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QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

THE MONEY-MAKING VALUE OF GOOD BREEDING IN CROPS AND STOCK.

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

[Paper read before the Wide Bay and Burnett Pastoral and Agricultural Society.]

It can be taken as a self-evident truth that the object of each man on the land is to make money. Each man's farm or holding is purely a business into which he has put a certain amount of capital, and on which he expends each year a considerable amount of money and work. The returns each year, or, rather, the average returns over a number of years, should be sufficient (*a*) to cover interest on the capital invested, (*b*) to pay an adequate wage for all labour expended on the farm, (*c*) to cover the annual expenditure on seed, manure, utensils, repairs, &c.—in fact, all those expenses incidental to the running of the farm—(*d*) to provide a reserve to cover depreciation of buildings, equipment, and working stock, and (*e*) to yield some surplus for the purpose of expansion and development.

This statement seems to be quite obvious and simple. And if anyone cared to run a farm with paid labour only, then a set of books would have to be kept setting forth accurately each of the above-mentioned items. The simplicity of the question, however, immediately disappears when we consider the case of a man working his own property. Here the man's own labour, and often the labour of his family, is put into the property without any fixed monetary value being allocated to it. Thus part of such labour may reasonably be devoted to improvements, and the money value of this should rightly be set against the capital invested. Again, some of the work done will be assuredly devoted to repairs or to some other item of farm work, and it should be recorded against that special section at its full monetary value. In this way only can we hope to get a clear idea of whether a farm is paying legitimate profits or not. Instead of adopting any such system of clear book-keeping, the general farmer merely takes his net revenue at the end of the year or at odd times during the year, as represented by his balance at the bank. He is certainly not in a position to say whether his and his family's labour has or has not earned a fair daily or hourly wage. I think it is because of the lack of definite ideas in this regard that farmers generally are so careless about their labour. They have no clear idea of the value of their day's work, and so, in a vast number of cases,

they unconsciously place their labour at a very low figure. This must be the case, or else we would not find so many farmers willingly wasting a great deal of effort.

There are several ways in which a farmer may waste effort. For example, he may prepare his land for planting in a careless and indifferent manner, with the result that no crop has a chance to grow and yield a satisfactory harvest. This low return gives the measure for the payment of the labour expended. In many such cases a little extra cultivation, a little extra labour given to the preparation of the land, would have ensured a double or threefold crop.

In a similar way a farm can be badly or well laid out. If badly designed it is quite possible that both man and beast are called on to waste a fair amount of each day, say, in travelling to and from paddocks, opening and shutting numerous badly constructed gates, and so on. This question of planning the farm is of much more importance than would appear on the surface, and it is so recognised in the U.S.A., where they have developed the profession of "rural engineer" for the express purpose of assisting farmers to reconstruct the layout of their farms.

However, I do not wish to speak of these two ways of wasting effort. Where such wastage takes place it is generally quite evident if the individual will merely stop and think and study his own work. The particular form of wastage of effort I wish to speak about is that which is due to the use of poor-bred seeds and stock. Here the wastage of effort is not so self-evident, yet there is no other section of the farm where a greater wastage of time and labour can be involved. Reversing the statement, we might put it this way:—Nothing makes so greatly for prosperity on the farm as well-bred seeds and stock.

SEED BREEDING.

Let me deal with seeds first. How often do we see a man spend a large amount of effort in preparing land for planting and then find that he has purchased the very cheapest seed available in order to plant. Surely this is deliberately putting a low price on his labour. If seed is cheap it is natural to suppose that it is also inferior. It may not be true to name; that is, it may contain considerable quantities of varieties which are unsuitable for the district, or it may be weak in germination. In either case a poor crop is almost certain to result. To wilfully accept a low yield of crop can only have one effect: it must put a low valuation on the labour expended in the preparation of the land, harvesting, and other activities. That is, the man who buys poor seed deliberately rates his labour at a low figure, and in consequence has no right to complain if his farming operations show no fair profits. Or we might put the matter this way: Suppose a man has engaged all the labour required to grow the crop and has paid this labour a fair wage, he would have no right to try and cut down the wages merely because he purchased such poor seed that the resulting crop was unpayable. The fault would be entirely the employer's, because he had been "penny wise and pound foolish" in his expenditure on seed. Now I want to emphasise the fact that this matter of well-bred seed of high productive value is a big thing. Good seed may easily give from 25 per cent. to 50 per cent. greater yield than poor seed, and this for no other expenditure than that involved in the slightly higher price paid for the seed.

To illustrate this we might mention the work that has been done in several other countries, notably Sweden, Canada, and Denmark. In Sweden, which was a grain-exporting country, it was found by 1870 that the competition from overseas began to be felt to such an extent as to threaten the prosperity of the graingrowers of the country. In 1886 the Swedish Seed Association was formed for the purpose of developing better yielding varieties, and the Society's work resolved itself into:—

(*a*) Procuring good yielding varieties from other countries;
(*b*) Finding the best yielding native varieties;
(*c*) Growing these side by side and comparing their yields;
(*d*) Eliminating the poor varieties and propagating the good till a stock had been accumulated;
(*e*) Keeping the good varieties pure and purifying the impure; and
(*f*) Distributing the good seed amongst members and other farmers.

This association acquired land at Svalöf, and for the first ten or twelve years it accomplished little beyond the finding and testing of varieties and the keeping of the best of these up to the standard of purity. Attempts were made to improve some varieties, but with little success. Later, however, Professor Nilsson was appointed in charge, and he, in the light of later knowledge of the laws governing breeding which had recently been discovered, introduced new methods, with the result that Sweden now has improved varieties of cereals which are capable of giving up to 50 per cent. better yields than were given by the best of the old varieties.

Somewhat similar results have been obtained with a variety of crops in Canada, Denmark, Germany, several of the United States, and in Australia with regard to our wheats. But while some of these countries have well-established co-operative societies, whose efforts are devoted to the propagation of pure types and the improvement of varieties, others, like Australia, depend on a few Government farms and Government-paid experts to carry out this vitally important work of improvement, and leave the distribution of the improved varieties to our commercial seedsmen. It is in this latter regard that our system is so weak. It would not be possible within the limits of a single article to give a full description of how this weakness arises, but I will endeavour to give some indication of it, as the matter is so important. Suppose we take a variety of wheat which might have been created, say, by the late Mr. Wm. Farrer. After a number of years of ordinary paddock sowing it can be expected that rogues, that is, foreign strains of wheat, will find their way into the crop. These rogues may, and often do, closely resemble the particular variety grown; that is, as far as the seed appearance goes. But they may differ very widely from the type, both as regards yield and disease resistance. Thus what was a good pure variety is almost certain, with time, to become a mixture of strains. When this happens we say that that variety has run out. In the vast majority of cases these so-called run-out varieties could be re-established under a proper system of pure breeding at a well-equipped seed-propagating station. Above I have spoken of wheat, which is a normally self-fertilising plant. We have a totally different case when we consider crops such as maize, pumpkins, sorghums, and other plants, which are normally cross-fertilised, or which cross-fertilise easily. In these cases varieties may be quickly lost, or be so hybridised as to become of low value. On the other hand, good and heavy-yielding types may very frequently be obtained by special selection in the field. Thus, with maize we have a very useful system of selection and propagation known as the remnant system. For this the first thing to do is to select in the field cobs from heavily yielding plants, but, above all, to select heavily yielding cobs. Next season one half of each cob is planted in a row, each cob being represented by a separate row. Each row is harvested separately, and the five heaviest yielding rows are selected for the propagation of the seed maize. For this purpose the original cobs are again resorted to; that is, the half of the cobs which were first selected in the field, and which gave the heaviest yield on trial. These five are then planted in hills, one seed from each cob in each hill, but the heaviest yielder in the centre of the other four. Repeat in as many hills as will give the amount of seed required for field planting. It is necessary to state that these hills must be well away from any other growing maize so as to obviate outside fertilisation. When the plants in the hills show the first signs of tasselling, each of the plants in each hill, except the centre or highest yielding plant, are de-tasselled. Thus it is secure that the four outside plants are fertilised by the central plant. The future seed is taken from the outside plants only in each hill.

Similar methods might be adopted for pumpkins, though the actual working arrangement would not be so simple as with maize. However, it is not necessary now to describe methods of improving seed; the control of this work is largely the work of experts. What is more immediately essential is the matter of the money-making value of well-bred seed, and I think it is obvious that it would pay to give double price for our seed, always provided we could be sure that its yielding qualities were of a high order. On the other hand, poor seed can only be expensive, no matter how low a price at which it is bought. The only point to be considered is: How can we act so as to ensure that we shall get the high quality seed required?

First, all must be prepared to pay a higher price for their seeds.

Second, everyone must insist on seeing that the seed sold is up to the standard advertised. In this respect it must be remembered that the Queensland Government has a Pure Seeds Act in existence, which can do much to assist us, provided we will take the trouble to insist that all our seed shall not only be guaranteed as up to sample, but is also occasionally tested or retested so as to ensure that the guarantee is correct.

Third, cut out entirely the purchase of seeds of unknown origin.

Fourth, form among ourselves a Good Seeds Association and keep it a live body. Collectively one can secure much more protection than if one attempted to act individually.

As a Good Seeds Association, keep in view the probability of establishing our own seed-propagating farm, with or without Government assistance.

The "Agricultural Gazette of New South Wales" says:—The regulations of the Canadian Pure Seeds Association are as follow:—

"1. Membership of the association is open and free to any *bonâ fide* farmer who has shown himself capable of producing improved pure seed.

"2. The farmer who undertakes to grow pure seed obtains his foundation stock from the Association. Such seed is either 'first generation registered seed' (*i.e.*, the first, second, or third generation progeny of an improved selected strain) or 'elite stock seed' (a pure stock of seed originating from a single plant, or obtained from a hand-selected seed plot).

"3. Any seed of any kind of crop produced or selected by a member during the succeeding years is entitled to registration by the Association.

"4. Two kinds of certificates are given by the Association—(1) for seed which has been grown according to regulations, and descended from 'elite stock seed,' such seed being marked 'registered seed' and (2) for pure 'elite stock seed.'

"5. No certificates are issued unless the seed be (*a*) pure as to variety and true to type; (*b*) free from seeds of other cultivated plants; (*c*) free from seeds of weeds coming within the meaning of the term 'noxious weeds' as applied by the Seed Control Act; (*d*) free from or containing not more than a total of one seed of other weeds of minor importance; (*e*) well matured, clean, sound, plump, of good size and colour, and free from disease; (*f*) up to the percentage standard of vitality recognised for good seed of the kind under the Seed Control Act.

"The methods thus outlined are eminently successful. Already the membership of the Association runs into considerable numbers, and the demand for 'registered seed' is greater than the supply.

"The Department of Agriculture in New South Wales has already taken the initial steps for the production of better seed, and the lines upon which it is proceeding have already been indicated in the 'Gazette.' The method adopted differs from those in Canada and Sweden in the fact that the Department deals directly with the farmer. The principle of producing pure improved seed is such a vital one that the scheme merits the attention and co-operation of all good farmers."

STOCK BREEDING.

Here we have exactly the same argument as before, viz., that the man who is willing to work with poor quality stock is willing to accept a low wage for his labour. With stock this is even more obvious than with seeds. Further, it lies in the hands of each man to be his own improver, which is not the case always with plants. However, co-operation is of undoubted advantage in any district just as it is in the case of developing good seeds.

To illustrate this argument I am taking dairy stock, not because dairy animals are the only ones affected, but because the yield from dairy stock is so easily measured, and because we have many reliable figures upon which to base our argument. Thus we know that a great number of so-called dairy cows produce less than 150 lb. of butter per year, while others give higher yields, until we have the Australian record producer, Melba 15th, a cow that has recently put up the splendid record of 1,150 lb. of commercial butter in the 365 days. Naturally, Melba 15th was specially cared for and fed, but we know of many animals which are capable of putting up 400 or even 500 lb. of butter in the year with no better care or pasturage than that given to the 150-lb. cow. Not to exaggerate the argument, let us compare the 400-lb. cows with those yielding only 150 lb. of butter per year. I use the 150-lb. cow as the lower limit because the indications are that this figure is somewhere near the average yield for all dairy cows in Queensland.

Let us assume that one man can look after and milk fifteen cows, each giving 150 lb. of butter per year. Also let us assume that each cow requires 3 acres of grazing, the rental value of which is 10s. per acre per year. Let us finally assume that the value of each pound of butter is 1s. 3d. Then for our fifteen cows of 150 lb. capacity we have the following financial statement:—

	£	*s.*	*d.*
Cost of labour for care of animals and milking, say ..	130	0	0
Cost of grazing for each cow is 3 acres at 10s. = 30s.; therefore cost of grazing for the 15 cows is	22	10	0
Total	£152	10	0

or £10 3s. 4d. per cow.

The returns per cow = 150 lb. of butter at 1s. 3d. per lb. = £9 7s. 6d. Now, if the man is the owner of the cows and is doing his own work, he will not have actually paid out the assumed £130 in wages. If he had he would have made a loss of 15s. 10d. per cow per year, or a total of £9 12s. 6d. for the fifteen cows. What this really means is that the owner of the cows did not actually lose; he was merely content to accept £130, less £9 12s. 6d., or £120 7s. 6d., as a reward for his labour.

Let us now consider the case of a herd of cows each giving 400 lb. of butter per year. We will assume all the above figures, except that we will presume that a man can only look after and milk twelve of these heavier milkers.

In this case the financial statement runs out as follows:—

	£	s.	d.
Cost of labour for care and milking, say	130	0	0
Cost of pasturage for the 12 cows—30s. per cow as before ..	18	0	0
Total	£140	0	0

or £12 6s. 8d. per cow.

The returns per cow are 400 lb. of butter at 1s. 3d. per lb., a total of £25, or £300 for the twelve cows. Thus, if the man is the owner and is doing his own work, he would not have to value his labour as low as £130. Instead, he would be able to value his labour at £300, less the £18 for pasturage, or at £282 per year. In truth he would have put a value on his labour of nearly two and a-half times that which it is necessary to place on the labour of the man with the fifteen cows which only produce 150 lb. of butter each per year.

It may be claimed that the high producers would be very expensive to buy, and so they should be if they were proved animals. But one would not secure these high producers by direct purchase. It is doubtful if one could, even if he wished to and had the necessary cash. There is another way in which we get such good animals, but more of this later. Before going on, however, I should like to state that I know of a case at a factory in the Lockyer district where a man milking fifteen cows has been drawing for months past a cheque of £45 or more, while a neighbour of his who is milking, roughly, an average of forty-five is not drawing as big a monthly cheque. Thus the figures worked out above are no exaggeration on cases that we find in actual practice.

But let us consider the case of a man running beef stock. In this class of animal it is possible to have some that will not mature or be fit for market until they are five years of age, while at the other extreme we can get some which can be prepared for market at eighteen months, and which will then be heavier than the poorer class at five years of age. Let us set out an example similar to that for good and poor dairy stock, and again, so as not to exaggerate the case, let us take a class of animal which mature at four years old as against a better class which mature at three years. Suppose that a man has a property which will run 400 head. With the poorer quality stock he should be able to market 100 head per year, provided he intends to market a regular number each year. On the other hand, if he had stocked up with the better quality animals he would be able to market an average of 133 head per year. Granted that the animals are of the same value at the time of marketing, though in all probability the younger stock would command the better prices, we have an annual return for the poorer stock of £1,000 per year, and for the better stock of £1,300, on the assumption of a market value of £10 per head. This shows a difference of £300 in favour of the better class animal, with no increased cost for care and management and pasturage. Certainly the better class stock would be more expensive if they were purchased for stocking-up purposes, but, even so, they would scarcely be £2 per head dearer as weaners than the poorer quality stock. But here again, as with the dairy stock, a man would not buy his high class animals; he would adopt the cheaper method of breeding them.

Now let me return to a dairy herd to indicate how it is possible for each man to improve his milkers.

1. The first essential is that each cow should be tested each year to see exactly what she is giving. Any cow below the standard one sets for one's self should be culled. She costs money to keep instead of making money for the owner. Or, to put it another way, she gives such a low return that she lowers the available wage for the working owner.

2. The next step is to secure a bull from a high-producing family. To ensure this it is necessary that the production of the dam, the g. dam, and, if possible, the gg. dam, should be known. Also the production of the bull's sire's dam and g. dam. To obtain this information it is obvious that consistent testing of animals must have been going on for a number of years.

3. It is next necessary to test the production of each of the heifers produced, and she should yield as highly as her dam, or higher, or else the bull is not doing any improving; that is, the bull you buy must be tested through his heifers.

4. The bull bought should be a pure-bred, and bulls to follow him should be of the same breed. I do not intend to deal with the reasons for this, as it would take another complete paper to do so. Here I can only state it for a fact, always provided the pure-bred bull satisfies condition 2.

5. Once a bull has been proved to be a great improver, and occasionally a bull will be discovered which is such, he should be used to the utmost of his vigour. If not by his first owner, then by succeeding owners, who should be only too anxious to get hold of a proved sire.

It is evident that the discovery of such an effective sire would be greatly assisted if a number of men in any one district were all working on the same lines and were using bulls of the same pure breed. Further, this would render the sale of a proved sire easier of accomplishment.

In short, the foregoing suggestion boils down to the advice to form a proper herd testing and breeding association. That such an association can accomplish much is indicated by the following:—

Denmark has been testing her cows for over half a century, and it is authoritatively stated that the estimated yield per cow was 80 lb. in 1864, 116 lb. in 1887, and 220 lb. of butter in 1908. This is a gain of nearly 300 per cent.

Recently Mr. Singleton, Assistant Director of the Dairy Division of the New Zealand Government, published the following figures:—

He said that at the last census they had 793,215 dairy cows for 1916-17 season. He estimated the average yield per cow at 161.8 lb.of butter-fat (about 195 lb. of commercial butter) as against 142.1 lb. of butter-fat (about 171.2 lb. of commercial butter) for 1910-11, or an increase of 23.8 lb. of commercial butter per cow in six years. This represented an increased export value of £1,276,000, besides an increase in the by-products. Mr. Singleton gave figures to show the good results of the Department's testing to assist the farmers to cull their herds. One man was getting more butter-fat from twenty-five cows than previously he got from fifty-four cows.

The foregoing speaks for itself, and indicates what can be accomplished from consistent herd-testing. Similar work is being carried out in Victoria and New South Wales.

The statement quoted, however, does not truly represent what can be accomplished, for it only deals with the averages, and it can be taken that the greater number of dairy farmers are either too careless or are so adversely placed that consistent herd-testing cannot be carried out. Therefore the improvement in those herds which do practise testing must be much greater than the figures indicate. Thus, we know of a few privately owned herds which average over 400 lb. of butter per cow per year. These men have attained their position by careful testing and culling and breeding for the best. What they can do, all can do, but much more easily if they combine in a well-organised herd testing and breeding association.

ELEPHANT GRASS AS A FODDER, AND NOTES ON SOME OTHER FODDERS.

By J. C. BRUNNICH.

Elephant grass (Pennisetum purpureum), also called Napier's fodder, one of the introduced South African grasses, has recently gained some prominence amongst farmers, inasmuch that it yields heavy crops and does not appear to be much affected by droughty conditions.

Special claims for its great feeding value at all stages of growth have been made, and in order to ascertain the truth of such statements several samples, of various stages of growth, from different localities, were obtained and analysed.

The analyses given below clearly show that only very young elephant grass can be classed as a fodder of fair quality, which has, however, only about half the value of couch grasses or of prairie grass as a feed for cows, and that with age the food value rapidly declines and becomes very low when maturity is reached. The protein contents of this grass are low and not as good as of sorghum or of sugar-cane tops, but about equal to that of Indian or cow cane. Most of our grasses, sorghums, &c., are deficient in proteins, the most valuable flesh-forming constituent of foods, and only few fodders like lucerne, cow pea vines, salt bush, sheep's burnett, and couch grass contain a sufficient amount of proteins for balanced rations, whereas the rations of the former must be supplemented with sufficient amounts of concentrated foods, like linseed meal, cotton seed meal, sunlight oil cake, bran, dried blood meal, &c., to get a properly balanced food ration.

A well-balanced ration for a cow should have a nutritive or albuminoid ratio of 1 ÷ 5, which means the ration should contain one part of digestible protein or albuminoid to five parts of digestible non-nitrogenous nutrients, including sugar, starch, cellulose, or fibre and fat.

The best method to judge the food value of any fodder in a simple practical way is based on the amounts of fodder required to furnish an animal with the necessary amount of nutrients, and for this purpose a cow of 750 lb. to 900 lb. live weight, yielding about 25 lb. of milk daily, is taken as a basis for calculation. Such a cow requires per day an amount of fodder containing at least about 1.9 lb. or nearly 2 lb. of digestible protein, and about 11 lb. of starch value, which includes all the digestible carbohydrates like sugar, starch, fibre, and also fat, calculated as starch.

In a ration which is properly balanced the amounts of food required to furnish the absolutely necessary amounts of proteins and of non-nitrogenous nutrients, briefly expressed as starch value, should be approximately the same, and we find in the table below that 71 and 79 lb. of couch grass are required for the ration of a cow containing the necessary amounts of nutrients, whereas 132 lb. and 183 lb. of very young elephant grass, and 29 lb. and 380 lb. respectively of mature elephant grass must be fed to give the same amounts of nutrients. The amount of 29 lb. giving the necessary starch value would be found in practice very much higher, on account of the coarseness and hardness of the fibre in the mature elephant grass, which would require a lot of extra energy for mastication and digestion.

