QUEENSLAND AGRICULTURAL JOURNAL

VOL. I. APRIL, 1914. PART 4.

# Agriculture.

## THE PHILOSOPHY OF SOIL.

### INOCULATION FOR LUCERNE.

It is a simple proposition, and yet to a great many farmers it looks so remote and mysterious that they do not clearly understand it, and so they cast it aside as some crank notion or humbug. Yet, it is the absolute keystone that holds the arch. The principle is this: All of those plants that are called legumes, like all of the clovers and lucerne, including peas, beans, and vetches, require the deposit on their roots of certain bacteria. These deposits are in the form of small colonies and are called "nodules."

Dig up a healthy clover or lucerne plant, and shake the dirt gently from the roots, you will see these nodules clustering on the finer roots about as big as a small pin head. The microscope discloses that these nodules are filled with certain bacteria that have the power to absorb the free nitrogen of the air, and change it over into plant nitrogen. What makes lucerne or clover valuable as a feed is its percentage of protein, which is another name for nitrogen. Milk and meat and the bodies of all animals require a great deal of nitrogen.

So we see that the soil must be in that condition to create and make a home for these bacteria, or else the clovers and lucerne will not live and flourish well.

Go into some fields of lucerne, and you will note spots where the plants look unhealthy, yellow, and starved out. Dig down to the roots, and you will find no nodules there. Why? Possibly, and very probably,

it is because the soil is too acid for the bacteria to exist. Exist they must, or the clover and lucerne will fail. Each one of the legume plants has its own kind of bacteria. Those on the lucerne are unlike those that inhabit the clover.

There are three prime lessons to be learned by the farmer in the consideration of this subject:—

(1) He must take the word of those scientists who have investigated the matter. Because he cannot understand it is no reason that it is not true. We have heard scores of farmers say that all this talk about bacteria was a humbug. But they spoke the words of ignorance, not wisdom.

(2) When a farmer is introducing lucerne upon his farm, it is fair to suppose that there are no bacteria in his soil that belongs to that plant. It is a simple matter for him to take some bags and go over to a farm where lucerne does well, and get a few hundred pounds of soil from the old lucerne field. This should be done on a cloudy day or just at nightfall, when the sun is not shining brightly, for, true to its purpose, the sunlight will kill the bacteria if they are exposed to its rays.

Keep the dirt in the dark, and apply it to the surface of the newly-sown lucerne field at the rate of about 500 lb. to the acre. Do this just at nightfall also. Now the effect will be to inoculate the soil with these bacteria. They make their way at once to the young lucerne roots, and there is altogether a different growth.

Or in place of soil from a lucerne field, if more convenient, get some of the commercial inoculating material called Nitragin, which is applied to the seed, and with its multitude of bacteria is carried to the soil with the seed. It has been noticed that lucerne, as well as clover, is a great deal more hardy, stands severe cold weather and all sorts of discouragements better, when there are plenty of its favourite bacteria in the soil.

The third lesson is an important one. If the soil is too sour, it must be sweetened. When clover does not grow well and is easily winter killed or summer killed, it is a pretty sure sign that the soil is in a bad condition for it. It is quite apt to need two things—lime and phosphate. The same is true of lucerne. The bottom reason for this is, that the bacteria, necessary for the health of the plant, cannot live in that soil because of a lack of lime. The phosphate is also necessary to the growth of the plant.

The more we look into these things the more do we see the need of using the mind in a study of the real meaning of the facts as they exist. Very often it takes ten times as long to know what to do as it does to do it when we know. A large proportion of men weary of study a great deal quicker than they do of hard work. But we have noticed that the richest rewards come to the men who think and study. Blind, unthinking labour never made anybody prosperous.—"Farm Bulletin."

## TEFF GRASS—"*Erogristis Abyssinica.*"

By G. B. BROOKS, Instructor in Agriculture.

A short time ago a quantity of Teff seed was introduced by the Department of Agriculture, and is being tested at the various agricultural institutions, samples also being sent to selected farmers in other districts. It is expected that the results from these tests will be known shortly, and will be published in this Journal.

Frequent mention of this grass has been made recently in agricultural and other publications, which have also in several instances advertised it for sale. The result is, that in my travels amongst farmers it has been found that many have been induced to purchase seed for the purpose of giving it a trial as a pasture grass.

It may be pointed out that this grass is not claimed to be of any great value for grazing purposes. It is essentially a hay crop and, moreover, practically an annual, which fact renders it useless as a permanent pasture grass.

It is a heavy and free seeder, and will undoubtedly reproduce itself by "shedding," if allowed to stand over or ripen before harvesting. Some caution should, therefore, be exercised if planted as a hay crop previous to lucerne, maize, or sugar-cane, to see that it is cut down before seeding. It is a very rapid grower, coming to maturity in a few weeks, so that if a spell of wet weather were experienced to prevent cultivation, it would be likely to choke out these crops.

Teff grass is a native of North-east Africa, grown principally for food, the small grains being made into bread.

The stem is fine in texture, attaining a height of from 2 to 4 ft. As it is a warm weather crop, planting should be carried out from September to February, the amount of seed necessary to sow an acre being from 3 to 7 lb.

The land should be put into good tilth previous to planting. The seed, being small, should be covered lightly either with lever or brush harrows and then rolled.

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## COMPOSITION OF REGISTERED FERTILISERS.

By J. C. BRÜNNICH, Agricultural Chemist.

Under the Fertiliser Act of 1905 every dealer—that is, any person who carries on business as manufacturer, importer, seller, or dealer in fertilisers—shall deliver before the 31st of January in each year a certificate stating the specific ingredients of each brand of fertiliser.

The following list comprises the fertilisers registered by the various dealers for the year 1914:—

| DEALER OR MANUFACTURER. | | Name of Fertiliser. | Nitrogen. | PHOSPHORIC ACID. | | | Potash. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| Name. | Address. | | | Water Soluble. | Citrate Soluble. | Citrate Insoluble. | | |
| | | | % | % | % | % | % | |
| A. E. Bateman ... ... ... ... | Stanthorpe... ... | Hassel's Onion Manure ... ... ... | 15·0 | 3·1 | 5·4 | ... | 13·0 | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Tomato Manure ... ... ... | 6·0 | 7·3 | 0·2 | ... | 13·0 | N. as nitrate |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Grass and Top Dressing ... ... | 1·1 | 4·5 | ... | 17·0 | 1·25 | |
| Ditto ... ... ... ... .. | Ditto ... ... | Ditto Maize and Cabbage Manure ... | 2·25 | 15·75 | ... | 1·0 | 1.75 | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Pea and Bean Manure ... ... | ... | 9·5 | ... | 3·0 | 6·5 | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Potato Manure No. 1 .. ... | 3·5 | 11·25 | ... | ... | 5·5 | |
| H. Baxter ... ... ... ... ... | Brisbane ... ... | Runcorn Bone Dust ... ... ... ... | 3·0 | ... | ... | 19 1 | ... | 35 % fine |
| Ditto ... ... ... ... ... | Maryborough ... | Baxter's Bone Dust ... ... ... ... | 2·8 | ... | ... | 20·5 | ... | 25 % fine |
| Baynes Bros. ... ... ... ... ... | Brisbane ... ... | Baynes Bros.' Fertiliser ... ... ... | 4·3 | ... | ... | 19·3 | ... | |
| T. S. Beatty .. ... ... ... ... | Mackay ... ... | Mackay Mixture ... ... ... ... | 4·5 | 8·0 | ... | ... | 15·0 | |
| Ditto ... ... ... ... ... | Ditto ... ... | Webster and Co.'s Manures. . ... ... | ... | ... | ... | ... | ... | |
| Bergl Australia, Ltd. ... ... ... | Bowen ... ... | Hashmagandy ... ... ... .. ... | 3·5 | ... | ... | 23·4 | ... | |
| Ditto ... ... ... ... .. | Ditto ... ... | Blood Manure ... . . ... ... ... | 12·8 | ... | ... | ... | ... | |
| Birt and Co., Ltd. ... ... ... ... | Brisbane ... ... | Phœnix Fertiliser ... ... ... ... | 4·5 | ... | ... | 18 0 | ... | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Dried Blood ... ... ... ... | 12·0 | ... | ... | ... | ... | |
| T. Borthwick and Sons ... ... ... | Ditto ... ... | Moreton Dried Blood... ... ... ... | 11·0 | ... | ... | 1·5 | ... | |
| Ditto ... ... ... ... .. | Ditto ... ... | Ditto Bone and Offal ... ... .. | 6·0 | ... | ... | 12·0 | ... | |
| Brisbane Gas Co. ... ... ... ... | Ditto ... ... | Sulphate of Ammonia ... ... ... | 20·8 | ... | ... | ... | ... | |
| Burdekin River M. P. Co.... ... ... | Burdekin ... ... | Burdekin Fertiliser ... ... ... ... | 3·8 | ... | ... | 17·9 | ... | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto Dried Blood ... ... ... ... | 10·0 | ... | ... | 0·4 | ... | |
| Burns and Twigg, Ltd. ... ... ... | Rockhampton ... | Yates' Plant Food ... ... ... ... | 3·3 | 12·0 | ... | ... | 12·9 | |
| Campbell and Amos, Ltd ... ... ... | Bundaberg ... | Baynes Bros.' Fertiliser ... ... ... | 4·5 | .. | ... | 14·4 | ... | 50 % fine |
| Ditto ditto ... ... ... | Ditto ... ... | Q.M.E. Fertiliser ... ... ... ... | 6·0 | ... | ... | 15·7 | ... | |
| Ditto ditto ... ... ... | Ditto ... ... | Baxter's Bone Dust ... ... ... ... | 2·8 | ... | ... | 20·5 | ... | 25 % fine |
| Ditto ditto ... ... ... | Ditto ... ... | Runcorn Bone Dust ... ... ... ... | 3·7 | ... | ... | 31·8 | .. | 52 % fine |
| Ditto ditto ... .. ... | Ditto ... ... | Shirley's Superphosphate ... ... ... | ... | 17·0 | ... | ... | ... | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto Nitrate of Soda ... ... ... | 15·5 | ... | ... | ... | ... | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto Sulphate of Ammonia ... ... | 20·0 | ... | ... | ... | ... | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto Sulphate of Potash ... ... | ... | ... | ... | ... | 52·0 | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto R. Mixture ... ... ... ... | 5·0 | 6·0 | ... | ... | 12·0 | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 3 ... ... ... ... ... | 3·3 | 13·0 | ... | ... | 2 0 | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 5 ... ... ... ... ... | 3·3 | 12·0 | ... | ... | 7·0 | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto L. S. D. Cane Fertiliser ... ... | 7·7 | 7 0 | ... | ... | 7·7 | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 11 ... ... ... ... | ... | 11·4 | ... | .. | 7 0 | |
| Central Queens'and M. W. ... ... | Lake's Creek ... | Fitzroy Fertiliser ... ... ... ... | 5 7 | 15·3 | ... | ... | 0·1 | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Corser and Co., Ltd. | Maryborough | Shirley's A Bone Phosphate | 0·5 | ... | ... | 29·8 | ... | |
| Ditto | Ditto | Ditto L. S. D. Cane Fertiliser | 7·7 | 7·0 | ... | ... | 7·7 | |
| Ditto | Ditto | Ditto Superphosphate | ... | 17·0 | ... | ... | ... | |
| Ditto | Ditto | Ditto No. 11 | ... | 11·4 | ... | ... | 7·0 | |
| Ditto | Ditto | Ditto No. 9 | 4·1 | 6·5 | ... | ... | 4·0 | |
| Ditto | Ditto | Ditto No. 5 | 3·3 | 12·0 | ... | ... | 7·0 | |
| Ditto | Ditto | Ditto No. 3 | 3·3 | 13·0 | ... | ... | 2·0 | |
| J. Croker | Mackay | Ditto L. S. D. Cane Fertiliser | 7·7 | 7·0 | ... | ... | 7·7 | |
| Ditto | Ditto | Ditto Sulphate of Potash | ... | ... | ... | ... | 52·0 | |
| Ditto | Ditto | M. G. C. Sulphate of Ammonia | 20·5 | .. | .. | ... | ... | |
| Ditto | Ditto | Nitrate of Soda | 15·5 | ... | ... | ... | ... | |
| Ditto | Ditto | Ross River Fertiliser | 6·0 | ... | ... | 16·0 | ... | |
| Ditto | Ditto | Alligator Creek Mix. Fertiliser | 5·5 | ... | ... | 18·5 | ... | |
| J. Francis and Co. | Ipswich | *Bone Dust | 2·7 | ... | ... | 25·8 | ... | 30 % fine |
| Ditto | Ditto | *Dried Blood | 11·4 | ... | ... | 0·5 | ... | |
| Gladstone M. W. | Gladstone | G. M. W., Q., Blood and Bone | 6·9 | ... | ... | 11·7 | ... | Cattle Fertiliser |
| Ditto | Ditto | Ditto ditto | 6·7 | ... | .. | 9·3 | ... | Sheep Fertiliser |
| E. Gleeson | Stanthorpe | Baynes Bros.' Fertiliser | 4·5 | ... | ... | 14·4 | ... | 50 % fine |
| W. E. Hamwood | Toowoomba | Wattle Bone Meal | 2·8 | ... | ... | 19·0 | ... | 35 % fine |
| Headrick, Ltd. | Cairns | B. M. E. C. Manure | 5·2 | ... | ... | 6·7 | ... | |
| J. L. Holmes and Co. | Toowoomba | Runcorn Bone Dust | 3·5 | ... | ... | 22·0 | ... | 45 % fine |
| J. C. Hutton Prop. | Brisbane | Hutton's Mix. Fertiliser | 6·0 | 2·8 | ... | 8·3 | ... | |
| C. F. Jordan | Zillmere | Normanby Bone Dust | 3·8 | ... | ... | 24·2 | .. | 59 % fine |
| R. B. Lawson and Co. | Stanthorpe | Blood and Bone | 6·5 | ... | ... | 11·0 | ... | |
| Ditto ditto | Ditto | Nitrate of Soda | 15·5 | ... | ... | ... | ... | |
| Ditto ditto | Ditto | Sulphate of Potash | ... | ... | ... | ... | 52·0 | |
| Ditto ditto | Ditto | Kainit | ... | ... | ... | ... | 12·5 | |
| Ditto ditto | Ditto | Shirley's A | 0·5 | ... | 8·8 | 21·0 | ... | |
| Ditto ditto | Ditto | Ditto M | 1·6 | ... | 4·6 | 11·4 | 1·0 | |
| Ditto ditto | Ditto | Ditto N | 1·6 | ... | 4·6 | 11·4 | 4·0 | |
| Ditto ditto | Ditto | Ditto O | 2·5 | ... | 4·2 | 9·5 | 6·0 | |
| Ditto ditto | Ditto | Ditto 36/38, No. 1 | ... | 16·5 | ... | ... | ... | |
| Ditto ditto | Ditto | Ditto No. 2 | 1·6 | 15·0 | ... | ... | 1·0 | |
| Ditto ditto | Ditto | Ditto No. 3 | 3·3 | 13·0 | ... | ... | 2·0 | |
| Ditto ditto | Ditto | Ditto No. 4 | 4·9 | 11·0 | ... | ... | 4·0 | |
| Ditto ditto | Ditto | Ditto No. 5 | 3·3 | 12·0 | ... | ... | 7·0 | |
| Ditto ditto | Ditto | Ditto No. 7 | 1·6 | 11·4 | ... | ... | 1·0 | |
| Ditto ditto | Ditto | Ditto No. 9 | 4·1 | 6·5 | ... | ... | 4·0 | |
| Ditto ditto | Ditto | Ditto No. 11 | ... | 11·4 | ... | ... | 7·0 | |
| Ditto ditto | Ditto | Ditto No. 14 | 2·5 | 5·5 | ... | 8·8 | 6·0 | |
| T. Leonard | Mackay | Fitzroy Fertiliser | 5·3 | 0·2 | 4·1 | 12·6 | ... | 57 % fine. |
| Marsh and Webster Ltd. | Ditto | Q.M.E. Dried Blood | 11·7 | ... | ... | 1·9 | ... | |
| Ditto ditto | Ditto | Ross River Dried Blood | 13·0 | ... | ... | 1·0 | ... | |
| Millaquin Sugar Co. | Bundaberg | B.O. and B.I. Bone Dust | 3·8 | ... | ... | 23·0 | ... | 5 % fine. |
| Mourilyan Syndicate | Mourilyan | Ross River Fertiliser | 6·0 | ... | ... | 16·0 | ... | |

| DEALER OR MANUFACTURER. | | Name of Fertiliser. | Nitrogen. | PHOSPHORIC ACID. | | | Potash. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| Name. | Address. | | | Water Soluble. | Citrate Soluble. | Citrate Insoluble. | | |
| | | | % | % | % | % | % | |
| Mourilyan Syndicate | Mourilyan | Alligator Creek Mixed Fertiliser | 5·5 | ... | ... | 18·5 | ... | |
| T. Nisbet | Innisfail | Sulphate of Potash | ... | ... | ... | ... | 52·0 | |
| Ditto | Ditto | Sulphate of Ammonia | 20·0 | ... | ... | ... | ... | |
| Ditto | Ditto | Shirley's L. S. D. Fertiliser | 7·7 | 7·0 | ... | ... | 7·7 | |
| Ditto | Ditto | Ditto R. Fertiliser | 5·0 | 6·0 | ... | ... | 12·0 | |
| M. O'Donohue | Ditto | Hanel's A1 Cane Fertiliser | 11·0 | 4·0 | ... | ... | 9·0 | |
| Paul and Gray Ltd. | Brisbane | Shirley's Superphosphate | ... | 17·0 | ... | ... | ... | |
| Ditto ditto | Ditto | Ditto No. 3 | 3·3 | 13·0 | ... | ... | 2·0 | |
| Ditto ditto | Ditto | Ditto No. 5 | 3·3 | 12·0 | ... | ... | 7·0 | |
| Ditto ditto | Ditto | Ditto No. 7 | 1·6 | 11·4 | ... | ... | ... | |
| Ditto ditto | Ditto | Ditto No. 9 | 4·1 | 6·5 | ... | ... | 4·0 | |
| Ditto ditto | Ditto | Ditto No. 14 | 2·5 | 5·5 | ... | 8·5 | 6·0 | |
| Ditto ditto | Ditto | Ditto No. 19 | 4·0 | 4·1 | ... | 7·3 | 2·0 | |
| Ditto ditto | Ditto | Ditto L. S. D. Cane Fertiliser | 7·7 | 7·0 | ... | ... | 7·7 | |
| Ditto ditto | Ditto | Sulphate of Potash | ... | ... | ... | ... | 52·0 | |
| J. W. Pohlmann | Doolbi, Isis | Bone Dust | 3·0 | ... | ... | 24·6 | ... | 60 % fine. |
| Queensland Fruitgrowers' Indust. Trading Society | Brisbane | Q.M.E. Dried Blood | 11·7 | ... | ... | 1·9 | ... | |
| Ditto ditto | Ditto | Q.M.E. Fertiliser | 6·0 | ... | ... | 15·7 | ... | |
| Ditto ditto | Ditto | Sulphate of Potash | ... | ... | ... | ... | 51·0 | |
| Ditto ditto | Ditto | Superphosphate | ... | 16·0 | ... | ... | ... | |
| Ditto ditto | Ditto | Sulphate of Ammonia | 20·0 | ... | ... | ... | ... | |
| Ditto ditto | Ditto | Nitrate of Lime | 12·7 | ... | ... | ... | ... | |
| Ditto ditto | Ditto | Nitrolim | 18·0 | ... | ... | ... | ... | |
| Ditto ditto | Ditto | Baynes' Fertiliser | 4·3 | ... | ... | 19·3 | ... | |
| Ditto ditto | Ditto | Runcorn Bone Dust | 3·7 | ... | ... | 21·8 | ... | 52 % fine. |
| Ditto ditto | Ditto | Shirley's No. 3 | 3·3 | 13·0 | ... | ... | 2·0 | |
| Ditto ditto | Ditto | Shirley's No. 5 | 3·3 | 12·0 | ... | ... | 7·0 | |
| Ditto ditto | Ditto | Foggitt, Jones, Fertiliser | 6·8 | ... | ... | 11·3 | ... | |
| Ditto ditto | Ditto | Hutton's Mixed Fertiliser | 6·0 | 2·8 | ... | 8·3 | ... | |
| Ditto ditto | Ditto | Organic Manure | 3·8 | ... | ... | 13·0 | ... | |
| Queensland Meat Export and Agency, Ltd. | Ditto | Eagle Farm Dried Blood | 13·3 | ... | ... | 0·8 | ... | |
| Ditto ditto | Ditto | Ditto Fertiliser | 6·0 | ... | ... | 13·9 | ... | |
| Ditto ditto | Ditto | Ross River Fertiliser | 5·8 | ... | ... | 17·3 | ... | |
| Ditto ditto | Ditto | Ditto Dried Blood | 13·1 | ... | ... | 0·5 | ... | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Redbank Freezing Works (John Cooke and Co.) | Ditto ... ... | Redbank J.C. Fertiliser ... ... ... | 6·4 | .. | ... | 13·0 | ... | | | | |
| C. F. W. Rehfeldt ... ... ... ... | Alberton ... ... | Redbank Fertiliser ... ... ... ... | 5·9 | ... | ... | 16·4 | ... | 42 % fine. | | | |
| G. Searle and Sons ... .. ... ... | Toowoomba ... | Baynes' B. Fertiliser ... ... .. ... | 4·4 | ... | ... | 14·4 | ... | 50 % fine. | | | |
| Ditto ditto ... ... ... | Ditto ... ... | Runcorn Bone Dust ... ... ... ... | 4·2 | ... | ... | 21·8 | ... | 52 % fine. | | | |
| C. Taylor ... ... ... ... ... | Brisbane ... ... | Redbank Fertiliser ... ... .. ... | 5·9 | ... | ... | 16·3 | ... | 42 % fine. | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Shirley's No. 3 ... ... ... ... ... | 3·3 | 13·0 | ... | ... | 2·0 | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto No. 5 ... ... ... ... ... | 3·3 | 12·0 | ... | ... | 7·0 | | | | |
| Walsh and Company ... ... ... | Toowoomba ... | Hutton's Mixed Fertiliser ... ... ... | 6·0 | 2·8 | ... | 8·4 | ... | | | | |
| Ditto ditto ... ... ... | Ditto ... ... | Shirley's No. 1 Super ... .. ... ... | ... | 17·0 | ... | ... | ... | | | | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 2 ... ... ... ... ... | 1·6 | 15·0 | ... | ... | 1·0 | | | | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 3 ... ... ... ... ... | 3·3 | 13·0 | ... | ... | 2·0 | | | | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 5 ... ... ... ... | 3·3 | 12·0 | ... | ... | 7·0 | | | | |
| Ditto ditto ... ... ... | Ditto ... ... | Ditto No. 9 ... ... ... ... | 4·1 | 6·5 | ... | ... | 4·0 | | | | |
| Webster and Co., Ltd. ... ... ... | Brisbane ... ... | Crown Superphosphate ... ... ... | ... | 16·0 | ... | ... | ... | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Nitrate of Soda ... ... .. | 16·0 | ... | ... | ... | ... | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto Sulphate of Potash ... ... ... | ... | ... | ... | ... | 51·0 | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto ditto of Ammonia ... .. | 20·0 | ... | ... | .. | ... | | | | |
| D. Whiteley ... ... ... ... ... | Emu Park ... ... | Shirley's Sulphate of Potash ... ... | ... | ... | ... | ... | 52·0 | | | | |
| Ditto ... .. ... ... ... | Ditto ... ... | Ditto Nitrate of Soda ... ... ... | 15·5 | ... | ... | ... | ... | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto No. 3 ... ... ... ... ... | 3·3 | 13·0 | ... | ... | 2·0 | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto No. 5 ... ... ... ... ... | 3·3 | 12·0 | ... | ... | 7·0 | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Ditto No. 11 ... ... ... ... | ... | 11·4 | ... | ... | 12·9 | | | | |
| W. G. Winnett ... ... ... .. | Kingston ... ... | Runcorn Bone Dust ... ... ... .. | 3·7 | ... | ... | 21·8 | ... | 52 % fine | | | |
| Thos. Wood ... ... ... ... ... | Brisbane ... ... | Shirley's No. 5 ... ... ... ... | 3·3 | 12·0 | ... | ... | 7·0 | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | B. S. A. Sulphate of Ammonia ... ... | 20·8 | ... | ... | ... | ... | | | | |
| Ditto ... ... ... ... ... | Ditto ... ... | Bone Meal ... ... ... .. ... | 4·0 | ... | ... | 24·2 | ... | 50 % fine | | | |
| Trackson Bros., Ltd. ... .. ... | Brisbane ... ... | Nitrate of Lime ... ... ... ... | 13·0 | ... | ... | ... | ... | | | | |
| Ditto .. ... ... ... | Ditto ... ... | Nitrolim ... ... ... ... ... | 18·0 | ... | ... | ... | ... | | | | |
| Associated Farmers of Queensland, Ltd., agents for Australian Phosphates Ltd. | Brisbane ... ... | AP1 Stone Fruit Fertiliser ... ... ... | 4·0 | ... | 8·0 | 3·0 | 5·0 | | | | |
| | Ditto ... ... | AP2 Citrus Fruit Fertiliser... ... ... | 3·75 | ... | 8·0 | 3·0 | 7·0 | | | | |
| | Etna ... ... | AP3 Potato Manure No. 1 ... ... ... | 3·25 | ... | 9·0 | 3·5 | 4·0 | | | | |
| | | AP4 Potato Spec. Manure ... ... ... | 5·0 | ... | 8·0 | 2·5 | 8·0 | | | | |
| | | AP5 Bean and Peas Manure ... ... | 0·5 | ... | 7·5 | 3·0 | 6·0 | | | | |
| | | AP6 Cabbage, Maize, Hay ... ... .. | 4·1 | ... | 8·5 | 3·5 | 2·5 | | | | |
| | | AP7 Cereals for Grain ... ... .. | 3·5 | ... | 9·0 | 3·0 | 2·5 | | | | |
| | | AP8 Pumpkins and Melons... ... ... | 4·1 | ... | 8·5 | 3·5 | 2·5 | | | | |
| | | AP9 Tomato and Onions ... ... ... | 3·5 | ... | 8·0 | 3·0 | 4·0 | | | | |
| | | AP10 Strawberry Fertiliser... ... ... | 5·0 | ... | 7·0 | 2·5 | 8·0 | | | | |
| | | AP11 Banana and Pineapple ... ... | 4·5 | ... | 8·0 | 3·0 | 5·0 | | | | |
| | | AP12 Wheat Fertiliser ... ... ... | 0·75 | ... | 10·5 | 6·5 | 2·0 | | | | |
| | | AP13 Pineapple Fertiliser ... ... ... | 3·5 | ... | 8·0 | 3·0 | 8·0 | | | | |
| | | AP14 Sugar Beet Fertiliser... ... ... | 3·25 | ... | 9·0 | 3·0 | 5·0 | | | | |
| | | AP15 Asparagus Fertiliser ... ... ... | 3·25 | ... | 7·0 | 2·5 | 5·0 | | | | |
| | | AP16 Oats Fertiliser ... ... ... ... | 1·0 | ... | 8·0 | 3·0 | 8·0 | | | | |
| | | AP17 Sorghum Fertiliser ... ... ... | 3·0 | ... | 9·0 | 3·0 | 5·0 | | | | |

