and small wood gradually extending to the longest billets was built up against it in the shape of a beehive. This was covered with grass, and about a foot thick of dry earth thrown over the grass. Small openings were left here and there on the ground floor to create a draught. Then the post was lifted out, and fire dropped into the chimney so produced. From this time forward a watch was kept night and day on the pile, and at any sign of fire breaking through, fresh earth was piled on. Some of these kilns would produce from 20 to 50 bags of charcoal. In about 36 hours the pile of burning timber began to subside, and eventually buckets of water were poured down from the top to extinguish the fire. On opening up the kiln the whole mass of timber was reduced to charcoal, which was spread out to cool on a cleared space, the lumps of charcoal being carefully separated, for wherever any of it happened to be still red hot it would communicate the fire to the rest, which would, in the open air, be reduced to ashes. The charcoal found ready sale at 2s. 6d. per bag. A community of Italians would sometimes have half a dozen of their kilns in operation at the same time.

Forestry.

QUEENSLAND TREES.

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

No. 2.

GIANT WATER GUM (*Eugenia Francisii*).

Common Name.—Giant Water Gum.

Derivation.—*Eugenia*, in honour of Prince Eugene of Savoy, an early protector and encourager of botany; *Francisii*, after William Douglas Francis.

Description.—A very large tree attaining 130 feet in height and a barrel diameter of 5 feet. Barrel mostly very widely and prominently flanged at the base. Bark brown or grey, smooth or with occasional partly detached fairly long flakes; when cut, brown, measuring ⅜-inch thick on a tree with a barrel diameter of 3 feet 6 inches. Sapwood white. Leaf stalks about ¼-inch long. Leaves opposite, somewhat egg-shaped or elliptical in outline, drawn out into a prominent point at the apex, upper surface dark green and glossy, underside paler, midrib and the numerous fine lateral nerves visible on both surfaces; measurement of leaf blade, 1½ to 3 inches long, twice to 2½ times as long as broad. Minute transparent dots (oil cells) are seen in the leaves of this and allied species when they are held between the eye and a strong light. Flowers in panicles at the ends of the branchlets and proceeding from the forks of the leaves. Stem and branches of panicles slender and often 4-angled. The flowers are borne at the end of the panicles branches in little clusters of 3 to 6. The individual flowers are very small, measuring less than ¼-inch long and are borne on a slender stalk of about one-tenth of an inch. The calyx and tube which forms the lowermost part of the flower is bell-shaped and bears 4 short, broad teeth at its rim. Within the calyx teeth are 4 round, yellowish petals about one-tenth of an inch in diameter. Within the ring of petals are numerous fine stamens about one-sixth of an inch long. The ovary fills the lower part of the calyx tube, and is surmounted by a style about as long as the stamens. Fruit bluish purple, often paler, round and somewhat flattened, nearly ½-inch in diameter and ¼-inch in depth, consisting of a mealy pulp surrounding a comparatively large seed.

Distribution.—Coastal scrubs of Eastern Australia from the Richmond River, N.S.W., to Gympie, Queensland. It is a very common tree in the scrubs eastward of Gympie, and is frequent along watercourses and on damp flats. Confined to Australia.

Uses.—The close-grained, pinkish timber has not been used so far as we know. It is easily worked, and could at least be used for cases.

Remarks.—The name "Water Gum" originated from the fact that quantities of a watery sap are sometimes contained in a central cavity or pipe of the barrel, and it flows out when the trees are being felled. We have called it Giant Water Gum to distinguish it from other smaller and hard-wooded trees, also called "Water Gums" in Queensland.

References.—*Eugenia Francisii*, F. M. Bailey, "Queensland Agricultural Journal" vol. 26, page 315, pl. 31 (1911). We are unable to separate this species from *Eugenia Tomlinsii*, Maiden and Betche, "Proceedings of the Linnean Society of New South Wales" vol. 27, page 247 (1913), and have taken this view in giving the distribution of the tree.