—	Moisture.	Crude Protein.	Carbo-hydrates.	Crude Fibre.	Crude Fat.	Crude Ash.	Nutritive Ratio.	Lb. of Fodder to give: 11 lb. of Starch.	Lb. of Fodder to give: 1·9 lb. of Protein.
Elephant Grass—	%	%	%	%	%	%		Lb.	Lb.
2 weeks old	85·5	2·1	6·4	4·3	·10	1·6	1 . 7·4	132	183
4 weeks old	83·5	1·3	6·6	6·1	·14	2·4	1 : 14·0	75	297
8 weeks old	78·1	1·7	9·2	7·4	·23	3·4	1 : 14·3	73	229
Mature	73·1	1·4	11·6	11·9	·19	1·8	1 : 23·2	46	268
6 months old (sticks up to 14 feet long)	70 0	1·0	13·8	13·2	·20	1·8	1 : 37·7	29	380
Couch Grass	74·1	4·1	10·0	8·4	·4	3·0	1 : 5·5	71	79
Sorghum	70·6	2·1	15·1	9·1	·6	2·5	1 : 17·9	58	158
Lucerne Hay	8·2	21·0	31·4	25·9	2·8	10·7	1 : 3·3	24	17
Linseed Meal Cake	10·0	36·1	36·7	8·4	3·6	5·2	1 : 1·4	16	6
Pollard	10·0	17·4	58·0	5·2	5·6	3·8	1 : 4·3	15	14

All the samples of elephant grass analysed, and besides them several other samples, including one of very young second cut, were tested for hydrocyanic (prussic) acid, and no trace could be found, so that it may be stated that elephant grass at all stages of growth does not contain a hydrocyanic acid yielding glucoside.

I take the opportunity of drawing attention to the use of many fodders, like most of the grasses belonging to the sorghum family, sweet potato vines, &c., which contain hydrocyanic acid yielding glucosides, as it happens frequently that farmers who successfully use many of these valuable fodders become careless at times, and fatalities among their stock occur.

One of our most valuable concentrated foods, particularly rich in proteins, is *linseed meal*, and although it is a well known fact that all samples of linseed meal contain a considerable amount of such poisonous glucosides, through simple carelessness it happens now and then, fortunately rarely, that calves have been killed by its use. The instructions with regard to preparation of the meal for feeding of calves, and particularly the quantities to be used for calves of various ages, must be strictly adhered to.

Among stock fed with *Soudan grass*, another of the introduced grasses, cases of death have been reported, but it has not been conclusively proved that such mortality was caused by the grass, or perhaps by Johnson grass growing among the Soudan grass. Several samples of Soudan grass, at various stages of growth, have been tested from time to time in our laboratory, but only very slight traces of prussic acid could be detected, so that the grass, under normal conditions of feeding, should be quite harmless.

A cross between Soudan grass and sorghum saccharatum, produced by Mr. Soutter on the Roma State Farm, was found, quite contrary to expectation, absolutely free from cyanogenetic glucoside at all periods of growth.

Sacchaline, a saccharine sorghum, now extensively grown in many localities, contains rather large amounts of a poisonous glucoside, and even up to the time of full maturity of seed heads, dangerously large amounts appear to be present, so

that utmost caution must be used at all times when feeding this sorghum variety. In most other sorghums the amounts of poisonous glucoside diminish with maturity, and when seed heads are fully formed the amounts are so small that the sorghum can be used with absolute safety.

There can be no doubt that cattle fed with fodders containing hydrocyanic-acid-yielding glucosides can eliminate during the process of digestion a fairly large amount of hydrocyanic acid without feeling ill-effects. Only in cases when the animals are in poor health, or if very large quantities of such fodders are consumed during scarcity of other green foods, or by some reason or another, the evolution of the poison is much quicker during digestion than under normal conditions, fatal effects may be caused. It is, for instance, quite possible that, with the fodder containing the poisonous glucoside, another food is consumed which contains a similar poison, or perhaps large amounts of the emulsion, which causes the rapid breaking up of the glucoside during the process of digestion.

It must be again pointed out that wilting and drying of the fodder does not destroy the poisonous glucoside, and the reason why the dried fodders can apparently be fed with greater safety is simply due to the fact that the animal does not consume rapidly such large quantities of the dried fodder as of the succulent green material, and it is also possible that in the dried fodder the decomposition of the glucoside is not so rapid as in the green fodder.

Making any of these fodders into silage causes complete decomposition of the glucoside during the fermentive processes taking place in the silo.

ELEPHANT GRASS (PENNISETUM PURPUREUM): PULPING QUALITIES.

This grass is said to yield about 20 tons dry weight of material to the acre per season. It is a bamboo-like grass, and as received was very moist, the moisture content being 65.4 per cent. The height is about 7 ft., and numerous nodes occur along its length. The following shows the proportion in which the nodes, &c., occur:—

	Per cent.
Internodes	45.0
Nodes	29.0
Leaves	26.0

Its pulping qualities were tried in the small rotary digester, by the usual caustic soda process; particulars of treatment and the results obtained are:—

Caustic soda on the dry material strength of caustic being 77 per cent. sodium oxide (Na_2O)	22.0 per cent.
Period of digestion	6.5 hours.
Time in reaching maximum pressure	1.0 hour
At maximum pressure	5.5 hours
Steam pressure	80.0 lb.
Yields (based on materials and pulps being moisture-free)—	
Unbleached pulp	36.0 per cent.
Bleached pulp	30.0 per cent.
Bleaching powder (on weight of air-dry pulp)	15.0 per cent.
Average length of fibres	0.82 millimetres.
Average diameter of fibres	0.016 millimetres

The maximum length of fibres observed was 4.3 millimetres, but comparatively few were of such length; the minimum length was 0.35 m.m. and, as the largest proportion of fibres were in the vicinity of 0.5 m.m., this accounts for the low average of 0.82 m.m. The average diameter is also low, making for flexibility of fibres, which allows of easy felting together. Approximately 15 per cent. of the total cellulose consists of non-fibrous cells, which on account of their extreme degree of hydration is sometimes the cause of troubles on the machine. There are a few shive particles present, derived from knots which are fairly refractory. The pulp is considered to be not quite as high in quality as that from good quality straw, which has been carefully treated. The unbleached pulp would be far too expensive for wrapping paper, but there would be some prospects for the use of a proportion of same in covers and coloured papers. The presence of such a large quantity of moisture in the grass is objectionable; this would be reduced in amount by allowing the grass to further mature before cutting, but the knots would then become still more difficult to deal with. The yield of bleached pulp is not high, 1 ton pulp requiring about 3 tons 7 cwt. dry material, or 9¼ tons moist grass. Taking the above into consideration, it is not thought that the prospects are at all promising for the use of this grass for pulping purposes.

QUEENSLAND AGRICULTURAL COLLEGE: DIPLOMA DAY, 1921.

June 10th was Diploma Day at the Queensland Agricultural College at Gatton, and, undeterred by torrential rain, a large and representative gathering, including visitors from various parts of Queensland and other States, assembled to witness the distribution of awards to successful students and to see something generally of College activities and, so far as the weather permitted, of dairy manufacturing and field operations.

The College was established in 1897 with three main objects: First, to provide sound training in the science and practice of agriculture, animal husbandry, and allied activities; second, to conduct experiments and investigations for the elucidation of agricultural problems; third, to establish stock studs from which pure-bred animals might be distributed at reasonable rates. All these objects have been achieved and continue in operation.

The College herds and flocks were paraded for the visitors' inspection, and everyone was struck by the uniformly high types of each particular breed. Later, a tour of inspection was made of the whole establishment, the general lay-out and equipment of which are strictly on the lines of economy and convenience.

PRESENTATION OF DIPLOMAS.

In the early afternoon the visitors, students, and their friends assembled in the College gymnasium, which had been prepared for the big event of the day—the presentation of diplomas. The Hon. W. N. Gillies, Minister for Agriculture, presided, and with him on the dais were Mr. Cuthbert Potts, B.A., Principal, and Mr. E. G. Scriven, Under Secretary.

The summarised points of the Principal's annual address were:—

The demand for agricultural education is growing, and its importance is being more widely recognised in our educational system right from the University down to Primary schools.

Of the ordinary students who have passed through the College, about 70 per cent. are now engaged in agriculture or allied industries.

A strenuous effort is being made to re-establish the College Old Boys' Union, which became moribund during the war.

The College Honour Roll lists the names of 200 ex-students and 35 members of the College staff.

The educational benefits of the College are not confined to students actually enrolled, and much important instruction is carried on by correspondence.

The number of visitors for the year was 1,020, the majority of whom were men who came for definite information on some branch of farming.

The College officers act as supervisors of practical field work as well as instructors.

There is a growing demand for the more general recognition of agriculture in the State educational system.

In the course of the year a move was made to establish an agricultural section in connection with the Lockyer High School at Gatton. This most important proposal came from the farmers of the Lockyer Valley. The design of the course is under consideration, and it is not expected to adversely affect the rural school movement. Agricultural education in connection with secondary schools will do much to check the cityward migration of country youth.

The Hon. W. N. Gillies affirmed that the science of agriculture is the most important subject on which the people of Queensland could engage thought. Other points of his address were:—

The experience of Great Britain during the war had driven home the importance of primary production.

Nature has been bountiful to Queensland in respect to rich and valuable soils and a generous climate that will respond in full measure to applied agricultural science. The possibilities of irrigation in the State are very great, and transport and methods of marketing claim equal attention. The Queensland Agricultural College is fulfilling a great purpose, and has an immensely beneficial influence on the State's development.

Mr. Gillies then presented the awards, congratulating each recipient on the honour he had attained. The successful students are:—

Diploma in Agriculture and Third Year Certificate in Agriculture.—J. A. Tait (Townsville).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—W. R. Straughan (Brisbane).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—A. W. McLuckie (Brisbane).

Second Year Certificate in Agriculture, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—D. S. Hall (Silverspur).

First Year Certificate in Agriculture.—A. Bray (Yorkshire).

First Year Certificate in Agriculture.—S. F. Murphy (Bowenville).

First Year Certificate in Agriculture.—K. M. Tait (Townsville).

First Year Certificate in Agriculture.—J. D. Land (Brisbane).

First Year Certificate in Agriculture.—T. Y. Bonar (Herberton).

First Year Certificate in Agriculture.—K. V. Henderson (Brisbane).

Diploma in Dairying, Second Year Certificate in Dairying.—W. B. Horneman (New Kareela, New South Wales).

Diploma in Dairying, Second Year Certificate in Dairying.—J. M. Irwin (Galala).

Diploma in Dairying, Second Year Certificate in Dairying.—N. A. Black (Neurum).

First Year Certificate in Dairying, Milk and Cream Testing Certificate, Third-class Engine-drivers' Certificate.—D. V. Ward (Helidon).

Milk and Cream Testing Certificates.—B. T. Seymour (Biggenden), A. V. Clarkson (Brisbane), J. R. F. Zillman.

Third-class Engine-drivers' Certificate.—J. Pitceathly (Toowoomba), O. de Stokar (Dalby), R. V. Hodges (Calcutta, India).

COTTON SEED FOR SALE.

Dairymen who are hand feeding their milch cows and require a cheap and nutritious concentrate to add to the bulk foods used, have an excellent opportunity at the present time of purchasing cotton seed from the Department of Agriculture and Stock, William street, Brisbane, at £3 per ton at the Department, or £3 10s. per ton bagged on rails, Brisbane. *Remittance, with exchange added, should accompany order.*

The seed requires to be finely crushed before use.

Commercial cotton seed meal, prepared after the extraction of the principal part of the oil contained in the seed, is one of the richest and most valuable cattle foodstuffs. Its food value exceeds that of maize by 62 per cent., and wheat meal by 67 per cent.

An average analysis of cotton seed meal is as follows:—

	Per cent.
Water	7.80
Fat	9.31
* Protein (albuminoids, &c.)	42.00
Nitrogen free extract (carbohydrates, &c.)	28.83
Fibre	7.18
† ‡ Ash	5.88

Cotton seed, after reduction to the form of meal by passing it through a machine commonly used for crushing grain, is richer than cotton seed meal.

Ground cotton seed is used at the Agricultural College, Gatton, in quantities of from 1 to 3 lb. per cow per day, according to circumstances. Five pounds per day is to be regarded as a maximum amount for an animal in full milk.

Cotton seed prepared in this way is not attractive in appearance, owing to the short lengths of cotton lint present, these being found naturally adherent to the seed. As this is a vegetable fibre similar to other indigestible fibres found in vegetable matter commonly consumed by stock, it is not considered injurious to animals.

Cattle require a few days to become used to ground cotton seed, when mixed in their food, and should be gradually accustomed to the change of diet.

* Containing nitrogen = 6.72
† Containing phosphoric acid = 2.42
‡ Containing potash = 1.95

Pastoral.

STOMACH WORMS (STRONGYLUS CONTORTUS).

By W. G. BROWN, Instructor in Sheep and Wool.

Last month a demonstration was given at Dalmally in respect to the experiments being carried out by the Special Blowfly Committee of the Institute of Science and Industry. Much information regarding sheep flies was given by the various speakers to a very representative gathering of Australian pastoralists. The writer seized the opportunity of issuing a warning on other pests; one especially, stomach worms, being almost as great a menace to the wellbeing of sheep in Queensland. In fact, it is a greater one, for there is sometimes respite from fly attack, but where the stomach worm is thoroughly established it is there all the time, and it is to be feared that the pest is now widespread in Queensland, not excluding the dry West. It is to be found on Peak Downs and Darling Downs, and in the Roma, Mitchell, and Charleville districts. Indeed, it is very difficult to say where it is not. The object of this article is to supplement a speech made at Dalmally, pointing out:—

(1) The danger to the wellbeing of Queensland flocks;
(2) The fallacy of the dry West not being favourable for the existence of the stomach worm;
(3) That the health of sheep governs to some extent blowfly infestation;
(4) Where to look for the parasite;
(5) The methods of combating the pest.

Like all introduced pests, little or no notice is taken at first of the spread of stomach worms. Sheep are doing well for a while and then for some unexplained reason they begin to fall off in a season when there is ample feed and water. They seem mopey and white faced, and, if driven hard, lie down. If driven further they probably die. There is no other disease in this, the healthiest stock country in Australia, so it is not hard to tell what ails the animals. They are wormy, and, being wormy, are infecting the whole country, for each female parasite lays from 1,500 to 2,000 eggs, and there are sometimes thousands of stomach worms in one animal. So the infestation of country is progressive. There is scarcely a district in Queensland where they cannot be found, though in many localities worms are comparatively few, and the sheep do not seem to suffer. Yet these few are the forerunners of many millions. Country is not naturally wormy. The pest must be introduced.

A fallacy many pastoralists cherish is that the dry West can never be the home of stomach worms. As a matter of fact they are strongly established there now, and every year sees an increase in their virulence. I have seen as bad a case as could be found on the Barcoo. Thanks to timely action on the part of the station-holder, however, they were soon exterminated on that particular holding.

There is no doubt that worm-infested sheep are more liable to fly attack than healthy sheep. Observation and experiment at Gindie State Farm and at Dalmally showed that conclusively. In fly infestation and also in worm infestation it is the weaners that suffer first and most. I know of a case where from 20 per cent. to 25 per cent. of the weaners died every year from worm attack. To-day the owner of that flock does not fear the pest, for he takes ample and timely measures against it, and his losses from that cause have now become negative. These measures I shall describe later.

HISTORY.

A short history of the life of *Strongylus contortus* as known to scientists informs us that the female lays eggs in the stomach of a sheep. These eggs pass out of the body in the excreta. They contain living embryos, which develop upon reaching moisture. The embryos moult three or four times after hatching, this process lasting from three days to four weeks according to the variation of humidity and warmth. The worms then climb the stalks of grass and await the coming of their host—a cud-chewing animal. The worms are swallowed with the grass. These, in the process of digestion, reach the fourth stomach, there again to copulate and lay eggs which pass out in the droppings, and the vicious circle is complete. It is known that the young worm is easily killed by cold or dryness, but when it is in the ensheathed or final form it may live for months until suitable conditions arise for its wellbeing. It is the ensheathed form which, endowed with length of life, matures in the stomach and produces eggs after intake by the sheep. It is in the fourth or true stomach where the parasite is found, and for the information of those who do not know where to look for the worms an illustration taken from "Sheep and its Cousins" (Lydekker) is reproduced. The worm itself is easily seen with the naked

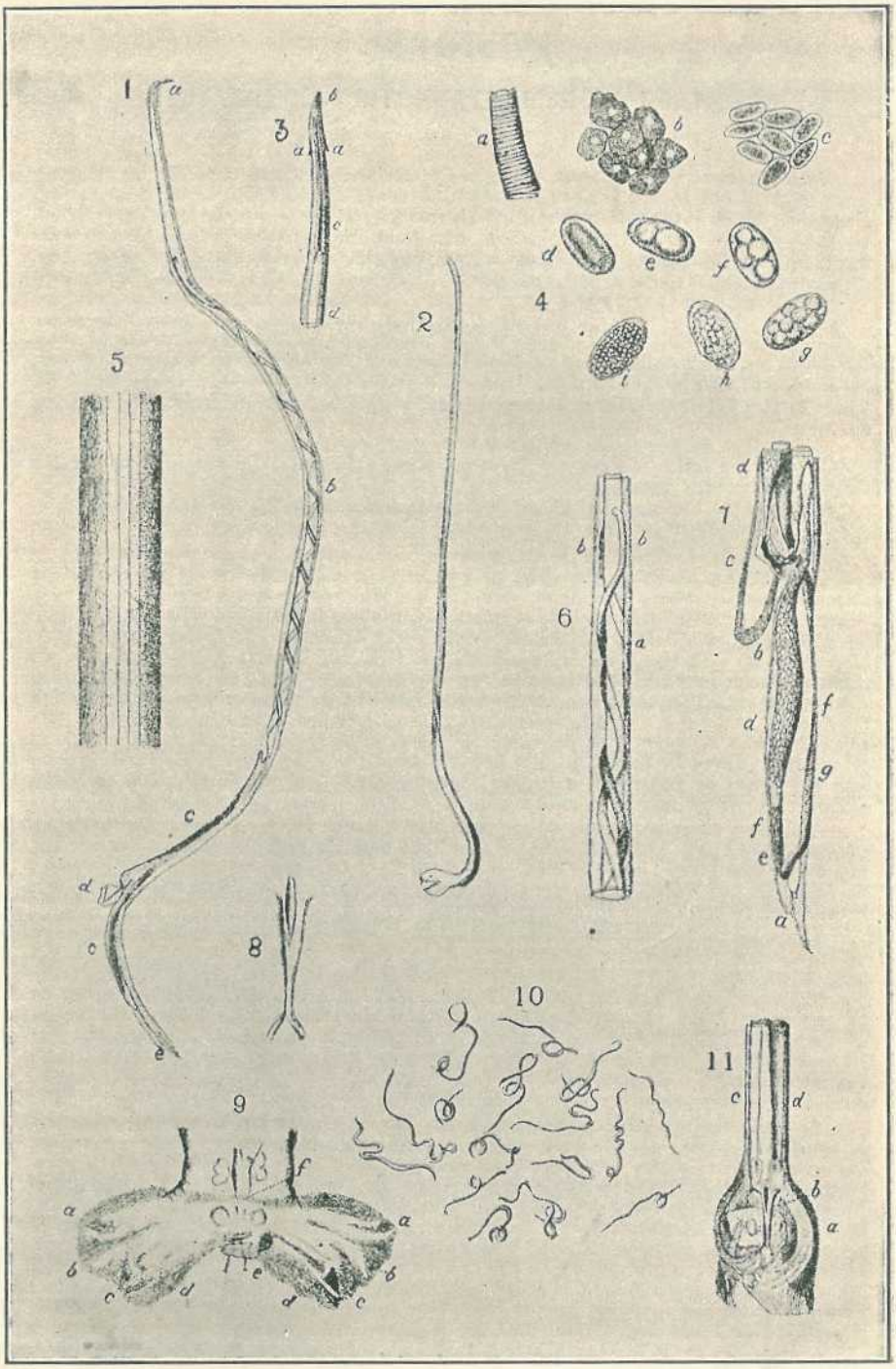
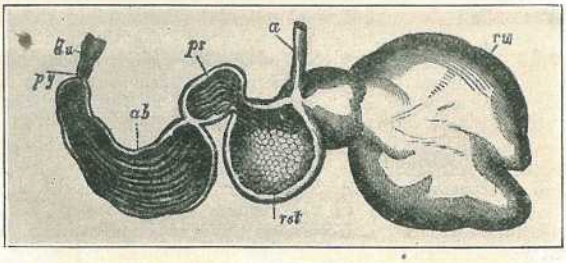


PLATE 1.—STRONGYLUS CONTORTUS. (The Twisted Stomach-worm.)

eye. The female is about 1 inch long, and presents the appearance of a barber's pole with its white and red spirals. The male is much smaller, and is plain red without spirals.



Stomach of a Sheep, partially cut open to show Internal Structure

œ, œsophagus, or gullet; *ru*, rumen, or paunch; *ret*, reticulum, or honeycomb; *ps*, psalterium, or manyplies; *ab*, abomasum; *py*, pylorus; *du*, duodenum, or commencement of the small intestine.