## AN EXHAUSTED SOIL.

Each time a crop is taken off the land, it takes with it all the ingredients which have built up the plants. If these materials are not replaced in some way or other, it is clear that, after a time, longer or shorter, according to the natural fertility of the soil, the whole of the plant-food which the roots can reach will be carried away, and the land becomes unproductive; but, in reality, there is no such a thing as an exhausted soil. The plant-food is there, but it is out of the reach of the roots of the plants, and requires to be brought up in some way or another to become available. Constant cropping has certainly removed the fertilising matter from the surface, and, such being the case, good crops cannot be produced, and in this sense, too, land is said to be exhausted.

In China, the production of crops has been carried on for thousands of years, as far as records can be traced, and conducted in an extensive manner. The soil, after these thousands of years of cultivation, is as productive as ever. The Chinese have always understood the necessity of restoring to the land the supply of nourishment extracted from it. They may not understand the chemistry of the subject, but long experience has been a good master. Lands in Europe which have been cropped for hundreds of years still continue to yield heavy crops.

Some six or seven years ago the Bureau of Soils of the United States Department of Agriculture put forth an entirely new theory on the subject of the so-called exhausted soils. As a matter of fact, the Bureau declared that a soil does not become exhausted by constant cropping, that the mineral plant food is always there, being reproduced as fast as it is absorbed by the crops. The cause of the failure of the soil to produce good crops is the formation of some chemical poison when one kind of crop is being continually grown. This idea naturally causes one's mind to consider lucerne-sick and clover-sick soils as containing such poisonous elements. To obtain confirmation of the new theory, Professor Whitney made systematic experiments, of which the following is a summary:—

"In order to test the idea, and find out if we were safe in announcing such a fact as this, so revolutionary as regards our former ideas, the Bureau of Soils has had parties in all parts of the State equipped with the most sensible methods for making these determinations in the field. We have taken out of the soil its own moisture, and have actually found similar quantities of phosphates of potash, of nitrates, and of lime, in the sandy soils of our truck region, in the 'worn out' soils of Virginia, in the fertile limestone soils of Pennsylvania, and in the black prairie soils of the West.

"We then went into the question of how much plant food is necessary; how strong a concentration the solution must have to support a growth of plants, and I may tell you investigators are not able to say how small the amount of phosphoric acid or of potash in the solution must become, if other conditions be maintained perfectly, before the plant will suffer. Plants have an extraordinary power for absorbing

material from solutions. Take the case of the seaweed, from which iodine is extracted. Sea water has so little iodine that, although we have an exceedingly delicate method for the detection of iodine, we cannot discover it, even if we concentrate the water to a very small part of the original bulk; but the seaweed can get it and store it up in its tissues from that very diluted solution."

Other experiments were made, and all of them pointed to the same conclusion: The difference of yields between fertile and what was popularly regarded as "exhausted" soil was not due to a difference in the supply of available plant nutrients. The suspicion was born that the unproductiveness of so-called worn-out soils was due, not to the absence of anything necessary to the plant's growth, but to the presence of something deleterious to its growth.

Several experiments were begun to test this suspicion. It was found at the outset that young seedlings would grow better in pure water, containing no plant nutrients whatever, than in the extract of soil which, though unproductive, lacked in none of the nutrient substances. This result again forced the bureau back to the conclusion that the unproductivity of the soil was due to the presence of a poison. To determine whether the soil was poisoned, lampblack was mixed with soil extract and filtered off. Wheat seedlings planted in it then grew lustily, though in the same soil previously they had done nothing. Both their top and their root developments were improved astonishingly. The lampblack added no nutrient to the soil; its sole service was to disinfect.

That these poisons render the soil unproductive, or, to speak more accurately, prevent the full and healthy germination of a seed, the bureau found out, determined their qualities, and identified them. Tyrosin, which is a substance found in green manure, is the name of one of them, and cumarin that of another. It was found that pure water, when impregnated with tyrosin, even to the small degree of 50 parts to a million of water, killed wheat seedlings outright, and that they thrived in the ratio that the quantity of tyrosin was diminished.

The question whether the soil can be cleansed from these poisons in some other way than the use of fertilisers is answered by the American scientists in the affirmative. It can be met by a systematic rotation of crops, and this, they think, is the true remedy.

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## COTTON.

Texas, in the United States of America, is the greatest cotton-growing State in that country, and this is the way in which "The Cotton and Cotton Oil News," of Dallas, Texas, and Memphis, writes of the cotton plant:—

"What a royal plant it is! The world waits in attendance on its growth. The shower that falls whispering on its leaves is heard around the earth. The sun that shines on it is tempered by the prayers of all

people. The frost that chills it and the dew that descends from the stars is noted, and the trespass of a little worm on its green leaf is more to England than the advance of the Russian army on her Asiatic outposts. It is gold from the instant it puts forth its tiny shoot. Its fibre is current in every bank, and when loosing its fleeces to the sun, it floats a sunny banner than glorifies the field of the humble farmer; that man is marshalled under a flag that will compel its allegiance of the world, and wring a subsidy from every nation on earth. It is the heritage that God gave to his people for ever as their own when He arched our skies, established our mountains, girt us about with the ocean, loosed the breezes, tempered the sunshine, and measured the rain. Ours and our children for ever. As princely a talent as ever came from His hand to mortal stewardship."

In connection with the cotton industry, Mr. E. E. Wood, of Childress, Texas, who is now visiting Queensland in the interest of manufacturers of cotton and other machinery, himself an expert in cotton culture, &c., says that we have in Queensland soil and climate equal to, if not better than, any like conditions in Texas or anywhere else in the States, and he reasonably wonders why Queensland farmers, as a body, do not take up an industry (which is purely a white labour industry), which would pay them better than wheat, maize, or potato-growing, and even better than dairying.

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## NAPHTHALENE *v.* CARBON-BISULPHIDE FOR PROTECTING MAIZE FROM WEEVILS.

Some very interesting and conclusive experiments in preserving maize in bins were made in October, 1912, on the Pusa Farm, Behar, India, by Mr. A. J. Grove, M.Sc., Officiating Imperial Entomologist, at the instance of the Imperial Agriculturist. The full account of the experiments was published in the "Agricultural Journal of India," as follows:—

The maize was stored in large cylindrical bins 6 ft. high and 3 ft. in diameter, with a closely fitting lid, and holding between twenty-five and thirty maunds (625 and 750 lb.) of maize each. In all, nine bins were used, eight of which $A_1$, $A_2$—$D_1$, $D_2$, were carefully fumigated with carbon bisulphide and the last (E) left unfumigated. The bins were charged in the following way, the tests being made in duplicate, except the last:—

Bins $A_1$, $A_2$—Unfumigated Maize.

Bins $B_1$, $B_2$—Unfumigated Maize with Naphthalene.

Bins $C_1$, $C_2$—Fumigated Maize.

Bins $D_1$, $D_2$—Fumigated Maize with Naphthalene.

Bins E—Unfumigated Maize in an unfumigated bin.

Bins A would act as a control to B, C, and D, and bin E to all the others.

The fumigation was in each case done with carbon bisulphide at the rate of 5 lb. per 1,000 cubic ft. The naphthalene was put in at the

rate of 1 lb. of flake naphthalene per bin; this quantity being divided into four equal parts and wrapped up in fine muslin, and one package placed in one-quarter of the way up the bin, one half-way, one three-quarters of the way, and one at the top.

The bins were all carefully sealed around the lid and down the seams with a mixture of white wax (1 part), fat (1 part), resin (6 parts), melted together and applied hot, and were stored in the farm godown.

In addition to these bins a complementary experiment was started in the laboratory, glass stoppered bottles, each holding 300 grms. of maize, being used and 3 grms. of naphthalene tied up in muslin for those bottles which were charged with naphthalene.

The bins were then left undisturbed until March, 1913, when some of the maize was required for feeding cattle, and consequently bins $A_1$, $B_1$, $C_1$, $D_1$, and E were opened and examined, and bins $A_1$—$D_1$ emptied, but bin E again closed and sealed. At that time not much damage was noticeable, as during the cold weather the insects are not very active. A few moths (*Sitotroga*) were found at the top of bin A and a large number in bin E, but examination of samples taken from bins A—D failed to reveal any of the beetles which are generally lumped together under the name "weevil." The remainder of the bins were left undisturbed until 24th July, when 100 grains were taken out for a germination test, the bins afterwards being closed and sealed.

About this time also the bottles kept in the laboratory began to show results. The bottles corresponding with bins $A_1$, $A_2$ showed that insects were active inside them. Numbers of specimens of moths (*Sitotroga*) could be seen and quantities of dust and frass had collected at the bottom. The bottles corresponding to bins $B_1$, $B_2$, $C_1$, $C_2$, $D_1$, $D_2$, showed that the grain was being preserved successfully, no signs of insect attack being visible.

The final examination of the bins was made on 29th September, 1913. Bin A was found to be badly affected with "weevils" at the top and also a few moths. In Bins B, C, and D the grain looked quite good. Bin E was, as one would naturally expect, badly attacked. Samples were taken from the top, middle, and the bottom of each bin, and 100 grains cut open and examined, with the following result:—

| Sample. | Bin. No. | Insects Found. |
|---|---|---|
| Upper sample ... ... ... | $A_2$ | 15 *Rhizopertha dominica*. 2 *Tribolium ferrugineum* |
| Middle sample ... ... ... | $A_2$ | 6 *R. dominica* |
| Bottom sample ... ... ... | $A_2$ | 2 *R. dominica*. 1 *T. ferrugineum* |
| Upper sample ... ... ... | $B_2$ | 1 *T. ferrugineum* dead |
| Middle sample ... ... ... | $B_2$ | 2 *T. ferrugineum* |
| Bottom sample ... ... ... | $B_2$ | 1 *R. dominica* |
| Upper sample ... ... ... | $C_2$ | 1 *Calandra oryzæ* dead |
| Middle sample ... ... .. | $C_2$ | 2 *T. ferrugineum* |
| Bottom sample ... ... .. | $C_2$ | 7 *T. ferrugineum* |
| Upper sample ... ... ... | $D_2$ | Nil |
| Middle sample ... ... .. | $D_2$ | Nil |
| Bottom sample ... ... ... | $D_2$ | 2 *T. ferrugineum* dead |
| Upper sample ... ... ... | E | 13 *T. ferrugineum*. 2 *C. oryzæ*. 3 *R. dominica* |
| Middle sample ... ... .. | E | 3 *C. oryzæ* |
| Bottom sample ... ... ... | E | 1 *C. oryzæ*. 4 *R. dominica* |

Of the beetles found it must be remembered that only *Rhizopertha dominica* and *Calandra oryzæ* actually damage the grains. *Tribolium ferrugineum* lives merely in the dust which is always to be found amongst grain. From the table it will be seen that the bin $B_2$, which contained ordinary maize and naphthalene, compares very favourably with the bin $C_2$, which contained maize fumigated with carbon bisulphide, the condition of both lots being very good.

It then remained to be seen whether the naphthalene had any effect upon the maize which would render it unsuitable as food for cattle. When the bins were opened in March, maize, which had been stored with naphathalene, was spread in the sun for four hours, crushed, and fed to one bullock. [It has been found, however, that a little naphthalene is left behind, and it is probably better to expose the grain for from six to twelve hours.] The animal ate up the whole quantity, and was not affected in any way. This was repeated when the remainder of the bins were opened in September, with the same result. It is therefore clear that if the naphthalene is allowed to evaporate, it has no deleterious effect upon the grain from the point of view of fodder.

The bottles kept in the laboratory were also examined, with the following result:—

| Bottle. | Contents. | Insects Found. |
|---|---|---|
| $A_1$ | 300 grms. unfumigated maize | 191 specimens *Calandra oryzæ* |
| $A_2$ | Ditto ditto | 126 moths |
| $B_1$ | 300 grms. unfumigated maize and 3 grms. naphthalene | Nil |
| $B_2$ | Ditto ditto | Nil |
| $C_1$ | 300 grms. fumigated maize | Nil |
| $C_2$ | Ditto ditto | Nil |
| $D_1$ | 300 grms. fumigated maize and 3 grms. naphthalene | Nil |
| $D_2$ | Ditto ditto | Nil |
| E | 300 grms. unfumigated maize | 164 moths |

It seemed also desirable to test whether storing with naphthalene would have any effect on the germinative capacity of the grain. Accordingly, germination tests in dishes were made, with grain from the bins and also from the bottles, the results being as follows:—

| Sample. | | No. of Grains Taken. | No. of Grains Germinated. | Percentage. |
|---|---|---|---|---|
| Bin $A_2$ | Upper | 200 | 27 | 13·5 |
| | Middle | 200 | 169 | 84·5 |
| | Lower | 200 | 166 | 83 |
| Bin $B_2$ | Upper | 200 | 178 | 89 |
| | Middle | 200 | 183 | 91·5 |
| | Lower | 200 | 174 | 87 |
| Bin $C_2$ | Upper | 200 | 185 | 92·5 |
| | Middle | 200 | 178 | 89 |
| | Lower | 200 | 186 | 93 |
| Bin $D_2$ | Upper | 200 | 174 | 87 |
| | Middle | 200 | 182 | 91 |
| | Lower | 200 | 179 | 89·5 |
| Bin E | Upper | 200 | 2 | 1 |
| | Middle | 200 | Nil | Nil |
| | Lower | 200 | Nil | Nil |

| Sample. | No. of Grains Taken. | No. of Grains Germinated. | Percentage. |
|---|---|---|---|
| Bottle $A_1$ ... ... ... ... | 200 | 141 | 70·5 |
| ,, $A_2$ ... ... ... ... | 200 | Nil | Nil |
| ,, $B_1$ ... ... ... ... | 200 | 184 | 92 |
| ,, $B_2$ ... ... ... ... | 200 | 166 | 83 |
| ,, $C_1$ ... ... ... ... | 200 | 191 | 95·5 |
| ,, $C_2$ ... ... ... ... | 200 | 192 | 96 |
| ,, $D_1$ ... ... ... ... | 200 | 188 | 94 |
| ,, $D_2$ ... ... ... ... | 200 | 189 | 94·5 |
| ,, E ... ... ... ... | 200 | 1 | ·5 |

The grains which were taken from the bins on 24th July were sown in the Insectary compound, and the number of plants which appeared counted. The result is as follows:—

Out of 100 grains from bin $A_2$ 85 grains germinated
,, ,, ,, $B_2$ 83 ,, ,,
,, ,, ,, $C_2$ 92 ,, ,,
,, ,, ,, $D_2$ 91 ,, ,,
,, ,, ,, E 80 ,, ,,

The sowing was too late, however, for the plants to mature properly.

A comparison of all the results recorded above shows that storing with naphthalene is practically as effective as fumigation with carbon bisulphide, that it has no bad effect on the grain from the point of view of its suitability as food for cattle, and also does not alter the germinative capacity to any appreciable extent. It is therefore a much more suitable compound to use for preserving grain than carbon bisulphide, its advantages over that insecticide being:—

(1) It is quite easy to use. Carbon bisulphide is an extremely volatile liquid, and the vapour when mixed with air forms a very explosive gas. This necessitates extremely careful use, as in inexperienced hands it may prove dangerous.

(2) No special apparatus is required, the only precaution necessary is that the naphthalene should be enclosed in muslin or some such porous material to prevent it becoming mixed up with the grain. With carbon bisulphide a special fumigating house is essential, and this is costly to build.

(3) The cost is much less. This is very important. Flaked naphthalene costs Rs. 16s. a cwt., or, says, 3 annas a lb. The charge used was 1 lb. per bin holding twenty-five maunds (1 maund = 25 lb.), and of this after eleven months only about a half had evaporated (in bin B 23¼ tolas (80 tolas=2 1/7 lb.) were left, and in bin $D_2$ 23 tolas). For the fumigation of the maize used in this experiment—that is to say, roughly, 100 maunds—7 lb. of carbon bisulphide were required, the fumigating house only accommodating about sixty maunds at a time, and the charge for the house at 5 lb. per 1,000 cubic ft. being 3½ lb. The cost of this alone, exclusive of the additional cost of labour required to cart the grain to the fumigating house and then back to the store, was about Rs. 7s., the cost of carbon bisulphide being Rs. 12s. a gallon. The charge of naphthalene for a similar quantity of maize would be 4 lb., of which only a half would be expended, and the cost of which would be 12 annas.

(4) The effect is continuous, as the naphthalene is stored along with the grain. The effect of fumigating with carbon bisulphide is to kill all the insects, larvæ, and eggs in the grain at the time, but after fumigating the carbon bisulphide must be allowed to evaporate, and any insects which found access to the grain could breed unchecked. The effect of the naphthalene is constantly to keep the insects in check. This is proved from a comparison of bins or bottles A and B, which contained exactly similar grain, and, from the condition of A at the end of the experiment, must have contained insects at the time of storing. The insects in A bred unchecked, whereas in B they were not able to do so, with the result that the grain in B was as good as that in C, in which the insects were all killed by the carbon bisulphide, and insects prevented as far as possible from gaining access to the grain.

The use of naphthalene, then, is a simple way in which grain kept for fodder and for other purposes may be preserved from damage by insects, the only things to be remembered being that the naphthalene should be prevented from becoming mixed with the grain,* by enclosing it in muslin, and that the grain should be exposed in the sun for from six to twelve hours before feeding to the cattle.

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## PICKLING WHEAT.

There are three methods of pickling wheat to destroy or prevent the germination of the spores of smut. The most commonly used pickles are:—(1) A solution of formalin; (2) Sulphate of copper (bluestone); (3) Plain hot water. The solutions are:—Bluestone at the rate of 1 lb. in 5 gallons of water, or formalin at the rate of 1 lb. in 40 gallons of water.

The seed, in either case, may be spread on a wooden floor, and the solution sprinkled over it, turning the grain over and over, either by shovelling or raking, so that all the grains become thoroughly wetted. The seed is then spread out to dry, and if left in a thin layer over night, it is ready for sowing in the morning. Instead of sprinkling, which is wasteful, dipping may be resorted to. A bushel or so is placed in a bag and dipped in the solution, taking care that all the grains are thoroughly wetted by shaking the bag and plunging it in and out. In the case of bluestone, only a minute or two is necessary for the dipping process, on account of its corrosive action; but, in the case of formalin, five minutes may be allowed and it is less injurious to the grain, the cost being about the same as for the bluestone process. Both processes are equally effective in destroying the smut germs. The bluestone solution may be used again and again, but formalin is volatile, and it follows, therefore, that only the amount of formalin should be prepared that is required for immediate use, and sprinkling, in this case, should be preferred to dipping. Formalin is poisonous and must be kept where there is no

* In this connection the use of naphthalene balls may suggest itself, but flaked naphthalene is cheaper, gives off vapour more easily, and above all, it is much easier to take out a package of muslin than to search for a number of loose balls which might easily be overlooked or broken up.

chance of children or others obtaining it in ignorance of its nature. One gallon of formalin solution is sufficient for 4 bushels of seed. For the hot water treatment, two boilers are needed, containing water at 120 deg. F. and 135 deg. F. respectively. A smaller vessel containing boiling water and an abundant supply of cold water should be at hand. The seed to be treated may be placed in a gunny bag or in a perforated kerosene tin. Plunge the vessel containing the grain into the first boiler (120 deg. F.) and move it about for a minute or two till the grain has all been warmed. Take care to keep up the temperature. Then plunge it into the second boiler (135 deg. F.). Leave it there for ten minutes, moving it about and agitating the grain. Then take it out and plunge it into cold water and then spread it out to dry, after which it is ready for sowing.

A leaflet on Pickling Wheat may be obtained from the Department of Agriculture and Stock.

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## LIME WATER.

Mr. H. Ross, in an article on the "Treatment of Seed Wheat for the Prevention of Bunt or Stinking Smut," in the "Agricultural Gazette of New South Wales" (2nd March, 1914), advises:—

"The action of the bluestone during the process of pickling is that it kills the tiny spores or seed of the bunt which adhere to the outside of the grain. Now, while bluestone has the power to kill these spores it has also the power to impair the vitality of the grain, and even to kill the germ. To guard against this the following measures should be observed. If there is no prospect of immediate germination—that is, if a "dry" sowing is made, the bluestoned wheat should, after having been allowed to drain for from ten to fifteen minutes, be dipped into a solution of lime water, which is made by stirring *½ lb. of freshly burnt lime into 10 gallons of water. This mixture is allowed to settle; then the clear lime water is decanted, and into this the bluestone-treated seed is dipped for from two to three minutes. The lime neutralises the effects of the bluestone, and so preserves the full vitality of the wheat germ. If, on the other hand, a "wet" sowing is made and an immediate germination of the seed is likely to follow, then there is little need to dip the bluestoned wheat into lime water.

"When using lime water care should be taken to make a fresh mixture now and again, as the constant dipping of the bluestone-saturated butts of wheat into the lime water will change this eventually from an alkaline into an acid solution, in which case it would be useless; and for that very reason bluestone and lime should never be mixed together in a solution used for pickling wheat.

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* Should it be found impossible to obtain freshly burnt lime, it is recommended that ½-lb. of slaked lime be mixed with 10 gallons of water, thus making milk of lime, into which the butts of the bluestoned wheat should be dipped for a period of from two to three minutes.