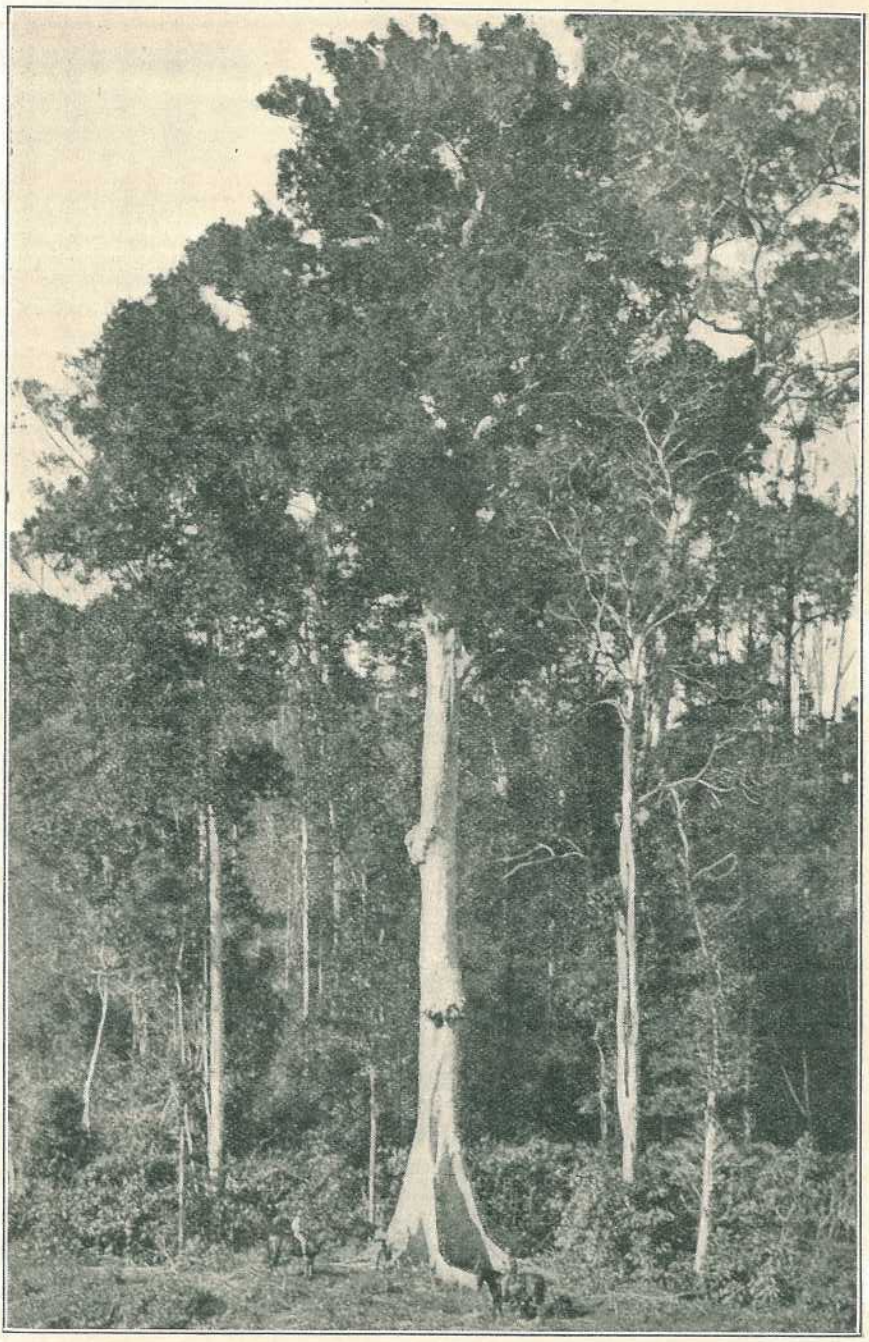


Photo. by the authors.]