METHODS OF EXTERMINATION.

Two practicable means may be used to clear land of the pest. One is to burn off the grass, one paddock at a time, and ensure that sheep introduced after the burning off are thoroughly drenched. It is idle to clear a paddock of worms if it is immediately afterwards restocked with infested sheep.

The second way is to quarantine a paddock for twelve months. Then the worms will die out for want of a host. It is worth while using a rotation of paddocks to get rid of so serious a menace as stomach worms. It will take time, but horses may be grazed in a paddock which is being spelled.

Drenching is a simple matter. A long race such as the ordinary branding race is best. The operator stands at one end, when the race is filled, and, throwing his leg over the shoulder of the animal, he lifts the lip with the left hand and introduces the mouth of the horn or bottle between the nippers and grinders of the animal, and, putting the horn or bottle well over the back of the tongue, he lets the liquid flow gently until the dose is swallowed. Sheep should be drenched on four legs, and the head kept nearly level during administration. It is all the better if the drench is warm, say, at blood temperature. The drench which I have found successful in the course of many years' experience is cheap and good, if proper care be taken in mixing. It is made up as follows:—

Arsenic (white)	2 oz.
Epsom salts	6 lb.
Water	5 gallons.

Boil 3 gallons of water in a 5-gallon drum, and when the water is boiling add the arsenic and salts. Boil for forty-five minutes, stirring occasionally. Then add cold water to make 5 gallons. The drench is then ready for immediate use. The doses are as follow:—

For grown sheep	2 fluid ounces
For hoggets	1½ fluid ounces
For lambs over 4 months	1 fluid ounce.

Sheep should be yarded for from fifteen to twenty-four hours before drenching, and should not be allowed to drink for four hours after.

A second drenching may be given in from seven to ten days. The arsenic used is really a tonic and cannot hurt the sheep if properly mixed, boiled, and administered.

DESCRIPTION OF PLATE.

STRONGYLUS CONTORTUS.

FIG. 1.—Adult female magnified six times: *a*, head; *b*, ovaries wound around intestines; *d*, papillæ.
FIG. 2.—Adult male magnified six times.
FIG. 3.—Head: *a*, two-barbed papillæ.
FIG. 4.—Eggs highly magnified: *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, different stages of development; *i*, egg as it is laid.
FIG. 5.—Skin showing nine of eighteen longitudinal lines.
FIG. 6.—Portion of female: *a*, intestines; *b*, *b*, end of ovary.
FIG. 7.—Caudal end of female: *a*, vulva; *b*, *c*, vagina; *d*, *d*, uteri filled with eggs; *e*, oviduct; *f*, *f*, ovary; *g*, intestines.
FIG. 8.—Spicula, enlarged.
FIG. 9.—Bursa expanded to show costæ.
FIG. 10.—Group of males and females; natural size.
FIG. 11.—Caudal end of male: *a*, bursa; *b*, spicula; *c*, seminal reservoir; *d*, intestine.

WOOL.

BY ALEX. WYNNE, Assistant Instructor in Sheep and Wool.

HISTORICAL SKETCH.

Notes on Australian sheep and wool would be incomplete without reference to the pioneers of one of our greatest rural industries. To Captain Waterhouse is due much of the credit for the laying of the foundation of the Australian wool business. It was he who purchased thirty-two Spanish Merino sheep from a Mrs. Gordon, of Cape Colony. He succeeded in landing twenty-nine at Sydney, where their arrival created great interest; and Captain Macarthur was so impressed with them that he offered their importer fifteen guineas a head for the lot, but only succeeded in obtaining three rams and five ewes, the remainder being distributed among other settlers. Captain Macarthur's little flock formed the nucleus of a merino-breeding establishment that was to prove of the utmost importance to Australia. As his small flock increased, Macarthur noticed that the sheep improved in fleece and frame, and the pastoral possibilities of Australia so impressed him that, it is reported, he endeavoured to float a company with a capital of £20,000 in England for the purpose of developing the sheep and wool industry in the new colony. In this, however, he was unsuccessful, but, undeterred in his object of firmly establishing the industry, he purchased more merinos from the flock of King George III. Wool subsequently grown by Captain Macarthur was sold in London at 6s. per lb. The Yorkshire spinners were attracted by its manufacturing qualities, and eagerly sought it. Part of the building in which Australian wool was first milled near Bradford is, I noticed while recently in England, still standing. The Rev. Samuel Marsden was another who saw the great future of woolgrowing in Australia, and followed with success the lead set by Captain Macarthur.

It is interesting to observe that the foundation flock of our great sheep industry came from South Africa, and to-day South African breeders are now eagerly looking to Australia to supply stock for their own flock improvement.

FORMATION OF GROWTH OF WOOL FIBRE.

By way of illustration I have had reproduced four drawings (see plate) from F. H. Bowman's work "Structure of the Wool Fibre," and a photograph of a Corriedale wool staple plainly showing its character. Figure 1 shows the genesis of the fibre in a minute bag or sack known as the hair follicle. This follicle contains a plastic fluid which provides the cells that go to make up the fibre. The hair follicle is continuously fed with the fluid, the quantity of which is governed by the health and condition of the animal. Immature or defective cells naturally affect the strength of the fibre. It will be noticed that two glands are attached to the fibre; those are the Sebiparous glands which supply to the fibre the fatty substance known as yolk. This is a natural lubricant, and also supports the growing fleece. Its components are oil, lime, and potash. Other glands, Sudoriparous, drain the skin

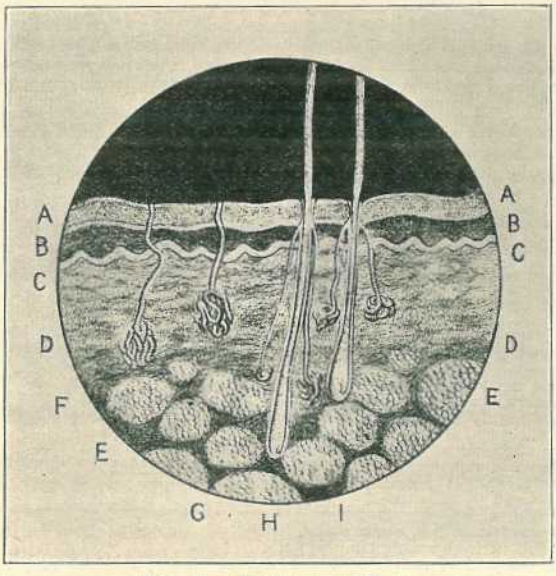


FIG. 1.—SECTION OF SKIN.

of swint or sweat which is conveyed to the surface of the pelt, where it intermixes with the yolk in the fibre. Swint is composed principally of potash salts, a valuable by-product of scouring.

In the composition of the fibre are the Medulla cells which are located in the centre and form the Medullary canal. A longitudinal section of a hair fibre (Fig. 2)

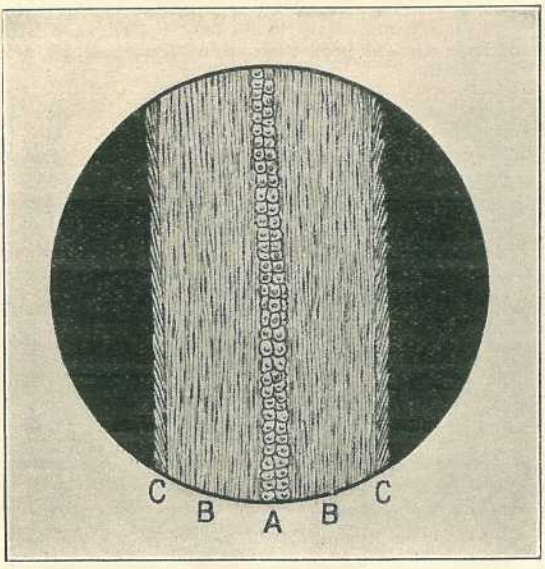


FIG. 2.—LONGITUDINAL SECTION OF HAIR.

shows this canal more plainly. Around the Medulla cells are two other sets of cells (see transection in Fig. 3). In addition are the outer Medullian cells (Fig. 4). The construction of cells in this minute hair follicle continues during the life of the

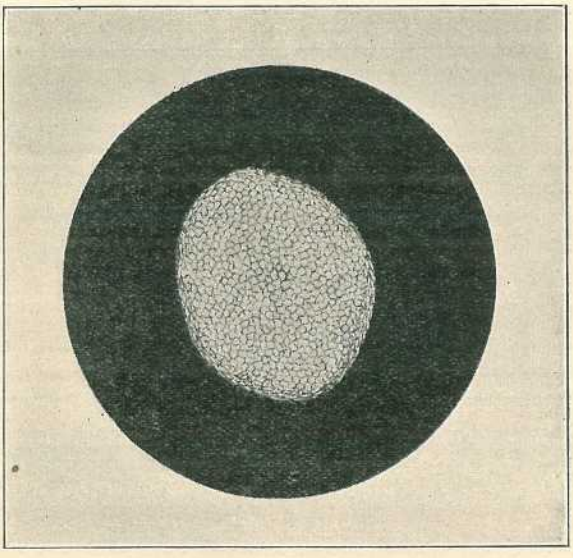


FIG. 3.—TRANSVERSE SECTION OF WOOL FIBRE.

sheep. These crowd out their predecessors in the form of a fibre on the surface of the skin. This crowding or pushing causes the crimps in the staple. The smaller the cell the greater the crimp. This action flattens the Medullian cells against the fibre (see Fig. 4) and is invisible to the naked eye.

As growers and others often confuse the two terms, crimps and serrations, I propose to define both, illustrating them by photograph (Fig. 5).

Crimps are the waves or undulations of the fibre.

Serrations are the pointed scaly coverings of the fibre caused by the flattening of the Medullian cells, which overlap from the base to the tip of the fibre and are invisible to unaided sight. These may be felt with a sensitive touch. By gently rubbing one's fingers from a staple tip to its base the edges will be felt to slightly grip; but if the finger movement is in the opposite direction, no grip will be sensed.

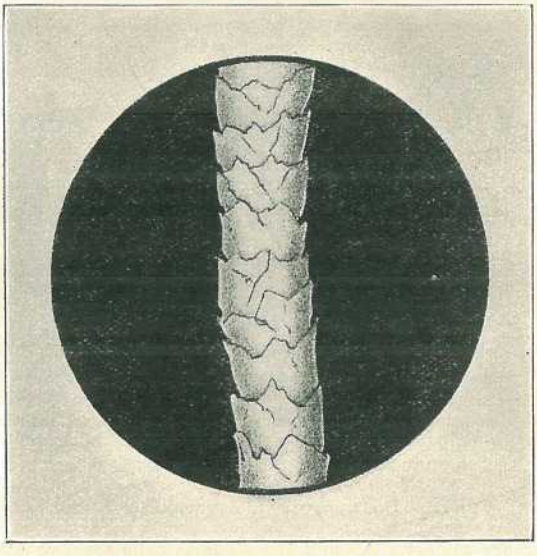


FIG. 4.—TYPICAL WOOL FIBRE.

It is obvious that, in order to get the best results, it is necessary for the wool-grower to bestow as much time and attention as possible to the welfare of his flock.

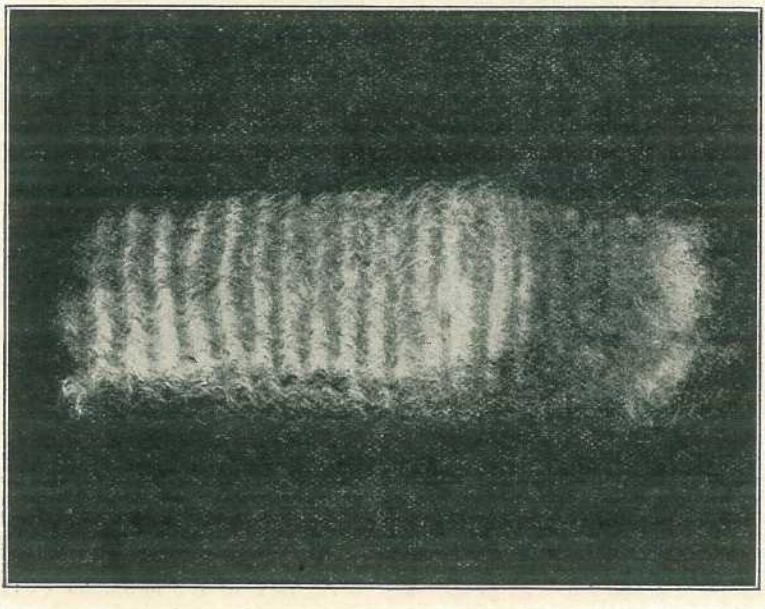


FIG. 5.—CRIMPS AND SERRATIONS.

BREEDS AND TYPES.

Every breed has its varying types; the same applies to covering. On this continent, with its diverse climatic conditions, no hard-and-fast rule can be laid down as to what breed or type is most suitable for a beginner in the pastoral industry.

The Merino we will discuss first. There are several factors that weigh in the decision as to the best type or variety of wool to grow, but it must be borne in mind that fine wool grows on a thin skin, and strong wool grows on a thick skin. Fine-woolled sheep, therefore, requires more beneficent conditions. For instance, in South-western Queensland, where the climatic conditions are sometimes severe, only an inexperienced grower would attempt to produce a fine-woolled animal. A medium to a strong fleeced sheep would, in that area, be more certain to fill the bales of the careful grower. The suitability of any locality for a particular type can be determined by local knowledge. A selector with limited experience would be ill-advised to attempt to breed his own rams. By doing so he would risk the propagation of nondescript and characterless types. Initial mistakes in this respect would take years of careful selection and breeding to correct. A better and more profitable course in the long run would be to secure rams of the type required from a reputable flock master.

WOOL *VERSUS* COTTON.

The old idea that wool is essentially the clothing of the West, while cotton is the clothing of the East, is undergoing revision. The Eastern peoples are demanding wool in greater quantity every year. The hygienic hydroscopic value of wool, *i.e.*, its more-ready absorption and retention of moisture, is being recognised more widely in Eastern countries, and its comfort as compared to cotton commends itself to inhabitants of tropical and sub-tropical countries. Its hydroscopic capacity is 18.4 per cent., compared to the 8.5 per cent. capacity of cotton. Where Eastern peoples formerly used very little wool they now import a big proportion of the Australian clip, and recent auction sales demonstrated the strength of Japan as a competitor for our best classes. From this trade development is drawn an obvious moral, and the necessity of maintaining and, if possible, improving our present high standards in sheep and wool production becomes apparent.

REPUTED POISONING OF SHEEP BY BUTTON GRASS.

In a letter from Barcarolle, Jundah, dated 9th May, 1921, Mr. F. L. Berney writes:—

"I have just lost a few sheep from their eating what at most times is the best of feed, and of this I am sending you two samples on the chance that you may consider an analysis worth while. The two plants sent are button grass and pig weed, both very common things, and the circumstances of the poisoning are as follows:—

> A small lot of sheep were yarded in a yard that had not been used for some months, and in which there was a dense and luxurious growth of the two above-mentioned plants—90 per cent. button grass and 10 per cent. pig weed; practically nothing else. They were left in all night, and the following day some of them showed symptoms of poisoning, staggered when they walked, and fell over. Half a dozen recovered during the following night, but two or three died.

"From a pamphlet on this subject I learn that of two lots of a plant under investigation one lot grown on highly fertilised soil developed a considerable amount of poison, while another lot grown on poor land showed little or no traces of it. The sheep yard that has been in use for some years would naturally become very rich from the accumulation of sheep manure."

Mr. C. T. White, F.L.S., Government Botanist, replies as follows:—

"The specimens when they reached me were too far advanced for a test to be satisfactorily carried out for the presence of a cyanophoric (prussic-acid-yielding glucoside). However, Dr. J. M. Petrie, the well-known investigator of Australian poisonous plants, in a list of tests made on Australian grasses, and published in Volume 38 of the Proceedings of the Linnean Society of New South Wales, has reported the fact that our common button grass (*Eleusine ægyptiaca*) is strongly cyanophoric at all times of the year, with the exception of the mid and late winter months.

"The note sent by Mr. Berney, however, is the first instance that has come under my notice where this grass has been definitely blamed as the cause of losses among stock in Queensland, and notes from the pastoralists on the subject would be welcomed."

The Horse.

CERTIFICATES OF SOUNDNESS.

Subjoined is a list of stallions registered and certified as sound, in the course of the month of May:—

Name of Horse.	Owner's Name and Address.
DRAUGHTS.	
Bute Baron (L)	J. W. Lowis, Waghorn st., Ipswich.
Royal Mac (L)	G. Myers, Kircubbin, Maryborough.
Prince (L)	J. Burgess, Bororen.
Saxon (L)	F. Hickman, Uplands, Bororen.
Operator (L)	G. Elliot, Laidley South.
King Boro'	J. A. Horrobin, Silver Dale, Tingoora.
BLOODS.	
Scottish King (L)	J. J. Little, Toogoolawah.
Firerack (L)	D. Vogel, Milbong.
Royal Form	T. Tuite, Toogoolawah.
LIGHT HORSES.	
Master Hall (L)	J. Baird, Toogoolawah.
Raporer (L)	W. J. Salmon, Harrisville.
PONIES.	
Master Badger II. (L)	W. A. Herrmann, Toogoolawah.
Cymro (L)	O. Davitt, Queen st., Newtown, Ipswich.
Pinto Ben (L)	W. Butcher, Oakhurst, Maryborough.
King Rufus	J. G. Reiser, Maroon, Boonah.

A RECIPE FOR BLACK WAX.

A South Burnett correspondent writes:—"The Farmers' Handbook of New South Wales," 3rd edition, contains a simpler recipe for making "Black Wax" than the one given in answer to a correspondent in the May Journal. Whether it is as good I cannot say, but I forward a copy for what it is worth. For "White thread," beeswax alone is used. For "Black thread," the mixture is 1 lb. pitch to 4 oz. of resin. The pitch and resin are heated until thoroughly liquified and intermingled, when the composition is poured into cold water in which it can be conveniently preserved.

When required for use, a piece about as big as the top of the thumb is cut off with a wet knife, and held while being used in a piece of soft leather to prevent it sticking to the fingers. These proportions of pitch and resin make a suitable wax for warm weather, but in winter it becomes hard and brittle. This can be overcome by making a mixture of the following:—1 lb. pitch, 3 oz. resin, 3 oz. mutton fat. The thread sometimes becomes hard and sticky when cold and will not run well. This can be remedied by smearing the fingers with raw beef or mutton fat, passing them up and down the thread a few times.

Dairying.

FRUITY FLAVOURS IN MILK AND CHEESE.

BY R. SNELL, Instructor in Cheese Making.

(An epitome of a Paper read before the Annual Conference of the Queensland Butter and Cheese Factory Managers' Association.)

DESCRIPTION.

Fruity flavours take their name from the peculiar odours they emit, that of certain ripe fruits, such as pineapple and strawberry, and not from the flavour they leave on the palate. To the palate they are sweet, sickly flavours, and are by no means pleasant. They are very hard to detect by taste or smell in the milk as delivered to a cheese factory, and seldom make their presence known until the cheese-making process is well advanced. As the cheese matures they develop into a very strong unpleasant smell and taste.

CAUSES.

Like many other defective flavours in cheese, fruity flavours are bacterial. Specific bacteria gain access to the milk from outside sources. They are not, as many suppose, transmitted to the milk through the system of the cow, but are carried into the milk through the medium of dust and dirt.

SOURCE OF CONTAMINATION.

Fruity flavours are closely associated with other undesirable flavours in milk and cheese, and a most prolific source of contamination is an organism known as Bacillus Coli Communis. The natural habitat of this organism is the intestines of all animals. Hence it becomes apparent that milk may be quickly and badly contaminated by the dust and dirt of the cow yard, dust falling into the milk pail from the flanks and udders of cows, and milking with unwashed hands. Another source of contamination not known to every producer of milk are the first few streams drawn from the cow's udder. This milk is known to contain bacteria, which gain access thereto through the small duct at the end of the teats. This first milk contains very little fat, and is not of very great monetary value to the dairyman, and therefore should be rejected. Vitiated atmosphere is undoubtedly another cause of contamination with fruity flavours.

I strongly advocate aeration, especially when cows are fed on strongly flavoured food. Aeration of milk should be thoroughly carried out both morning and evening. Aeration, however, will defeat its own object if not carried out properly. In the light of the foregoing as to sources of contamination, it is at once apparent that to aerate milk in the atmosphere of the cow yard, or in an atmosphere that has just previously passed over the cow yard, hog pen, fowl yard, or other odorous places, would be to invite contamination of what is otherwise pure milk. Milk should be thoroughly strained. I regret to say I have seen dairymen, who otherwise take very great care, devalue their product by the use of some unsuitable strainer. The practice of using a piece of cheese or other cloth is open to the severest condemnation, as is also the use of a strainer that cannot be dissembled for the purpose of cleansing. I have seen cloth strainers, even in otherwise clean dairies, so soiled as to spoil the best of milk. Yet another source of contamination of milk with fruity flavours is a dirty whey tank. Failure to empty and thoroughly cleanse and scald cans, foul factory drains, and lactic starters cannot be too strongly condemned.

PREVENTION.