Milk of lime differs from lime water in so far that in the former the particles of lime are not dissolved but held in suspension, whereas in the case of clear lime water the particles are dissolved.

"The chief advantages gained from using lime water, in addition to bluestone, are: firstly, that a farmer following this practice is in a position to pickle all his seed wheat, say, in March, ready for sowing in April and May, without running any risk of the germination being affected; secondly, that a better germination will be obtained if the sown seed should lie in the ground for some time before rain falls and germination takes place.

"Little extra trouble is involved in the bluestone-lime treatment, and farmers are strongly advised to adopt this method in preference to the bluestone treatment only."

### TOMATO SOILS.

Although the tomato can be and is largely grown on many different types of soil from heavy clay to light sand, there is no doubt that the soil which provide the best conditions for the culture of this fruit is a deep, fertile, sandy loam with a well-drained clay subsoil. An Indiana (U.S.A.) State Bulletin says that the highest yields are secured on sandy loam soils, well drained, and comparatively rich in plant food. On the heavier soils, the yields have not been so large as on the lighter types, although the tomatoes are usually more firm and meaty, which makes them better for canning. On lighter soils, as a rule, the fruits are more juicy and the meat is less solid. Then, again, the fruits of many varieties, especially the early ones, are smoother and more symmetrical when grown on sandy soils.

## VEGETABLE GARDENING.

### PURE SEEDS AND SEED-GROWING.

Complete success in vegetable gardening is not possible without good seed. Expert gardeners have always exercised great care in procuring good seed, although the significance of the subject has not been fully appreciated until recently, when the Pure Seeds Bill was introduced by the present Minister for Agriculture. "If," as Henderson states in "Gardening for Profit," "there is one thing of paramount importance in vegetable gardening, it is—purity of seed." And he spoke from his experience of a long and active life as a commercial grower.

Good seed must meet five requirements:—1. It must be true to name and not mixed. 2. The seed must produce the best type of the variety in question. The strain is by far the most important factor for consideration in obtaining seeds, although it has received comparatively little attention. 3. The seeds must be viable. That is, a high percentage should be able to grow under favourable conditions. 4. They must be free from weed seeds. 5. They must be free from impurities such as grit, sticks, or other foreign materials.

In the United States, seed supply houses were established in 1820, and these have since grown to mammoth establishments. The seed business is highly specialised, requiring the services of experts who understand the principles of plant breeding. The most reliable firms maintain extensive trial grounds where the seeds are tested before being sold. It is a means of protecting both the dealer and the buyer.

With respect to seed guarantees, several States in America have enacted laws to regulate the seed trade. Such laws have undoubtedly proved very valuable, but it is a very difficult matter to control by law. Legislation is imperatively needed more for farm seeds than for garden seeds, as impurities are seldom found in the latter. The difficulty with the former, even with reputable firms, is that errors in labelling may occur, and inclement weather may affect the vitality of the seeds, and unjust penalties might be imposed if legislation were too severe in this matter, as even the most reliable dealers may unintentionally make mistakes. Rules and regulations for official seed testing have been adopted by the Association of American Colleges and Experiment Stations.

The life of seeds depends upon: 1. The kind of vegetables. 2. The conditions under which they are grown. 3. Thoroughness of curing. 4. Storage conditions. In some years seeds lose their vitality more rapidly than in others. The figures in the following table relative to the longevity of vegetable seeds are conservative, for it is not best to place too much reliance upon tables of this character; the only certain means of determining the vitality of seeds is to make germination tests.

Professor Watts then supplies the following table showing the maximum ages of properly cured and stored vegetable seeds when they will be likely to germinate satisfactorily:—

| | Years. | | Years. | | Years. | | Years. |
|---|---|---|---|---|---|---|---|
| Artichoke | 2 | Celery | 2 | Lettuce | 4 | Pepper | 3 |
| Asparagus | 2 | Cucumber | 5 | Muskmelon | 5 | Radish | 2 |
| Bean | 3 | Eggplant | 5 | Okra | 4 | Salsify | 2 |
| Beet | 4 | Endive | 2 | Onion | 1 | Squash | 3 |
| Cabbage | 3 | Kale | 2 | Parsley | 1 | Tomato | 5 |
| Carrot | 1 | Kohlrabi | 3 | Parsnip | 1 | Turnip | 4 |
| Cauliflower | 4 | Leek | 3 | Pea | 3 | Watermelon | 5 |

The following table, showing the average percentages of germination of one-year-old seed when planted under proper conditions, is given by Ralph L. Watts, Professor of Horticulture in the Pennsylvania State College, in his book on "Vegetable Gardening," 1912:—

| | Per cent. | | Per cent. | | Per cent. | | Per cent. |
|---|---|---|---|---|---|---|---|
| Asparagus | 90 | Celery | 60 | Okra | 80 | Salsify | 75 |
| Bean | 90 | Corn, Sweet | 85 | Onion | 80 | Spinach | 80 |
| *Beet | 140 | Cucumber | 85 | Parsley | 70 | Squash | 85 |
| Cabbage | 90 | Egg Plant | 75 | Parsnip | 70 | Tomato | 85 |
| Carrot | 80 | Lettuce | 85 | Pea | 90 | Watermelon | 85 |
| Cauliflower | 80 | Muskmelon | 85 | Radish | 90 | | |

* Botanically a fruit, often containing more than one seed.

# Pastoral.

## SHEEP ON THE COASTAL AREAS.

LECTURE by MR. W. G. BROWN, Sheep and Wool Expert, at Beaudesert, 18th February, 1914.

For some years it has been thought that sheep have never had a fair trial on the coastal lands.

I am, of course, aware that they were tried many years ago and were found unsuitable. Since I have been appointed to my present position I have made close inquiry into the matter, and have concluded that under certain circumstances there is no reason why sheep should not do as well here as in any other part of Queensland.

My lecture to-night is to give these circumstances, and also reasons why sheep on the coast have failed in the past.

I was a witness on the Meat Commission two years ago, and was asked then if I thought that sheep would do well below the Range. I replied that I was not sufficiently acquainted with the conditions obtaining to give an answer either way. Since then I have, by observation and inquiry, learned a good deal of these conditions. Consequently, if I inform you why sheep have failed in the past, and further show that the factors which caused that failure need be taken little account of now, I shall have covered the whole ground in a general lecture such as this is to be.

If my conclusions are accepted as correct, and any of you present should be induced by them to try sheep, then I am at your service to give particular instruction at some future date.

I shall divide the lecture into two parts:—

First, a short statement of the reasons why I believe sheep farming failed in the past, and, secondly, my reasons for believing sheep will do very well under the altered conditions now obtaining on the coastal belt as far as Rockhampton.

Taking the first section of the lecture, it seems plain to me that one of the chief factors which caused the failure was the nature of the natural grasses which prevail over the whole of the coastal belt.

To begin with, these grasses grow, as a general rule, rank and coarse, and as it is well known that sheep thrive best on a "short bite," and prefer the fine grasses which in the early days were comparatively rare, they did ill for that reason. Then there is the spear-grass. When that grass is plentiful and in seed, it is impossible to keep sheep on it.

In the course of my inquiries as to the failure or otherwise of sheep on the coast, Major Boyd, Editor of the "Queensland Agricultural

Journal," informed me: "In 1880 William Landsborough, the celebrated explorer, against the advice of many practical men, put sheep on 2,000 acres of land at Caloundra. Within two years every sheep was dead, and the causes were spear-grass seed, stomach worms, and foot scald." These sheep too, were of Merino blood, an important thing to remember, as I shall show later on.

Another factor, and an important one, was the presence of stomach parasites—the wire worm (*Strongylus contortus*) and the bowel worm (*Oesophagostoma columbianum*). These were very prevalent, and probably are still, for they are often found in calves and other ruminants. These parasites, when food failed, caused very great losses, and mainly because in the early days little was known of the life history of these pests, and less was known of successful treatment. Another cause of failure, too, was the fact that the country was in a virgin state, and, on the whole, very ill-drained on the flats. For this reason, sheep running there were afflicted with "scald foot," misnamed "foot-rot." The latter disease does not exist in Queensland. Then there was scab, which caused a good deal of loss and trouble. That was a contributing cause of failure. This ends the list of causes which existed in the early days, and little wonder that sheep-masters then gave up the hopeless struggle, more especially when we remember how the cheap, healthy Western lands were discovered and stocked, and found to be admirably adapted to wool-growing. You are in a much better position for growing mutton and lamb, as I hope to show.

Having mentioned what I believe to be the chief causes of failure in the past, we come now to discuss whether they are operating now, or are likely to operate.

I shall take them in the order I have just given them, but before I do so I would like to point out that if you can successfully grow mutton and lamb on coastal areas (and I firmly believe you can), then you are in a very good position to supply much of the big demand (and which is a growing world's demand) for sheep and lambs, as compared with your brother farmers inland of the Great Dividing Range.

For one thing, you are very much nearer the ports where the big meat exporters have seen fit to place their works, and can thus send in your products within a very few hours. This is a very important advantage, for, aside from the waste in condition which a long railway journey entails, the animals can be delivered fresh from the pasture, in full bloom, so to speak, and are consequently more valuable. For another thing, your rainfall is more regular and abundant than that of the interior, starting from the foot-hills of the Range westward.

In the year ending 30th June, 1913, for instance, an average of about 49 in. fell in coastal areas right up to the Range, and every month gave its quota of from 1½ to 10 in. of rain. If you scan the tables of rainfall you will find that such an average is pretty nearly normal.

Now, then, we have seen that five causes operated in the past against the successful keeping of sheep on these areas on the coast side of the Great Dividing Range. They were:—

1. Unsuitability of natural grasses.
2. Parasitic diseases.
3. Scald-foot, misnamed "foot-rot."
4. Unsuitable sheep.
5. Low prices for wool, and a very limited market for mutton.

To these might be added the stocking up of the Western country.

In regard to the natural grasses of this area, there are grave objections against their use as sheep feed. First, they are rank and coarse, as a rule, and, as I said before, sheep love a "short bite." They do not willingly go into long grass, especially where it is wet. Then there is grass seed. All grasses, of course, have seed, but when I mention grass seed in connection with sheep, I mean those seeds which destroy the fleece or interfere with the wellbeing of the animal. There are several species which grow profusely on the coastal areas, which have seed deleterious to sheep. Chief amongst them are two varieties of spear-grass.

These grasses, when young, are excellent food, but when the seed comes there is nothing, excepting poisonous weeds, which will kill sheep more certainly. I have seen a pelt stripped from a newly-killed animal which was one mass of black, sharp-pointed grass seed. On the flesh side, the points of hundreds of these were protruding at least one-third of an inch, and the flesh of the poor brute had seeds sticking out, which had gone right through the skin into the body.

I was shearing a large number of sheep once with machines, and the flesh came away in pieces the size of half-a-crown, with the wool all over the bodies.

Therefore I say again that I believe that the natural grasses of the coast are unsuited to the keeping of sheep. Certainly, I have seen cases in the Emerald district where stocking heavily with sheep for two or three years eradicated this grass, but there were heavy losses in the meantime. The land was cheap. Even supposing, however, that the coastal grasses were as good for sheep as any of the Western grasses, the price of land has so risen that it will not pay to simply graze the land in its natural condition. The problem is a simple one, and can be solved by a boy of fourth class in school.

It is laid down as true that when land has risen above £2 10s. per acre in value, it cannot, in a series of years, be grazed successfully if it is only natural pasture, for this reason: There is not a great deal of land in Queensland or elsewhere which will feed one sheep on 1 acre of natural grass over a series of years. Even on such land, in its natural state, fat lamb-raising would be a precarious business, therefore the land would be used for wool-growing and the production of fairly good mutton.

On the average, a sheep will produce 6s. worth of wool per annum, and a possible 5s. worth of mutton, a gross return of 11s. per acre.

Supposing, then, that you have land worth, say, £5 per acre, and you are using it as grass land, then you are getting a gross return of 1½ per cent. per annum, out of which has to come taxes, a living for yourself and family, interest on capital expended in the purchase of sheep, and a possible failure now and again when you have not made 5s. for mutton (the wool return would be fairly constant at 6s. per head), and all this on the best of land. The return would be too poor for a business man to consider. Thus, if you intend your land to be kept as grass land, you may certainly expect that the price will recede to grass land values—that is, not more than £2 10s. per acre.

The alternative is, I need hardly say, cultivation and mixed farming, and especially the feeding of sheep.

Now, what may you reasonably expect from sheep if you cultivate? All countries have, at one time or another, been faced with the problem of dealing with land which has become too dear for merely pastoral purposes.

The question is not whether you can afford to keep sheep on high-priced land, but whether you can afford to keep high-priced land without sheep.

The closely settled lands of Queensland have to deal with it now. In Britain there are kept 31,000,000 sheep which are fed on land worth from £20 to £30 per acre. In New Zealand, where the price of land is perhaps at its maximum, they fatten sheep and lambs on farms valued at upwards of £40 per acre, and are doing well. In Victoria and South Australia something the same is being done to-day, and I am confident that before many years the same thing will be done in Queensland, and especially on the coastal areas, where there is good land, a sufficient rainfall to grow anything, and almost complete immunity from sheep diseases, with an ideal climate for stock of all kinds, especially sheep.

To give all the particulars of feeding sheep would require half a dozen lectures, so I shall only give the bare outline of what has been done elsewhere, and one or two instances of what has been and is still being done in Queensland in the direction of systematic feeding of sheep.

First there is lucerne, the king of all sheep feed.

I shall quote an extreme case—that of Mr. Gatenby, at Forbes, in the drought of 1902. He stated at the Forbes Show, at the judges' dinner, that 200 acres of irrigated lucerne would feed 15,000 sheep, and the Minister for Agriculture, who was present, asked him if he could prove it. Mr. Gatenby said: "I will prove it by sustaining in good condition 75 sheep to the acre for four months, under any test imposed." The Minister sent an officer to Mr. Gatenby's farm, and the net result, to be short, was, as the officer reported to his Department: "The sheep were in a starving condition; the feed was cut and carted twice each day to them in the hottest months of the year; and 1,675 starving sheep were put in good condition on 22½ acres of irrigated lucerne, an average of 75 sheep per acre, for five months."

At North Yanko, N.S.W., again, sheep were pastured (feed not cut) to the number of fifteen sheep per acre, irrigated land. I know of at least three farms on the Darling Downs where five to six sheep were grazed on unirrigated lucerne for ten months, and recently on St. Helens, Pittsworth, the manager, Mr. Tait, fed twenty-four sheep to the acre (64 acres) on a mixture of rape, barley, and turnips, and fattened off nearly 2,000 sheep before the crop was eaten off or became too old. At Gatton College an average of about twenty sheep (ration sheep) to the acre was fed on about 7 acres of rape for months, last year. And so it is with many other fodders, which can be grown quite as well on the coastal areas as on the Darling Downs.

I have to get on to the other factors, so I will conclude this section of the lecture by quoting the experience of Mr. Frank Anderson, Clifton, Darling Downs. For twenty years Mr. Anderson has fattened sheep and bred fat lambs, and for the past fourteen years has averaged 10s. per head (four months old) on the ground for his lambs. His own evidence under oath before the Meat Commission is as follows:—

The experience of one very successful and practical sheep-farmer may be given here. I had it from his own lips, and saw, just before the rain came in June, 1912, 426 fat lambs sold on his farm for 11s. each. They were about five months to six months old. All through the dry spell he was selling fat lambs and sheep at regular intervals. His method is as follows:—He bought Merino ewes to begin with. These had 70 per cent. of lambs at foot by Merino rams. Immediately on their arrival at the farm, he put Leicester rams to the ewes, and a little later, sold the weaned lambs for 5s. each. Five or six months later, he had a very good drop of crossbred lambs, about 80 per cent.; and five months later again, he sold these for an average of 10s. each on the ground. The net result was:—

| | £ s. d. | £ s. d. |
|---|---|---|
| 1,200 Merino ewes (lambs given in), at 15s. .. | | 900 0 0 |
| 70 per cent. Merino lambs sold, 840 at 5s. each | 210 0 0 | |
| Fleeces off ewes, 1,200 at 5s. each .. .. | 300 0 0 | |
| 80 per cent. of crossbred lambs, 960 at 10s. each .. .. .. .. .. | 480 0 0 | |
| 1,190 ewes fattened off, and sold at 12s. each | 714 0 0 | —1,704 0 0 |
| Balance credit on transaction .. .. | | £804 0 0 |

This was done on about 400 acres of lucerne; and besides this, expenses of cultivation, &c., were more than covered by sales of surplus hay at the drought prices ruling last autumn. The thing was done, and these results put on record before the Meat Commission, where the gentleman in question gave most important evidence in regard to the fat lamb business. It is not a fancy picture. This is only one year's experience, in a year when most farmers in the same neighbourhood lost heavily owing to dry weather. Other years showed still better results, he tells me. It will be noticed that he bred and sold, as fat lambs, the *first* cross, and had not the slightest difficulty in disposing of them.

I must leave this part of the subject just now, as there are several other matters on which I must speak, yet to be dealt with, and time is limited.

The next thing we have to consider, which caused a good deal of loss in the past, is parasitic diseases. Scab need no longer be considered, as Australasia generally has been free from that pest now for very many years. There are other two parasites, however, still existing. They are the Wire Worm (*Strongylus contortus*) and the Intestinal Nodule Worm (*Oesophagostum columbianum*), both of which are prevalent over a good deal of Queensland.

Much progress has been made in the study of parasites in the past twenty years, and the life history of these is complete in many cases. The wire or stomach worms, it is now known, lay their eggs in the bowels, and these eggs pass out in the excreta, and there lie dormant until sufficient heat and moisture are present to hatch them out. According to Neumann, the temperature must not be below 45 degrees, and there must be considerable humidity. The worms moult three or four times, and then climb up the stalks of grass and lie there until the sheep or cattle come along and nip them off with the grass. The worms, which on infested country exist in myriads, make their way to the fourth stomach and there abide, living on blood drawn from the veins of the stomach, then they lay their eggs and the process begins again. It is known that a 1 per centum solution of salt will kill them, consequently all farmers who keep sheep or cattle should supply salt to their stock, giving them as much as they will take

It is known, too, that if ruminants be taken off country for about fifteen months, the worms will die out for want of a host. Horses may be grazed, however.

There are many medicines which will kill worms in sheep, but it is waste of time to kill the worms in the sheep if the animals are put back on infested country. That is why practical men everywhere are agreed that a holding should be split up into small paddocks (10 acres is not too small), and a rotation established whereby paddocks shall have a spell. With cultivation, much of the danger of infection disappears, and as cultivated fodders have a big food value, the worms do not do the same amount of harm as if the sheep were ill-fed. A homely illustration will make my explanation clearer.

If we look upon the sheep as keeping a boarding-house for worms, and the worms are getting the best of the food in the form of blood, we can understand that while the sheep can keep itself in good condition, and also keep up the food supply to the worms, there is little harm done to the animal beyond some discomfort. The minute, however, food supplies go off or fail, then the boarders get more than their fair share of food, and the sheep dies later on, literally of anaemia or starvation. Therefore, if we feed the sheep well, give them plenty of salt, do not overstock the paddocks, keep one or two paddocks in reserve with no sheep or cattle in them, rest assured that wire worms will give little trouble other than a bluestone drench will cure.

Almost the same can be said of the nodule worm. It is not so hard on sheep as the wire worm. It inhabits the last gut of the bowels, and may be found in the centre of cheese—like lumps along and attached to the bowel.

With regard to so-called foot-rot, that is only found in Queensland if the sheep have been running for weeks on wet, swampy, ill-drained lands. In wet weather it is always advisable to put them on dry ridgy country, and every holding should have a dry ridge, or sandy country at least, in case of excessive rain. The true foot-rot, which is infectious, does not exist in Queensland, I am glad to say. That is an almost negligible disease, and even if scald-foot be present, the shifting of the sheep on to dry country will cure the animals.

Now we come to another question. I understand that in the past, with very few exceptions, the sheep running on the coastal areas were Merinos. Merinos in their pure state are not farmers' sheep. In the first place, they mature much more slowly than the British breeds. They are more delicate in constitution than British breeds, because they are daintier feeders. Their habitat is the dry Western pastures, and are primarily a wool-bearing animal. A farmer should breed or feed primarily for mutton. Yet because the Merinos have such valuable wool, and have the power to transmit to their progeny by a British sheep their good qualities, it has become a fixed practice in Australasia to have at least one quarter of the blood of the farmers' sheep Merino.

The Merino is more susceptible to the attack of worms than the British sheep, cannot stand so much moisture or wet conditions, and, as they move about in mobs, while the British or cross-bred sheep scatter on a pasture, destroy much more food than they eat. We conclude therefore that pure Merinos must not be cultivated on farm lands. It is little wonder that this breed did so ill for the pioneers on the coastal lands. In regard to that phase of the matter we are discussing, the time is coming when the Merinos, and perhaps the cross-breds too, will be bred on the dry sound country for the farmers of the coast, who, with their splendid land and regular rainfall, can grow feed in enormous quantities, and so be able to fatten sheep within a few hours' travel of what is growing into a very big market.

The pioneers, too, must have been discouraged at the want of an adequate market for the survivors of their flocks when disease and unsuitable food had done with them. Nowadays there is an unlimited market abroad. The freezing processes guarantee that the meat shall arrive at the other side of the world as fit for consumption almost as the day it was killed. Besides that, as was pointed out in Dalgety's Review last year, since 1895 the meat-eating and wool-consuming people of the world have increased by 119,000,000, while the expansion since then can only provide for 65,000,000. That is why wool prices are high, keeping high, and increasing, and we householders know what is happening in the meat trade when our monthly bills come in. The world is hungry for meat, and expansion is limited in its production.

The cheap, sound, Western country is going to supply you farmers who possess high-priced land on which you can grow unlimited sheep feed, with healthy stock to fatten, or, if you prefer it, you will be able to breed and fatten lambs for export.

To sum up the whole matter, I can see absolutely no reason why you cannot take on sheep. Try a few, and see how little trouble they are. Even if you have little or no experience, the Department will be only too pleased to give you instruction—not talk, but practical instruction on your own farms. Lectures such as this have a certain amount of value, but nothing equals the lessons given with the sheep before you.

Now I shall give you shortly what I consider to be essentials to the successful keeping of sheep. I am assuming good land. First of all, you must have sheep-proof fences. Nothing is so annoying to a man as to see his sheep getting free board in his neighbours' crops. What his neighbours feel about it is another matter. Existing fences can be made sheep-proof with 24-in. cheap netting at a cost of about £12 per mile.

As soon as you can, subdivide your paddocks. Twenty-five acres is a comfortable size for working. Ten acres is not too small.

Find out the carrying capacity of your land, and keep well below it. Five well fed sheep will pay better than eight underfed.

Give your sheep as much salt as they will take. They will not take more than they require. Rock salt is all right, but coarse salt is better.

If you are going to breed fat lambs, get big, plain, roomy ewes, and do not buy somebody's cast-off rams. Go to a good breeder and buy young rams of the breed you want. You will be put in the way of getting good advice on those points in the Department. Do not think there is any mystery in the business. Plain common sense is what is required. Knowledge will come with experience.

Do not buy very old ewes, for if you want to part with them for any reason, people want to look at their mouth, and if they have nothing to eat with, well—no buyer. In short, see that they have sound mouths. If you fear dogs, put a bell on about one sheep in fifty, and see that you do not bell mates, for the bells will not be distributed. A dog-proof fence, of course, would be better, but that will come later when you see that profits will warrant. You may yard them every night until your paddocks are dog proof. Do not arrange that lambs shall fall five months later, trusting Providence that there will be feed for them. Keep feed in reserve. Sheep require very little to give a handsome return, and the wool is growing night and day at the rate of 6d. per month on average quality sheep.

Watch that your sheep do not get pale skin, pale tongue and lips, bluish-white eyes, and, in later stages, a swelling under the chin. If they are like that, they have taken in boarders who are eating them out. They are overstocked with worms. Communicate with the Department at once, and they will deal with the worms for you.

Interest the children in the sheep. I have found that boys and girls on a sheep farm know more about sheep after awhile than the elders. They take more kindly to sheep than to any other animal on the farm.