PLATE 24.—GIANT WATER GUM (*Eugenia Francisii*). Kin Kin.
Three men, two on horseback and one on foot, may be seen near the base of the tree.

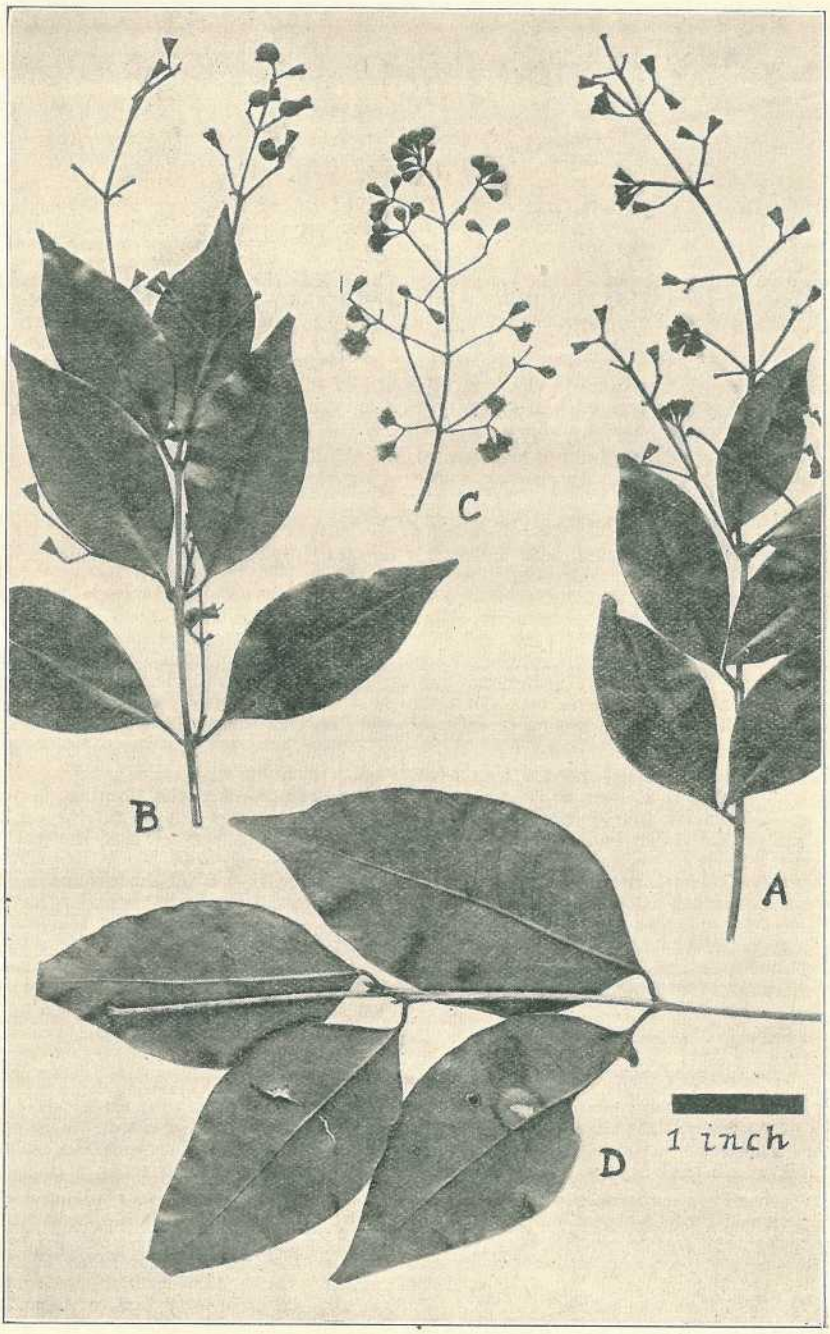


PLATE 25.—GIANT WATER GUM (*Eugenia Francisii*).