Rules to observe for the prevention of fruity flavour are very clear. (1) Udders and flanks of cows should be freed as much as possible from dust and dirt, and the teats washed in clean water prior to milking. (2) Milkers should wash their hands after milking each cow. (3) Milk should be removed as soon as possible to a clean dairy house, and thoroughly aerated in a pure atmosphere. (4) The first few streams of milk from each teat should not be retained. (5) Strainers of cloth or strainers so constructed as not to admit of thorough cleansing, should not be used.

REMEDY.

The flavours should not be in the milk, and the remedy is in the hands of the dairyman. When the cheese maker suspects fruity flavours in his milk, he should use a good clean lactic starter. He should set the milk at such an acidity as to allow of the curd being well firmed before drawing the whey. If this is not possible he must use a fairly high cooking temperature. Develop a little more acidity than ordinarily before drawing the whey. Aerate the curd well after milling. The use of a little more salt than ordinarily is recommended, especially on curds that are inclined to be soft.

QUEENSLAND BUTTER AND CHEESE MANAGERS' ASSOCIATION.

ANNUAL CONFERENCE.

The members of the Queensland Butter and Cheese Managers' Association met in conference in Brisbane on 15th and 16th June. In the course of the proceedings many matters of importance bearing on two of the chief industries of the State were discussed.

Combined with the conference was an exhibition and competition in dairy products; thirty-five factories were represented. Mr. W. F. Uhlmann presided.

Dual Grading.—The conference viewed the existing system of dual grading with disfavour, and was of opinion that State control would prove more satisfactory than Federal control.

ADDRESSES.

Fruity Flavours in Cheese.—Mr. R. Snell, Instructor in Cheesemaking, Department of Agriculture and Stock, read a paper on the subject of "Fruity Flavours in Cheese," an abridgment of which appears elsewhere.

Mr. E. Graham, Chief Dairy Expert, outlined the new Dairy Act and Regulations which deal with every activity of the dairying industry and are in keeping with the general progress of the industry in recent years. The main points of his address were—

The new Act provides for returns from factories showing particulars of the quality of their products, and seeks to secure co-operation towards a general improvement of quality. The Act provides also for new powers in respect to insistence upon the cooling of milk intended for cheesemaking on farms, for special attention being given to cream subject to infrequent delivery, and for pasteurisation or aeration when considered necessary. When first and second grade products are received at the factory provision is made for separate receptacles for each grade.

Hon. W. N. Gillies, Minister for Agriculture, addressed the conference on various phases of the industry, and illustrated its importance with the following statistics:—Quantity of butter graded for export, 33,615,848 lb., value, £4,096,924. Butter consumed locally in Queensland, 16,016,000 lb. (approximate); value, £1,623,024. Total production of butter, 49,631,848 lb.; value, £5,719,948.

Quantity of cheese graded for export, 7,068,334 lb.; value, £382,868. Cheese consumed locally in Queensland, 2,000,000 lb. (approximate); value, £108,333. Total production of cheese, 9,068,334 lb. Value, £491,201.

Total value of butter and cheese manufactured for export and local consumption, £6,211,149.

Mr. M. A. O'Callaghan (Commonwealth Dairy Expert) remarked upon the present position of Australia in the butter world, and stressed the importance of continuing to market first quality product.

Mr. M. Wallace (Chief Commonwealth Grader) dealt with the manufacture and grading of cheese for export, and in the course of his remarks made the following points:—

The cheese now marketed on the other side of the world is not similar in quality to that sold locally. In order to manufacture a cheese which would have many of the characteristics of the Cheddar—one that would be palatable when a few months old—it is necessary that it should be made firmer than the cheese sold to local consumers. The sooner cheese goes into cold storage after it becomes dry the better.

The British grocer demands large cheeses about 70 or 80 lb. in weight. Cheese for export should be bright in colour, but not too much so. He favoured a cheese equal in breadth and height. Ninety per cent. of the low yield in summer may be attributed to over acidity. Uniformity in package and marking is essential. Faults in grading include faults in flavour headed by tainted and fruity flavours. Pasteurisation of whey and clean tanks assists in the avoidance of tainted flavours. The only remedy for fruity flavour rests in hygienic handling and the better cooking of the product.

THE EXHIBITION.

POINTS AWARDED.

The points awarded at the exhibition of dairy products held in conjunction with the conference are listed as under. The maximum number of points obtainable in each butter class was 100, proportioned as follows:—Flavour, 65; texture, 20; colour, 7; salting, 4; packing and finish, 4. In cheese the maximum number comprised:—Flavour, 50; texture, 25; colour and finsh, 25. The exhibits were judged by Mr. E. Graham, Chief Dairy Expert.

BUTTER.

——	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
CLASS NO. 1—EIGHT WEEKS STORAGE.						
Salted, Packed for Export.						
Downs Co-operative Dairy Co., Ltd., Toowoomba	57½	19½	7	4	4	92
Queensland Farmers' Co-operative Dairy Co., Ltd., Boonah	58½	20	7	4	4	93½
Maryborough Co-operative Dairy Co., Ltd., Maryborough	54½	19½	7	4	4	88½
Caboolture Co-operative Co., Ltd., Caboolture	54	19	7	3½	3½	87
Warwick Butter and Dairy Co., Ltd., Allora ..	57	19½	7	4	3	90½
Queensland Farmers' Co-operative Co., Ltd., Grantham	55	19½	7	4	4	89½
Caboolture Co-operative Co., Ltd., Eumundi ..	52	19½	7	4	4	86½
Gayndah Co-operative Dairy Co., Ltd. ..	55	19½	7	3	4	88½
Oakey District Co-operative Butter Co., Ltd.	59	20	7	4	4	94
Queensland Farmers' Co-operative Co., Ltd., Booval	58½	19½	7	3½	3½	92
Warwick Butter and Dairy Co., Ltd., Mill Hill	58½	19½	7	4	4	93
Downs Co-operative Dairy Co., Ltd., Dalby ..	56	19½	7	3½	3½	89½
Caboolture Co-operative Co., Ltd., Pomona ..	53½	19½	7	3½	3½	87
Queensland Farmers' Co-operative Co., Ltd., Laidley	57	19½	7	3½	3½	90½
Downs Co-operative Dairy Co., Ltd., Crow's Nest	52½	19	7	3	3	84½
Warwick Butter and Dairy Co., Ltd., Texas	57	19	7	4	3	90
Maryborough Co-operative Dairy Co., Ltd., Kingaroy	56½	19	7	4	3	89½
Downs Co-operative Dairy Co., Ltd., Clifton ..	56½	19	7	4	3½	90
CLASS NO. 2—THIRTY DAYS STORED.						
Salted, Packed for Export.						
Warwick Butter and Dairy Co., Ltd., Texas ..	57	19	7	4	3	90
Caboolture Co-operative Co., Ltd., Pomona ..	56	19	7	4	3	89
Maryborough Co-operative Dairy Co., Ltd., Kingaroy	57	19	7	4	3	90
Downs Co-operative Dairy Co., Ltd., Brook St.	59	19½	7	4	3	92½
Gayndah Co-operative Dairy Co., Ltd. ..	58	19½	7	4	3	91½
Queensland Farmers' Co-operative Co., Ltd., Laidley	58½	19½	7	4	4	93
Downs Co-operative Dairy Co., Ltd., Dalby ..	56	19½	7	4	3	89½
Oakey District Co-operative Butter Co. ..	55	19½	7	4	3	88½
Queensland Farmers' Co-operative Co., Ltd., Boonah	58½	20	7	4	4	93½
Downs Co-operative Dairy Co., Ltd., Clifton ..	56	19½	7	4	3½	90
Maryborough Co-operative Dairy Co., Ltd., Maryborough	55	19	7	4	3½	88½
Queensland Farmers' Co-operative Co., Ltd., Grantham	57½	19½	7	4	4	92
Caboolture Co-operative Co., Ltd., Caboolture	53	19	7	3½	3½	86
Downs Co-operative Dairy Co., Ltd., Brook St.	56	19	7	3½	3½	89
Queensland Farmers' Co-operative Co., Ltd., Booval	57	19	7	3	3½	89½
Warwick Butter and Dairy Co., Ltd., Mill Hill	55	19	7	4	3	88
Caboolture Co-operative Co., Ltd., Eumundi ..	52	19	7	4	3	85
Warwick Butter and Dairy Co., Ltd., Allora ..	57	19½	6½	4	3	90

BUTTER—*continued.*

CLASS NO. 3—FRESH BUTTER.

Salted.

——	Flavour.	Texture.	Colour.	Salting.	Packing and Finish.	Total.
Caboolture Co-operative Co., Pomona ..	57½	19	7	4	3	90½
Queensland Farmers', Boonah	59	20	7	4	4	94
Warwick Butter and Dairy Co., Mill Hill ..	57	19½	7	4	3	90½
Maryborough Co-operative Dairy Co., Kingaroy	58	19½	7	4	3	91½
Caboolture Co-operative Co., Caboolture ..	57½	19½	7	3	3	90
Warwick Butter and Dairy Co., Allora ..	57½	19½	7	3½	3	90½
Maryborough Co-operative Dairy Co., Maryborough	58½	19½	7	4	3½	92½
Downs Co-operative Dairy Co., Brook St. ..	57	19½	7	4	3½	91
Caboolture Co-operative Co., Eumundi ..	58½	19½	7	4	3½	92½
Downs Co-operative Dairy Co., Dalby ..	57	19½	7	4	3½	91
Queensland Farmers,' Grantham	58½	20	7	4	4	93½
Oakey District Co-operative	59½	20	7	4	4	94½
Downs Co-operative Dairy Co., Clifton ..	58	19½	7	4	3½	92
Queensland Farmers', Laidley	59	19	7	4	4	93
Downs Co-operative Dairy Co., Brook St. ..	58½	19	7	3½	3½	91½
Gayndah Co-operative Dairy Co.	58	20	7	4	3½	92½
Queensland Farmers,' Booval	57	19½	7	4	4	91½

CHEESE.

——	Flavour.	Texture.	Colour and Finish.	Total.
CLASS NO. 4.				
Two Export Cheese, Coloured, not less than 60 lb.				
Kooroongarra Co-operative Dairy Co.	43	30	19	92
Merrimac Co-operative Cheese Co., Ltd.	44	30	20	94
Downs Co-operative Dairy Co., Gowrie Junction	41	29	18	88
Downs Co-operative Dairy Co., " Unity," Westbrook	41	30	19	90
Downs Co-operative Dairy Co., " Unity," Jondaryan	39	29	19½	87½
Downs Co-operative Dairy Co., " Unity," Koondai	38	29	20	87
Downs Co-operative Dairy Co., " Unity," Hodgson Vale	44	30	19	93
Warwick Butter and Dairy Co., Ltd., Victoria Hill	42	30	19½	91½
Warwick Buttr and Dairy Co., Ltd., Bony Mountain	41½	29½	18½	89½
Warwick Butter and Dairy Co., Ltd., Talgai	40	30	20	90
CLASS NO. 5.				
Two Medium Cheese, Coloured, under One Month.				
Warwick Butter and Dairy Co., Talgai	40	30	19½	92½
Kooroongarra Co-operative Dairy Co., ...	39	30	20	89
Pittsworth Dairy Co., Ltd., Pittsworth	42½	29	19	90½
Pittsworth Dairy Co., Ltd., Brookstead	41½	30	20	91½
Warwick Butter and Dairy Co., Ltd., Bony Mountain	39	30	19	88
Downs Co-operative Dairy Co., Ltd., Jondaryan	40	29	19	88
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	41½	30	19½	91
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Ltd., Westbrook	41	30	20	91
CLASS NO. 6.				
Two Medium Cheese, Coloured, over Two Months old.				
Warwick Butter and Dairy Co., Talgai	40	30	20	90
Warwick Butter and Dairy Co., Bony Mountain	40	39	19	88
Downs Co-operative Dairy Co., Gowrie Junction	42½	30	20	92½
Downs Co-operative Dairy Co., Jondaryan	41	30	19	90
Downs Co-operative Dairy Co., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Westbrook	43	30	20	93
CLASS NO. 7.				
Two Loaf Cheese, Coloured, under One Month.				
Warwick Butter and Dairy Co., Ltd., Bony Mountain	40	29	19½	88½
Kooroongarra Co-operative Dairy Co.	39	30	20	89
Pittsworth Dairy Co., Ltd., Pittsworth	42	29	19	90
Warwick Butter and Dairy Co., Ltd., Talgai	38	29½	19½	87
Pittsworth Dairy Co., Ltd., Brookstead	41	30	19½	90
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	41	30	20	91½
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	43½	30	19½	93
Downs Co-operative Dairy Co., Ltd., Jondaryan	38	39	19	86
Downs Co-operative Dairy Co., Ltd., Westbrook	42	30	20	92

CHEESE—*continued.*

—	Flavour.	Texture.	Colour and Finish.	Total.
CLASS NO. 8.				
Two Loaf Cheese, Coloured, over Two Months old.				
Warwick Butter and Dairy Co., Ltd., Bony Mountain	38	30	19½	86½
Warwick Butter and Dairy Co., Ltd., Talgai	43½	30	19½	93
Downs Co-operative Dairy Co., Ltd., Gowrie Junction	42½	30	20	92½
Downs Co-operative Dairy Co., Ltd., Hodgson Vale	42½	30	19½	92
Downs Co-operative Dairy Co., Ltd., Jondaryan	38½	29	19½	87
Downs Co-operative Dairy Co., Ltd., Westbrook	41	30	20	91

The Awards were as follow:—

BUTTER.

CLASS NO. 1.—
Oakey District Co-operative Co., Ltd. 1
Queensland Farmers' Co-operative Dairy Co., Boonah 2
Warwick Butter and Dairy Co., Ltd., Mill Hill 3

CLASS NO. 2.—
Queensland Farmers' Co-operative Co., Ltd., Boonah 1
Queensland Farmers' Co-operative Co., Laidley 2
Downs Co-operative Dairy Co., Ltd., Brook St. 3

CLASS NO. 3.—
Oakey District Co-operative Co., Ltd. 1
Queensland Farmers' Co-operative Co., Boonah 2
Queensland Farmers' Co-operative Co., Grantham 3

CHEESE.

CLASS NO. 4.—
Merrimac Co-operative Cheese Coy., Ltd. 1
Downs Co-operative Dairy Co. "Unity," Hodgson Vale 2
Kooroongarra Dairy Co-operative Co. 3

CLASS NO. 5.—
Warwick Butter and Dairy Co., Talgai 1
Downs Co-operative Dairy Co., Hodgson Vale 2
Pittsworth Dairy Co., Brookstead 3

CLASS NO. 6.—
Downs Co-operative Dairy Co., Westbrook 1

CLASS NO. 7.—
Downs Co-operative Dairy Co., Hodgson Vale 1

CLASS NO. 8.—
Warwick Butter and Dairy Co., Talgai 1

STRAWBERRY STALKING DEVICE.

Mr. H. G. Eckhardt, a strawberry grower, of Cleveland West, has patented a very ingenious device for cleanly picking strawberries. The main principle of the device is a steel cutter with V-shaped jaws. It makes a clean cut of the calyx from the fruit. After the berry is cut it drops on to a minute wire grid, through which drops all dirt and grit, and the berry passes cleanly into the picking tray or tin. The device is very simple, and is sure to become a useful and hygienic addition to the strawberry-grower's outfit.

Poultry.

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

The laying in the group sections was excellent throughout the month. In the light group section only five pens out of the eighteen failed to pass the 100 mark, and five out of the twelve heavy group pens failed to secure the 100. The singles in most cases have been very choppy. Several times during the month they appeared to have settled down to work, but a couple of days of westerlies with cold nights put a number off the lay for several days. The health of the birds is excellent. The highest individual score was made by R. Burns's "F" bird with 29 eggs in thirty-one days. W. Becker's White Leghorn in "E" pen laid 27 for the month. The following are the individual records:—

Competitors.	Breed.	May.	Total.
LIGHT BREEDS.			
R. Gill	White Leghorns ...	139	254
H. C. Thomas	Do.	133	245
F. Birchall	Do.	126	233
*G. Trapp	Do.	108	233
W. A. Watson	Do.	127	222
*W. and G. W. Hindes	Do.	92	215
R. C. Cole...	Do.	105	204
*J. Newton	Do.	108	202
Oakleigh Poultry Farm	Do.	131	201
*C. M. Pickering	Do.	111	199
*Mrs. R. Hodge	Do.	93	197
*H. C. Towers	Do.	112	195
O. C. Goos	Do.	118	191
*H. Fraser	Do.	115	190
*J. M. Manson	Do.	116	190
*R. C. J. Turner	Do.	95	186
J. W. Short	Do.	106	175
Miss E. White	Do.	111	172
*C. Goos	Do.	88	172
*W. Becker	Do.	89	166
M. F. Newberry	Do.	103	162
E. Stephenson	Do.	102	158
*E. Chester	Do.	73	157
W. Barron...	Do.	89	154

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	May.	Total.
LIGHT BREEDS—*continued.*			
Bathurst Poultry Farm	Do.	105	153
*Haden Poultry Farm	Do.	67	151
*T. Eyre	Do.	74	150
*T. Fanning	Do.	70	149
*Thos. Taylor	Do.	82	149
*W. and G. W. Hindes	Brown Leghorns... ...	88	149
*E. A. Smith	White Leghorns ...	79	143
*Mrs. L. Anderson	Do.	97	142
*S. L. Grenier	Do.	86	139
*B. Chester	Do.	80	137
Mrs. E. Z. Cutcliffe	Do.	82	134
*G. Williams	Do.	82	132
H. Stacey	Do.	101	118
Brampton Poultry Farm	Do.	35	104
W. N. Glover	Do.	59	94
Linquenda Poultry Farm	Do.	72	91
*H. P. Clarke	Do.	45	65
HEAVY BREEDS.			
Jas. Potter	Black Orpingtons ...	152	270
T. Fanning	Do.	129	259
Jas. Avery	Langshans	117	220
*J. Ferguson	Chinese Langshans ...	144	216
*A. E. Walters	Black Orpingtons ..	124	207
*T. Hindley	Do.	104	203
Jas. Ryan	Rhode Island Reds ...	125	201
Rev. A. McAllister	Black Orpingtons ...	109	196
G. Muir	Do.	120	196
*E. Morris	Do.	73	175
W. Becker	Langshans	63	169
*R. Holmes	Black Orpingtons ...	66	168
*C. C. Dennis	Do.	117	164
*E. Stephenson	Do.	83	163
*Parisian Poultry Farm...	Do.	76	159
*R. Burns	Do.	83	157
*E. F. Dennis	Do.	91	153
*H. M. Chaille	Do.	63	148
*J. A. Cornwell	Do.	105	140
G. Cumming	Do.	72	128
J. W. Newton	Do.	80	105
*Mrs. G. Kettle	Do.	66	94
*A. Shanks	Do.	65	85
*J. E. Smith	Do.	48	65
*E. Oakes	Do.	31	62
*N. A. Singer	Do.	38	57
F. Harrington	Rhode Island Reds ...	31	37
Tom C. Hart	Black Orpingtons ...	24	32
Total	...	6,293	11,102

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	41	30	36	43	44	39	233
W. and G. W. Hindes	45	21	39	46	45	19	215
J. Newton	33	40	39	22	40	28	202
C. M. Pickering	42	34	31	25	42	25	199
Mrs. R. Hodge	31	42	36	33	41	14	197
H. C. Towers	36	29	32	25	34	39	195
H. Fraser	41	27	32	22	38	30	190
J. M. Manson	26	41	35	24	39	25	190
R. C. J. Turner	31	24	29	30	32	40	186
C. Goos	27	43	8	19	24	51	172
W. Becker	19	35	34	24	45	9	166
E. Chester	23	37	23	24	25	25	157
Haden Poultry Farm	23	30	17	25	18	38	151
T. Eyre	25	15	22	32	34	22	150
T. Fanning	29	20	31	24	17	28	149
Thos. Taylor	30	34	20	10	18	37	149
W. and G. W. Hindes	16	14	22	39	27	31	149
E. A. Smith	42	21	31	8	19	22	143
Mrs. L. Anderson	23	27	23	22	29	18	142
S. L. Grenier	17	39	11	30	22	20	139
B. Chester	8	22	35	24	31	17	137
G. Williams	46	28	16	10	15	17	132
H. P. Clarke	34	6	7	1	0	17	65
HEAVY BREEDS.							
J. Ferguson	38	40	23	39	37	39	216
A. E. Walters	28	42	32	38	28	39	207
T. Hindley	45	27	37	30	36	28	203
E. Morris	33	33	13	41	17	38	175
R. Holmes	23	19	21	32	45	28	168
C. C. Dennis	37	18	7	37	37	28	164
E. Stephenson	32	23	35	18	21	34	163
Parisian Poultry Farm	22	25	25	45	7	35	159
R. Burns	18	13	49	5	39	38	157
E. F. Dennis	4	33	19	25	29	43	153
H. M. Chaille	3	42	21	46	36	0	148
J. A. Cornwell	28	4	27	29	27	25	140
Mrs. G. Kettle	4	27	35	0	0	28	94
A. Shanks	4	16	0	20	18	18	76
J. E. Smith	34	29	2	0	0	0	65
E. Oakes	0	26	0	36	0	0	62
N. A. Singer	6	2	9	7	0	33	57

CUTHBERT POTTS,
Principal.

PHALARIS.

Phalaris Bulbosa is described by the manager of the Bathurst (N.S.W.) experimental farm, as among the best winter grasses, and is therefore deserving of more attention from farmers. He is experiencing a strong demand for seed. A new grass from Africa, called wheat grass, is now undergoing trial at the farm, and, so far, it has proved promising.