If your sheep are doing ill, or are sick, send to the Department. No country on earth has so short a list of sheep diseases at Queensland, so you will not be troubled very much, nor will you have to trouble anybody else.

Remember that sheep always improve country; 90 per cent. of what they eat goes back to the land in the form of one of the very best of manures. It is thinly and evenly scattered over the land, and ground up with sharp toes, so that the rain washes it in. The ancients called the sheep "Golden Toe," and with reason. Remember, too, that sheep eat anything on the farm in the form of weeds, and are used in England and elsewhere to clean the fallows. There is no better destroyer of weeds on a farm than sheep. It pays to shelter sheep either from the sun or from the rain. Do not let your rams run with the flock for more than six or eight weeks. This ensures evenness in size of lambs—a most desirable thing.

Sheep like a change, if even the new paddock be as bare as the former one out of which they came.

There are a lot of other things to know, but those I have mentioned are essentials.

And now I shall be pleased to answer any question, as I look upon the questions at the end of my lectures as being really more than the lectures themselves.

Differences in management, location, fluctuations in prices, and accidents are apt to upset the most careful calculations.

## THE USEFUL TOAD.

"Garden and Field" says that cut flowers will last longer if the stems are split up about an inch before putting them in water. Maidenhair fern will last longer if, when it is gathered, the stems are inserted in boiling water and allowed to stand in it until the water is cold before arranging in vases.

Another confirmation of our contention as to the value of toads in the garden and bush- and hot-houses comes from the same source.

Toads are most useful reptiles, and devour thousands of small insects that would otherwise eat up the vegetation. Gardeners well know this when they turn them into the hothouses. An English gardener gives the following testimony:—"In the autumn of last year a pit wherein I grew melons was so much infested with ants as to threaten the destruction of the whole crop, which they did first by perforating the skin, and afterwards eating their way into the fruit; and after making several unsuccessful experiments to destroy them, it seemed to me that I had seen the toad feed on them. I accordingly put half a dozen toads into the pit, and in the course of a few days hardly a single ant was to be seen.

It should be noted that toads, although very ugly, are perfectly harmless.

# Dairying.

## THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MONTH OF FEBRUARY, 1914.

| Name of Cow. | Breed. | Date of Calving. | Total Milk. | Test. | Commercial Butter. | Remarks. |
|---|---|---|---|---|---|---|
| | | | Lb. | % | Lb. | |
| Bee ... ... | Jersey ... ... | 7 July, 1913 | 679 | 6·2 | 47·64 | |
| Glen ... | Shorthorn... ... | 27 Oct. ,, | 778 | 4·8 | 42·63 | |
| Butter ... | ,, ... ... | 27 Sept. ,, | 752 | 4·9 | 41·57 | |
| Daisy ... | Holstein ... ... | 14 Feb. ,, | 737 | 4·8 | 39·87 | |
| Honeycombe | Shorthorn... ... | 7 June ,, | 691 | 5·1 | 39·81 | |
| Lavinia's Pride | Ayrshire ... ... | 11 Dec. ,, | 817 | 4·2 | 38·43 | |
| Madame Melba | Holstein ... ... | 10 Nov. ,, | 974 | 3·5 | 37·80 | |
| Pauline ... | Shorthorn... ... | 8 Oct. ,, | 680 | 4·9 | 37·59 | |
| Bluebelle ... | Jersey ... ... | 13 July ,, | 530 | 6·1 | 36·37 | |
| Nellie II. ... | Shorthorn... ... | 5 June ,, | 757 | 4·2 | 35·61 | |
| Lady Loch... | Ayrshire ... ... | 31 Aug. ,, | 811 | 3·8 | 34·34 | |
| Burton's Lady | Shorthorn... ... | 23 June ,, | 584 | 5·1 | 33·66 | |
| Miss Bell ... | Jersey ... ... | 25 Sept. ,, | 581 | 5·1 | 33·48 | |
| Miss Jean ... | Ayrshire ... ... | 13 Jan. ,, | 692 | 4·2 | 32·55 | |
| Miss Lark ... | ,, ... ... | 27 Dec. ,, | 680 | 4·1 | 31·19 | |
| Conscience... | ,, ... ... | 20 Jan., 1914 | 661 | 4·2 | 31·09 | |
| Queen Kate | ,, ... ... | 4 Jan. ,, | 810 | 3·4 | 30·48 | |
| Lady Margaret | ,, ... ... | 26 Mar., 1913 | 507 | 5·3 | 30·43 | |
| Burton's Lily | Shorthorn... ... | 29 Dec. ,, | 678 | 4·0 | 30·29 | |
| Countess of Brunswick | ,, ... ... | 22 July ,, | 534 | 4·9 | 30·01 | |
| Silver Nell ... | ,, ... ... | 26 Sept. ,, | 616 | 4·3 | 29·70 | |
| Sweet Meadows | Jersey ... ... | 20 Aug. ,, | 324 | 7·8 | 29·0 | |
| Cocoatina ... | ,, ... ... | 19 May ,, | 661 | 4·2 | 28·46 | |
| Miss Melba | Holstein ... ... | 22 Jan., ,, | 636 | 3·9 | 27·67 | |
| Miss Edition | Jersey ... ... | 19 July ,, | 380 | 6·2 | 27·36 | |
| Lonesome ... | Ayrshire ... ... | 26 Oct. ,, | 565 | 4·3 | 27·24 | |
| Lennie ... | ,, ... ... | 1 Sept. ,, | 625 | 3·9 | 27·19 | |
| Gem ... ... | Shorthorn... ... | 8 Aug. ,, | 555 | 4·3 | 26·76 | |
| Rosine ... | Ayrshire ... ... | 27 Nov. ,, | 669 | 3·6 | 26·76 | |
| Bella ... | ,, ... ... | 16 Dec. ,, | 581 | 4·1 | 26·65 | |
| Auntie ... | ,, ... ... | 15 July ,, | 404 | 5·1 | 23·28 | |
| Miss Morton | Shorthorn... ... | 14 Oct. ,, | 579 | 3·6 | 23·16 | |
| Lilley ... | ,, ... ... | 2 Jan. ,, | 391 | 4·6 | 20·22 | |

Fed on natural grasses, with an added ration of 40 lb. of sorghum ensilage per head per day.

## NEW TUBERCULIN TEST.

According to a Canadian paper, the tuberculosis test used by the British Columbian authorities is a comparatively new one known as the intra-dermal test, from the fact that it is introduced between skin layers and has no effect whatever on the temperature, for testing purposes at any rate. Under the old mode of testing, known as the thermal test, the

experts introduced a tuberculin, and then took the temperature of the beast being examined. Whether it had tuberculosis or not largely depended, according to the inspectors, upon the rise in temperature immediately after the first injection. No further injection could make any difference in temperature for some time, until the effects of the initial one had worn off. This test is believed to be a good one when in the hands of careful men.

The new test employed by the Department, however, is realised as probably the best in use on the American continent. The Dominion Government authorities are now examining it with a view of using it for all Dominion Government work of this nature, and several States across the line are said to be on the point of adopting it. It is claimed to be unfailing.

The inspector takes a small amount of tuberculin and injects it between two layers of skin on the animal. The reaction in diseased animals is manifested in an enlargement at the point of injection. No temperatures are taken at all, and thus all danger of causes other than tuberculin influencing a reaction are obviated. An expert can work five times as rapidly with this test as with the old style one.—"New Zealand Farmer."

## TIMES OF SUNRISE AND SUNSET AT BRISBANE—1914.

| Date. | JANUARY. | | FEBRUARY. | | MARCH. | | APRIL. | |
|---|---|---|---|---|---|---|---|---|
| | Rises. | Sets. | Rises. | Sets | Rises. | Sets. | Rises. | Sets. |
| 1 | 4·56 | 6·46 | 5·21 | 6·42 | 5·41 | 6·20 | 5·57 | 5·47 |
| 2 | 4·57 | 6·46 | 5·21 | 6·42 | 5·41 | 6·19 | 5·58 | 5·46 |
| 3 | 4·58 | 6·46 | 5·22 | 6·41 | 5·42 | 6·18 | 5·58 | 5·45 |
| 4 | 4·59 | 6·46 | 5·23 | 6·41 | 5·42 | 6·17 | 5·59 | 5·43 |
| 5 | 4·59 | 6·46 | 5·24 | 6·40 | 5·43 | 6·16 | 5·59 | 5·42 |
| 6 | 5·0 | 6·47 | 5·24 | 6·39 | 5·44 | 6·15 | 6·0 | 5·41 |
| 7 | 5·1 | 6·47 | 5·25 | 6·39 | 5·44 | 6·14 | 6·0 | 5·40 |
| 8 | 5·1 | 6·47 | 5·26 | 6·38 | 5·45 | 6·13 | 6·1 | 5·39 |
| 9 | 5·2 | 6·47 | 5·27 | 6·37 | 5·45 | 6·12 | 6·1 | 5·38 |
| 10 | 5·3 | 6·47 | 5·28 | 6·37 | 5·46 | 6·11 | 6·2 | 5·37 |
| 11 | 5·4 | 6·47 | 5·28 | 6·36 | 5·46 | 6·10 | 6·2 | 5·36 |
| 12 | 5·4 | 6·47 | 5·29 | 6·35 | 5·47 | 6·9 | 6·3 | 5·35 |
| 13 | 5·5 | 6·47 | 5·30 | 6·35 | 5·47 | 6·8 | 6·4 | 5·34 |
| 14 | 5·6 | 6·47 | 5·31 | 6·34 | 5·48 | 6·7 | 6·4 | 5·33 |
| 15 | 5·7 | 6·47 | 5·31 | 6·33 | 5·49 | 6·6 | 6·5 | 5·31 |
| 16 | 5·8 | 6·47 | 5·32 | 6·32 | 5·49 | 6·4 | 6·5 | 5·30 |
| 17 | 5·9 | 6·47 | 5·33 | 6·31 | 5·50 | 6·3 | 6·6 | 5·29 |
| 18 | 5·9 | 6·47 | 5·33 | 6·30 | 5·50 | 6·2 | 6·6 | 5·29 |
| 19 | 5·10 | 6·47 | 5·34 | 6·30 | 5·51 | 6·1 | 6·7 | 5·28 |
| 20 | 5·11 | 6.47 | 5·35 | 6·29 | 5·51 | 6·0 | 6·7 | 5·27 |
| 21 | 5·12 | 6·46 | 5·35 | 6·28 | 5·52 | 5·59 | 6·8 | 5·26 |
| 22 | 5·13 | 6·46 | 5·36 | 6·27 | 5·52 | 5·58 | 6·8 | 5·25 |
| 23 | 5·13 | 6·46 | 5·37 | 6·26 | 5·53 | 5·57 | 6·9 | 5·24 |
| 24 | 5·14 | 6·45 | 5·37 | 6·25 | 5·53 | 5·56 | 6·9 | 5·23 |
| 25 | 5·15 | 6·45 | 5·38 | 6·24 | 5·54 | 5·54 | 6·10 | 5·22 |
| 26 | 5·16 | 6·45 | 5·39 | 6·23 | 5·54 | 5·53 | 6·10 | 5·21 |
| 27 | 5·16 | 6·44 | 5·39 | 6·22 | 5·55 | 5·52 | 6·11 | 5·20 |
| 28 | 5·17 | 6·44 | 5·40 | 6·21 | 5·55 | 5·51 | 6·11 | 5·19 |
| 29 | 5·18 | 6·43 | ... | ... | 5·56 | 5·50 | 6·12 | 5·18 |
| 30 | 5·19 | 6·43 | ... | ... | 5·56 | 5·49 | 6·12 | 5·18 |
| 31 | 5·20 | 6·43 | ... | ... | 5·57 | 5·48 | ... | ... |

| PHASES OF THE MOON. | | | H. | M. | |
|---|---|---|---|---|---|
| 4 Jan. | ☾ | First Quarter | 11 | 9 | p.m. |
| 12 „ | ○ | Full Moon | 3 | 9 | „ |
| 19 „ | ☽ | Last Quarter | 10 | 30 | a.m. |
| 26 „ | ● | New Moon | 4 | 34 | p.m. |
| 3 Feb. | ☾ | First Quarter | 8 | 33 | p.m. |
| 11 „ | ○ | Full Moon | 3 | 35 | a.m. |
| 17 „ | ☽ | Last Quarter | 7 | 23 | p.m. |
| 25 „ | ● | New Moon | 10 | 2 | a.m. |
| 5 Mar. | ☾ | First Quarter | 3 | 3 | p.m. |
| 12 „ | ○ | Full Moon | 2 | 18 | „ |
| 19 „ | ☽ | Last Quarter | 5 | 39 | a.m. |
| 27 „ | ● | New Moon | 4 | 9 | a.m. |
| 4 Apr. | ☾ | First Quarter | 5 | 41 | a.m. |
| 10 „ | ○ | Full Moon | 11 | 28 | p.m. |
| 17 „ | ☽ | Last Quarter | 5 | 52 | „ |
| 25 „ | ● | New Moon | 9 | 22 | „ |

# Poultry.

## REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1914.

Three thousand six hundred and forty-three eggs were laid during the month. With the exception of the three leading pens and the Black Orpingtons, all the pens are more or less in heavy moult. Some have from one to three birds nearly through the moult, while Stephens's and Zahl's pens are all in moult, so that we do not anticipate very heavy laying during March. Black Orpingtons (No. 2) owned by R. Burns win the monthly prize with 121 eggs. It looks like a great tussle between Padman and Moritz Bros., only two eggs separating these two pens, and each laid 26 eggs during the last week. The following are the individual records:—

| Competitors. | Breed. | Feb. | Total. |
|---|---|---|---|
| A. H. Padman, S.A. ... ... ... | White Leghorns ... | 109 | 1,442 |
| Moritz Bros., S.A. ... ... ... | Do. ... ... | 117 | 1,440 |
| J. R. Wilson ... ... ... ... | Do. ... ... | 85 | 1,401 |
| Loloma Poultry Farm, N.S.W. ... ... | Do. ... ... | 106 | 1,396 |
| T. Fanning ... ... ... ... ... | Do. (No. 2) | 98 | 1,380 |
| Range Poultry Farm ... ... ... | Do. ... .. | 87 | 1,339 |
| R. Burns ... ... ... ... ... | Black Orpingtons (No. 2) | 121 | 1,337 |
| E. A. Smith ... ... ... ... | White Leghorns (No. 2) | 112 | 1,326 |
| O.K. Poultry Yards ... ... ... | Do. ... ... | 74 | 1,318 |
| J. F. Coates ... ... ... ... | Do. ... ... | 91 | 1,293 |
| T. D. England ... ... ... ... | Do. ... ... | 78 | 1,286 |
| H. Tappenden ... ... ... ... | Do. ... ... | 97 | 1,270 |
| R. Burns ... ... ... ... ... | Black Orpingtons (No. 1) | 102 | 1,268 |
| W. D. Bradburne, N.S.W. ... ... | White Leghorns ... | 97 | 1,262 |
| S. E. Sharpe ... ... ... ... | Do. ... ... | 90 | 1,262 |
| F. McCauley ... ... ... ... | Do. ... ... | 93 | 1,260 |
| Jas. McKay ... ... ... ... | Do. ... ... | 104 | 1,257 |
| Mrs. Munro ... ... ... ... | Do. ... ... | 102 | 1,254 |
| E. A. Smith ... ... ... ... | Do. (No. 1) | 103 | 1,251 |
| J. Zahl ... ... ... ... ... | Do. ... ... | 59 | 1,246 |
| A. T. Coomber ... ... ... ... | Do. ... ... | 70 | 1,236 |
| Cowan Bros., N.S.W. ... ... ... | Do. ... ... | 82 | 1,228 |
| A. F. Camkin, N.S.W. ... ... ... | Do. ... ... | 105 | 1,225 |
| Doyle Bros., N.S.W. ... ... ... | Do. ... ... | 86 | 1,222 |
| Yangarella Poultry Farm ... ... | Do. ... ... | 90 | 1,215 |
| Mrs. Sprengel, N.S.W. ... ... ... | Do. ... ... | 82 | 1,213 |
| H. Hammill, N.S.W. ... ... ... | Do. ... ... | 85 | 1,206 |
| Mrs. Craig ... ... ... ... ... | Do. ... ... | 104 | 1,176 |
| T. Fanning ... ... ... ... ... | Do. (No. 1) | 92 | 1,175 |
| J. Murchie ... ... ... ... ... | Brown Leghorns ... | 95 | 1,169 |
| R. Jobling, N.S.W. ... ... ... | White Leghorns ... | 88 | 1,169 |
| C. Leach, N.S.W. ... ... ... ... | Do. ... ... | 95 | 1,157 |
| J. Archibald, N.S.W. ... ... ... | Do. ... ... | 94 | 1,151 |
| D. Grant ... ... ... ... ... | Do. ... ... | 69 | 1,135 |
| J. Gosley ... ... ... ... ... | Do. ... ... | 75 | 1,120 |
| A. C. Collis, N.S.W. ... ... ... | Do. ... ... | 96 | 1,088 |
| Mrs. Bieber ... ... ... ... | Brown Leghorns ... | 88 | 1,082 |
| A. Schbrowski ... ... ... ... | Do. ... ... | 64 | 1,069 |
| T. Stephens, N.S.W. ... ... ... | White Leghorns ... | 68 | 1,063 |
| J. Andersen, Victoria ... ... ... | Red Sussex ... ... | 90 | 1,045 |
| Totals ... ... ... ... | ... | 3,643 | 49,432 |

# Statistics.

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1913 AND 1914, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|
| | Feb. | No. of Years' Records. | Feb., 1914. | Feb., 1913. |
| *North Coast.* | In. | | In. | In. |
| Atherton ... ... | 10·10 | 11 | 7·27 | 21·06 |
| Cairns ... ... | 14·69 | 25 | 17·42 | 13·90 |
| Cardwell ... ... | 16·13 | 25 | 15·25 | 23·83 |
| Cooktown ... ... | 11·79 | 25 | 17·02 | 18·67 |
| Herberton ... ... | 7·59 | 25 | 6·68 | 12·57 |
| Ingham ... ... | 15·34 | 20 | 17·84 | 11·66 |
| Innisfail ... ... | 21·48 | 25 | 21·05 | 32·73 |
| Mossman ... ... | 16·47 | 5 | 18·23 | 25·95 |
| Townsville ... ... | 11·83 | 23 | 4·76 | 13·27 |
| *Central Coast.* | | | | |
| Ayr ... ... ... | 10·17 | 25 | 3·15 | 11·62 |
| Bowen ... ... | 9·33 | 25 | 3·91 | 10·75 |
| Charters Towers ... | 3·98 | 25 | 0·97 | 7·96 |
| Mackay ... ... | 12·14 | 25 | 4·41 | 24·13 |
| Proserpine ... ... | 10·63 | 10 | 12·66 | 14·21 |
| St. Lawrence ... | 8·98 | 25 | 4·64 | 13·97 |
| *South Coast.* | | | | |
| Crohamhurst ... | 15·71 | 20 | 22·05 | 8·36 |
| Biggenden ... ... | 3·72 | 14 | 4·27 | 4·25 |
| Bundaberg ... ... | 6·81 | 25 | 3·40 | 5·36 |
| Brisbane ... ... | 6·55 | 63 | 3·20 | 5·06 |
| Childers ... ... | 6·02 | 17 | 6·34 | 5·47 |
| Esk ... ... ... | 6·07 | 25 | 4·46 | 1·94 |
| Gayndah ... ... | 4·28 | 25 | 2·85 | 7·70 |
| Gympie ... ... | 7·04 | 25 | 6·83 | 3·91 |
| Glasshouse M'tains | ... | ... | 23·94 | 9·44 |
| Kilkivan ... ... | 5·85 | 25 | 3·85 | 3·18 |
| Maryborough ... | 5·85 | 25 | 11·95 | 5·61 |

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|
| | Feb. | No. of Years' Records. | Feb., 1914. | Feb., 1913. |
| *South Coast*—continued: | In. | | In. | In. |
| Nanango ... ... | 4·95 | 25 | 3·36 | 5·89 |
| Rockhampton ... | 8·57 | 25 | 2·77 | 7·02 |
| Woodford ... ... | 9·90 | 25 | 10·32 | 4·92 |
| Yandina ... ... | 13·20 | 19 | 13·37 | 7·19 |
| *Darling Downs.* | | | | |
| Dalby ... ... | 2·89 | 22 | 0·69 | 3·57 |
| Emu Vale ... ... | 2·28 | 17 | 5·54 | 0·40 |
| Jimbour ... ... | 3·72 | 24 | 0·90 | 1·92 |
| Miles ... ... | 2·94 | 25 | 1·38 | 1·16 |
| Stanthorpe ... | 3·34 | 22 | 1·80 | 0·28 |
| Toowoomba ... | 4·98 | 22 | 4·15 | 1·81 |
| Warwick ... ... | 3·29 | 22 | 0·59 | 1·29 |
| *Maranoa.* | | | | |
| Roma ... ... | 3·34 | 21 | 6·91 | 2·99 |
| *State Farms, &c.* | | | | |
| Gatton College ... | 3·35 | 14 | 2·53 | ... |
| Gindie ... ... | 2·34 | 13 | 3·32 | 3·76 |
| Kamerunga Nurs'y | 14·84 | 23 | 17·95 | ... |
| Kairi ... ... | ... | ... | 9·57 | ... |
| Sugar Experiment Station, Mackay | 9·95 | 16 | 5·55 | ... |
| Bungeworgorai ... | ... | ... | 5·92 | 2·89 |
| Warren ... ... | ... | ... | 1·50 | 4·34 |
| Hermitage ... | 3·08 | 7 | 0·71 | ... |

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February this year and for the same period of 1913, having been compiled from telegraphic reports, are subject to revision.

# State Farms.

## ROMA STATE FARM.

The manager, Mr. R. E. Soutter, reports as follows for the month of February:—

*Meteorology.*—The unfavourable conditions prevailing when previous report was submitted have been wholly dispelled, and the prospects are better than they have been for two years at this season of the year so far as the pastoral industry is concerned.

The maximum temperature recorded was 105·1; average, 87·3. The minimum temperature recorded was 60·0; average, 64·0. Rainfall recorded was 8·75 inches, representing eleven falls. On one occasion 1·30 points fell in thirty minutes, and did a good deal of damage on cultivated areas.

*Vineyard.* Prior to the rain practically the whole of the crop fit for marketing had been removed.

*Orchard.* The citrus trees, which were looking really bad, have made a most wonderful recovery and some fruit will now be obtained, there being sufficient moisture, and more in the soil to carry it on to maturity.

*Olives.*—These have responded marvellously to the congenial conditions, some of the trees now being covered with heavy crops of good-sized fruit.

*Silage Crops.* The early-sown maize has been fit for this purpose two weeks now, but owing to the wet weather and still boggy state of the paddocks, it will be another week before operations (cutting) can be commenced. The late sown maize has come on wonderfully, having grown over 3 ft. during the last fortnight.

*Cowpeas.*—The block of 25 acres sown for green manuring purposes is all that could be desired.

*Teff Grass.* This has given most surprising results. When the rain was first experienced a fortnight ago, the plants were from 4 to 6 in. high, and thin in appearance. Two days ago a measured area was cut, the length of the material being 2 ft. 9 in., and estimated weight per acre of green material 6 tons 4 cwt. 1 qr. Notwithstanding such good results, its being an annual will no doubt preclude its being grown to any extent in the near future.

*Rhodes Grass* has again demonstrated its remarkable recuperative powers, and within a week after the first rain was 6 in. high, in places where it had been eaten close to the ground.

*Wheat.* The grading of seed intended for sale has been completed, and there will be about 600 bushels available for this purpose. Orders have come in a little more freely since the rain.

*Stock* of all descriptions look exceedingly well, and should continue to do so, as the recent rains have made feed plentiful.