A. Branchlet showing inflorescence.
B. Branchlet showing very young fruit.
C. Inflorescence.
D. Branchlet from barren shoot, showing underside of leaves.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from Dr. J. F. Illingworth, the Entomologist to the Bureau:—

Rains have continued during the past month, so that the soil is now (15th March) thoroughly saturated and all the watercourses are flooded bank high. Between showers the weather has been exceedingly oppressive; hence, conditions could hardly have been better for the growing crops. Fortunately, too, these tropical disturbances have not developed much wind, so most of the cane is standing well. Babinda district, as usual, has come in for her full share of the deluge—an average of about an inch per day for the months of January, February, and March—yet the cane there is making splendid growth.

Grub injury is beginning to show at Greenhills; and arsenic where used in sufficient amount, is already showing encouraging results.

DEVELOPMENT OF LEPIDODERMA ALBOHIRTUM.

This species, as usual, has developed very rapidly in the red-volcanic soils. Digging in the fields at Greenhills, on 11th March, showed that 73 per cent. of the grubs had already reached the third stage, which is the period in their development when they are most destructive; 26 per cent. were in the second stage, and only about 1 per cent. still remained in the first stage. Since straggling beetles were on the wing up to about the middle of February, the duration of the first and second stages is apparently something less than a month each. The final stage, on the other hand, remains with us right up to cold weather, and even then the grubs frequently continue for several months deeper in the soil in their hibernating chambers.

In spite of the super-saturation of the soil, much of the cane at Greenhills already looks as if it were suffering from extreme drought—*i.e.*, the terminal leaves are rolling, giving the characteristic piping appearance, and the beautiful dark-portions of the stalks badly gnawed. During the prevailing wet weather the grubs are particularly abundant, the leaves have become almost dry and brown in colour. Stools of cane in this condition can easily be lifted right out of the ground with one hand, for the roots have been eaten entirely away and even the underground portions of the stalks badly gnawed. During the prevailing wet weather the grubs are just under the surface of the soil and near the cane, so that when the stools are pulled out bodily most of the grubs are disclosed. These vary in numbers considerably in different parts of the field, chiefly with regard to the distance to the feeding trees, but it is not at all uncommon to find twenty to fifty in a single stool, especially in the ratoon cane.

ARSENIC FOR CONTROL OF CANE GRUBS.

Most of the plant cane on the Greenhills Estate was treated with arsenic at the time of planting, the poison being placed in the drill at the rate of about 80 lb. per acre. This cane has made excellent growth, except in a few places on the rising ground, where grub-injury is already showing.

In our two experimental fields on this estate we have forty-six plots, each having a width of five rows (25 ft.). Right through, the treated plots alternate with checks, so that we may get a better line on the real effect of the poison. As was noted almost a year ago, we used arsenic in the following amounts per acre: 40 lb., 80 lb., 100 lb., and 200 lb. One field was planted to D. 1135 and the other to Badila. The first was planted in April, 1920, so that there is fully 7 ft. of cane on it. The poisoned areas were treated during May, 1920, when the cane was almost a foot high, but before the drills were filled. This field has always been one to show grub-injury first, so, as usual, much of the cane is already (15th March) suffering there. Most of the checks have fallen, due to the excessive wet weather, while the treated plots show varying degrees of immunity. On 11th March, I was much interested to find the cane in the plot treated with arsenic at the rate of 200 lb. per acre standing erect, while the check plots at either side and at the end had fallen. It was good enough for a picture, for this standing cane had made excellent growth,

far ahead of that in the checks. Five rows away on one side was cane treated with arsenic at the rate of 100 lb., which was somewhat fallen; and the plot with 80 lb. of arsenic, on the other side, was not quite as good. Sixty lb. of arsenic showed some value, though the cane in the checks had not fallen so badly in that part of the field and the results were not so apparent. The plots treated with 40 lb. of the poison hardly show any results so far. The injury has not developed far enough in our Badila field for results upon the appearance of the cane. Digging, however, showed that there were fully 50 per cent. less grubs in the treated plots than in the checks, and, furthermore, the grubs were not so far developed. We found about 73 per cent. of the grubs in the checks had reached the third stage, while practically none had gotten to that stage where the heavier doses of arsenic had been applied. It will probably be interesting to have the following exact figures of the number of grubs that we found during our examinations:—

24th February, 1921—

Field D. 1135, check, 3 Stage I., 29 Stage II., and 13 Stage III., or a total of 45.