The Orchard.

INTENSIVE CULTIVATION.

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

In a young country like Queensland, with its vast undeveloped areas, it may at first sight appear somewhat premature to advocate intensive cultivation, and yet when one considers the subject carefully it is very evident that one of the greatest mistakes our agronomists have made has been the tendency to acquire more land or to put a larger area under cultivation than they can possibly attend to.

This fault is not confined to one particular class, as there is a general tendency to grasp more land than the owners or lessees thereof can possibly utilise to the best advantage.

In no branch of agronomy is this more evident than in that of fruit culture, as many of the failures in this industry are directly attributable to the orchardist's attempting to handle a much larger area than he can manage, with the result that the yield of his fruit trees, vines, or other fruit-bearing plants is very much smaller than they would have been had they been given the care they required to produce a maximum return.

The importance of maintaining an orchard in a vigorous state of health and of maintaining the soil in a high state of fertility—in other words, the intensive cultivation of the orchard—has been pointed out by me in my writings on many previous occasions, as I have always maintained and still maintain that a small area properly looked after will frequently yield a greater net return than a much larger area that is more or less neglected.

During recent years there has been a very great increase in the number of small fruit holdings, both in the coastal districts of Southern and Central Queensland and also in the granite belt, a large proportion of the occupiers of such holdings being returned soldiers. These small holdings, if properly handled, are ample to support their owners in comfort, provided they are utilised to the best advantage; that is to say, that they are made to yield a maximum return.

This can only be accomplished by keeping the soil in a state of perfect tilth and in a high state of fertility, and by keeping the trees, vines, or other fruits free from disease and in a state of vigorous growth. These conditions can only be maintained on comparatively small areas, as they demand the constant attention of the orchardist, which they would not get did he attempt to handle a bigger area than he is capable of dealing with thoroughly.

The profits to be obtained by intensive cultivation would astonish those who have not gone into the matter carefully, as when land is kept in a high state of fertility and cultivation and is utilised to the best advantage it returns many times the yield it would do were it treated in the casual manner that many of our farms, orchards, and gardens are. To prove this, one has only to see the returns a Chinese market gardener gets off a small area which he works systematically and utilises to the best advantage.

Intensive cultivation demands two things:—One, the thorough preparation of the land and its maintenance in a state of perfect tilth; and the other, the maintenance of the fertility of the soil so that it contains an adequate supply of all essential plant foods in an available form. The former necessitates not only the working of the surface soil, but the deep stirring and pulverisation of the subsoil, so that the trees or fruit-producing plants grown thereon may be induced to root deeply, and thus be able to withstand dry spells much better than they would do were the majority of their roots near the surface.

The latter is not merely a matter of supplying the land with certain plant foods required as nutriment by the particular tree or plant, but, what is more important, the plant foods added to the soil must be available. No plant foods that are added to the soil in the form of commercial fertilisers can be made use of by any plant until they are dissolved in the water contained in the soil, as they can only enter the plant when in solution, and then only by means of the growing extremities of the finer roots.

It will thus be seen that, unless the soil retains an adequate supply of water, the application of artificial fertilisers will do little good, as the plant is unable to

PLATE 2.—BANANAS, MR W. E. DEAN'S FARM, BUDERIM MOUNTAIN.

make use of them. The retention of the necessary water in the soil is dependent first on the maintenance of the soil in a state of perfect tilth, so as to prevent the loss of moisture by surface evaporation; and, second, by keeping up the supply of humus or organic matter in the soil; as soils rich in humus have the power of absorbing and retaining more moisture than those that are deficient in this respect. Humus must be present in all soils in sufficient quantity, and when a deficiency occurs it must be made good either by the addition of farmyard manure or by the growing of suitable crops and ploughing them under—in other words, by green crop manuring.

Thorough cultivation and systematic manuring thus go hand in hand and are absolutely essential to the success of intensive cultivation.

Some years ago the Agricultural Chemist and the writer carried out a number of experiments for the purpose of determining the value of intensive cultivation as applied to the growing of bananas and pineapples, and the results of these experiments proved without a shadow of doubt that thoroughness in the culture of these two crops paid handsomely, and, further, that it was possible to so treat land that had been starved and neglected that it could be made to yield returns equal to those obtained from it in its virgin state.

Quite recently a further practical example of the results obtained by intensive cultivation has been brought under my notice, and, as the results are so satisfactory and show what good land properly treated is capable of producing, I purpose describing it for the benefit of our young growers, to many of whom it should be a valuable object lesson. In order that the description shall be as clear as possible, I am reproducing herewith photographs that were taken by Mr. Mobsby, the Departmental Artist, specially for this article, as they show better than any words of mine the effect of thoroughly preparing the land, maintaining it in a state of perfect tilth, and systematically manuring it.

The example to which I refer is on the property of Mr. W. E. Dean, Buderim Mountain, and consists of rather less than an acre of good volcanic soil that was originally scrub, and was first planted with bananas twenty-eight years ago. It remained under bananas for six years, when it was planted with paspalum and has since then been used as a grazing paddock, till broken up by Mr. Dean in 1919.

The paspalum when the land was broken up was saved, instead of being burnt, and was placed in the bottom of trenches 24 ft. apart, on the top of which banana suckers were subsequently planted 8 ft. apart in the row, or at the rate of 226 plants to an acre. Two hundred and nine suckers were planted in September, 1919. The land between the rows of bananas was well and deeply worked, and midway between the rows a double row of pineapples was planted, the lower side of the row being Ripleys and the upper smooths. The object of this method of planting the two varieties together was that the Ripleys, having a better hold of the ground, tend to keep the smooths from falling over. This principle is evidently a good one, as the plants of both varieties show a very healthy and vigorous growth; the colour is excellent, and they are bearing a heavy winter crop.

The soil is a deep volcanic loam from which the basalt stones and small boulders have been removed. It is in good heart, and, as previously stated, is kept in a thorough state of tilth.

During the spring of 1920 the land between the pineapples and the bananas produced a heavy crop of cucumbers, for which a very satisfactory price was obtained, and the cucumber crop was followed by peanuts which have recently been harvested, so that it will be seen that none of the land has been allowed to remain idle.

With regard to the bananas, selected suckers having large well-developed bulbs and a stem about 3 ft. 6 in. long were planted in September, 1919, and these mother plants bore their first bunches during the end of 1920 and early part of 1921. From the mother plant only three followers have been allowed to grow, and these at different intervals, and so spaced that no one sucker interferes with another. All superfluous suckers were removed by means of a spud bar some 4 ft. long and sharpened to a chisel point some 2¾ in. wide at one end. Such a tool does the work neatly and does not injure the parent bulb to any serious extent.

Of the 209 stools, each of the two oldest followers is now carrying a bunch, so that on less than an acre of land there are over 400 bunches, which average over 20 dozen individual fruits each, and one bunch had no less than 27½ dozen.

The photographs herewith give an excellent idea of the size of the plants and of the bunches, and the one looking up the centre between the rows shows that the bunches are on both sides of the row, or, as I have said, two to the stool. In one row the bunches are uncovered for the purpose of showing the fruit when taking the photo., but in the other row they are shown covered as a protection against cold nights.

PLATE 3.—A STOOL OF BANANAS, MR. DEAN'S FARM, BUDERIM.

The photograph showing a single stool, beside which Mr. Dean is standing, gives an even better idea of the growth; and the second follower in the foreground, which has made its entire growth during the present year, measures no less than 45 in. in circumference at the ground level.

The land is kept well worked right up to the pines and bananas, and there are no surface roots. The bananas are manured twice annually—the end of August and during February—when they receive either 2 lb. of dried blood, 1½ lb. of superphosphate, and 1 lb. of muriate of potash per stool at each application, or 4 lb. of meatworks manure and 1 lb. of muriate of potash per stool. The manures are distributed around the stools and are well worked into the soil, and cost at the rate of £25 15s. 9d. per acre. When the returns are taken into consideration, this is a reasonable expenditure; further, once the initial expense of preparing the land and planting the crops has been met, the upkeep of the land has been light, as it is in such good order that its cultivation is a simple matter. Horse, not hand, culture is employed, as there is no fear of damaging the roots.

The gross returns from this plot of land of less than an acre in extent will probably amount to over £400 in the year, provided the prices now being realised for bananas in the Southern markets are maintained, as the crop of fruit actually in sight is not far short of 300 cases, and, unless something at present unforeseen happens to destroy them, this quantity should be marketed. Mr. Dean's success is the result of good work well carried out, a striking example of the benefits to be derived from intensive cultivation, and a proof of my statement that a small area well worked will frequently yield a greater net return than a much larger area indifferently looked after. His success should also be an encouragement to many young growers who, instead of utilising their land to advantage, are frequently dissatisfied with the smallness of their holdings and think that they would do better if they had more land. In the majority of cases this is the greatest mistake they can make, as if they are not able to work a small area profitably they will have little chance of working a larger area to better advantage.

THE MARKETING OF FRUIT IN CALIFORNIA.

BY H. W. MOBSBY, F.R.S.A.

While in America as one of the Queensland representatives at the World's Fair at San Francisco in 1915 I was much impressed with the manner in which various fruits appeared in the city shop windows as they came in season. The product from the tree to the table had been properly graded, wrapped, packed, and displayed in the retail establishments in such an inviting way as to make its purchase irresistible. The high level of standardisation helped the fruit to sell itself, and made every buyer a "booster" for the home-grown product. One's curiosity as to Californian marketing methods was aroused and knowledge that might prove useful to the Queensland grower eagerly sought.

Being in San Francisco through the complete seasonal cycle and having observed how fruit retailing was done, I made it my business to call on the local executive of the California Fruitgrowers' Association. I was fully instructed on the Association's sale system and advertising campaigns, and obtained many samples and examples of its sale-compelling publicity.

I was informed that the Association was one big co-operative organisation, handling the production of some 6,000 growers (this number increased later to 8,000) and distributing and marketing through three systems. These were:—(1) Local associations of growers; (2) district exchanges; (3) Central or California Fruitgrowers' Exchange.

The three systems are organised and managed by the growers on a non-profit co-operative basis, each operating at cost, and each distributing the entire net proceeds to the growers after operating expenses are deducted.

(1) Local Associations or Exchanges.—The members (growers) usually organise as a corporation without profit under the laws of California, issuing stock to each member in proportion to his bearing acreage, to the number of boxes he ships, or in equal amounts to each grower.

The local association assembles the fruit in a packing-house and there grades, pools, packs, and prepares it for shipment. It is governed by a board of directors through a manager, and conducted exclusively for the benefit of the growers.

The fruit is pooled each month, each grower having his proportion of the proceeds received for each grade shipped.

Many of the associations pick the fruits, and some of them prune and fumigate trees for their members.

Each association has brands for each grade.

(2) District exchanges are corporations without profit. There may be one or more district exchanges, depending on the number of local associations. The district exchange acts as a clearing-house in marketing the fruit for the local associations through the Californian Fruitgrowers' Central Exchange, and as a medium through which most of the business relations between the exchanges and the local associations are conducted.

(3) The Californian Fruitgrowers' Exchange is formed of district exchanges governed by a board of seventeen directors through a general manager, one director representing each district exchange, and furnishes marketing facilities for the district exchange at a *pro rata* share of cost, places bonded agents in the principal markets of the United States and Canada, defines the duties of agents and exercises supervision over them, gathers information through them of conditions in each market, and receives telegraphic advices of the sales.

The exchange business is on a cash basis, makes prompt accounting of returns to the growers through the district exchanges, conducts extensive advertising campaigns to increase the demand for fruit, develops new markets, and performs other collateral functions between the Central Exchange and the district exchanges.

The Central Exchange levies an assessment against each district exchange for a *pro rata* share of the expense on the basis of the number of boxes shipped.

It does not buy or sell fruit or any other commodity, and exercises no control either directly or indirectly over sale or purchase, its function being to provide facilities for distribution and marketing of the fruit of those shippers who desire such facilities.

The Exchange being a democratic organisation, the growers exercise control over all matters and may withdraw from an association at the end of the year, or the association from a district exchange, or a district exchange from the Central Exchange. These relations are set forth in the various contracts that hold the members together.

The Exchange is organised into several divisions—Sales, Legal, Traffic, Advertising, Insurance and Mutual Protection, and a Supply Department, which furnishes the materials used in the packing-houses and on the ranches at cost to the members; and also directs an advertising campaign which is carried on in all important cities of the Union.

The expense of maintaining the Exchange, including advertising and every other expense, has never been higher than 3 per cent. of gross sales.

THE RIPE OLIVE: ITS FOOD VALUE.

Olives are harvested both ripe and green for pickling, as well as for oil. The ripe olive is too often considered as a relish than as a food. As to its food value there is no doubt as an examination of the following table showing the analysis (made by Professor M. E. Jaffa, University of California) of the ripe olive, green olive, pickles, bread, rice, and potatoes:—

Per pound.	Calories.
Olive, ripe	1,136
Olive, green	598
Pickles	110
Bread	1,215
Rice, raw	1,630
Rice, boiled	525
Potato, raw	385
Potato, boiled	440

The percentage of fat or oil is twice as much in the ripe olive than in the green olive. According to chemical analysis this appears to be the main difference between them. This, however, is not the only interesting point brought out by a study of the

table. Bread is generally considered to contain, weight for weight, far more nutriment than the olive, yet as far as total food value or heat unit is concerned, it will be noted that 1 lb. of ripe olives contains practically eleven-twelfths of the caloric value of bread.

Again, if the ripe olive is compared with raw rice, it will be seen that rice ranks far ahead in total food value—that is, in 1 lb. of raw rice we have much more nutriment than in 1 lb. of ripe olives. If, however, the rice is boiled its food value is reduced to practically half that of ripe olives.

It is not always correct, however, to compare food values on the basis of caloric content, because very often the real value of the food to the body depends on the ingredients more than the caloric value. For example, 1 lb. of sugar contains 820

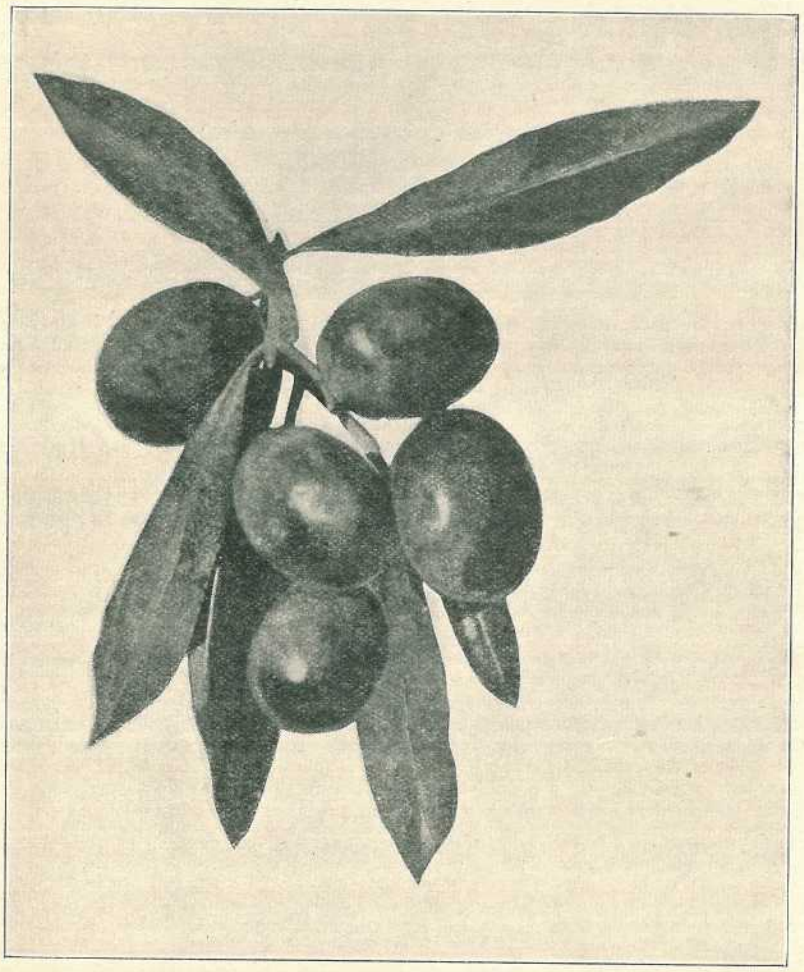


PLATE 4.—A FRUITED SPRIG OF RIPE OLIVES GROWN AT DALMALLY, NEAR ROMA.

calories, 1 lb. of meat less than 1,000; yet one would hardly say that 1 lb. of sugar is equal to 1 lb. of meat where the question of growth is concerned.

Summarising, it may be said that the ripe olive is a very valuable, palatable, and easily digestible form of food, and should be considered as such and not as an accessory or condiment.

Olives find Queensland conditions very congenial, as may be judged by our illustration of a fruited olive branch grown in the homestead garden at Dalmally, Mr. W. A. Russell's property, near Roma. The photo is by Mr. H. W. Mobsby, F.R.S.A., of the Department of Agriculture.

DEHYDRATION.

Californian dehydrated fruit producers are (*vide* "California Grape Grower," April) strongly organising for the purpose of standardising, advertising, and otherwise controlling and directing the commercial side of their enterprise.

The points listed hereunder comprise an epitome of ideas expressed in the course of proceedings of a meeting of producers at San Francisco on 8th March last, and are cited for their topical interest.

POINTS FOR PRODUCERS.

Before any attempt is made to standardise dehydrated products, it will be necessary to standardise methods of production.

The demand for canned and dried fruits is insufficient to relieve market congestion in seasons of plenty. It is necessary, therefore, to seek to produce a dehydrated article that will create a distinct and separate demand—an article that is different from canned fruit and absolutely superior to sun-dried fruit.

It is desired to offer something tasty, absolutely sanitary; something that will occupy small space, will not spoil, and that will keep indefinitely.

The experimental stage of dehydration has passed. An article can now be produced thoroughly suited to the most exacting and refined taste.

Standardisation, either in methods of production or marketing, cannot be done individually. Associated effort on the part of dehydrated fruit producers is essential.

The public must be educated. People must be made familiar with the idea of dehydration, and popular demonstrations as to its forms and culinary use must be conducted at central points.

The question is not that it can be done, but how. Quality and uniformity of the product are essential if public demand is to be created. Quality of production alone determines the value of a dehydrating plant and its output.

Standardise and advertise.

At the meeting, the Pacific Coast Dehydration League was formed and an active organisation established to work along the lines suggested in the foregoing summary.

In the course of the week a parcel of dehydrated peaches was received at this office from Mr. R. G. Booth. The fruit was soaked in water for about twenty hours. Half was cooked in the water in which it had been soaked, and half in fresh water. In each instance the reconditioning as regards flavour, colour, and texture was good, though varying. That cooked in the water in which it had been soaked retained its full flavour and texture, and was equal in every respect to fresh fruit. That cooked in the second water was not equal in flesh texture or flavour to the other. It is apparent, then, that, in order to retain the essential qualities of the product in the process of preparation for the table, it is advisable to use the first water, *i.e.*, the water in which it has been soaked.

Our illustrations show (1) a sample of dewatered peach in its treated form, and (2) the fruit reconditioned.

THE 1921 SUGAR CROP.

At the end of last year the indications were that a record sugar crop would be harvested during 1921. Due to various causes—too much rain and absence of humid heat in some districts, too little rain in others, and the severity of the grub pest in the Hambledon and Mulgrave areas—the original estimates have been much reduced. The present approximate estimate, we are informed by the General Superintendent of the Bureau of Sugar Experiment Stations (Mr. Easterby), is 250,000 tons of sugar. This, if realised, will be the best year Queensland has seen for sugar production, with the exception of 1917, when the yield was 307,000 tons. It may, therefore, be described as an exceedingly good crop.