## GINDIE.

Writing on 14th March, the manager makes the following remarks on sowing Rhodes grass seed:—In my last report I mentioned that we had sown some Rhodes grass, and stated I was afraid there would be a difficulty in getting it to grow on our heavy black soil. Owing to the expansion of this kind of soil during wet weather, and the consequent shrinking and cracking afterwards, there is always a difficulty in getting a start with any small seed that requires to be covered lightly, more particularly in the summer. Ample rain fell to germinate the grass seed sown last month had it taken, say, three days to fall instead of about twenty minutes. After a shower of this kind, if the sun comes out strong the following day, which is usually the case, the surface of the land cracks up into flakes—in fact, acts just the same as the mud in the bottom of a waterhole from which the water has evaporated. The depth to which the cultivated land scales up depends on the amount of rain and the rapidity with which it falls; it may be anything from ⅛ to ½ in., and it is here where the trouble comes in. If it cracks to the depth to which the seed was sown, the greater portion of it is exposed to the direct rays of the sun and the drying effects of the wind. Of course, this cracking only takes place to a limited extent if the rain continues for a few days. The same expansion of the soil takes place, but it is more gradual, and, as the subsidence is more gradual, little or no cracking takes place.

Where frosts do not occur I am of the opinion that it would be advisable to postpone the sowing of the grass seed as late as possible, as in the cooler months the cracking only takes place to a very limited extent—that is, on the kind of soil to which I have referred.

We have put in 18½ acres of Rhodes grass in one of the lower paddocks. The greater part is planted on soil of a lighter character than that previously mentioned. There was a good deal of rubbish on this land, which was harrowed together and burnt. The land was then lightly worked up with the spring-tooth harrow. After the seed was sown, a portion was covered by a light seed harrow and the balance with a chain harrow. On about an acre that had received no previous working, the seed was sown and covered with a heavy harrow. As no rain has fallen up to the time of writing, I cannot say at present what the outcome of these experiments will be.

Our maize crop, with which we hope to fill the silo, is looking much better than could be reasonably expected. Though it will not be a heavy crop, it is cobbing well, and will be a welcome addition to our stock of fodder.

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## WARREN.

The acting manager, Mr. R. B. Tennent, reports on the work of the Farm for February:—

The early part of the month of February proved very dry, and a detriment to the farm in general. Towards the latter end of the month, however, 1.50 in. of rain fell. This was followed up by good rains in

the early part of March and, as a result, everything is appearing at its best.

Over 30 acres of ground have been ploughed and prepared for the reception of seed; 6 acres have been sown with Hunter River Broadleaf lucerne, and is promising well; 5 acres have been planted with seed potatoes, and a good crop is anticipated. The soil in which the potatoes are planted is of a loose sandy nature, rich in nitrogenous matter, a crop of lucerne having previously grown there. This land is very well drained, being situated on the banks of the creek, and the potatoes have been planted under ideal conditions. Three varieties have been sown, these being Carmen, Brownell's Beauty, and Up-to-Date. Some "Defiance" potatoes imported from England have also been planted.

We have cut over 40 acres of lucerne and obtained excellent hay; 20 acres of land have been prepared for the reception of cereals, which will comprise of Revetan, Bald Medeah, and Kubanka wheats, Californian Feed Barley.

Ten tons of maize have been harvested and put into the silo. This maize was chaffed and should make good ensilage. We have at present 20 tons of ensilage, comprised of White Panicum, Japanese Millet, and maize.

The maize crop promises very well, but is being greatly damaged by the ravages of the innumerable parrots. We have at present 70 acres under maize, the chief variety being Early Leaming, which is well adapted for Central Queensland.

There is an abundance of green fodder in the grazing paddocks, and the cows are in full flush. We are at present milking eighteen head of cattle, and supplying the local butter factory with cream three times per week. The records of the herd will be available for publication next month.

In the orchard the citrus trees are bearing very well, but, owing to the clay subsoil, part of the orchard will be demolished.

The stock are in excellent condition, and the young animals show great promise.

## KAMERUNGA STATE NURSERY.

The manager, Mr. C. E. Wood, in his report for the month of February, records a heavy rainfall for that month, amounting to 17·95 in., making a total of 47 in. since 1st January.

So far as operations in the field go, this is a heavy handicap, and every dry spell has to be taken advantage of to get the scarifying implements going. Soya beans have never been a success at the Nursery, but a planting was made on 5th February, of five varieties of seed received from Assam, which all came as Soya beans, but two of them are undoutedly Phaseolus, including *P. Mungo* and *P. max*. Most of the seed germinated fairly well, and the plants were beginning to make fair progress, when same were attacked by the bean fly, especially all the Phaseolus, with the result that little, if any, were expected to arrive at maturity. A small plot planted on the 12th February had, up to time of

writing, not been attacked, but these had tobacco dust sprinkled along the rows and were afterwards hilled up. On more than one occasion this treatment has been successful, when the plants untreated were destroyed by the fly. We frequently are asked how to prevent the ravages of the bean fly in the case of French beans. We would suggest a trial of Mr. Wood's method, although he qualifies his statement by saying that he has on occasions known it to fail.

Teff grass, which at present is attracting much attention, has been planted at Kamerunga, and in two months from sowing it reached a height of from 18 to 30 in., and was in full flower. The plot was sown too thickly, and the individual blades were very narrow. On harvesting the crop off a measured square yard, the weight (green) worked out approximately at 6 tons 15 cwt. per acre. The dry weight—that is, as hay, was at the rate of 2 tons 3 cwt. per acre.


PLATE 32.—TEFF GRASS AT KAMERUNGA STATE NURSERY, 30 DAYS FROM SEEDING—2 FEET HIGH.

The accompanying photograph shows a part of the plot thirty-eight days after planting, the height of the grass being just on 2 ft. A further plot was to be sown.

## KAIRI.

The manager reports that 957 points of rain fell on fifteen days of February, the rain falling mostly in plumps, alternating with bright sunshine. The weather is very trying for young grass, and it is feared that the strike on new clearings may be adversely affected.

Maize on the new clearing is making satisfactory progress; and cowpeas, green-manure beans, sugar-cane, cow cane, and lucerne are all making great growth, while the grass on the clearings sown down last year and the year before is over the backs of the cattle, all of which are in splendid condition.

# The Orchard.

## FRUITING OF THE MALE PAPAW.

Although the male papaw very rarely produces fruit in the Southern portion of Queensland, it is by no means a rarity to see in the Northern districts, especially in the rich lands about Cairns, male trees bearing dozens of fruits which are produced at the end of the long flower-stems, and dangle like a number of bells from the top of the tree. The accompanying photo. represents a male papaw-tree in full bearing, on Messrs.

PLATE 33.—MALE PAPAW FRUITING.

Smith Bros.' Victoria Farm, Ayr, Lower Burdekin. When this tree was about 3 ft. high, the sprout on the top was pinched off, with the result that it threw out several branches. About three months later it bore a few fruits, and recently, when eighteen months old, it began to bear abundantly, having now (2nd February) over 100 fruits on each branch. The same process was tried with other trees, but up to the date mentioned only a few papaws had appeared.

## FRUIT-GROWING IN THE GRANITE REGION.

Mr. C. Ross, F.R.H.S., Instructor in Fruit Growing, reports to the Under Secretary as follows on his tour in the undermentioned districts—namely, Wallangarra, Wyberba, Lyra, Ballandean, Beverly, Stanthorpe, Blue Mountains, Roesseler, The Summit, Thulimbah, Dalveen, and Warwick.

The weather was very hot and dry during my visit—in fact, very little rain had fallen during the previous eight months, consequently vegetable crops were very poor and fruit trees did not exhibit the usual amount of vigour. In comparison, however, the trees had suffered very little otherwise. The carrying crop, generally, was heavy, and, excepting the earliest varieties of apples, promised to be quite equal in quality, size, and quantity to any previous year. The plum crop is excellent in every way, and the peach crop was never better. Expansion is fairly rapid; new clearings are being opened up in every direction, and upwards of 40,000 trees were planted last winter.

A good class of men, possessing capital, with some knowledge of fruit culture, gained elsewhere, are becoming established. The young men of the district are also paying more attention to the industry, and this with a sprinkling of city men who are looking towards the future and establishing profitable country homes is having a very good effect. The more up-to-date methods of culture, and the stricter attention paid to pests, are becoming better understood, and the condition of fruit-growing (which is already on a fairly sound basis) is gradually assuming a more satisfactory condition. There is still much room for improvement as regards packing, marketing, pruning, and the thinning of the fruit. More thorough methods require to be adopted with the two latter operations, together with the application of suitable fertilisers and green manuring.

Windfalls, as a rule, are more in evidence under early and profuse cropping trees, and some means should be devised whereby the waste could be utilised. In the full-bearing orchards where ground crops are not grown, poultry, pigs, and even sheep are all useful in this respect, as well as for keeping down weeds. Sheep have been used in this manner at the State farms, and no injury to the trees had resulted. One orchard at Thulimbah is adopting this phase by grazing in sections within portable fences.

Those growers who are desirous of planting very early apples should remember that, although showy colours are represented, high quality is not a prominent feature in this section, and when put on the market they have to compete with American shipments. It is, therefore, advisable to plant in moderation and to specialise with the second earlies, mid-season, and late sorts.

I herewith append a list of varieties, some of which are well known and have done well in the granite region, and others that bear a good reputation, and have been proved by my own personal experience.

Orchardists should note the blossoming periods of the various varieties and plant those that blossom at the same time in close proximity to each other. This will ensure pollination and cross-fertilisation, whether

it is effected by bees or wind agency. It may here be remarked that the want of pollination is a primary cause of fruit dropping, quite independent of wind force and dryness at the root.

*First and Second Early Varieties.*

| | |
|---|---|
| Climax | Beauty of Bath |
| Marjorie Hay | Coldstream Guard |
| Cardinal | Emperor Alexander |
| Golden Spire | Gravenstein |
| Lady Sudeley | Langley Pippin |
| Sharpe's Early | Williams' Favourite |
| Scarlet Pearmain | Astrachan |
| Liveland Raspberry | |

*Mid-season Varieties.*

| | |
|---|---|
| Allington Pippin | Bismarck |
| Charles Ross | Esopus Spitzbergen |
| Foster | John Sharp |
| Peasgood Nonsuch | Cox's Orange Pippin |
| Mona Hay | Prince of Pippins. |

*Late Varieties.*

| | |
|---|---|
| Adam's Pearmain | Jonathan |
| Alfriston | King David |
| Annie Elizabeth | Loy |
| Black Ben Davis | Munroe's Favourite |
| Canada Reinette | Prince Alfred |
| Cleopatra | Purity |
| Fall Pippin | Rome Beauty |
| Gloria Mundi | Sharp's Late Red |
| Glowing Coal | Stayman Winesap, and |
| Hawthornden | Wright's Perfection. |

Codlin moth, San José scale, and scab have been kept well under control, and the dreaded fruit fly is practically absent. The Rutherglen bug attacked ground crops, and some of the early peaches, but the effect of this pest has not been serious this season. A preparation invented by a Stanthorpe resident appears to have suppressed the depredations of this insect wherever it has been tried. If its efficacy is all that is claimed for it, it may become a great boon to the citrus-grower in helping to fight the orange bug, fruit fly, and other winged pests.

With regard to the summer pruning of young peach trees, the side shoots in the interior of the tree should be thinned out and properly spaced in spring, but not stopped, and the terminal points may be pinched out in late summer. If this operation is performed earlier, a profusion of laterals may be produced, which are not required; but when the operation is performed late, the effect is to fill out the fruit buds for next summer's production.

In the case of apple trees, fully one-third of the lateral growth may be suppressed or checked by pruning off, or fracturing. The operation is

best performed during February or March, as the sap is then elaborated in the base buds, and will form good fruit spurs when pruned back in winter.

Amongst the older trees of heavy bearing varieties, hard winter pruning must be resorted to if high-class productivity is to be maintained, followed in summer by severe thinning, for producing a good-sized marketable commodity.

Many growers, as regards packing and grading, are as proficient as need be, but there is much room for improvement in the majority of sheds. Too much of this work is relegated to children and inexperienced hands. Instead of being handled like eggs, properly sized, firmly packed according to system, the second-grade fruit is often dumped into the cases and shaken down as if it were potatoes.

Although the whole range of deciduous fruits is profitably grown, the following fruits may be specialised in the localities named:—

| | |
|---|---|
| Apples, pears, &c. .. | .. Thulimbah. |
| Peaches, plums, &c. .. | .. Stanthorpe to border. |
| Cherries and grapes .. | .. On slopes at foot of Range, or where protection is afforded against late spring frosts. |

In the Warwick district, orchardists usually experience more trouble with the fruit fly, but happily this season it has not been so, and the following can be well grown:—Peaches, plums, apricots, grapes, and almonds, with apples and pears in moderation.

Chestnuts, walnuts, pistacios, and olives, besides being useful as food for stock, are profitable commercial commodities, and form handsome trees for shade and breakwinds.

There are many moist situations between Warwick and the border, where the first two nuts would do well. The pistacio nut and olive are better suited to drier situations. The pecan nut is also a handsome tree, but probably would not yield heavy crops in the coldest spots.

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## A GOOD SEEDLING MANGO.

Mr. J. C. Beal, Corinda, who takes great interest in raising new varieties of fruit, has been very successful in obtaining a very fine mango (here illustrated) from the seed. The two fruits shown weighed a shade over 2 lb. The trees are growing in a sandy loam and are now about eight years old, bearing well. A remarkable difference between this variety and others is the great length of the leaves, which measure 15 in. by 3¼ in. The flavour of the fruit is very different from that of all other varieties, no trace of any turpentiny flavour about it, and combining the flavour of other fruits, as in the case of the mangosteen.

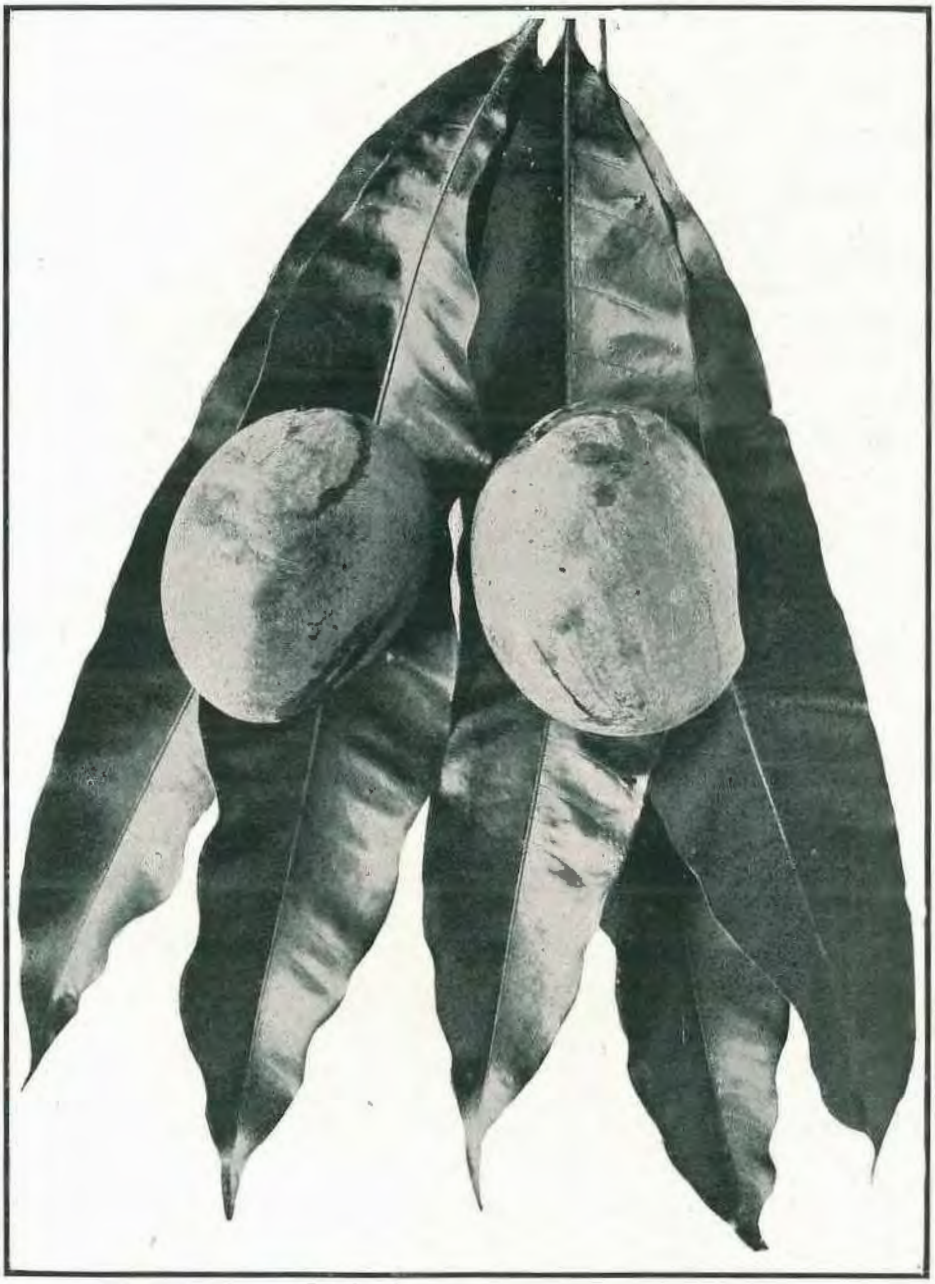

PLATE 34.—SEEDLING MANGOES GROWN BY MR. BEAL AT CORINDA.

# Tropical Industries.

## NOTES ON DATE-GROWING.

[CONTINUED FROM MARCH ISSUE.]

*Distance between the Trees in a Plantation.*—Considerable differences of opinion exist as to the most economic distance to plant the trees apart from each other in plantations. All distances between 12 ft. and 25 ft. have been advised. In the best plantations that I have seen, the trees have been 17 to 20 ft. apart. If each tree is allowed a circular space having a diameter of about 19 ft., good results should be got. To get most trees into a given area of ground, the trees should be set out in lines, and the trees in adjacent lines should not be opposite, but should alternate with each other. With the distances of 19 ft. apart of the trees in the rows, and 16·4 ft. between the rows, 139 trees approximately will be planted per acre. When there is a distance of 25 ft. or more between the palms in a plantation, fruit trees are usually grown between them.

*Preparations for laying down a Plantation.*—When a plantation is to be laid down, the land should first be thoroughly levelled or contoured. The positions of the trees should then be carefully marked; holes about 2½ ft. in diameter, and 2½ ft. deep, should be dug. Small water-channels should be made connecting the holes in each row, and main channels should be made where necessary. Many writers advise manure being given to the trees when they are planted, but the Arabs I met in Egypt, and our Arab date-grower from Basra, are all emphatically against manure being used at planting time. Personally, I should not use manure until the plants become established, unless the soil is very poor, in which case I should only use very well rotted manure, and a quantity of it equal to about one-fourth of the bulk of the earth removed from the hole.

*Planting the Off-shoots.*—Usually the off-shoot is not quite straight, but has a slight curve on it. Date-growers always plant the off-shoots so that their tops lean very slightly towards the south, and the inner side of the curve on the stem is in that direction. The off-shoot is placed in the centre of the hole in the position above described, and the earth is filled in and pressed fairly firmly around it; a basin is usually made round the plant, and a watering is given immediately. The basin should be about 2½ ft. in diameter, and the level of its bottom should be 1 to 1½ in. lower than the bottom of the irrigating channel which runs into it, so as to trap a small pool of water round the tree, and irrigate the soil properly then. The water in the pool should disappear within six to eight hours after the irrigation. In planting, a very important point to notice is, that the crown of the off-shoot (*i.e.*, the position from which the bud of very young leaves starts) is at least 1 or 2 in. above the level of the irrigating water. If the crown is below this level, the irrigating water will get into it and kill the plant by rotting out the young terminal

bud. Frequently the off-shoots and the soil around it sink considerably after the first few irrigations, and the crown of the plant then becomes covered with water at each irrigation. This happens especially when the holes in which the off-shoots were planted have been dug very deep. The hole is perhaps the best depth when, on the plant being placed with its lower end resting on the bottom, the crown is just at its proper height. As the off-shoots are not all of one size, I find that it is most convenient to have all the holes dug to just the correct depth for the smaller plants, and then dig out a little more earth where necessary when planting the larger plants. This method of digging holes, of course, only applies to good loamy lands. Where there are bands of impervious clays, or hard pans, &c., in the soil, the hole should be dug to a depth of 3 ft. or more, and some days, at least, before planting is begun, the earth should be replaced and thoroughly packed to the height required in planting the off-shoot, so as to prevent the plant sinking later on.

*To prevent Water getting into the Crown of the Off-shoot when the Plant has sunk.*—If, in spite of everything, the plant sinks too low, the irrigating water may be prevented from entering the crown of the plant by filling up the basin round it with earth, and making instead a circular trench round the off-shoot, and about 12 in. away from it, as shown in the accompanying diagram.

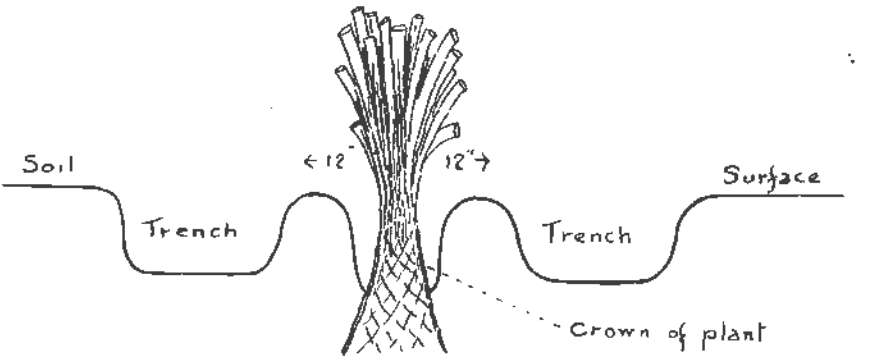


PLATE 35.

The soil around the off-shoot receives water from this trench just as it did from the basin. Care should be taken that earth and dirt do not collect in the crown of the tree, as that is also bad for the plant. Another method of preventing irrigation water entering the crowns of the trees when they have sunk after being planted is, to lower the levels of the water-channels and basins around the trees, and then to only partly fill the channels with water when irrigating. The previous method is, however, usually the better one. When the crowns have not sunk too low, I prefer the plain basins without the rings.

*To prevent cracking of the Soil round the Plants, and excessive evaporation of Water.*—If the soil is of a stiff nature, a mulch of some sort should be spread on the surface of the soil in the basins around the plants, as soon as possible after planting. The mulch may be composed of clear river sand that will not run together, forming a compact hard cake when it dries, or it may be composed of decaying leaves, refuse

litter, straw, or any material which will form a loose layer an inch or two in depth on the surface of the soil. The idea is to form a layer of matter which will contain a considerable volume of air in the spaces between its component particles, and so retard the swift exchange of dry air of the atmosphere for the more or less moist air that is in contact with the soil surface. When the soil is stiff and no mulching is done, the earth around the plants contracts and cracks very readily, and the young tender roots of the off-shoots are apt to be torn during the contraction, or dried up by exposure at the cracks. In the Punjab coal ashes perhaps form one of the best materials for spreading round the plants, as they not only form a nice mulch, but retard the attacks of white ants.

*Newly planted Trees must be shaded by Thatch.*—On the day that the off-shoots are planted, each plant should be loosely thatched with sufficient grass to provide a gentle shade for its young terminal bud.

*Trees must not be shaken till firmly established.*—The trees must on no account be shaken or pushed about after being planted, as this breaks the young roots, or allows dry air to get between the plant and the soil, which shrivels up the roots. Ordinary bullock labour should, therefore, not be allowed in the plantation between the time the plants are planted and the time when they become firmly established.

*Auxiliary Crops.*—It is the general practice in date-growing localities to grow a variety of crops between the trees. While these are small, only such crops are grown as will not injure the palms by over-shading them. Common crops grown, then, are wheat, barley, lucerne, clover, and vegetables. Later, such fruits as grapes, pomegranates, figs, peaches, apricots, almonds, and similar fruits are often grown under the shade of the palms, if there is sufficient space for these. In the Sahara many of these fruits can only be grown successfully under the shade of other trees, and do best where grown under the date palm, and it is quite common to see three crops occupying the land at the same time. First, the date trees towering above everything, then a mixture of other fruit trees, and under them the more shade-loving garden vegetables. Gardens of this sort are, of course, excellent where the other fruit trees can be grown well, and the fruits from these and the crops of vegetables can be dealt with. Rice crops must not be grown between the young date trees, as the stagnant water of the rice plots harms the young plants.