Plot treated with 200 lb. arsenic, 1 Stage I., 4 Stage II., or a total of 5; and 4 dead second-stage grubs were found, that had just succumbed to the poison.

The next check plot had 2 Stage I., 12 Stage II., and 4 Stage III., or a total of 18.

A stool in a plot treated with 100 lb. arsenic gave 1 Stage I., 8 Stage II., or a total of 9; and one dead of arsenic.

The plot treated with 80 lb. gave 2 Stage I., 4 Stage II., and 1 Stage III., or a total of 7; and 1 dead of arsenic.

The check gave 2 Stage I., 6 Stage II., and 10 Stage III., or a total of 18.

A plot treated with 60 lb. of the poison gave 1 Stage I., 6 Stage II., and 1 Stage III.

Where 40 lb. of arsenic had been applied we found 6 Stage II., and 4 Stage III., or a total of 10 grubs.

From the above figures it would appear that most of the grubs are destroyed by the poison during the second stage, just before they reach the very destructive period in their development. The dead grubs only last a few days in the soil before disintegrating, which accounts for finding so few dead in the soil.

It is too soon to offer conclusive remarks on how much arsenic is necessary for complete control of this pest, or which method of application is best; nevertheless, the results are encouraging.

WHITE GRUBS DESTRUCTIVE TO GRASS PADDOCKS AT ATHERTON.

A species which resembles very closely our cane grubs has been doing rather serious damage to grass lands in the vicinity of Atherton. Mr. Dodd recently did some investigating in this district, and found the grubs very near the surface, where they were destroying the roots of the grass, but fortunately in rather localised areas. I have been able to secure specimens of the beetles of this species through the kindness of Mr. Wilson, of the Babinda Mill staff, who was on the Tableland during their flight, and was thoughtful in securing specimens for us.

These beetles are different from anything that we have in our collections, so are evidently a localised species. It may be remarked, however, that this is a pest which might easily become very important, especially on crops like corn, if not repressed in some way.

TO PICKLE CHILLIES.

Take large, green capsicums, and slit them sufficiently to remove the seeds. Then make a brine of salt and water of sufficient density to float an egg. Place the chillies in this when the brine is cold, and let them remain there for twenty-four hours. Then drain again, rinsing in cold water. Then place in wide-mouthed stone or glass jars. Now take vinegar and water in the proportion of one quart of vinegar and one quart of water to every thirty chillies. Heat to boiling point and pour it over the peppers in the jars. Leave it to stand till cold; then drain off the vinegar and water and throw it away. Now heat fresh vinegar without water and pour it over the peppers boiling hot. Cover the jars tightly and set in a cool place.

General Notes.

SOIL ALKALI: ITS ORIGIN, NATURE, AND TREATMENT.

By F. S. HARRIS, Ph.D., Director and Agronomist of the Utah Agricultural Experiment Station.

One of the most serious problems confronting the farmer of arid and semi-arid regions, more particularly in those where irrigation is practised, is the prevention of accumulation of soluble salts in the soil, which in excessive amounts act as plant poisons. The name "Soil alkali" is not restricted to substances having strong basic reaction, but is popularly used for the designation of all soluble salts in the soil which may be injurious to plant life.

A very large amount of literature has been published during the past years on the question of "Soil alkali," but the author is the first to condense this work in text-book form.

The origin of alkali, the nature of injury to plants and seeds, toxic limits, native vegetation indicative of alkali, chemical method of determination of alkali, relation of alkali to physical and biological condition of soil, methods of reclaiming alkali lands, crops suitable for such lands, drainage, alkali irrigation water, &c., &c., are dealt with in the many chapters, the author utilising the numerous fundamental facts collected in all parts of the world, giving the references at the end of each chapter.