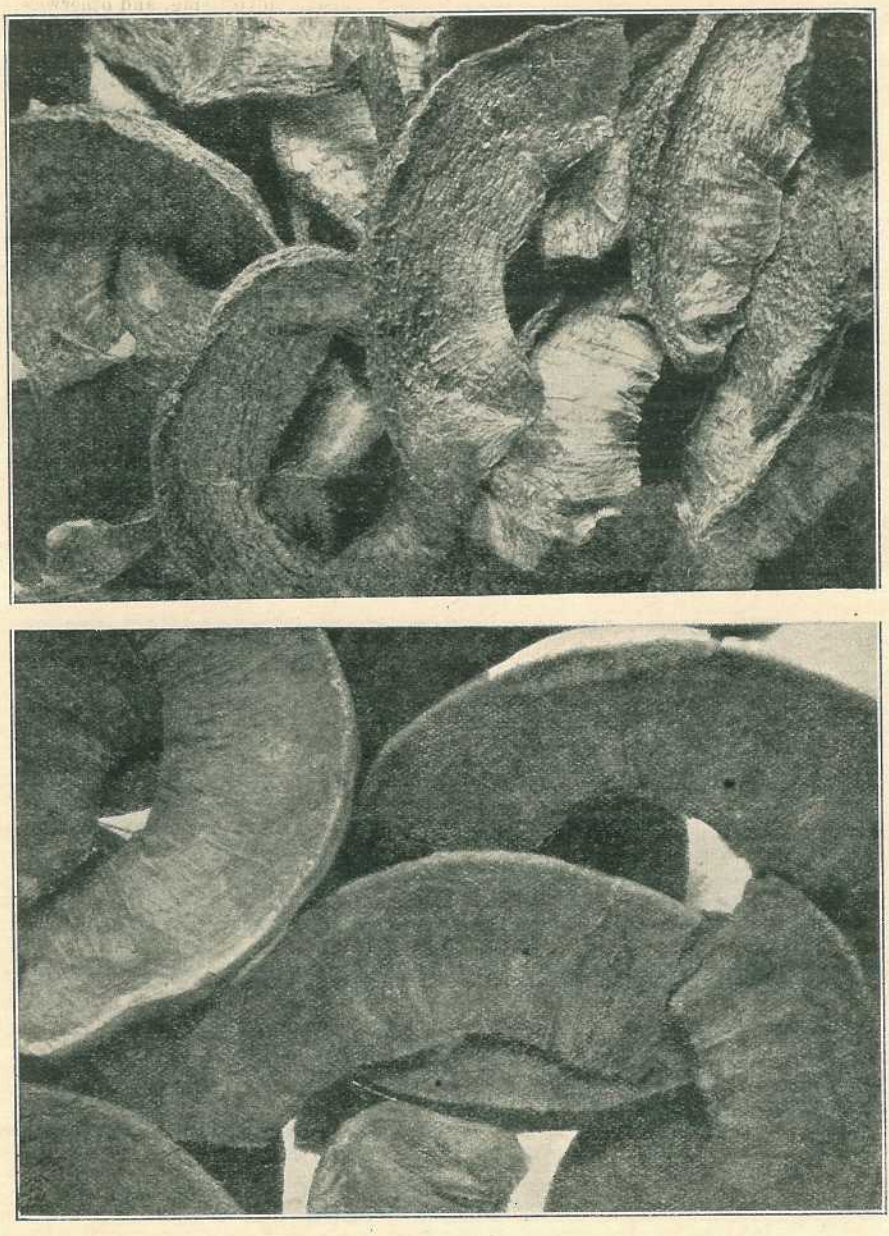


Photo. Dept. Agriculture and Stock.]

PLATE 5.—DEHYDRATED PEACH.

1.—The Marketable Product.

2.—Reconditioned and Ready for Cooking.

(Natural size.)

Horticulture.

TREE PLANTING FOR SHADE AND SHELTER.

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

A thing that strikes visitors from other countries to the rural districts of Queensland is the absence of trees. Of course, on the plain or downs country this is natural, but where trees were originally plentiful they in many cases have either all been cut down or ringbarked. This is, surely, evidence of a great lack of foresight in clearing operations. I know stockmen will say, "You can't have both trees and grass"; that may be so in a general way, but in forest country a few trees for shelter will benefit stock considerably. Many a wind-swept, sun-scorched paddock would be vastly improved by a judicious system of wind breaks—belts of individual, or small groups of trees here and there. On large holdings groups would be better. Fine examples of this may be seen in brigalow country where groves of these fine trees provide excellent shelter. The planting of trees or the preservation of indigenous timber has not received the attention it deserves, as the bare condition of many homesteads and paddocks testify. That stock appreciate shade is evident by the way in which on a hot summer day they may be seen seeking shelter from the sun, if it is only alongside a stunted bush or underneath a small tree. Even sheep on open country may be seen in the middle of a summer's day crowding along dry watercourses taking advantage of what shelter the stunted bushes afford. Another point that should not be overlooked is that in drought time judicious lopping would provide quite a lot of feed for stock. Even the Moreton Bay Fig, where it would grow, could be used for this purpose, and the Carob Bean (*Ceratonia siliqua*) planted as a shelter belt would provide a lot of nutritious fodder from its pods.

Where it is intended to plant lines or belts of trees the ground may be prepared by ploughing and subsoiling. Work it well to a fine tilth, then open the holes sufficiently large to spread out the roots of the plants. In such a belt, plant thickly, say 12 to 15 ft. apart, and two, three, or more lines diagonally, the object being to get a thick belt of trees in a short line. Groups may be planted in various shapes, such as triangle, crescent, or horseshoe, or other formations that may be desired; very large growing trees may be planted much further apart, say up to 40 or 50 ft. When planting, in opening the holes place top soil on one side, then remove the next layer and break up bottom of hole with a pick. If any dead grass or leaves are handy, put a layer in the bottom of the hole, then replace lower soil which, if very poor, may be much improved by the addition of some farmyard manure fairly well decomposed. Place the tree and fill in with the surface soil, tramp firmly around the roots, and leave a depression or "saucer" around the base of the young tree to hold water. Water well and mulch the surface lightly to graduate evaporation. July and August are good months to plant, for all kinds of trees, and are the only months for the planting of deciduous kinds. February and March are also good months for trees planted out of pots. Young trees must, of course, be protected from stock by either tree guards or fencing, and they will repay the trouble of keeping the surface free from grass or weeds by their better growth; also it will be a protection from fire. Watering occasionally will be necessary until the trees get a good hold of the ground.

In giving a list of what to plant, difficulty is experienced in keeping it from being too lengthy. For shelter belts grow *Araucaria Cunninghami* (hoop pine), *Callitris robusta* (cypress pine), carob bean (*Ceratonia siliqua*), *Olea Europea* (olive), *Eucalyptus tessellaris* (Moreton Bay ash), *Grevillea robusta* (silky oak), *Pinus longifolia* (Himalayan pine), Casuarinas (she-oaks), *Acacia anæura* (mulga), *Celtis australis*, and *Platanus orientalis* (plane tree), the two latter being deciduous.

For individual planting or small groups choose *Eucalyptus tessellaris*, *Ficus Benjamina* (weeping fig, warm districts), *Ficus Hillii* (Hill's weeping fig), *Ficus macrophylla* (Moreton Bay fig), *Flindersia australis* (crow's ash), *Gmelina Leichhardti* (Queensland beech), *Pinus longifolia*, and plane tree. For Western Downs and cold districts the best to plant are *Albizzia Lebbek*, *Schinus molle* (pepperina), *Melia composita* (white cedar), Kurrajong (*Sterculia diversifolia*), broad-leaved bottle tree (*Sterculia trichosiphon*), and *Sterculia rupestris* (narrow-leaved bottle tree).

GARDEN NOTES.

Rose pruning should have been finished last month, and the plants should now be making a good start. The first thing after pruning is to manure well with well-decayed manure; if this is not available, a good sprinkling of bonedust is beneficial. Work it well into the soil without unduly disturbing roots. Should dry weather prevail, do not let the plants suffer for want of water. Be particularly careful of newly planted roses, for many are lost after making their first growth through being allowed to dry and the plants being unable to stand a severe check. Keep a sharp lookout for insect pests and deal with them as they arise. Rub off any superfluous shoots such as those that grow across centre of plant; this will ease the annual pruning and benefit the plants.

Flowering shrubs not already pruned should be attended to at once, and beds prepared for summer flowering annuals. Keep the surface soil loose and in a good state of cultivation by running the dutch hoe over frequently.

This is about the best month to break up and replant old gerbera plants. Before lifting, cut off all the old leaves, leaving only the young or last ones; then lift and separate the "clumps" of old plants and replant. A change of position is beneficial. Work in a good sprinkling of lime through the soil and be careful not to bury the crowns.

Another planting-out of some of the hardier flowering plants can be made, such as antirrhinum, coreopsis, calliopsis, gaillardia, verbena, petunia, cornflower, and dianthus. Sowings of seed of aster, zinnias, amaranthus, celosia, petunia, balsams, and other summer-flowering annuals may be made.

STOCK POISONING BY "WHITE CEDAR" BERRIES—A REPORTED REMEDY.

Mr. Walter L. Guy, Rockhampton, writes:—

Just about twelve months ago I communicated with you about eleven young pigs poisoned by "White Cedar" berries.

Now I have just had a similar experience, but have been successful this time, and with the hope of helping other inquirers I will relate the details. Owing to congestion in my pigstyes I was forced to put 6 months old Berkshire pigs in a fowl run adjacent to which is growing a large White Cedar, which I value for its shade. Owing to business delay I did not arrive in time to feed the pigs. Getting hungry, they charged the wire netting and got at the berries. About an hour later I was able to attend to them, and immediately saw what had happened. Remembering my previous experience, I tried to think of the best way out. This is what I did: First of all I administered a big dose of castor oil to each, and this caused four to vomit a lot of berries. Half an hour later I gave them each a dose of Epsom salts, two packets per pig, in milk from a pint bottle. The dose was administered with each pig lying on its back with head held up. Two hours later they received a bran and hot milk mash, which had to be forced down their throats, as they were too sick to take it naturally. I heavily cut their ears to relieve blood pressure, as that symptom is first to show. I then prepared a deep warm bed for them, and at 9 p.m. administered 3s. worth of raw brandy mixed with three double handsful of bran formed into balls and forcibly fed. This on account of their evident suffering from shock and cold. The net result was that one died and the rest are alive and as well as ever. The one that died was harder to catch than the others and its treatment was delayed in consequence.

Tropical Industries.

1921 CANE CROP PROSPECTS.

The General Superintendent of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, who has returned from a visit to the northern sugar districts of Mackay, Proserpine, Lower Burdekin, Innisfail, Babinda, and Cairns, comments as follows on the 1921 cane crop prospects:—

The anticipations of a record crop formed at the end of last year are not going to be fully realised. Excessive rain in some districts, insufficient rain on the Lower Burdekin, and grub damage at Cairns have checked growth. The crop all round, however, will be good.

At Mackay the crops have stooled out well and have a beautiful appearance, but the growth in length is disappointing. This is principally due to the fact that while the wet season has been very heavy there has not been sufficient hot and steamy weather this season to ensure a maximum growth of cane.

A comparison of the average maximum temperature in 1919, 1920, and 1921 for the first three months of the year shows the following results:—

	1919.	1920.	1921.
January	90.2	89.5	87.1
February	90.0	87.2	84.9
March	91.0	88.9	82.7

These statistics show that the temperatures in 1921 for February and March were considerably lower than in either 1919 or 1920, and must have had a marked influence on the making of the cane during the best growing period. The ratoon crop also is not so forward as usual. However, it is expected that a satisfactory yield of cane will be harvested, and the present estimated output of the mills is between 45,000 and 50,000 tons of sugar for Mackay district. New land is being brought under cultivation at Mackay principally to the south along the new line of railway to Rockhampton. There are about 3,000 acres of fine land near Carmilla, and a good deal of this is already settled and producing cane. The Plane Creek Central Mill are putting in about 4 miles of tramway from the main line to the area in question. About twenty settlers have taken up land, and it is expected that next season about 15,000 tons of cane will be sent in to the mill. There are other good pockets of land along this line which are also being brought under cane. The opening up of these new lands and the additional cane to be supplied to the Plane Creek Mill will add largely to the prosperity of the Mackay district, and will also increase our average sugar production.

The Sugar Experiment Station at Mackay is looking particularly well; and the growth of cane for the season upon the experiment plots is very satisfactory. The new West Indian canes are doing well, as are also the Java and Hawaiian canes. The annual field day of the station will be held on Saturday, 2nd July.

Due to the continued rain in the Mackay district, little or no early planting has been carried out.

At Proserpine the cane is also backward for the same reasons as are mentioned in connection with Mackay. Rain was falling every day during the time of inspection, and farmers were being sadly hampered in their preparatory cultivation. Due to this fact, the early planting this year will be negligible. The district of Kelsey Creek has very greatly improved and a number of new areas have been brought under cane. Some very fine crops of Badila were seen here along the creek banks. There is still a good deal of land in the Proserpine district that might profitably be put under cultivation when means of transport can be provided.

The transition from the wet districts of Mackay and Proserpine to the dry belt of the Lower Burdekin is particularly marked this year. After about a fortnight of rain and mud in the Mackay and Proserpine districts, the Lower Burdekin areas were found to be exceedingly dry and dusty. Since the beginning of the year only 15 in. of rain had fallen up to 30th April. This has been increased by a fall of 3 to 5 in. in May, while at Proserpine about 70 in. have been registered. These two districts are not very widely separated, but there is a vast difference in the climatic conditions. This appears due to the fact that there are no ranges of mountains

coming in close to the seaboard in the Ayr district. This district has, therefore, to rely upon irrigation, and if this is applied in time good crops are generally secured. Owing to its high cost, however, a temptation to wait for rain in the early part of the year, when it is most usual, manifests itself, and many growers hold off irrigating in the belief that rain will fall. When it fails to do so to any extent, as in this season, growers pay the penalty in reduced crops, while those whose faith was not so strong and who applied water early reap the benefit. The consequence this year is that those who did not irrigate early are doing so late, in order to save the crop, and many of the pumps were hard at work providing water for the cane. Although the cane is backward, for the most part it looks well and healthy. An interesting feature in this district is the introduction of windmills for irrigation. So far there are not many of these, and they are only being used on small areas. It is stated, however, that 24-ft. mills to work 18-inch pumps, giving a flow of 15,000 to 20,000 gallons per hour, are to be erected, and the work done by these mills will be watched with keen interest, as they should tend to considerably lessen the cost of the application of water. The experiment plot upon Mr. James Mackersie's farm was found to be progressing satisfactorily. New varieties from Java and Hawaii were sent up from the Bundaberg Sugar Experiment Station in April, and these had been planted out and had germinated well, the Hawaiian 227 being on the lead. On the Home Hill side of the river the cane, though backward (except where irrigated), is looking well. The completion of the electric power scheme in connection with irrigation is eagerly awaited, farmers at the present time being much handicapped under dry conditions. Varieties sent to the Lower Burdekin district from the Sugar Experiment Stations from time to time have been of the utmost benefit to this district, the main cropping sorts being the Badila and Gorus, which took the place of the Imperial Cane some fifteen years ago. Many of the Queensland varieties are also being grown, the high-density cane known as Q.813 doing very well.

Leaving the dry areas of the Lower Burdekin, the next district visited was Innisfail, which, with Babinda, is the wettest part of Australia, and this year the rainfall has been high. Up to the middle of May some 136 in. of rain had been precipitated at Innisfail. This heavy rainfall has undoubtedly checked the growth of the cane to some extent, while the softening of the soil and high winds have caused much of the cane to fall. Nevertheless, there is a fine crop in this district, and the cane is green and healthy. All the mills anticipate good crushings. Very little damage by grubs has occurred on the Johnstone this year. At the Sugar Experiment Station a very fine crop will be harvested. Badila cane six to seven months old, first ratoons, had all the appearance of a 40-ton per acre crop. The various experiments in fertilising, cultivation, and subsoiling all look magnificent, while the variety canes have also made astonishing growth considering the comparatively poor nature of the soil. Owing to the waterside workers' dispute at Mourilyan, the South Johnstone Sugar Mill had still 3,000 tons of last year's sugar to get away, and a good deal of this has deteriorated in the abnormally wet season. The Maria Creek soldiers' settlement is going ahead. Sixty-seven ex-service men are on the land so far, and twenty-one farms are now under cane. It is expected that 157 farms in the Innisfail side of the range will be taken up.

At Babinda the rainfall was found to be even greater than at Innisfail. Up to the 14th May some 186 in. had fallen. This enormous rainfall had caused floods, which had damaged the cane, about 120 acres being affected. Of this amount 30 per cent. is estimated to be damaged beyond recovery, but this is only a small percentage of the entire area. The damage by grubs in the Babinda area this year is, fortunately, not great, being principally confined to the northern end, about Fig Tree and McDonnell's Creek. The cane has a fine, healthy appearance, and the crops should cut well. The Babinda Mill expects to treat 150,000 tons.

At Cairns the devastation by grubs this year has been most deplorable. Old growers state that such an outbreak has never been seen for years. The principal damage has been at Green Hills and around Hambledon and Mulgrave, and it has resulted in the estimates of the Hambledon and Mulgrave mills being reduced by some 50,000 tons. This only shows the magnitude of the problem and the enormous losses that the unfortunate grower has to suffer in given years. Floods have also caused a good deal of damage on the Mulgrave flats. The cane not damaged by flood or grubs is looking magnificent, and comparatively large crops will be harvested both at Hambledon and Mulgrave. At the latter place many improvements have been made in the mill, and its capacity is being largely augmented in order to deal with about 50,000 tons more cane which, due to a re-arrangement of areas, is expected next year.

During the course of Mr. Easterby's tour seven lectures on cane-growing and increasing production were delivered. At the close of each meeting, all of which were well attended, discussions ensued, and a great deal of interest in the various questions of cane-growing, cultivation, and fertilising, was displayed.

It may be expected that, despite the checking of the growth by too much rain and damage by floods and grubs, the crop will be very much larger than any since 1917. This is mainly due to the drought having broken and to the increased areas that have been put under cane. In the course of the next week or so the Bureau will be in a position to issue an approximate estimate of the 1921 crop.

It is unfortunate that, owing to the very wet weather in North Queensland, very little early planting has been done this season, so that a great deal of leeway will have to be made up later in the year.

FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports under date 8th June, 1921:—

During the past month a further inspection was made of the Mackay district, also Carmilla, and the Bundaberg and Avondale cane areas.

MACKAY.—This district was dealt with in last month's report, but an interesting tour over the Carmilla Creek country revealed some very fine cane land. This area is situated some 30 miles south of Sarina, and is not promising to look at from the railway siding, but on following the route of the new tramline, which is being built by the Plane Creek Milling Company, the hills fall back from the stream, and some thousands of acres of fine alluvial and forest flats are to be seen. Already new settlers are pushing in there, and the old-established ones are vigorously clearing and planting land hitherto used only for grazing.

The topsoil is deep and well drained, while the subsoil is mostly a porous loam. In the wet season there is a heavy seepage.

The timber growing on this country is mostly bloodwood and ironbark. There are plenty of other varieties, but these two are principally in evidence.

Of the cane already growing on Carmilla Creek, there are some very fine crops of D.1135 and 1900 Seedling. It is probable that these two canes could safely be grown as staple varieties. They are displaying all the characteristics of the best types, and are free from disease of any kind. Other canes would, however, do well, especially such varieties as Q.855, 813, 426, 285, Badila, N.G.24A and 24B.

The geological formation shows nothing apparently of outstanding importance. Many of the peaks are of volcanic origin, although not much of the agricultural country is of volcanic nature.

The spring water in this locality is good, and would be suitable for irrigation. There is always abundant water in Carmilla Creek.

Every facility for getting about was afforded me by the Plane Creek Company. This organisation is to be congratulated on the speedy erection of bridges and preliminary work in connection with the new tramline.

BUNDABERG.—In the Bundaberg district the cane looks well. The season has been a very good one, and the farmers should have nothing to complain of regarding tonnage.

The different Queensland seedlings mentioned in previous reports are going to give splendid results. Some very fine blocks of Q.813 are in evidence at the present time. 1900 Seedling looks well, although the ratoons are not so heavy in stool as they might be. On the Qunaba plantation Badila is making a good showing, although it is not growing to a perfect type of that variety such as seen round Cairns. Cane pests are not numerous. There appears to be a higher percentage of mortality among cane grubs this season than previously. Borers are being greatly checked, perhaps by the ravages of small ants, which are swarming in the cane.

On the areas north of Bundaberg equally favourable conditions prevail. Autumn-planted cane has struck well. There is no evident disease. Even canes usually susceptible to leaf infection have this year a normal healthy green colour. An insect parasite is attacking, in a minor way, the leaf midriff in D.1135.

Varieties mentioned in previous reports on these areas are all doing well, and should still make considerable headway between now and the end of June. A mild winter is anticipated.

AVONDALE AND MIARA.—Fine growing weather has prevailed for the last six weeks, and the tonnage at the time of cutting should be satisfactory. The growers have the upper hand regarding weeds, and are not worried with cane pests. Some of the autumn strikes of plant cane were not quite satisfactory, possibly the cause of this being that the farmers, anticipating a dry spell, covered too deeply.

At Avondale the canes looking best are D.1135, 1900 Seedling, and Yuban. The latter variety has taken a great hold of the ground and is ratooning well, but the canes are thin. It is not a cane to be recommended to the small farmer for planting, especially as there are several very good varieties already widely known that he can plant with better results.

At Miara such canes as B.208, N.G.40, 1900 Seedling, and D.1135 are all growing satisfactorily. There is some excellent cane-growing land in this locality, with a loose well drained subsoil. Much headway ought to be made here by the growers if they devote their time exclusively to cane culture. The principal difficulty is transportation.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date 9th June, 1921:—

In the course of the month of May the following districts were visited:—

INNISFAIL.—Up to the 9th of May the rainfall for this area was 126.96 in. This excessive fall has been a very serious drawback to cultivation. The chief cane grown in the area is Badila and some very good plant crops of this are to be seen. H.Q.426 is only represented by a small percentage. It does not seem to do well in the wet areas and appears to be liable to disease. Very few other varieties are to be seen, but a number of farmers expressed their intention of planting a few of the new varieties from the South Johnstone Experimental Station.

Growers are now using lime to a greater extent than formerly and speak well of its effects upon the crops. Green manuring is also increasing in favour. Up to time of writing grubs or borers were not causing much trouble in this area.

SOUTH JOHNSTONE.—Some very fine crops of plant and ratoon cane are to be seen in this area. Upon both the red soils and alluvial excellent results should be obtained. Practically nearly all the cane is Badila with a small percentage of 24, 24A, 24B, and H.Q.426. Owing to the constant wet weather very little early planting has been possible. Borers are active. Grubs are also doing a certain amount of damage on red soil country, the most affected part being on the 17-mile area. This is mainly old banana country, and some of the farmers are having a bad time. One farmer here used arsenic at the rate of 2½ cwt. per acre on his plant cane. The land was cane holed, the plant laid down, and a little soil on top of it, and later on the dressing of arsenic and the balance of soil. The plant cane looks extremely well.