*Method of keeping Records of Trees in a Plantation.*—The great necessity for keeping a minute and accurate record of the trees will be hereafter pointed out. My method of keeping a record is by making a plan of the plantation, and filing with it all letters and notes of anything of interest connected with the case. Every tree in the plantation is represented on the plan by a small circle with a number inside it, and a reference on the margin of the plan shows the nature of the variety under that number. The date of planting and a reference are given to the connected correspondence.

*Register of Watering.*—A register should also be kept of the number and dates of waterings, and, if possible, the amount of water given, as different soils and positions require different amounts of water. . . .

*Water and other requirements of a young Plantation in Multan.*—An irrigation must be given to the date plants as soon as they are planted. A very great stream of water should not be turned on to the plantation when irrigations are given, as this is apt to submerge too much of the plant, carry dirt into its crown, rot the central bud, and kill the plant. The land must be kept almost continuously wet for the first month after planting, and continuously moist until the plants become established. Sandy soils will require much more water than clayey soils will, to keep them in proper condition, and the waterings may have to be applied more or less frequently in different classes of soil, so that the only reliable way to discover when a young plantation requires watering is to see the dampness of the soil in the basin round the plants. When plants have been planted in the first week of September, on well-drained, medium loams in Multan, however, the plants will stand one watering per day for the first forty days, one watering every two days for the next forty days, and one watering every six days till growth starts, and the heat commences in spring. After the frosts in spring are well over, and before the weather is very hot, the thatching may be removed from the plants for a week or two, and then fresh thatching put on. Care should be taken, however, not to shake the plants much while removing the old thatch or replacing it with new. This thatch may finally be removed when the plants have formed a few strong leaves. From spring, the plants may require a watering every four or five days till the rains begin, and one watering per week, or less, after that. One watering every six or seven days will probably have to be given during the next hot weather. By the end of that time the plants will be firmly established, and will require water twice per month or less, the number of waterings depending on the character of the soil, the climate, the height of the permanent water-table, or the amount of percolation of water if near a river, canal, or other body of water. When the permanent water-table is well within 20 ft. of the surface of the soil, adult date palms seem to require no artificial waterings. . . .

*The Effects of Allowing the Soil in a Young Plantation to dry up.*—A remarkably long time elapses before a palm shows signs of the damage done to it by want of water, and it frequently happens that the soil has been kept in excellent condition as regards water for months after the time it was allowed to dry up, before the palm shows signs of dying off. If the off-shoots are planted in the first week of September, all the weakly plants will have died out, and the others will have produced several well-grown leaves by that time next year. Proper attention as regards water, &c., is well repaid by a young date plantation, as strong, vigorous trees come several years sooner into fruit-bearing than weakly ones.

*Death-rate in a Young Plantation.*—In most parts of the world the death-rate in a young plantation is usually between 20 and 30 per cent. The results of the past three years' experiments in the Punjab show us that the death-rate could be kept well within these figures by planting fair-sized plants on average quality soil in early September and by giving them the attentions prescribed. For example, forty-three

trees out of fifty planted at Lyallpur in September, 1909, are now (1913) firmly established and flourishing vigorously.

*Manuring Date Palms.*—In many cases no manure is given to date palms, and, if any is applied, it is usually given to young date palms just after they have established themselves firmly in the soil. This will be about two years after the off-shoots were planted, and the plants will then have about a dozen well-developed leaves. The manure applied is usually well-rotted cow-dung, and it may be given at the rate of 100 lb., approximate, per tree. The earth may be removed around the tree to a radius of 3 to 4 ft., and to a depth of 2 to 3 in. In this excavation the dung may be spread and covered up by replacing the soil. The operation is done before spring growth commences. It may be repeated every two or three years.

[TO BE CONTINUED.]

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## RUBBER SUPPLY AND DEMAND.

Dealing with the Rubber Lesson of 1913, "Investigator," writing in "Grenier's Rubber News," for 1914, forecasts the probabilities of the rubber industry during 1914:—"There is," he says, "no doubt that a feeling is becoming increasingly prevalent that the slump, which has been carried too far, may cause another sharp rise in rubber before long. Whether the long decline be attributed, as in some quarters, to bear manipulation, or as in others to the temporary slackening of demand from America, there is good support for the theory that the present situation will bring about its own remedy in the form of a shortage, followed by a rapid rise in prices.

### RESTRICTED OUTPUTS.

"The principal reason for this expectation lies, of course, in the restriction of output both of wild and plantation rubber, the latter largely on account of the postponement of tapping on young areas. Various estimates of supply and demand have already been published, some of which err on the side of generosity, but I will endeavour to keep my figures on strictly conservative lines. Referring first to the world's production it has been already shown that the total in 1913 was 105,000 tons.

"Some very drastic modifications may be looked for during the present year. Brazil will probably show a decrease to about 30,000 tons. West Africa may be responsible for 5,000-6,000 tons, and East Africa for about 1,000 tons, while Central America rubber, Guayule and Jelutong, will probably not account for more than 4,000 tons between them. Allowing an increase of plantation rubber to 55,000 tons, the result is an estimate of not more than 95,000 tons. I will increase this to, say, 100,000 tons to cover all contingencies. How does this compare with the probable demand?

### ANTICIPATED DEMAND.

"In 1913, which was admittedly an abnormal year, the demand increased by about 6 per cent. over 1912, the total of 105,000 tons, as shown above, all being utilised, plus a large quantity of reclaimed rubber. At the same rate of increase the demand for 1914 should be in the neighbourhood of 110,000 tons, at the lowest estimate, which leaves a deficiency of 10,000 tons or more. The requirements for 1914 are, however, generally set at 120,000-140,000 tons, so that, unless trade falls off to a phenomenal degree, it would appear that a rubber shortage of considerable extent is in sight.

"Only one outcome of such a position would be possible—namely, a wild upward rush of prices, as in 1910, followed by another long period of depression. The present low prices suit certain producing groups very well, and also some of the buyers, but their long continuance is to be deplored. A moderate level of prices would have a much more healthy influence, not only by saving some of the younger companies from ruin, and by preventing large areas going out of cultivation, but would at the same time obviate any pronounced shortage and tend to regularity of prices, which are much more to the advantage of the manufacturer than wide fluctuations."

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## THE GINNING OF COTTON BY THE DEPARTMENT IN NORTH QUEENSLAND.

By HOWARD NEWPORT, Instructor in Tropical Agriculture.

The cotton harvest for this season is now over in Northern Queensland. Those growers who took advantage of the Government's offer to gin and market for them, as well as advance them 1½d. per lb. on their boll cotton—an amount that would cover the out-of-pocket expenses of the grower in picking, bagging, and transporting the raw cotton from the field to the factory (in this case the ginnery)- got their cotton in by the end of the year.

During the last six, and, in some cases, seven, months of 1913 in most parts of the North no rain was experienced, and conditions were approaching those of a drought. While cotton generally appreciates a fairly dry season, this was rather too long for this staple, and though it afforded a good and safe picking season, the crops were generally not as heavy as would have been the case had rains been obtained in August and September. When crops are small, however, the staple benefits in quality as a rule, and this season's was of fair length, uniform, and of fair lustre.

The variety sent in was exclusively Caravonica, and indeed very little, if any, of any other variety is grown in the North now.

The cotton submitted to the Department was dealt with this year by the Gossypium Park Estates Company, at their ginnery at Kamma,

on the Cairns-Babinda Railway, about 12 miles out from Cairns. There, under the supervision of the Department's officer, Mr. J. Campbell, the director of the company put the cotton through the machines, and description of the processes to which their cotton was submitted may be of interest to the growers.

Fig. 1 is an illustration of the cotton gin that deals with the long-stapled Caravonica cotton, and that cleaned the cotton sent in on behalf of the Department as well as the Gossypium Park Estates Company. It is of the roller type, and is run by a small oil-engine, which may also be seen on the right of the illustration.

Some of the aboriginals that are working on these plantations have been taught to run this machinery, and one of them may be seen serving it with boll cotton taken from the open bale in front, which is just as

PLATE 36 (FIG. 1).—COTTON GINNERY, SHOWING ENGINE, GIN, BALING PRESS, &C.

it comes from the grower, unless it has been sent in wet or damp, when redrying is necessary before it can be treated. The lint is drawn by a leather-covered roller between knives working to within a very small fraction of an inch of each other, and requiring very delicate adjustment. These separate the seed, which, in the case of Caravonica, and indeed with practically all cotton of the Sea Island type, is, except for a little tuft at one end, clean or free. It is, however, impossible to get the seed away quite clean; some short lengths of lint or small particles of long lint always remain with the seed as it passes through a sieve and falls below the machine in the space through which light can be seen in the illustration. The adhering short cotton is known as linters, and in big factories or previous to being pressed for oil the seed is put through another machine called the linter or "de-linter," which is a finely-set

gin of the "saw" type, and removes the last particle of cotton lint. The seed in its dirty state, and with a certain amount of rubbish (usually from 1 to 2 per cent.), and of course both "light" or bad seed with the good, is shovelled away and bagged. This is dealt with afterwards in a manner that will be described later on, as it does not concern the subject of this article. After the process of ginning, the cotton is known technically as "lint."

From the gin the now seedless cotton lint comes out in billows as shown in the illustration (Fig. 1). From there it is gathered up and put into the baling machine, into the bottom part of which the hessian or wrapping of the future bale has already been placed. The baling machine may be seen on the left-hand side of Fig. 1, reaching to the top of the pictnre. The bale consists of a series of boxes, some 2½ ft. square, fitting upon one another, with an arrangement of wire ropes and

PLATE 37 (FIG. 2).—LOADING THE BALES INTO DRAYS.

cogged wheels and levers, whereby the cotton, which at first fills the whole series, can be compressed until it is all contained in the lowest of the boxes. The pressure having been applied and the cotton compressed, the hessian cover of the bale is sewn up, the bale turned out and branded, when it is ready for its journey to the market. The branding generally includes the weight, the variety of cotton (in this case "Caravonica"), the initials of the estate or company who grew it, and town of destination, &c. An ordinary bale of cotton shown in Fig. 2 weighs about 2 cwt., so is rather lighter than wool, and the freight on which is similarly charged for by measurement and not by weight. This illustration shows the bale being loaded from the ginnery on to a dray for transport to the railway siding.

Fig. 3 illustrates the process of carting, and Fig. 4 the loading from the dray into railway wagons at the Kamma railway siding. The director

PLATE 38 (FIG. 3).—CARTING THE BALES OF COTTON TO THE RAILWAY.

of the Gossypium Park Estates Company stands in the foreground, and the company's ginnery and store buildings can just be seen in the distance on the right.

PLATE 39 (FIG. 4).—LOADING INTO RAILWAY TRUCKS AT KAMMA, NEAR CAIRNS.

The growers' cotton sent in for treatment by the Department is among the consignment here photographed. This after being trained

to Cairns wharf has now been despatched per s.s. "Roscommon" to Liverpool, England, for realisation.

It will take about three months to get the returns and account sales, when it is hoped it will be found that a good price has been realised.

The outturns of the cotton sent in have been as follows:—

| | | |
|---|---|---|
| Lint | .. .. .. | 31·91 per cent. |
| Seed | .. .. .. | 59·64 per cent. |
| Loss | .. .. .. | 8·45 per cent. |

The latter item is made up with dryage of the cotton due to moisture contained when sent in, as well as leaves, dust, &c., and is less than usual, the loss generally amounting to 9 per cent., and often touching 10 per cent.

The percentage of lint might have been higher had a little rain been obtained earlier in the season, as already mentioned, and with more attention to cultivation.

## AGRICULTURE AND ELECTRICITY.

### EXPERIMENTS WITH THE SOIL, PLANTS, AND ANIMALS.

The "Agricultural News," of Barbadoes (17th January, 1914), publishes a paper on the above subject by Mr. T. Thorne Baker, A.M.I.E.E., F.C.S., which originally appeared in the "Journal of the Royal Society of Arts" (12th December, 1913). From this we take that portion dealing with "practical experiments in the application of an electric stimulus to animal life," from which it will be seen that in one direction certainly there is great promise of economic success.

"Young chickens hatched in incubators can be grown under electric stimulus at about double the rate, thus doubling the output of a chicken farm and halving the food bill per chicken. But what is of far more importance from an economic standpoint is the decrease of the death roll during the first few days after hatching. In the summer months, under normal conditions, the mortality is often as much as 50 per cent. This disastrous dying off is practically non-existent where suitable electrification is used. In the experiments, the chickens were kept in a chicken-house which was electrified by a large helix of heavily insulated wire wound round it in turns about 6 in. apart. The current was applied for ten minutes every hour during the day. There was only a mortality of 1·5 per cent. and as much as 35 per cent. increase in weight of the electrified chickens after three months. The vitality of the treated birds is reported to be remarkable. In the words of the author: 'Instead of running away when one puts one's finger to the netting, they will rush up and peck vigorously. During the treatment they are so highly charged with electricity that quite a distinct shock is felt in the fingers on touching them, although the birds themselves are unconscious of anything. The sparks which fly from their beaks on their pecking one's finger do not appear to be felt in the least by them.' It must be borne in mind, however, that too strong or too frequent application is liable to have a harmful rather than a stimulating action."

# Vegetable Pathology.

## NOTES ON DISEASES OF CITRACEOUS PLANTS.

By E. JARVIS, Assistant Government Entomologist.

With reference to recent investigations relating to diseases of citraceous plants occurring in the Howard and Maryborough districts, I have the honour to state that the present trouble is for the most part due to Collar Rot (*Fusarium limonis*), although Root Rot (*Armillaria sp.*) and a few other diseases are also doing much damage.

### COLLAR ROT.

The injurious symptoms noticed as being typical of this malady may be briefly mentioned here for the benefit of growers who may not be familiar with them.

*Symptoms.*—(1) Abundant gumming on trunk and near base of tree, followed by a brownish discolouration of portions of the collar-bark, and the presence of cavities beneath such diseased areas filled with gum.

(2) Rotting of the bark at these affected spots, generally characterised by a disagreeable odour.

(3) Yellowing of the foliage, and death of the diseased bark at collar, which ultimately scales off leaving the sapwood exposed and dead looking.

*Note.*—In this connection I wish to take the opportunity of recording a form of gumming noticed at Howard on Emperor mandarin trees attacked by collar rot.

The first symptom is the appearance of a white frothy fermenting liquid accompanied by watery-looking gum which exudes from a crack in apparently healthy bark, and sometimes flows a few inches downwards. The wound gradually enlarges, and upon removing the bark one sees a shallow cavity in the sapwood filled with a substance resembling thick milk, which often contains maggots of some dipterous insect, doubtless attracted to the place by the ferment odour. Before long the bark over such spots dies, and in course of shrinkage projects slightly from the surrounding surface in blackened irregular flakes, which ultimately peel off, leaving an unsightly scar.

These injuries, which vary much in size, are usually about 1½ in. across by 2 or 3 in. in vertical length, the general shape being somewhat ovate with pointed ends.

Occasionally they are 6 or even 9 in. in length, but the width is not proportionately increased; and it is interesting to note that, unlike typical collar-rot scabs—which are said to seldom extend more than 18 in. above the soil—these scabs in several instances occurred 3 ft. or more from ground level. I was told that they usually heal well, and the tree makes fresh bark to repair the damage.

Larvæ of a beetle (*Trogositidæ*) were associated with the early stages of this gumming, and are probably predaceous on the dipterous maggots.

Microscopical examination of the gum revealed the presence of the fungus *Fusarium limonis*, and another species not yet identified.

*Nature of the Fungus.*—Collar rot is supposed to be caused by the fungus *Fusarium limonis* Briosi, which both McAlpine and Briosi have always found accompanying the disease; its presence, together with the symptoms already mentioned, being conclusive proof, as far as we know, of the identity of this form of bark rot.

I made a microscopical inspection of infected material obtained in the Burrum district, and found it to contain conidia and hyphæ of this fungus.

*Conditions Favouring the Disease.*—It appears that this malady is by no means new to the locality but has been known for at least fifteen years, during which time it has annually destroyed a varying small percentage of orange trees.

I am inclined to believe that the severity of the present outbreak may be due in a measure to recent unfavourable climatic changes.

Heavy rain succeeding a period of comparative drought on badly-drained soils is liable to cause the skin of half-grown fruit to become ruptured, for the simple reason that long-continued warm weather tends to toughen plant tissue and partially destroy its powers of expansion.

When copious rains fall, such fruit, unable to swell quickly enough under the rapid development of internal growth pressure, often bursts open along some line of least resistance.

It is, therefore, only reasonable to conclude that prolonged dryness of the crown bark of citrus trees, followed by a sudden rush of sap, may at times injure its cellular structure, and so pave the way for more serious complications.

These thoughts were suggested by the occurrence of plenty of such ruptured oranges growing on undrained soil in some of the plantations near Howard.

*Remedial Measures.*—Our Fruit Expert has already dealt with this important side of the question, but I would like to supplement his remarks by saying that the Florida Experiment Station claims to have perfectly prevented this disease by budding nursery trees to roots of sour orange (*Citrus bigaradia*); and, that whilst they consider this stock to be the most suitable for low-lying wet lands or flat country, they recommend the grape-fruit stock (*C. decumana*) for high dry lands. I agree with Mr. Ross in thinking that the rough lemon stock should not be ignored. A capital illustration of its value was seen at Mr. E. J. Stafford's orangery.

Trees badly affected with collar rot are said to frequently recover if transplanted and given more room. A remarkable instance of this is recorded by the United States Department of Agriculture, who state that in 1892 40 acres were planted with large trees affected with this

disease, and that after three years every tree out of the several thousand transplanted appeared to have fully recovered.

In many cases a cure has been effected by simply digging away the earth and exposing the diseased roots to the drying influence of the air, a procedure that in California is thought of more importance than the usual commendable practice of cutting away injured portions and disinfecting the damaged surface.

## ROOT ROT (*Armillaria sp.*).

Citrus trees attacked by this fungus disease were not uncommon on badly-drained land on the banks of the Burrum River. The trouble usually starts on a deep root and spreads through the soil by means of black strands, or rhizomorphs, as they are called, which are conspicuous when present on affected roots. Mr. H. Smith, of Howard, has noticed that the fructification of this fungus appears during October, when clusters of light-brown toadstools come up under diseased trees and cover the ground and surrounding leaves with an immense number of dust-like spores.

*Treatment.*—Fortunately, the disease does not increase rapidly, but knowledge of this fact should not induce growers to neglect taking prompt action with a view to its eradication or possible prevention.

Professor Horne, of California, is of opinion that "the greatest importance attaches to treatment of the margin of the affected area to prevent the further spreading of the fungus," and says: "Where the trouble is still confined to one or more distinct spots it has been suggested that a number of healthy trees should be uprooted in the zone of advancing infection, hoping thereby to remove enough roots so that the fungus will not have anything on which to travel through the soil. If done with sufficient thoroughness, this may be effective, but it must be borne in mind that all the larger roots must be gotten out of the cleared strip."

## GUMMING DISEASE.

I wish to record the presence of a rather serious gumming disease affecting the main branches of citrus trees at Melrose, and occurring also to some extent on the Burrum River.

The effects produced by it are very similar to those said to be characteristic of "Scaly Bark" in California, the presence of which is believed to be closely connected with extreme changes of moisture conditions in the soil.

The disease in question commences with the appearance of small longitudinal cracks in the bark, about an inch long and half an inch apart, from which gum exudes more or less freely.

The bark ultimately dies and scales off in ragged flakes, the injury being repaired by a fresh layer, which, however, is in turn liable to become similarly affected, and the limb is either seriously injured or else gradually killed. I noticed a tree twenty-five years old on Mr. N. C. Richards' selection at Howard that had lost two side branches and a large central main limb, and many older trees at Melrose severely crippled by this gumming disease.

## GENERAL REMARKS.

With regard to the distribution of the diseases enumerated, I may say that collar rot was prevalent in all orangeries visited on the banks of the Burrum River except that of Mr. E. J. Stafford, root rot being also present in the same locality to a lesser degree on selections belonging to Messrs. H. G. Smith, R. Burgess, and Ross.

The state of the citrus crop as a whole in the Howard district reflects great credit on all concerned, the fruit being remarkably free from blemish of any kind. Injurious scale insects have been effectively controlled by fumigation and systematic spraying with a 40 per cent. solution of red oil emulsion.

In conclusion, I would advise growers to put into immediate practice the various remedial methods advocated by us for the treatment of collar rot, and to lose no time in planting young trees budded on suitable resistant stocks—of varieties to be determined by our Fruit Expert—giving them liberal treatment and the best drainage conditions possible.

As soon as these trees attain a fair size, as they should do in about six or seven years, transplant any old existing trees worth saving, and destroy the remainder to prevent possibilities of ill-effects from overcrowding. Avoid using organic fertilisers, especially those rich in nitrogen, using as a substitute chemical manures such as sulphate of ammonia or nitrate of soda.

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## TOMATO DISEASES.

Of late years, several diseases of the tomato plant have appeared in various parts of this State, owing to which growers have suffered severe loss. An excellent Bulletin (No. 142, October, 1913) on Tomato Diseases, has been issued from the Agricultural Experiment Station of the Louisiana State University, Baton Rouge, from which we take the chapter on

TOMATO WILT (*Fusarium lycopersici*),

this being the most prevalent in Queensland, although much loss is often sustained by anthracnose or black rot of the fruit, yet in Louisiana this is looked upon, according to the writers of the above Bulletin, as of very little importance, the disease doing so little damage as to make treatment not worth while. The subject of "Tomato Wilt" is, however, treated at length as follows:—

"EFFECT OF TOMATO WILT ON DIFFERENT PARTS OF THE PLANT.

| Roots. | Stems. | Leaves. | Fruit. |
|---|---|---|---|
| Rotten or black on inside | Outside normal, inside black | Turn Yellow and die | Ripen prematurely |

"The disease is produced by a fungus which lives over from year to year in the soil, and after a field is once badly infected it is difficult to grow tomatoes there for a number of years.

"APPEARANCE OF DISEASED PLANTS.

"The effect of this disease usually becomes noticeable at about the time the plants are coming into flower or a little later. The lower leaves of the plants turn yellow and finally die. The whole plant also becomes more or less stunted and has a more or less sickly appearance. As the disease progresses more of the leaves die and fall off, and finally the whole plant dies. Usually a few fruits develop on the plants, but they do not grow very large, and as the leaves of the plants have been shed they cannot ripen normally. They gradually colour up on the dead or dying plants, though they are not normal in size or flavour. During the last stages of the disease the dead plants hang limp on the stakes, the leaves have fallen or dried up, the stems are black, and the prematurely ripened fruit gradually rots. A plant that becomes infected late often ripens a few fairly good fruits before it dies, but a plant that becomes infected early usually dies before any first-grade fruit develops. Plants infected with the wilt may be scattered through the field, or the infection may be general; that is, with practically all of the plants infected.

"APPEARANCE OF THE STEMS AND ROOTS.

"If a plant that is affected with the wilt disease is pulled up and the stem cut across with a knife, the interior of the stem will be seen to be wholly dark coloured, or else there will be black areas in it. If a longitudinal section is made of the stem, these black areas will be seen to extend from the roots up to the leaves and sometimes even out into the petioles. An examination of the interior of the stems forms the best method of diagnosing the tomato wilt disease. A positive determination of this trouble can always be made in this manner, and it also forms a very easy method.

"The roots of the diseased plant are also discoloured on the inside, and many of the smaller roots and often some of the larger ones will be seen to be rotten. This disease is primarily a root and stem trouble, and all of the damage is done in these parts. The leaves only show the effect of the disease after the stems and roots are badly diseased and are unable to function as they should.

"THE CAUSE OF THE DISEASE AND ITS COURSE OF DEVELOPMENT.

"The tomato wilt disease is caused by a very small microscopic fungus, which is known technically as *Fusarium lycopersici*. This fungus is very closely related to the one which causes cotton wilt. The cotton wilt disease, perhaps better known to the Louisiana farmer than any other wilt disease, has a very similar appearance to the tomato wilt. Its presence in a diseased cotton plant is told by the same method; that is, by cutting open the stem and examining for the dark discolouration. However, the two diseases are distinct and the tomato plant cannot become infected from cotton or the cotton plant from tomatoes.