His own personal experiences in the treatment of alkali lands make the work particularly valuable to anyone interested in this problem, which affects Australia as much as any other part of the world.

IMPORTANCE OF LIME FOR THE SOIL.

When a soil is found to be deficient in carbonate of lime the remedy is simple. So common is the want of lime that the recommendation to apply it is the most obvious remedy which occurs to any practical agriculturist or agricultural chemist. If a soil is sour; if it is newly broken up from pasture or waste; if it has been reclaimed from a boggy condition; if it is worn out by exhaustive cropping; if pastures or meadow land exhibit coarseness of herbage; if land is addicted to "finger and toe"; if potatoes are rough-skinned or scabby, or if a field produces stunted or diseased herbage, the first suggestion is to lime it.—"Garden and Field."

SULPHUR AS A FERTILISER.

Of recent years a number of tests and experiments have been carried out in the United States of America in the use of sulphur as a fertiliser for lucerne fields.

From the reports that have come to hand, it is gathered these have been very successful. For instance, in eastern Oregon nearly six times as much alsike clover hay has been secured from paddocks treated with sulphur at the rate of 100 lb. to the acre, as compared with untreated areas. In the same district a single application of 100 lb. sulphur increased the yield of lucerne on an average 1½ tons per acre for four years. Of course, Australian soil and climate conditions are different from those obtaining in America, but it should be worth somebody's while to make a few tests in this country.

THE SUFFOLK HORSE.

The soundness of the Suffolk horse was indicated in the recent report of the Ministry of Agriculture in England on stallions for which licenses were applied.

This point was specially referred to at the meeting of the council of the society. Attention was drawn to the fact that only 5 per cent. of the stallions were rejected as unsound, and only two animals had side-bone. The faith which breeders of Suffolk horses have in the Punch prompted them to accept without demur the proposal of the breeding scheme committee that at the three sales of pedigree Suffolk horses to be held by the society in March, July, and September next every animal except foals must be sold sound. It was agreed that this proposal meant a bold step, but the members of the council unanimously declared they were prepared to take it.—"Queensland Grazier," 17th March.

CANNED FRUIT SHIPMENTS.

To save the fair name of Australia being dragged in the mire by unscrupulous dealers, and to avert any further cause for complaint by oversea purchasers of Australian canned fruits that such were badly packed or arrived in a condition detrimental to the Australian fruit export industry, the Customs Department, South Australia, will, we understand, next fruit season, adopt a system of inspection at factories, and see that consignments for export are properly graded, canned, and cased, and generally are in accord with a standard adopted by the department. All fair minded fruitgrowers, packers, and exporters, who have the welfare of the Australian fruit industry at heart, will (says "Garden and Field") agree that action in the direction indicated is right and proper.

The Queensland Government some time ago took the same action, with the result that the canned pines for export are pronounced to be equal to any packed in other countries.

PRICES OF RUBBER.

Messrs. Leslie and Anderson, in their market report issued on 27th January last, remark that the market for rubber had been dull during that month, with a declining tendency in prices which showed a fall of 2½d. to 2⅝d. per lb. in ribbed smoked sheet which then stood at a discount of 2½d. to 3d. on Crepe. They quoted standard smoked sheet 9¾d. per lb. London stocks then totalled nearly 55,000 tons. "The Planters' Chronicle," Madras (26th February), states that restriction of output was agreed upon during the latter part of the year, to continue to the end of 1921.

QUEENSLAND FELIX.

If the rest of the world only knew what a bright, happy State this is, how glorious our climate, how fertile our fields, and how diversified our products, Queensland would be so packed with home-seekers that there would not be a spot to loaf on. Home-seekers are what we want, and we are glad to welcome them. We don't want lazy adventurers who cannot make a success of life anywhere, but the hard-working farmer with a little capital, the hard-working farm labourer with his strength and his brains for his capital. These are what we want to build up our State, and it is pleasant to know that they are coming to us in increasing numbers.