So far very few tractors are in use in this region as a very big area of the land has yet to be stumped.

Whilst at South Johnstone the Maria Creek Soldiers' Settlement was visited. There are about 24 settlers at work upon their blocks, and they will probably harvest about 100 acres of cane this year. The cane is backward in growth, due to continual wet weather and lack of warmth. The railway authorities expect to have the line through by the end of October or early in November.

BABINDA.—In this district the rainfall has been very heavy. Up to the end of May 187.38 in. were recorded. Farming work has been seriously delayed. Grubbing is being carried out in all parts of the area and the extent of cultivation for 1922 should be considerable. Plough teams and tractors are also very busy.

Although the rivers and creeks were in flood several times this year the damage caused was not as much as one would expect, only a few farmers being badly affected. Although grubs are to be seen they had not done a great deal of damage up to time of writing. Borers are still about, although evidently the parasitic flies have helped to keep them in check.

The principal cane grown is Badila of which about 90 per cent. will be harvested. Other canes are 24, 24A, 24B, H.Q.426, 1900 Seedling, D.1135, B.147, and B.208. Of these the Gorus seem to promise best results.

Very little manuring has so far been carried out in this area, but numerous growers intend using lime and artificial manures. Returns from the manured areas have so far been very satisfactory.

BOWEN.—The Bowen district was visited early in April and the cane areas adjoining the Don River were green and healthy, and should develop into good crops. The cane areas are very small, as fruit growing and mixed farming generally are mostly favoured. Farmers interviewed who are now growing cane expressed their intention of increasing their present area, as the Proserpine mill is anxious to get a larger supply from this district. The principal varieties noticed were H.Q.426, 24, 24A, and 24B, and Malagache. Mr. J. Nichol has a number of varieties planted, and amongst them D.1135, 1900 Seedling, 24B, and H.Q.426 look very healthy. Several of the farms have small irrigation plants, and the cane thereon looks extremely well. Liming and green manuring would benefit most of the farms visited.

PROSERPINE.—At Proserpine very heavy rain had been experienced—January 14.96 in., February 15.25 in., March 26.87 in., and April to date 3.16 in., or a total of 60.24 in. This gave the ground a thorough soaking and delayed all farm work. The soil is mostly a dark alluvial, covering a clayey subsoil necessitating surface drainage, and in other places a sandy subsoil is found. Some very good scrub land is found upon the river, and creeks. The various districts are well served with tram lines. Samples of soil taken show the need of drainage and liming in most cases. I am informed that burnt lime at £4 5s. per ton and earth lime at 27s. 6d. per ton delivered at Proserpine can be obtained.

So far very little cane disease has troubled this district. Several tractors are in use, the owners claiming that although very expensive to work lately on account of high cost of fuel yet they are a good investment when large areas have to be prepared. The principal varieties of cane harvested last season with their average c.c.s. are as follow:—

Variety	Average c.c.s.	Proportion of Crop.
H.Q.426 (Clark's Seedling)	15.2	23 per cent.
Malagache	13.2	18 per cent.
Goru	13.6	16 per cent.
Badila	14.4	13 per cent.
S. Singapore	13.1	10 per cent.
D.1135	13.3	8 per cent.
1900 Seedling	14.3	4 per cent.

and 13 other varieties amounting to only a proportion of 8 per cent. of total crop.

Q.1121 and Q.813 together were represented by only 1 per cent. of crop, and they had an average density of 13.1 and 14.3 respectively. A far larger proportion of Q.813 is now, however, being planted as this cane is rapidly increasing in favour.

Grubs were found last year in isolated places and about 5 tons of beetles were paid for early this year by the Farmers' Association. At Strathdickie, Mr. R. Redhead suffered somewhat from grubs in 1920. He then planted a crop of corn and when plowing out same, found numerous grubs about. When planting this with cane he put arsenic to the amount of 80 lb. to the acre in the drills with the plants, and then covered over with soil. The cane (Clark's Seedling) now looks very well. Upon the river bank Ruge Brothers have a very fine crop of 1900 Seedling ratoons. It is a good colour and has stooled out well. A large area of land is now being cleared by the use of 2-horse grubbing machines, supplied to the farmers at a weekly rental by the mill management. The use of these is much appreciated, and judging by present results should very materially aid in a larger area being placed under cultivation in the near future.

With present weather conditions the mill should harvest a tonnage of about 60,000 tons for 1921.

HERBERT RIVER.—The conditions here, too, had been extremely wet, preventing ploughing and cultivating generally. The two mills should approximately cut 220,000 tons. The soil generally is a dark or light coloured alluvial loam, covering clayey and sandy scrub soils. The principal varieties of cane grown are H.Q.426 (Clark's Seedling), N.G.15 (Badila), Goru, 24, 24A, 24B, Black Innis and 1900 Seedling. The Colonial Sugar Refinery are also now distributing the variety known as H.Q.409. It is said to be a good striker, and a very large stooler, and is of good density. A number of tractors are in the district, but the horse is still doing the greater amount of the work. Owing to the absence of seed very little green manuring has been possible. Liming is increasing in favour everywhere, and when used the crops show up correspondingly. Mr. Glover of Hawkins Creek used about 2½ tons of earth lime to the acre on his first ratoons, and a couple of months later 2 cwt. per acre of blood manure. The cane looks very fine. Mr. Enticknap also used 1 ton to the acre of lime on a 12 acre block of plant cane, this also looks better than his unlimed cane. Also upon the abovementioned block was a small patch of land that repeatedly failed to grow cane, but, after liming, this piece is well up to the average of the block. Grubs are showing up in several parts of the district and may yet do some damage to the growing crops. At Halifax, Mr. Skinner is now carrying out an interesting trial. His farm always suffers very badly from this pest, and so after ploughing in a crop of cow pea and subsequently planting, he used arsenic at the rate of 40 lb. to the acre, running the arsenic mixed with a little lime through a manure distributor, and as close as he could to the cane, covering over with a disc harrow; later on he used a top dressing of about 2 cwt. sulphate of ammonia to the acre. This cane now looks splendid although in a place where grubs always show up early.

Although I have not noticed it, I was informed that borers were in evidence on a few farms. It must be emphasised most strongly that the utmost care should be taken in selecting plants from any of these infested paddocks.

Forestry.

QUEENSLAND TREES.

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

No. 4.

YELLOW SASSAFRAS (*Doryphora sassafras*).

Common Names.—Yellow sassafras, Sassafras, New South Wales Sassafras, Golden Deal.

Derivation: Gk. *dory*, a spear; *phoreo*, I carry (alluding, perhaps, to the bristle-like points of the anthers), sassafras is the name of a well-known North American tree with a similar fragrance.

Description.—A large tree attaining a height of 120 ft. and a barrel diameter of 4 ft. Barrel not prominently flanged. Bark grey, sometimes slightly wrinkled and finely scaly; when cut it is brown and measures 7/16 in. thick on a tree with a barrel diameter of 2 ft. 4 in., sapwood pale. Heartwood deep yellow. The bark and sapwood are fragrant, but the sassafras odour of Queensland specimens is not so strong as in *Cinnamomum Oliveri*. Young shoots and flowers downy with silky hairs; adult leaves and branchlets hairless. Leaf stalks $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Leaves opposite, elliptical, narrowed at the base, the apex with a blunt point, margins coarsely toothed, lateral nerves and net veins more conspicuous on the underside; measurement of leaf blade, $1\frac{3}{4}$ to $3\frac{1}{4}$ in. long; $2\frac{1}{2}$ to $3\frac{1}{4}$ times as long as broad. Flowers in small bunches in the forks of the leaves. In each flower-bearing fork there are one or two stalks (peduncles), measuring from $\frac{1}{8}$ to over $\frac{1}{4}$ in. long, at the top of which are generally three silky downy flowers each on a stalklet about $\frac{1}{4}$ in. long. Individual flowers about 1 in. in diameter when expanded. The outer part of the flower consists of six perianth lobes tapering into fine points. On the inside of the perianth lobes and opposite to them are six stamens nearly as long as the perianth lobes; the anthers or pollen-containing organs of the stamens are situated towards the base of the stamens and are surmounted by long bristle-like points; alternating with the stamens are six shorter and narrower staminodia. The carpels, the female organs of the flower, of which there are several, are situated within the lower part of the perianth.

In the fruit the lower part of the perianth is enlarged, becoming narrowly egg-shaped and measuring over $\frac{1}{2}$ in. in length; it eventually splits on one side and exposes the carpels, which are covered with long brown hairs attaining $\frac{1}{2}$ in. in length.

Flowering period, July; in fruit, November and December.

Distribution.—Confined to Australia. A very common tree in the "scrubs" of the ranges near Killarney, Macpherson Range, National Park, and Upper Nerang River. We have no record of it north of Brisbane. It is found in New South Wales in "scrubs" or "brush," from near the Victorian border on the south to the Queensland border on the north.

Uses.—The timber appears to be used fairly extensively in the Warwick district for general indoor purposes, such as lining, flooring, &c. It is often known there as "Golden Deal." In New South Wales it is also used for lining, flooring, &c. According to Mr. J. H. Maiden, it is rarely touched by white ants, but takes a long time to dry and will not stand glueing.

Chemical.—Dr. J. M. Petrie, Linnean Macleay Fellow in Biochemistry, found that the bark, leaves, and fruit contain an essential oil of a characteristic sassafras odour. The bark contained 1.35 per cent., leaves 4.3 per cent., and fruit 4 per cent. (percentage calculated on material dried at 100 deg.). He also found in the bark, leaves, and fruit a poisonous alkaloid which he named "Doryphorine."

References.—Doryphora sassafras *Endlicher*, "Iconographia Generum Plantarum," tablet 10; Bentham, "Flora Australiensis," vol. v., p. 283; F. M. Bailey, "Queensland Flora," part iv., p. 1295; J. H. Maiden, "Forest Flora of N.S.W.," vol. 1, p. 42, with figure.

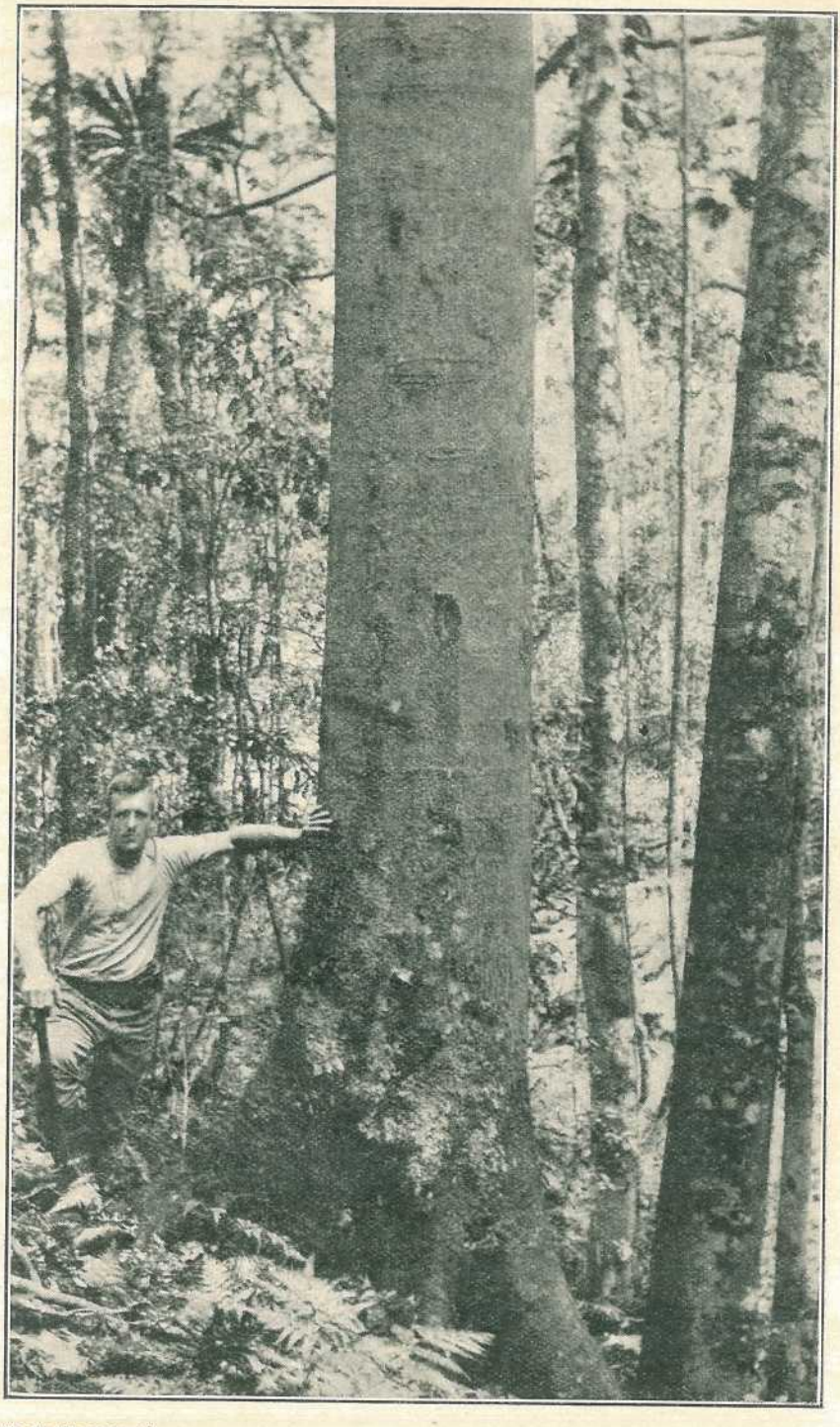


Photo. by the authors.]

PLATE 6.—YELLOW SASSAFRAS (*Doryphora sassafras*).
Mountain Ranges East of Emu Vale, near Killarney.

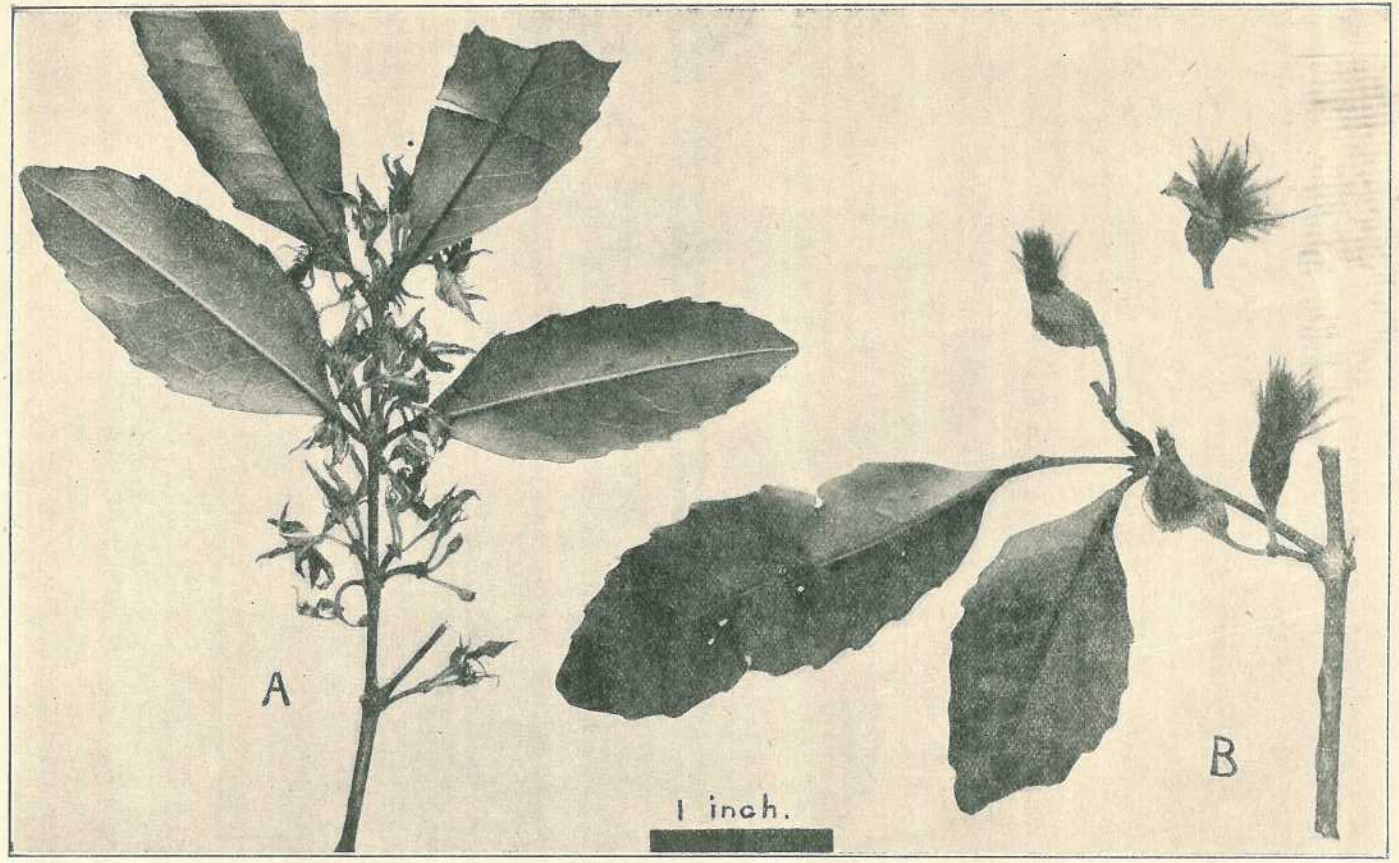


Photo. Dept. Agriculture and Stock.]

PLATE 7.—YELLOW SASSAFRAS (*Doryphora sassafras*).
A.—Flowering shoot. B.—Fruiting shoot.

Entomology.

THE "MEALY" OR "GREY-BACK" CANE-BEETLE.

BY EDMUND JARVIS, Entomologist, Bureau of Sugar Experiment Stations.

Although much has been published, both of a scientific and popular character, respecting the cane-grub problem, no attempt has, I believe, been made, up to the present, to describe and at the same time illustrate the metamorphosis and external anatomy of our principal cane-beetle, *Lepidoderma* (*Lepidiota*) *albohirtum*, Waterhouse.

The figures on the accompanying plate were drawn and coloured from nature by the writer. The illustration will enable growers to at once distinguish the various life-cycle stages of this pest from those of other closely related but less injurious root-eating Scarabaeidæ associated with sugar-cane, and also obviate any necessity for lengthy technical descriptions that are often objectionable to the average reader.

THE EGG.

In general appearance the egg is obtusely-ovate, creamy-yellow (fig. A), the chorion or shell somewhat coriaceous, finely and irregularly sculptured on the surface, as shown enlarged in fig. B.

When first deposited it is about 4.25 m.m. long by 2.85 m.m. in width, but during development gradually swells, until just prior to hatching it becomes more rounded, darker, sometimes brownish, and may measure fully 6 m.m. in length (nearly a quarter of an inch).

The depth at which these eggs are found depends, naturally, to a great extent upon the amount of moisture in the soil at the time of deposition, which needs to be sufficient to keep them thoroughly damp during a period of at least two weeks.

Practically all of the female specimens confined by the writer in cages of moist earth 5 in. deep at Gordonvale Laboratory (December, 1916) oviposited against the bottom of their cages, where the earth had purposely been made wetter and firmer than that nearer the surface. Had there been more depth of soil, they would probably have gone down a few inches deeper.

Those laying large batches of eggs usually constructed a chamber of irregular shape, from 1 to 1½ in. in length (fig. A), with sides more or less compacted, sufficient room being allowed for the eggs to expand during development.

This cavity generally contained some loose earth, displaced most likely by the beetle whilst crawling from the spot after having oviposited.

The eggs are placed in a flattened mass on the floor of the chamber, and may be produced separately or attached in short strings of two or more, or in adherent groups consisting of as many as seventeen (so far as observed); but as a general rule they are laid singly, and nearly always intermixed with small particles of soil.