"The tomato wilt fungus lives in the soil, and will grow and develop there on the dead organic matter for some time even if there are no tomato plants in the field, though it will gradually decrease from year

to year, if tomatoes are kept off the ground. The fungus apparently attacks the young roots of the plants and then grows up through them and into the stems. The tubes in the stems, in which the water is carried from the roots to the leaves, become plugged with the fungus mycelium and the water supply is shut off. This shutting off of the water supply, combined with the damage done to the roots, results in the wilting and the death of the whole plant.

"After the plant dies of the wilt disease, the fungus grows out to the surface of the stems and roots, and there produces the spores, which are the fruiting bodies of the fungus.

"While the life history of this disease in the plants is comparatively simple when compared with many other plant diseases, the location of the fungus in the ground and in the interior of the plant makes the disease a very difficult one to combat.

"The Spread of the Disease.

"A question of much importance in the study of a disease of this nature is the methods that the fungus uses in spreading throughout the field, and especially from field to field. There are many fields in the State that have the disease in only scattered places, and also there are many fields which do not have the disease at all at present. It is important that we know how the disease is apt to get established in these fields so that we may guard against any infection. The spread of the disease in the field, or from one field to another, is accomplished in several ways. These may be taken up separately.

"*By Growing through the Soil.*—The fungus may spread in the field by means of the fungus mycelium growing through the soil from a diseased plant to a healthy one. This, however, is one of the least important methods as the fungus grows slowly in the soil.

"*By Old Diseased Material that is left in the Field.*—If the old diseased and dead plants are left in the field during the fall and winter, an excellent opportunity is afforded for the spread of the disease. The pieces of the dead plant with the disease still in them are blown around the field by the wind or are carried from place to place by various agencies, or are scattered about in ploughing. Wherever these pieces find lodgment, the disease is liable to develop the coming season.

"*By the Scattering of the Spores.*—When the plants die, spores of the fungus which causes the disease develop abundantly on the stems. These spores are very light and they are easily blown about the field by the wind, or they may be carried by men or animals that walk through the field and brush against the diseased plants.

"*By Planting Seed from Diseased Plants.*—While it has never been proven it would seem possible at least for the disease to be transplanted to a field by spores which might have found lodgment on the seed in the field. It is probable, however, that this is not a very important method of the spread of the disease.

"*By Planting the Seed in Infected Seed Beds.*—One of the most important ways in which the disease finds its way into new fields is by means of infected seed beds. In many places in the State, truckers use their seed beds or cold frames year after year without changing the soil, or at least not all of it. In many places these are filled with infected dirt or the disease later finds its way into them. When young plants are grown in such places, they become infected before they are set in the field. They do not show the disease at the time of transplanting, but later they show it in the field. Often a grower will ask why he had this disease in a field where he had never grown tomatoes before, not realising that he put it there himself when he set out his plants.

All of these factors have their influence on the spread of this disease and should be considered; though perhaps the most important ones are the leaving of the old plants in the field and the setting out of plants in the field that had already become infected in the seed beds or cold frames.

"THE CONTROL OF THE DISEASE.

"As the disease is one that is confined to the soil or to the interior of the plants, none of the ordinary treatments, such as spraying, will have any effect on it. In order to control this disease, we must keep it from infecting the soil, or if it is already present, we must try to eradicate it, or we must grow plants that will not become infected by the fungus. The important points which should be considered in the control of this disease are perhaps as follows:—(1) Keeping the disease out of a field that is not infected, or at least only has a small amount of the disease; (2) the rotation of crops; (3) the growing of resistant varieties.

"KEEPING THE DISEASE OUT OF THE FIELD.

"By looking at the methods of infection of this disease, as given on a previous page, we see that the disease is admitted to a field by pieces of old diseased plants, by spores of the fungus, by transplanting diseased plants from the cold frames, and possibly by planting seed with the disease on them. A great deal can be accomplished in checking this trouble by taking steps to prevent the introduction of the disease in the field. In the first place, all of the old infectious material should be destroyed. As the plants die from this disease they should be pulled up and piled and then burned as soon as they are dry enough. This will prevent the spread of the disease by the spores, which are produced on the dead plants, being blown around by the wind, and also from developing from the old diseased material in the soil in the coming year.

"Then particular care should be taken to keep the disease out of the cold frames or seed beds. Soil for these should only be obtained from fields that have never grown tomatoes, and it is questionable whether the same soil should be used for more than a year. If the disease can be kept entirely out of the field by a little care in this matter and a little extra work, more has been accomplished than can be done in any other

way. There is no question but what many fields become infected by setting out diseased plants from the seed bed or cold frame.

"While it has not been proven that the disease is carried on the seed, it is possible that it can be carried in this manner, and it would probably be well to disinfect seed before planting. Tomato seed will stand short exposures to strong disinfectants without injuring their germinative power. Some experiments were tried to see what effect some different disinfectants would have on the germinative power of tomato seed. The seed were soaked in the different solutions and then, without drying, were tested for germination. In the following table the results of this test are given:—

TABLE II.

EFFECT OF DISINFECTANTS ON TOMATO SEED.

| Treatment. | Germination, Per Cent. |
|---|---|
| Checks, not treated ... ... ... ... ... ... ... ... | 70 |
| Soaked in corrosive sublimate solution, 1 to 1000, for ten minutes ... | 86.5 |
| Soaked in corrosive sublimate solution, 1 to 1000, for fifteen minutes ... | 83 |
| Soaked in formalin solution, 1 to 300, for fifteen minutes ... ... | 70.5 |
| Soaked in formalin solution, 1 to 100, for ten minutes ... ... ... | 76.5 |
| Soaked in corrosive sublimate solution, 1 to 1000, for ten minutes and then soaked in pure water for ten minutes, in order to wash off the poison | 92.5 |

"From this table it is seen that a soaking of the seed for ten to fifteen minutes in a 1 to 1,000 corrosive sublimate solution does not hurt its germinating power. In fact, this treatment seems to help the seed, perhaps by killing the various rotting organisms that are normally on the seed. Corrosive sublimate solution is very easily obtained. It can be purchased at the drug stores in the form of tablets, each tablet to be dissolved in a pint of water, making a 1 to 1,000 solution. It would probably be well for a farmer to always disinfect his seed before planting. Not only this disease but perhaps some of the others also may find their way into a field on the seed. Care should be taken, however, when this solution is used, as corrosive sublimate is very poisonous. It will not hurt the hands, but is very poisonous when taken internally. Porcelain vessels should be used to contain the solution.

"ROTATION OF CROPS.

"Tomatoes should not be grown in the same ground for more than one year out of three. In old tomato sections, truckers have found that this is a rule which must be followed if tomatoes are to be grown successfully, and while the tomato industry is young in this State, we should start in right. If the tomato wilt disease is present in the ground, it will increase in severity rapidly from year to year if tomatoes are kept on the ground. However, if tomatoes are planted only every third year, much of the disease will die out during the two years when tomatoes are not on the ground."

# Botany.

## CONTRIBUTIONS TO THE FLORA OF QUEENSLAND.

By F. MANSON BAILEY, C.M.G., F.L.S., Colonial Botanist.

### Order URTICACEÆ.

FICUS, *Linn.*

*F. frutescens,* Bail. sp. nov. (Plate 40).—An upright, rather slender shrub or small tree (or shrub mostly under 15 ft. in height). Branchlets mostly terete, only the very young growth slightly angular; stem hollow, distinct, mark brown and smoothish. Leaves from 3 to 5 in. long and ¾ to 1 in. broad, margins rather wavy, lanceolate, roundly truncate at the base; petiole mostly under 1 in. long and slender; the parallel primary nerves numerous but rather slender. The reticulate veins rather widely open. Stipules very narrow, 8 to 12 lines long. Receptacles axillary in pairs, globular, smoothish, about 5 lines diam., on peduncles of about 6 lines, rather thin. Male flowers not seen in the ripe fruit examined. Achene deep blood-red, shining, and minutely rugose. Style lateral, elongate.

Hab.: Bellenden-Ker Creek and Harvey's Creek, *E. W. Bick.* Feb., 1914.

The specimen examined was in bad condition, and the receptacles too far advanced for detailed examination.

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## TO MAKE SAUERKRAUT.

This favourite German method of utilising cabbages is often of value when there is a glut in the market, or when many of the cabbages are soft or burst. The process is very simple as described in Professor R. L. Watts's "Vegetable Gardening." After removing the cores and outside leaves, the heads are sliced or shredded (by special machines in manufactories). The finely cut cabbage is then placed in a barrel in successive layers of about 6 in. Each layer is slightly salted and pounded. This operation is repeated until the barrel is nearly full. About one pint of salt is required for a barrel of kraut. The cabbage is then covered with a cloth, and boards cut to fit loosely in the barrel are heavily weighted. The brine formed by the salt and the juice should cover the cabbage during the acetous fermentation. When this is complete the kraut is ready for eating or canning. Vinegar is sometimes added to sauerkraut made on the farm, but in the factories nothing is used to sour the cabbages.


Plate 40.—Ficus frutescens, *Baul, sp. nov.*
A—Stipule (nat. size). B—Ripe achene (enlarged).

# The Horse.

## CAN MULES BREED?

"La Hacienda" shows a photograph that says Yes! How often, we wonder, have all those to do with estate work, either in North or South America, as well as in many other centres, discussed the whys and wherefores that prevent a mule from breeding. We have always understood that such a thing is impossible. Venezuelan llaneros, American breeders, negro overseers, Spanish hacienderos, East Indian coolies, even Portuguese and Chinese shopkeepers have all in turn discussed the matter with us, and proved conclusively that for a mule to foal is impossible. In spite of all this, our contemporary, "La Hacienda," of Buffalo, trimphantly includes a photograph of a mother mule and a foal, with these words underneath (see their August issue, p. 349): "Mula que dio á luz un potrello en la Hacienda Hortela, Pilar de Alagoas, Brasil." (Mule which gave birth to a foal on the Hacienda Hortela, in Pilar de Alagoas, Brazil). Surrounding the two animals, which stand side by side, is a crowd of twelve men and boys, and probably there were others that could not be squeezed in the picture. We wonder whether all of these realised at the time how many tongues will be set wagging again over this evergreen controversy, at the sight of the photograph of this mother and son, since *potrello* not *potrella,* is used.

To further remove any doubt on the matter, we reproduce the following paragraph from the "Agricultural News" of Barbados, W.I., of a similar case in Cyprus, but in this instance it will be seen that two young mules had made their appearance. This would disprove any claim of the occurrence being a freak.

Under the heading "A Fertile Mule," our West Indian contemporary reports that some very interesting correspondence recently appeared in "The Field" (August 2nd and 9th, 1913) concerning the case quite lately observed in Cyprus of a female mule with foal at foot, (Plate.) The observations were recorded in the first instance by G. J. Harvey, M.R.C.V.S., Government Veterinary Surgeon, Nicosia, Cyprus. When called to the case he was informed that the foal was the second one born; last year the animal had given birth to a filly foal which lived two months. The present one was a colt foal two months old by a jack donkey and resembled somewhat a young donkey, but was bigger. The mule herself was 6 years old, 13.2½ hands high, and bay with black points. There were no special marks or stripes, and the animal was of a very good type. Inquiry seemed to indicate that she was bred from a she-donkey, sire unknown. At the time of writing she was giving milk, and the foal suckled in the presence of the veterinary surgeon, who was able to certify that both mule and foal were genuine. —"Tropical Life."

PLATE 41.—MARE MULE WITH FOAL. ILLUSTRATING NOTE BY G. J. HARVEY, GOVT. V. S., NICOSIA, CYPRUS.

# Entomology.

## A NEW FRUIT-BORING CATERPILLAR OF BANANAS OCCURRING AT TWEED HEADS (*HETEROMICTA LATRO*).

By E. JARVIS, Assistant Government Entomologist.

The following notes are written for the purpose of directing the attention of planters to an insect, hitherto unrecorded as economic, that is causing damage to green Cavendish bananas in the above-mentioned locality.

Samples of affected fingers, exhibiting the peculiar form of injury shown in the accompanying illustration, were submitted at this office last November, and examination soon revealed the presence of large, active grubs hidden under the damaged skin and engaged in devouring the fruit pulp.

*Previous Occurrence.*—These larvæ were transferred at once to a breeding cage, and in due time, when the first moth emerged, it was seen to be identical with a species previously bred by the writer during September, 1908, from larvæ tunnelling the trunks of grass-trees on Moreton Island. In the spring of the following year (1909) Mr. H. Tryon, Government Entomologist, noticed it boring the same plant at Glass House Mountains; so it seems reasonable to assume that this moth may eventually be found to breed more or less freely throughout grass-tree country.

Its possible occurrence in the Wide Bay district constitutes a danger which, although by no means alarming at present, may perhaps prove a source of trouble later on, and it behoves banana-growers at Nambour and Mooloolah, &c., but particularly those on the Southern border of the State, to keep a lookout for early signs of the presence of these fruit grubs.

My thanks are due to Dr. A. J. Turner, who has identified this pest as *Heteromicta latro*, and to Mr. N. Joubert, a well-known planter, for supplying information relative to its first appearance on the Tweed River.

This occurred about seven years ago, and at present the insect is more or less in evidence on all banana plantations in that district. He informs me that the injury is usually noticed on isolated plants, and seemingly may originate on either very young, half-grown, or ripening fruit.

Large or small bunches may be attacked, but as a general rule only a few fingers of a bunch, and these do not infect adjacent fruits.

*Nature of Injury.*—The disease invariably commences at the flower end of a finger, and soon becomes too conspicuous to be easily overlooked.

It bears no resemblance, however, to the comparatively smooth scab-like blemishes produced on green bananas by our other fruit-eating caterpillars,* but appears more like dry rot of a greyish-brown colour, and

* See—"Fruit Caterpillar of the Banana," E. Jarvis, "Qld. Ag. Journal," Jan., 1914

apparently does not hasten the decay of fruit or cause it to fall prematurely. The excreta of the grub are often noticeable on the damaged skin, and usually webbed together to form a mass, that serves to hide the mouth of the tunnel through which it has been ejected.

Although this disease may extend an inch or so towards the middle of a banana, it does not prevent the lower half from ripening in a normal manner; unless, as sometimes happens, fungi, such as ripe-rot (*Glocosporium sp.*) or other organisms have invaded the tissues, in which case the entire finger may quickly blacken and decompose.

Our common maize moth (*Dichocrocis punctiferalis*) has lately taken to boring green bananas, and its work might easily be mistaken for that of the insect under discussion, as it attacks the flower end of the fingers, producing effects very similar to those alluded to above.

*Note.*—It will be of interest to mention that a few diseased bananas, kindly submitted by Mr. Joubert, exhibited symptoms differing in many respects from those just described.

No moth-borer occurred, but the extremities of these fingers were whitish or flesh-coloured, presenting a remarkable form of dry rot of the consistency of hard cheese, that when broken across was found to enclose pupæ from which there ultimately emerged specimens of a beetle belonging to the genus Dotieus, and apparently identical with *Doticus pestilens*, an insect known to be injurious to apples in some parts of Victoria.

This beetle should be regarded with suspicion until we know more about its economy. Apples attacked by it are said to shrivel on the tree and hang there the whole year, the larvæ pupating in the dried fruit, from which, in the ensuing spring, the beetles emerge to lay their eggs.

The diseased portions of these fingers also harboured numerous larvæ of a species of *Nitidulidæ* closely related to *Carpophilus hemipterus*, a notorious destroyer of dried Turkey figs, &c.

*The Moth.*—Life-size photos of both sexes of the perfect insect are figured on plate 42, but, as it is seldom noticed in the field, a technical description of the moth is unnecessary, and it will be sufficient to mention that the front wings of the female are of a uniform pale brownish-gray, and those of the male similarly coloured, but with the addition of a longitudinal white streak and a dark-brown one adjoining it running the full length of the wing, the latter streak occupying a nearly central position.

The hind wings in both sexes are very pale-silvery gray, with the outer angles faintly clouded with brown.

*Description of Larva and Pupa.*—The following brief descriptions will enable growers to identify the caterpillar and pupa of this fruit grub:—

*Larva.*—General colouration, dark smoky-brown with a dull yellow band down centre of back on the three posterior segments constituting the tail end, and less noticeable blotches of the same colour on segments just behind the head.

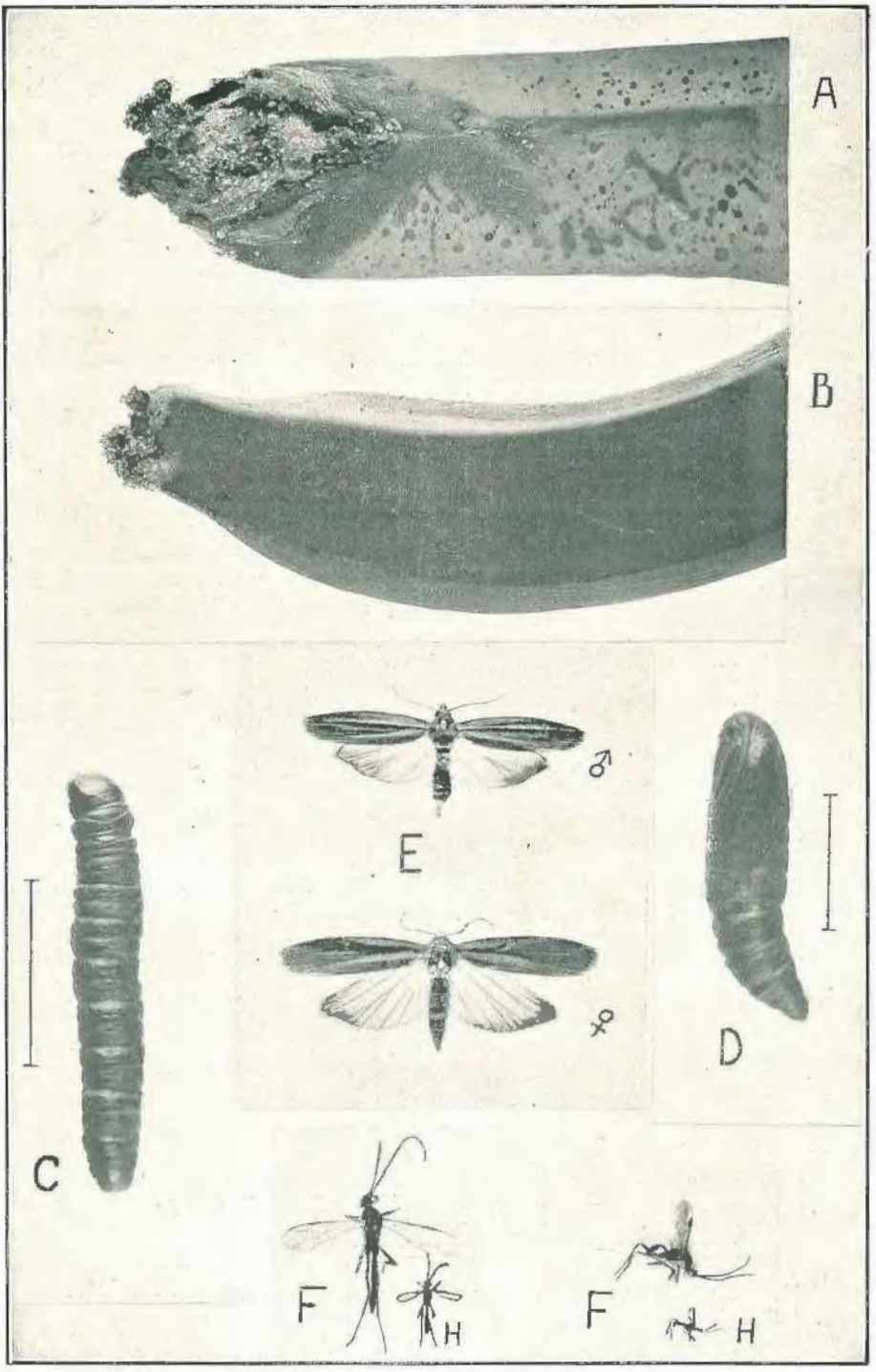


PLATE 42

A—Injury to flower end of finger (advanced stage). B—Injury to flower end of finger (early stage). C—Caterpillar, magnified about 2¼ times. D—Pupa, more than twice natural size. E—Moth (*Heteromicta latro*) natural size (♂ male, ♀ female). FF—Hymenopterous parasites of *H. latro* (magnified). HH—Natural size of these parasites.

First thoracic segment (next to head) reddish-yellow, smooth, and shining, with a narrow light-yellow central line and the frontal edge blackish.

Head dark shining red. Under surface of body, including feet, dull greenish-yellow.

Length about 25 mm. (about 1 in.).

*Pupa.*—The pupa, which is enclosed in a somewhat papery-looking silken cocoon covered with excreta and débris, is pale yellow suffused with dark reddish yellow on the back and head, and has a narrow keel-shaped ridge running along the middle of back and extending the whole length of the body.

The extremity of the anal or last body segment is dark reddish in colour and provided with eight short, stout, pointed protuberances.

Length of pupa about 18 mm. (about ¾ in.).

*Control Methods—Natural Enemies.*—Fortunately this insect is held in check by hymenopterous parasites which, up to the present, appear to have kept it from doing serious damage.

The two parasitic wasps, figured F.F. on the accompanying plate, were bred by the writer from larvæ procured in 1908.

The thorax, head, and antennæ of the larger species are black, the abdomen light-red, barred with somewhat triangular-shaped black dorsal blotches, and the legs light red with hind tarsi black. Length of insect about 7 mm. (¼ in.).

The smaller wasp is brownish-yellow with green eyes, and two-thirds of the dorsal surface of its abdomen—viz., the basal and apical portions—are dark-brown, the remaining central third being brownish-yellow bordered on each side with black. Nervures of the wings and stigma brown, the latter large and conspicuous. Length of insect about 4-50 mm. (⅛ in.).

*Artificial Control.*—Growers should endeavour to prevent the moths from breeding by picking and destroying all infested fruits as soon as noticed.

Such treatment followed systematically would go far towards exterminating this pest, and at the same time check the breeding—among bananas, at any rate—of its more dangerous associate the maize moth (*Dichocrocis punctiferalis*). In this connection, I should like to embrace the opportunity of warning growers of the danger likely to result from planting maize in the immediate vicinity of bananas.

Other hosts favoured by this pest are—cotton, pawpaws, loquats, custard apples, peaches, &c.

It will be of interest to mention that a grower at Blackall has succeded in keeping the maize moth in subjection by simply rubbing off the flowers from the ends of fingers as soon as they have assumed a brown tint and become partially dry, from which we may infer that the eggs of this insect are probably deposited among the petals of withered flowers on half-grown fruit. These useless blossoms not only afford possible security to eggs of noxious insects, but in some districts may be

a source of positive danger to developing bananas, as they occasionally harbour destructive fungi, the spores of which, when scattered broadcast over the bunch in enormous numbers, are ever ready to invade green or ripening fruit as soon as favourable opportunity offers.

Whilst on this subject, I would like to emphasise the advisability of preventing, as far as practicable, the spread of "Ripe Rot" or Anthracnose (*Gloeosporium* sp.) among banana plantations.

This fungus attacks a great variety of different fruits and vegetables, usually gaining an entrance through wounds in the peel or skin, caused by puncturing or biting insects, birds, falling twigs, hail, or unsuitable cultural conditions, &c.

I cannot do better than briefly summarise in part the admirable advice published by Professor Cobb relative to the best preventive treatment for this fungus:—

(1) Prevent the fruit from being injured by insect pests or other enemies.

(2) Destroy all affected unmarketable fruit that may be growing in the vicinity of the plantation.

(3) Destroy all rotting tomatoes, cucumbers, pumpkins, and vegetable matter generally.

(4) Apply fungicides to affected banana plants and to other plants or trees in the vicinity that may be found harbouring the ripe rot fungus.

(5) Do not spray at a time when the operation will be immediately followed by hot sunshine; and take care to apply spraying solutions in a mist-like form.

(6) Guard against injury to the fruit from chafing, or from falling twigs and other débris.

(7) Provide efficient drainage conditions.

(8) Disinfect fruit cases, boxes, &c., by immersion in boiling water or weak formalin solution.

To return to the question of the control of *Heteromicta latro*, I may say, in conclusion, that grass-trees growing near banana plantations are a possible source of infection and should be rooted out and burnt.

And now, just one word with regard to the treatment of grub-infested fruit.