THE LARGEST STATION IN AUSTRALIA.

In reply to a correspondent from North Queensland, the "Pastoral Review" (Melbourne) writes:—"Notwithstanding what other papers may have published, the area of Victoria River Downs, N.T., is 11,561 square miles, all connected and under the one manager, and made up of ten leases and two permits. The owners of the property have supplied us with the exact figures for each lease, and we hold their signature as to the accuracy of same. The areas of each block are as follows:—Block 2,184, 8,746 miles; block 2,158, 336 miles; block 2,182, 147 miles; block 2,157, 96 miles; block 253 (permit), 83 miles; block 279 (permit), 98 miles; block 2,183, 240 miles; block 2,174, 327 miles; block 2,159, 249 miles; block 2,175, 388 miles; block 2,180, 353 miles; block 2,181 miles, 498 miles. Total, 11,561 square miles."

THE BUTTERMAN.

We've reached another stage of life,
When failing years are born anew;
This lovely year has seen no strife,
And peacefully departs from view.
A sunny summer filled with fruit,
An autumn crowned with golden lore,
A richer year beyond dispute
Than many that have gone before.
Bountiful year, adieu, farewell,
Go home and tell your Father how
We thank Him more than tongue can tell,
And pray Him still, "God speed the plough."
To patrons, readers, far and near,
And dairymaids throughout the lan',
We wish you all a bright New Year,
Most truly yours, "The Butterman."

Answers to Correspondents.

COTTON SEED.

"S.C.," Marwood, Mackay.—

The request for a supply of cotton seed has received attention. Copy of cotton pamphlet has also been forwarded to Mrs. Ditton and yourself.

COBBLER'S WAX.

Some time ago a correspondent asked us how to make "Black Wax." We could get no information on the subject from anyone in the boot trade. We find a recipe in "The Land" for making cobbler's wax, which may possibly have been the material in view:—Melt together ½ lb. white wax, 1 lb. hard soap, 1 oz. ivory black, and a quarter pint of linseed oil. Dissolve over a slow fire, stir until cool, and turn into small moulds.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1921.

Article.		APRIL. Prices.
Bacon, Wholesale	lb.	1s. 3d. to 1s. 4d.
Bacon, Retail	,,	1s. 5d. to 1s. 6d.
Barley	bush.	...
Bran	ton	£9 10s.
Broom Millet	,,	£24 to £29
Broom Millet (Sydney)	,,	£30 to £40
Butter (First Grade)	cwt.	196s.
Chaff, Mixed	ton	£5 10s. to £7 10s.
Chaff, Oaten	,,	£5 to £8
Chaff, Lucerne	,,	£6 10s. to £9 5s.
Chaff, Wheaten	,,	£5 5s to £7
Cheese	lb.	1s. to 1s. 0½d.
Flour	ton	£19 10s.
Hams, Retail	lb.	1s. 4d. to 1s. 9d.
Hams, Wholesale	,,	1s. 3d. to 1s. 4d.
Hay, Lucerne	ton	£6 to £7
Hay, Oaten	,,	...
Honey	lb.	4d. to 4¾d
Maize	bush.	4s. 4d. to 4s. 5d.
Oats	,,	3s. 6d.
Onions	ton	£4 to £8
Peanuts	lb.	3d. to 6d.
Pollard	ton	£10
Potatoes	,,	£6 to £9 5s.
Potatoes (Sweet)	cwt.	2s. to 4s.
Pumpkins (Cattle)	ton	£3 to £4 10s.
Eggs	doz.	2s. 1d. to 3s. 1d.
Fowls	per pair	4s. to 7s.
Ducks, English	,,	4s. to 6s. 6d.
Ducks, Muscovy	,,	5s. to 7s. 6d.
Geese	,,	10s. to 12s.
Turkeys (Hens)	,,	9s. to 10s.
Turkeys (Gobblers)	,,	17s. to 21s.
Wheat	bush.	5s. 7d. to 6s. 6d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans, per sugar bag	4s. to 8s. 6d.
Beetroot, per dozen bunches	1s. to 1s. 7d.
Cabbages, per dozen	4s. to 13s. 6d.
Carrots, per dozen bunches	1s. to 1s. 6d.
Chocos, per quarter case	1s. 6d. to 3s. 6d.
Cucumbers, per dozen	1s. to 1s. 6d.
Lettuce, per dozen	6d. to 1s.
Marrows, per dozen	1s. 3d. to 4s.
Parsnips, per dozen bunches	...
Peas, per sugar bag	1s. 5d. to 13s.
Potatoes (Sweet), per sugar bag	2s. to 4s.
Pumpkins (table), per ton	£4 15s. to £4 17s. 6d.
Rhubarb, per dozen bunches	9d. to 2s. 3d.
Tomatoes, per half-bushel case	3s. to 6s. 9d.
Turnips (Swede), per dozen	4d. to 6d.