In view of the possibility of such bananas containing parasitised larvæ, they should not be burnt, but the dried ends cut off just below the injury and thrown into an empty kerosene case or other wooden box that has been previously made grub-proof and fitted with a cover of perforated zinc (16th inch mesh). A few dead leaves and a little sawdust sprinkled over the bottom will induce larvæ to pupate in this box instead of attempting to crawl away; and moths that may emerge later on will be unable to escape, whilst any parasites hatched will at once crawl through the holes in the metal lid and be free to carry on their useful work.

# General Notes.

## POISONING TREES.

We have received the following letter from Mr. G. H. Bomford, Izulwini, Byrnestown, giving his and Mr. E. Neilsen's experience in the work of not only killing growing trees, but in also preventing the growth of suckers. We have many inquiries on this subject, and Mr. Bomford's letter will doubtless be read with much interest by many farmers and new settlers, who are troubled with an after-growth of suckers after ringing or felling the trees. Mr. Bomford writes:—

"In your issue of a few months back you ask for information and experience with the arsenic method of poisoning trees. Two years ago I tried that method on about 5 acres of thickly-timbered box and ironbark country, with the result that about 80 per cent. died right out, about 15 per cent. died at the top, but suckered below the ring, and the remaining 5 per cent. are still green.

"I rung the trees about 2 ft. 6 in. from the ground, with a single ring, and then poured the poison in the ring. The trees that remain green at the top are those in which the cuts did not meet all the way round the tree. The ring is apparently complete in the trees that have suckered at the bottom, but died at the top. I only tried the treatment on the one occasion in the month of February. My neighbour, Mr. E. Neilsen, has treated about 80 acres (mostly grey gum), and his experience with the ring about 2 ft. 6 in. from the ground is practically the same as mine. Most of his, however, were done with the ring as close to the ground as practicable, and he reckons his result with that is practically 100 per cent. of deaths without suckering, if the ring is continuous. Mr. Neilsen was ringing for several months at about the same time that I did mine. The poison used by both of us was 1 lb. ordinary grey commercial arsenic, dissolved in a kerosene tin of boiling water, with 2 lb. of washing soda."

## BANANA JUICE *v.* SNAKE-BITE.

A correspondent of the Rockhampton "Bulletin," from Mount Larcom, gives an instance of a cure effected by the use of banana juice, on a dog which had been bitten ten days ago by a brown snake. He writes: "At 9 o'clock on Friday morning, 20th February, my cattle slut was bitten by a brown snake about 3 ft. long. I killed the snake, but did not know my dog was bitten until 10 o'clock. The bite was on the lip, and the head was swollen, the heart was thumping against her ribs, and the poor animal seemed in a bad way. I got some banana juice from young suckers, and gave the slut a dose. This seemed to relieve the heart-beating at once. I gave five doses, I should say, about half a

pint in all, and by the evening she seemed much better. She is now quite well except for a swelling where the bite was. My dog has killed a large number of snakes, and this is the fifth time she has been bitten, but it is the first time a brown snake got hold of her. The cure seems to show that banana juice is a good antidote for snake-bite, and I think I should chance taking some myself if ever I have the bad luck to be bitten. We have killed over 150 snakes since coming here. I think it is the worst place I have ever struck for the reptiles."

We have several times drawn attention to reported cures of snake-bite in Brazil and India, and now we have apparently confirmation of the benefit of banana juice in Queensland. Of late there have been several cases of snake-bite in the country districts near Brisbane, one of which proved fatal. Surely the antidote could have been tried, the juice being perfectly harmless. Now we hear of the death of Dr. Fox, in India, a scientist who has been demonstrating the powers of an antidote he possessed. He frequently allowed himself to be bitten, and unfortunately he overlooked one of five punctures made in his arm by a "fraity" snake, and his death consequently followed.

An analysis of the juice of the banana would doubtless reveal the presence of something besides tannin and water.

## A JUMPING RABBIT.

It is generally understood that rabbits in Queensland have developed a climbing habit, which enables them to overcome such an obstacle as rabbit netting. What is most remarkable is, that the rabbit here has developed a new nail—a long nail by which they can retain their hold on a wire fence whilst climbing.

An article in the "Enquirer," in connection with this new feature in the rabbit's anatomy, was to the following effect:—"About forty-five years ago, three pairs of enterprising rabbits were introduced into Australia. To-day the increase of those six immigrants may be counted by millions. They became a pest to the country Fortunes have been spent to exterminate them. Wire fences many feet high have been built to keep out the invaders for hundreds of miles in the West. The rabbits had to fight awful odds to live, but now they have outwitted man. They have developed a new nail, which not only enables them to climb the fences, but to burrow 6 to 8 in. beneath the wire." This statement was submitted in March, 1913, to Dr. Hamlyn-Harris, Curator of the Queensland Museum, and he said that so many variations have been noted in the structures of rabbits that he would have considerable hesitancy in giving a direct negative to the story of an abnormal development of a rabbit's nail, since rabbits introduced into the island of Porto Santo have developed distinct characteristics. But there is no definite record of any such modification in Australian specimens. The new nail is probably an individual abnormality. We find in the "British Live Stock Journal" (16th January, 1914), that "Brer" Rabbit has developed

jumping tendencies. A paragraph in that journal, taken from "The Field," is to the following effect:—

> "The other day, when covert shooting, I saw a rabbit jump a 3 ft. 6 in. stake and bound fence. I have never before seen a rabbit do anything but crawl through a gap in a stake and bound fence; the ditch was towards the rabbit in the above instance, but the ditch was small, the fence newly made up, and no doubt the rabbit, which had been shot at and missed, found its usual gap made up and had to jump."

It will be a sorry day for Australia should our rabbits contract a jumping habit, as our rabbit fences are only 3 ft. 6 in. high, and they would require to be raised to the height of dog-proof fences.

## A NEW SISAL SCUTCHING MACHINE.

A new machine for extracting sisal hemp fibre is referred to in the "Monthly Bulletin of Agricultural Intelligence and Plant Diseases" (May, 1913). This machine is stated to be distinguished by its great simplicity; and the recent trial before a number of managers of plantations in German East Africa showed the extraction of the fibre to be excellent. The "Roland" machine—as it is called—is built of heavy iron, and the intermediate gearing is mounted on the machine itself, which is besides fitted with ball bearings of a special type, which allow it to run with extraordinary smoothness. About 25-h.p. are required to drive it when working at its maximum.—"Agricultural News," Barbados.

## SUGAR FROM LUCERNE.

We already well know the various sources whence sugar is derived, and at least many proposed sources for the commercial extraction of sugar, many of which, so far, have never got beyond experiments in the laboratory.

Now, however, it is from the lucerne plant that it is proposed to extract sugar. Naturally, it is from the United States that this news comes, and it is said that during the past year a company has been formed entitled "The National Alfalfa Products Company," to place the products of lucerne on the market. Amongst these, that of greatest importance is a syrup containing 33·15 per cent. of sugar—that is to say, as much as is contained in the syrup of apples. The flavour of the lucerne syrup is said to be very delicate, and this product is obtained from very young lucerne, cut after only twelve days of growth. This admits of twelve crops in a season. The product is treated by artificial heat, and the cost of production is set down at 1 fr. 25 (about 1s.) per gallon. According to the promoters of the company, lucerne thus utilised would be so valuable that it would no louger be cultivated as simply fodder for stock. It would, furthermore, be a source of cheaper sugar.—"Journal d'Agriculture Tropicale," Paris.

According to an analysis of green lucerne by Mr. J. C. Brünnich, Agricultural Chemist (1st December, 1901), published in the "Queensland Agricultural Journal," the constituents of the grass are as follows:—

| | Per Cent. |
|---|---|
| Moisture ... ... ... ... ... ... ... | 79·30 |
| *Total dry substance* ... ... ... ... ... | *20·70* |
| Soluble albuminoids ... ... ... ... ... ... | ·69 |
| Insoluble albuminoids ... ... ... ... ... | 2·20 |
| Digestible fibre ... ... ... ... ... ... | 5·61 |
| Woody fibre ... ... ... ... ... ... ... | 5·06 |
| Soluble Ash ... ... ... ... ... ... ... | 7·41 |
| Insoluble Ash ... ... ... ... ... ... ... | ·55 |
| *Crude Ash* ... ... ... ... ... ... | ... |
| *Pure Ash* ... ... ... ... ... ... ... | *2·31* |
| Fat ... ... ... ... ... ... ... ... | ·31 |
| Amides, &c., by difference ... ... ... ... ... | 4·52 |
| Amide nitrogen ... ... ... ... ... ... | ·243 |
| Total nitrogen ... ... ... ... ... ... ... | ·706 |

Notwithstanding this dazzling project, Queensland dairymen will still continue to feed lucerne to their stock, and thus make more money out of it than by any such Utopian scheme as above described of turning the fodder into sugar.—[ED. "Q.A.J."]

## TO COTTON GROWERS.

The Department of Agriculture and Stock is prepared to receive raw cotton for ginning, to be consigned to Brisbane. The cotton will be ginned and sold, and the net proceeds, after deducting the cost of ginning and marketing, will be paid to the grower.

An advance of 1½d. a lb. will be paid upon receipt of the raw cotton in Brisbane, calculated upon the weight received.

# Answers to Correspondents.

## COOLING CREAM.

J. TRAVERS, Crow's Nest—

Your letter asking for a simple method of cooling cream and retaining it at a comparatively low temperature on the dairy farm was submitted to Mr. E. Graham, Dairy Expert, who has forwarded to you his pamphlet entitled, "Advice on the Routine of the Dairy," on page 21 of which is given an illustration of one of the best designs of cream-coolers, set ready for operation. The water supply is contained in water-bags as shown, and the water may be reused for the purpose required of it.

Explanatory notes on the treatment of the cream supply on the dairy farm are given on page 22 of the pamphlet.

After cooling and aerating the low temperature of the cream may be retained by lodging it in a cream cabinet. A sketch of this device is shown on accompanying plan, marked in red ink, while the structural essentials of the cabinet are detailed in the latter portion of the specification enclosed.

To your question on feeding dairy stock, Mr. H. C. Quodling, Inspector of Agriculture, replies:—

"Panicum and Japanese millet are incomplete foods for milk production, as they do not contain sufficient protein; this element is essential to carry on the vital function of an animal.

"When using these or other green fodders such as sorghum or maize, it is necessary to use about 40 or 45 lb. of this greenstuff per day for each animal, and add from 15 to 18 lb. of lucerne or cowpea chaff to it, in order that the beast may receive a properly-balanced ration.

"Skinless barley and field peas, grown together, afford a nutritious fodder, well suited for milk production. Use about 50 lb. of barley and 25 lb. of peas per acre. The present month is a suitable time to plant."

## ORANGES AND THE FRUIT FLY.

Replying to a query from A. E. L. Birtling, Boyne River, Mundubbera, Mr. C. Ross, F.R.H.S., Instructor in Fruit Culture, writes:—

"The close proximity of the deciduous orchard, owing to its subjection to fruit fly, would certainly be a menace to a late orange crop. The Washington navel is a shy bearer when young, especially on weak soils. It does best on a fairly strong loam with proper drainage, and requires more generous treatment regarding fertilisers than most varieties. It can be brought into a regular habit of bearing by cincturing, articles on which are to be found in the January and February numbers of the "Queensland Agricultural Journal." The Joppa, being a more consistent bearer, may be substituted. The Valencia, being late, is more

liable to fly attack, nevertheless, taking year by year, it is probably the most profitable variety. Mediterranean Sweet and St. Michael are both sure croppers, and much earlier will suit the locality."

## TOP-DRESSING PASTURE LAND.

W. V. JOCUMSEN, Cooroy—

To be effective bone dust applied as a surface pasture fertiliser should be in a very fine state of division, such as bone flour. Bone dust is a phosphatic manure, and for grass land a manure containing both soluble phosphoric acid and nitrogen is to be recommended. The nitrogen is very important. As to when the paddock would require another dressing, this would depend upon the class of land and the amount of manure applied in the first instance, possibly three or four years. There is no danger to stock from an application of bone dust—in fact, it would be more a benefit than otherwise. Should it be intended to apply a fairly heavy dressing of fertiliser, the pasture could be improved to a much greater extent by spending the money on breaking up the land and putting it under Rhodes grass, but as you will be unable to plough it for three years, your plan will have to be followed.

## SAP-SUCKING INSECTS.

H. H. STEGMAN, Ebagoolah—

The insects referred to in your letter were handed to Mr. Edmund Jarvis, Assistant Entomologist, who has furnished the following report thereon:—

"The two insects forwarded by Mr. Stegman are different species of plant-bugs, the larger belonging to the family Coreidæ, and the smaller one to family Pyrrhocoridæ.

"Both insects are sap-sucking in habit, the latter, which is very common, having been unusually plentiful during the past season.

"The Coreid bug has not hitherto been recorded as a serious economic insect, although it is closely related to species that are known to be destructive at times to cucurbitaceous and other plants.

"Both of these bugs when numerous will probably attack any cultivated fruits that they may find will afford palatable moisture.

"They can, however, be effectively controlled by hand methods of collecting, practised during early morning or at times when the insects are seen to be resting on foliage and disinclined to fly.

"At such times they may be shaken or brushed off the leaves into a shallow pan or dish containing a little water and kerosene, or trapped in any other manner which may suggest itself as being adaptable to circumstances."

## TESTING THE SOIL FOR LIME.

"SISAL," Logan road—

Sisal (*Agave rigida var. Sisalana*) will not thrive without a certain proportion of lime in the soil. It is very easy to ascertain whether this is present or not, by taking a portion of the soil and pouring some

hydrochloric acid on it. If lime is present, an effervescence will follow. Should this not occur, it will be necessary to apply lime before planting. About one ton per acre would be sufficient. The above test will not tell you what quantity of lime is in the soil; it merely shows that it is there.

## APRICOT AND PLUM TREES CEASING TO BEAR.

A. S., Veradilla—

Our correspondent asks if anything can be done for plum and apricot trees that have ceased to bear when eight years of age, after having borne heavy crops at the second and third fruiting, the plum-trees flowering well, but the fruit dropping off after attaining the size of a pea, the apricot-trees not flowering at all.

Mr. C. Ross, F.R.H.S., Instructor in Fruit Culture, advises:—

"Endeavour to form a new head to the trees by pruning hard back next winter, reducing the size of the head to at least one-half. Do not allow the following summer's growth to become overcrowded. See that the new growths are properly spaced by rubbing off superfluous shoots with the finger and thumb. Encourage root action by good cultivation. Keeping the surface well stirred will conserve sufficient moisture to prevent dropping. Dress the soil as far as the extremities of the branches with 4 lb. superphosphate, 2 lb. sulphate of potash, and 1½ lb. sulphate of ammonia for each tree, and chip in annually."

## FEEDING FOWLS FOR EGGS.

C. D. C., Cooktown—

In reply to yours of 16th instant *re* feeding fowls for eggs: Fowls when laying require flesh-forming foods. A laying ration should be of meat or green bone in addition to a living ration. The latter should consist of warm soft food, and each hen should get a lump the size of a tennis ball in the morning, a good handful of grain (preferably wheat) at night, with plenty of green food at midday. Then the laying ration should be ½ oz. of meat or green-cut bone given at midday. A little meat may also be given with the morning meal, but the diet should never consist of all meat or all grain or all greenstuff, otherwise you will engender liver disease, gall bladder, and disorders of the intestines. For a good egg supply a varied diet composed of meat, grain, and vegetables is undoubtedly the best. Pollard and bran are good for the soft morning meal. Maize is a dangerous food. Given in excess, it produces liver disease. It is heating and fattening, and therefore dangerous to birds in a warm climate or in constant confinement. It produces a yellow fat and induces the laying on of internal fat which clogs the organs of egg production. It is all right for broody hens, which should be fed only once a day, and want a heating, fattening, filling grain that does not digest too rapidly. Maize is just such a food. One pound of potatoes and 1 lb. of bran is a useful soft mixture. There is a deficiency of fat in this, but a handful of grain in the evening will supply it. When using bran, be sure and scald it well before mixing. Water should be supplied plentifully, seeing that the body of the fowl is composed of 75 per cent. of water, and the egg 75 per cent.

# The Markets.

## PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1914.

| Article. | | MARCH. Prices. |
|---|---|---|
| Bacon | lb. | 11½d. |
| Bran | ton | £5 10s. |
| Butter | cwt. | 108s. |
| Chaff, Mixed | ton | £5 10s. to £6 |
| Chaff, Oaten (Victorian) | ,, | £4 to £4 10s. |
| Chaff, Lucerne | ,, | £5 5s. to £5 12s. 6d. |
| Chaff, Wheaten | ,, | £3 5s. to £4 |
| Cheese | lb. | 6d. to 6½d. |
| Flour | ton | £9 |
| Hams | lb. | 1s. 1½d. to 2s. |
| Hay, Oaten (Victorian) | ton | £6 to £6 10s. |
| Hay, Lucerne (Prime) | ,, | £3 10s. to £4 15s. |
| Honey | lb. | 1½d. to 2¾d. |
| Maize | bnsb. | 4s. 4½d. to 4s. 5½d. |
| Oats | ,, | 3s. 9d. to 4s. 6d. |
| Onions | ton | £11 |
| Pollard | ,, | £5 10s. |
| Potatoes | ,, | £9 to £11 10s |
| Potatoes (Sweet) | cwt. | 3s. to 4s. 6d. |
| Pumpkins | ton | £1 10s. to £2 10s. |
| Wheat, Milling | bush. | 3s. 6½d. to 3s. 6¾d. |
| Eggs | doz. | 1s. to 1s. 6d. |
| Fowls | pair | 2s. 3d. to 3s. 9d. |
| Geese | ,, | 5s. to 5s. 6d. |
| Ducks, English | ,, | 2s. 3d. to 2s. 6d. |
| Ducks, Muscovy | ,, | 3s. to 4s. |
| Turkeys (Hens) | ,, | 7s. to 9s. |
| Turkeys (Gobblers) | ,, | 15s. to 20s. |

## SOUTHERN FRUIT MARKETS.

| Article. | MARCH. Prices. |
|---|---|
| Bananas (Fiji), G.M., per case | 13s. to 16s. 6d. |
| Bananas (Fiji), per bunch | 2s. 6d. to 3s. |
| Bananas (Queensland), per case | 9s. to 11s. |
| Bananas (Queensland), per bunch | ... |
| Mandarins (Emperors), per case | ... |
| Oranges (Navel), per case | ... |
| Oranges (other), per case | ... |
| Pawpaw Apples, per quarter-case | |
| Passion Fruit, per half-case | 11s. |
| Pineapples (Queensland), (common), per case | 6s. to 7s. |
| Pineapples (Queensland), (Ripleys), per case | 6s. to 7s. |
| Pineapples (Queensland), (Queens), per case | 7s. to 8s. |
| Pineapples (Rough), per half-case | 1s. 6d. to 2s. 6d. |
| Strawberries | ... |
| Tomatoes, per quarter-case | ... |

## PRICES OF FRUIT—TURBOT STREET MARKETS.

| Article. | MARCH. Prices. |
|---|---|
| Apples, Eating (American), per case | 8s. to 10s. |
| Apples, Cooking (American), per case | 6s. to 7s. |
| Apricots, per quarter-case | ... |
| Bananas (Cavendish), per dozen | 2d. to 3½d. |
| Bananas (Sugar), per dozen | 1¼d. to 2d. |
| Cape Gooseberries, per quarter-case | ... |
| Cherries, per quarter-case | ... |
| Citrons, per cwt. | ... |
| Cocoanuts, per sack | ... |
| Cumquats, per case | 6d. to 9d. |
| Custard Apples, per case | ... |
| Grapes, per pound | ½d. to 4d. |
| Lemons (Local), per case | 8s. to 10s. |
| Limes, per case | ... |
| Mandarins, per case | ... |
| Mangoes, per case | 3s. to 4s. |
| Oranges (Italian), per case | ... |
| Oranges, per case | ... |
| Papaw Apples, per quarter-case | ... |
| Passion Fruit, per quarter-case | 7s. to 8s. |
| Peanuts, per pound | 3d. to 3½d. |
| Peaches, per quarter-case | 3s. to 4s. 3d. |
| Persimmons, per quarter-case | 1s. to 1s. 9d. |
| Pineapples (Ripley), per dozen | 6d. to 3s. |
| Pineapples (Rough), per dozen | 4d. to 2s. 6d. |
| Pineapples (Smooth), per dozen | 1s. to 3s. |
| Plums, per quarter-case | 3s. to 4s. |
| Quinces, per case | 1s. to 3s. |
| Quinces, per quarter-case | 1s. to 1s. 6d. |
| Rockmelons, per dozen | ... |
| Strawberries | ... |
| Sugarmelons, per dozen | 1s. to 1s. 6d. |
| Tomatoes, per quarter-case | 1s. 6d. to 2s. 6d. |

## TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1914.

| Animal. | FEBRUARY. Prices. |
|---|---|
| Bullocks | £11 12s. 6d. to £13 17s. 6d. |
| Bullocks (Single) | £14 7s. 6d. |
| Cows | £8 10s. to £10 17s. 6d. |
| Merino Wethers | 21s. 3d. |
| Crossbred Wethers | 28s. |
| Comeback Wethers | 31s. 3d. |
| Merino Ewes | 19s. 6d. |
| Crossbred Ewes | 21s. |
| Lambs | 19s. 6d. |

## ENOGGERA FAT STOCK STATISTICS.

THE FOLLOWING WERE THE SALES OF FAT STOCK THROUGH THE NEWMARKET YARDS FOR THE MONTH OF FEBRUARY, 1914.

| — | Sheep. | Lambs. | Cattle. | Calves. |
|---|---|---|---|---|
| Fenwick and Co. ... ... ... | 7,358 | 770 | 1,116 | 243 |
| Morehead's Ltd. ... ... ... | 6,105 | 450 | 671 | 157 |
| Dalgety and Co. ... ... ... | 4,200 | 115 | 613 | 160 |
| N.Z. Loan and M.A. Co., Ltd. ... | 2,625 | 437 | 119 | 49 |
| The Aust. Estates and M. Co., Ltd. | 1,910 | 314 | 61 | 49 |
| Winchcombe, Carson, Ltd. ... ... | 1,814 | 51 | 391 | 84 |
| John Bridge and Co., Ltd. ... ... | 1,481 | 52 | 676 | 87 |
| Sturmfels Ltd. ... ... ... | 1,201 | 649 | 212 | 14 |
| Thos. Noyes ... ... ... ... | 1,037 | ... | 126 | ... |
| Mactaggart Bros. ... ... ... | 70 | ... | 217 | 59 |
| A. M. Land and Finance Co., Ltd. ... | ... | ... | 1 | 11 |
| | 27,801 | 2,838 | 4,203 | 913 |

# Farm and Garden Notes for May.

Field.—During this month, the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the department from the growers, to whom an advance of 1½d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments; freight will be deducted. Thus it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to insure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass, notably, Rhodes grass, will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta, Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

Kitchen Garden.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

Flower Garden.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all

trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

# Orchard Notes for May.

## THE SOUTHERN COAST DISTRICTS.

The advice given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to speeking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit fly, and sweat the fruit carefully before packing. If this is done, there will be little fear of the fruit going bad in transit or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil; keep down undergrowth, and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon

overtaken by trees planted later, that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done, it will probably be moist enough for planting; but should there have been a dry spell, then when the hole has been dug and the tree set therein, and the roots just covered with fine top soil, 4 to 8 gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound, free sandy loam that are naturally scrub, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting the better. If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to be well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedlings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked—first, to retain moisture; and, secondly, to prevent injury from frost—as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure, or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place; but quickly-acting manures should not be applied now.

## THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, pawpaws, and granadillas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and, though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast Districts being equally applicable here.

## THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as, although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district grow a crop of blue or grey field peas or a crop of vetches between the trees in the older orchards as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than 4 cwt. of phosphatic manure, such as Thomas' phosphate or fine bone dust, per acre; the crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes overlarge and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, when the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit—scabby, warty, or otherwise unsightly fruit—is not suitable for peel, and trees producing such require cleaning or working over with a better variety, possibly both.

The remarks *re* other citrus fruit and the work of the orchard generally, made when dealing with the Coast Districts, apply equally well here, especially as regards handling the crop and keeping down pests.