SOUTHERN FRUIT MARKETS.

Article.	APRIL. Prices.
Bananas (Tweed River), per double case	13s. to 16s.
Lemons, per bushel case	7s. to 15s.
Pineapples (Queens), per double case	10s. to 15s.
Pineapples (Ripleys), per double case	5s. to 7s.
Pineapples (Common), per double case	5s. to 7s.
Oranges, (Queensland), per case	20s. to 25s.
Oranges (Other), per case	3s. to 10s.
Tomatoes, per half bushel case	2s. to 3s.
Passion Fruit, per half bushel case	8s. to 18s.
Peaches per bushel case	2s. 6d. to 7s.
Pears, per bushel case	5s. to 10s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, (Imported), per bushel case	5s. to 15s.
Apples, Cooking, (Imported), per bushel case	7s. to 11s.
Bananas (Cavendish), per dozen	3½d. to 8d.
Bananas (Sugar), per dozen	3d. to 9d.
Citrons, per cwt.	8s. to 9s.
Cocoanuts, per sack	£5
Grapes, per case	7s. to 9s.
Lemons (Lisbon), per half bushel case	3s. 6d. to 7s. 6d.
Persimmons, per half bushel case	5s. to 9s.
Rockmelon, each	6d. to 1s.
Oranges, per bushel case	5s. to 11s.
Oranges (Seville), per cwt.	13s.
Pineapples (Smooth), per dozen	1s. 4d. to 7s. 6d.
Pineapples (Rough), per dozen	7s. 3d.
Pears, per bushel case	10s. to 15s.
Papaw Apples, per tray	3s. 5d. to 7s. 6d.
Peaches	1s. 6d. to 4s. 6d.
Plums	5s. 6d. to 8s.
Quinces, per case	6s. to 8s.
Mandarins, per bushel case	16s.
Custard Apples, per tray	5s. to 7s.

TOP PRICES, ENOGGERA YARDS, MARCH, 1921.

Animal.	MARCH. Prices.
Bullocks	£16 5s. to £17 7s. 6d.
Bullocks (Single)	...
Cows	£10 5s. to £13 17s. 6d.
Merino Wethers	34s. 6d.
Crossbred Wethers	40s.
Merino Ewes	25s. 3d.
Crossbred Ewes	32s. 9d.
Lambs	35s. 3d.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	67s.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence, insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but, obviously, this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest, in warm, early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills lay them on a thick layer of sand, then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems. A hand machine for this purpose was once introduced into Queensland from France, which would turn out 65 lb. of clean fibre in a day of ten hours; but it proved to be unworkable.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of

plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes, the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days, thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frosts, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth and that weak, so that the fruit produced thereon is small, it is advsable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to over-produce fruit spurs, which become long and straggling, and bear a large quantity of small-sized fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark, in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

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	5·0	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	3·14	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	5·30
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.