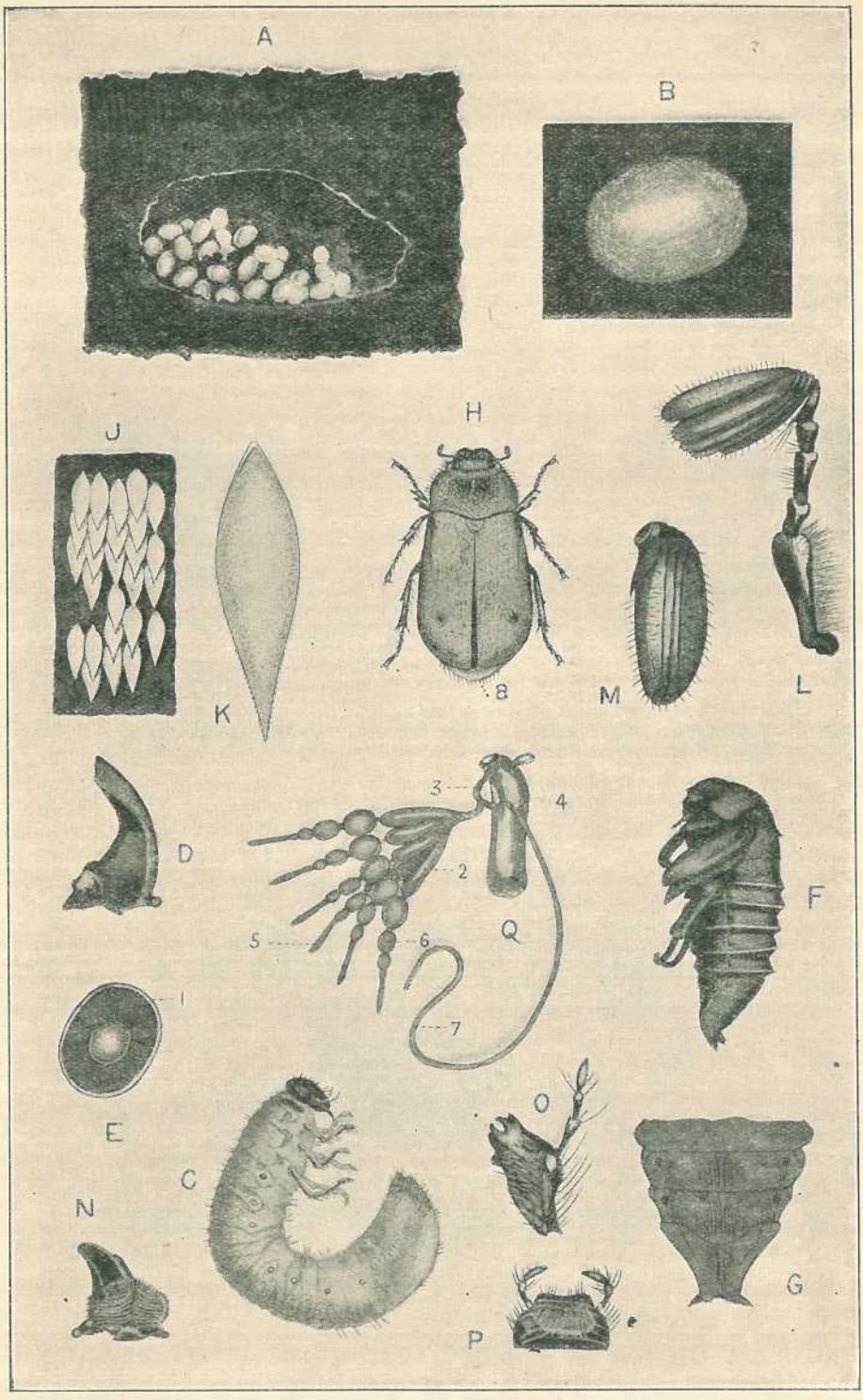
The maximum number derived from one caged female was thirty-six, while other lots, taken from chambers formed in cages of damp earth, comprised eight batches of thirty eggs, three of twenty-nine, one of twenty-eight, one of twenty-seven, seven of twenty-six, three of twenty-five, eight of twenty-four.

The seventy-three females used in the above experiments produced collectively 1,537 eggs (21.5 per insect); but, disregarding specimens laying less than twenty-four eggs, a total of 861 was obtained from thirty-two females, giving an average of about twenty-seven eggs per insect.

When producing twenty or less, the eggs in such lots were generally a little larger at the time of deposition than those taken from chambers containing twenty-five to thirty-six.

Among batches of thirty to thirty-six it was not unusual to find two or three eggs much smaller than the rest.

The two ovaries, one of which is shown in fig. Q, consists of twelve ovarian tubes (Q-2) connected with two oviducts (Q-3), which, together with the long worm-like spermatheca (Q-7), communicate directly with the vagina.



Drawn by Edmund Jarvis.]

PLATE 8.—THE "MEALY" OR "GREY-BACK" CANE-BEETLE.

THE GRUB.

The following brief description of the grub during its third instar (full size) will enable growers to separate it from those of related *scarabaeid* cane beetles.

Description.—General colour creamy-white, bluish, and somewhat translucent just after moulting; the anal segment suffused with dark grey, slatey-blue, or brown, due to the presence and varying colour of the kind of soil ingested. Angular ridges of mandibles black (fig. D); antennæ brownish, five-jointed, the distal ends of same yellow; first joint broadest, about as long as wide; third longest, fourth longer than second, with lower edge of apex produced into a finger-like point; fifth joint about half length of third, with the extremity sub-acute. Stigmata convex, light ochraceous suffused basally with brown, peritreme closed, dark reddish-yellow edged with deeper red, concave, circular near tail end of body (fig. E), and becoming ovate towards head; the spiracle on first thoracic segment largest and usually of irregular oval form. Latero cervical shield light yellow.

Vestiture.—Body clothed with a few rather long light reddish hairs, more plentifully near stigmata and on ventral surface; the ridged elevations of dorsal area of abdominal segments 2 to 6 covered with numerous short very stout brown spines; lower surface of legs thickly clothed with long red spine-like hairs, most abundantly on tibiæ and tarsi; the median path on venter of posterior portion of last abdominal segment consisting of two nearly parallel rows of small stout bristles, about twenty-six on each side, surrounded by longer bristles.[1]

> NOTE.—This disposition of the hairs, &c., can be clearly seen with a simple pocket lens, and, being arranged in different order on the anal segments of the various species, affords one of the best means of separating the grubs of our cane beetles.

Greatest size when fully extended, about 2½ in.; in natural doubled-up position, 1 in. Greatest width ½ in., taken across base of anal segment.

The only other large cane-grubs likely to be confused at first sight with that of *albohirtum* are *Lepidiota frenchi*, Blackb.; *L. consobrinus*, Gir.; and *L. caudata*, Blackb.—all of which, however, are slightly darker, decidedly opaque, and have quite different arrangements of the anal path and surrounding bristles.[2]

When a third stage grub of *albohirtum* is first brought to light in the plough-furrow, it displays a rather curious habit of convulsively doubling its head and thorax, for the space of about half a second, against the ventral surface of the anal segment.

If uninjured by the plough, it often repeats this movement at intervals of about ten seconds during the first minute of exposure, before commencing to bury itself again.

THE PUPA.

A popular description of this stage is given by Tryon in his "Grub Pest of Sugar Cane of the Mackay District."[3]

The pupa of *albohirtum* is about the largest of those occurring commonly in the furrows, full size specimens being 1½ in. long by nearly ¾ wide. The general form and colouration are shown in fig. F; but a brief allusion to the chief points of difference between this pupa and those of closely allied species will serve to throw additional light on this phase of its metamorphosis.

The pupæ of several of our scarabæid cane-beetles were classified for the first time in 1916 by Mr. A. P. Dodd, Assistant Entomologist, whose table of the pupæ in Bulletin No. 6 of this Office will be found helpful. In this "key" the pupæ of *albohirtum* is distinguished by the following characters:—"Size large to medium. Cremaster bearing two sharp spines. Clypeus straight or nearly so. Posterior tarsi distinctly shorter than their tibiæ. Outer edge of anterior tibiæ without teeth; spiracles not raised or prominent. Abdominal segments 3 to 6 ventrally with a small triangular transverse slit with serrated margins, the one on the third segment smaller; ridges of abdominal segments 2 to 6 dorsally acute; longitudinal path of irregular striæ on dorsal segments 7 to 9 of abdomen rather broad, narrowed at base, with about 20 fine striæ at its widest part; medio-dorsal line of abdominal segments 1 to 6 plainly visible."

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[1] Bulletin No. 4, Qld. Bureau Sugar Expt. Stations Div. Ent., Plate 1, fig. 3, 1916 (see anal path of *L. albohirtum*, Water.).

[2] Bulletin No. 6, Qld. Bureau Sugar Expt. Stations Div. Ent., Plate 1, figs. 17 and 18, p. 5, 1917 (see illustrations of arrangement of bristles on anal paths of *L. frenchi*, Black., and *L. consobrinus* (No. 683), respectively).

[3] Department of Agriculture and Stock, Brisbane, July, 1895.

These striæ, which I have slightly enlarged at fig. G, appear to be a reliable specific distinction. The very noticeable horn-like processes on the cremaster diverge right and left, and are directed upwards and posteriorly at an angle of about 45 degrees.

The lower portion, two-thirds the length of this horn, is dusky-ochraceous, swollen, cylindrical, and slightly tapering, but thence become suddenly contracted, and terminate in a stout black-pointed spine. In some specimens the surface of this tumid basal portion is wrinkled, exhibiting a series of encircling rings.

The pupa of *L. frenchi*, although somewhat resembling that of *albohirtum*, differs in being much smaller (about 1 in. long), and in the possession of three darkly pointed teeth on the edge of the front tibiæ.

With reference to the situation of the pupa of our "grey-back" cockchafer, most growers are aware that the fully developed grub of this species, after tunnelling downwards vertically beneath a cane stool, constructs an oval chamber measuring about 2 in. by 1 in., in which it pupates.

The walls of this chamber are smooth and firmly compacted, being, according to Tryon, specially lined with the food material and ingested earthy matter contained in the hind segments of these grubs.

In order to ascertain the position of pupæ occurring in volcanic land at Gordonvale, tests were made by the writer during October, 1915, by digging a number of pits 5 ft. square by 2 ft. deep. The first four of these holes contained collectively a beetle, four larvæ, and twenty-three pupæ of *albohirtum;* besides thirty-two grubs of other species of Scarabaeidæ (principally *L. frenchi*) in various stages of growth. No pupal chambers occurred nearer than 1 ft. from the surface, and none deeper than about 15 in., the majority being in soil that was nearly dry.[4]

The occurrence of pupæ at depths of 4, 5, 5½, 6, 12, and 15 in. was recorded by Girault and Dodd in 1915; the lesser depths (from 4 to 5 in.) having been obtained by them from sandy and sandy-loam soils.[5]

Judging by the above records, one might be inclined to imagine that the position of the pupal chamber may not always be determined by varying degrees of moisture in the ground; but it should be borne in mind that, although the occurrence of pupæ in dry situations is by no means uncommon, satisfactory conclusions in this connection are impossible in the absence of exact knowledge regarding the climatic conditions prevailing at the time when the pupal chamber is under construction.

Such great variation in depth (from 4 to 15 in.) must, I think, be attributed to the combined influence of several factors, such as the temperature, moisture, drainage, and mechanical condition of infested lands, operating in conjunction with other agencies influencing the movements of the mature grub; or possibly to the aggression of certain predaceous insect or other enemies chancing to be present in the soil at a time when grubs happen to be tunnelling below to pupate.

The lining or, in reality, puddling of the cell walls would naturally tend to retard evaporation and to some extent lessen the need for absolute dependence on outside moisture.

Tryon was the first to record the interesting fact that grubs of our "Grey-back" cane-beetle usually pupate directly under the stools they have been destroying. "This," he remarks, "is probably the outcome of an instinct for self-preservation—the dryness of the soil often proving fatal to their existence—and an inherited experience that moisture is retained for a long time perpendicularly beneath the cane stool, when it has vanished in great measure from the earth that surrounds it."

It will be seen from the foregoing notes that the pupa of *albohirtum* occupies a position of complete isolation, lying not only at a greater depth than the eggs, but being placed in a specially prepared chamber, with its smooth walls lined in a manner calculated to effectually exclude small insect enemies, and prevent it from drying up or being harmed by heavy rains. This isolation of the pupa proves advantageous also to the beetles themselves, which often have to remain several weeks, occasionally months, in these subterranean chambers while waiting for rain to soften the ground sufficiently to allow them to tunnel to the surface and enter upon their aerial existence.

THE BEETLE.

Description.—Size and general appearance as shown in fig. H. Deep-brown, almost black, more or less thickly covered, except on legs and central area of venter of abdominal segments, with minute, white, sharply-pointed, pear-shaped scales (figs. J, K); not lying in punctures but exposed and readily detachable.

[4] Queensland Agricultural Journal, vol. iv., pt. 6, p. 350, Dec. 1915.

[5] "The Cane Grubs of Australia," Qld. Bureau Sugar Expt. Stations, Division Entomology, Bulletin No. 2, p. 25, 1915.

Freshly emerged specimens are uniformly grey and mealy-looking, but after a few days on the wing become more or less rubbed, these denuded places appearing as irregular black blotches. The scales on elytra of fresh specimens occur most numerously over an area extending about a quarter of an inch on each side of the suture, the central edge or epipleurum being often nearly naked. The pygidium (H. 8) is large, evenly rounded behind, and uniformly but not densely scaled. A small irregular bare patch is usually present on the apical area of each elytron, these two dark spots (indicated in fig. H) being quite a characteristic feature. Just behind each spot lies a small, obtuse, upward projection of the surface of the wing-case, which from this point slopes rather steeply to its apical edge. The sides of the abdomen are thickly covered with scales, which near the costal edge of the elytra are replaced by a mat of finer yellowish-grey decumbent hairs, that cover also the mesonotum and the entire dorsal surface of the propygidium and fifth abdominal segments. Long red bristly hairs occur more or less thickly on the following portions of the body:—Dorsal hind margin of head; outer edges of clypeus, extending ridge-like on frontal portion of eyes; the trophi (figs. N, O, P); anterior edge of prothorax; front margin and upper half of lateral edges of pronotum; legs; centro-ventral area of mesothorax; and posterior edges of pygidium. The form of the antennæ is shown in fig. L, the club being composed of five plates in the male, four in the female; the fifth plate varying in length, and being in some specimens as long as the other four; in others only half the length or even less. The club of female (fig. M) is generally a trifle shorter and more regularly ovate than in the opposite sex. Outer edge of distal end of front tibia with two large bluntly-pointed teeth, and an almost central smaller rather sharp tooth; inner edge provided with a single very stout blunt spine of about the length of first tarsal joint. Intermediate and hind tibiæ with a central tooth and two stout, blunt, curved spurs at distal extremity.

Details respecting the economy and control of this species do not fall within the scope of the present article, but most of our canegrowers are more or less familiar with the principal habits of the adult "Grey-back" beetle, and have collected thousands of specimens from their feeding-trees.

DESCRIPTION OF PLATE.

(Drawn by the Author.)

A—Eggs of "Grey-back" cane-beetle; *in situ*, nat. size.

B—Egg of same, enlarged.

C—Grub of same, third instar, nat. size.

D—Mandible of grub, enlarged.

E—Stigma of same, enlarged; 1, Peritreme.

F—Pupa of "Grey-back" cane-beetle, nat. size.

G—Dorsal view of abdominal segments 7 to 9 of same, showing arrangement of striæ.

H—*Lepidoderma* (*Lepidiota*) *albohirtum*, Waterh.; male, nat. size.

J—Portion of wing-case of same, showing arrangement of scales, enlarged.

K—A single scale, highly magnified.

L—Antenna of same, showing 5-lamellate club, male.

M—Antennal club of female, with 4 lamellæ, enlarged.

N—Mandible of same, enlarged.

O—Maxilla of same, enlarged.

P—Labrum of same (lower lip), enlarged.

Q—An ovary of same, eight days after copulation; 2, ovarian tube; 3, oviduct; 4, copulatory pouch; 5, terminal chamber; 6, immature egg; 7, spermatheca.

THE CANE GRUB.

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

Following the deluge of March and April in the Cairns district, we have had almost constant daily showers, keeping the soil in a state of saturation. While this excessive moisture has improved the appearance of dying cane in grubby fields, it has made it very difficult to keep the young plant crop clean. Cane on the forest land, where there is scarcely an indication of grub injury, is making splendid growth, especially the D1135, which is a variety splendidly adapted to the poorer soils. This

cane, however, is unsatisfactory for the rich scrub lands, for the growth is too rank, and the stalks, being so slender, invariably lodge and root to the ground wherever the joints touch. This we have found to be the result in our experimental plots at Greenhills; hence it will be a very troublesome cane to harvest.

The abnormal weather conditions, moreover, have upset our experiments with arsenic, though the fungus disease has caused a real epidemic again among the grubs, the excessive moisture and cool nights being just the conditions required for perfect development of these lowly organisms.

EFFECT OF FLOODING UPON GRUBS AND SUGAR CANE.

During the excessive rains of 1917 I found many apparently lifeless grubs lying about in the water on the surface of the soil. This appealed to me as a possible method of control, so I made some further observations. Much to my surprise, however, the apparently dead grubs soon revived when taken out of the water. Experimenting, I found that it required several days' submergence to really kill them.

Following upon the recent floods, we again took up this phase of the problem. By using pots of soil with one grub in each, and submerging them, we were able to get definite data. These showed that an overflow of one or two days would only destroy the weaklings, while three or four days would begin to have a vital effect even upon the strong, and none of the grubs could withstand an inundation of five days. These conclusions were further borne out by field observations after the soil dried out so that we could dig in it.

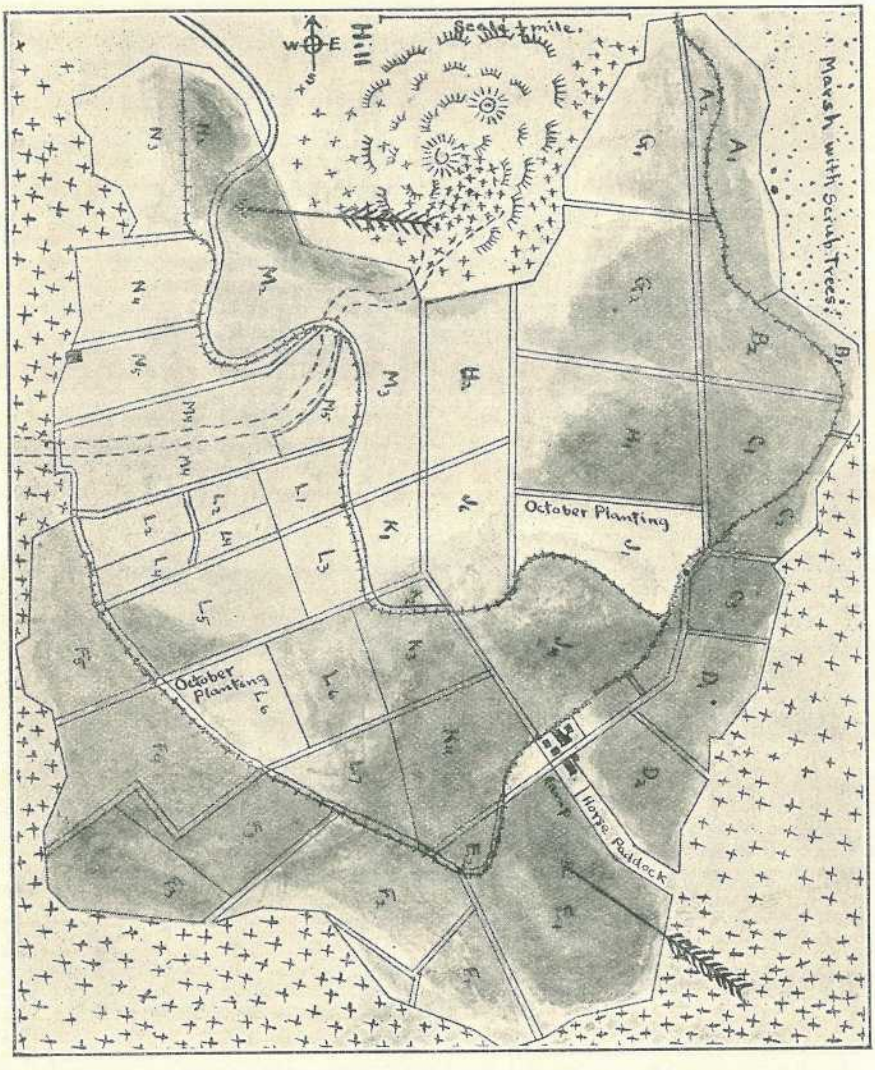
The effects of flooding on the cane, however, were rather disastrous, causing the terminal shoot to rot, probably because of the silt that settles into the soft growing tissues. This results in a growth of the lateral buds, with a loss which may vary from 50 per cent. upward.

GRUB DEVASTATION AND ARSENIC AT GREENHILLS.

The appearance of the cane on this estate is enough to make the strongest heart discouraged. The heavy standover crop, which went flat through the wind during April, is shooting badly at the eyes, so that it will probably deteriorate so much that it will be unfit to mill and hence result in a total loss. The ratoon crops, too, were nipped in the bud, so that they came to nothing. The May, 1920, plant cane, however, though the leaves had mostly dried brown by the action of grubs on the roots, is beginning to recover; new roots are forming, and the terminal shoots are showing green again. This cane, though the stalks were fairly heavy, did not fall much, since it was planted very deeply. It will probably give a fair cut.

There has been much correspondence on the use of arsenic, so I realise how anxiously growers are watching the results of our experiments. I am distressed, therefore, to report that placing the poison in the bottom of the drill with the plants has given no results, no matter what quantity was used, even up to 200 lb. per acre. This may possibly be due to the excessive moisture forcing the grubs to the surface, where they feed on the stalks without getting the poison.

On the other hand, where the arsenic was dusted alongside the young shoots when they were about 12 in. high, in May, 1920, the drills being pretty well filled in, we got results. These were most apparent, however, where the poison had been used at the rate of 200 lb. per acre; cane treated with 100 lb. showed some injury, 80 lb. less, beneficial results being scarcely noticeable where 40 lb. was used. From time to time during the development of the grubs we have removed stools of cane in the various plots to determine the effects of treatment. To review briefly: Examination on 8th February, while the grubs were mostly in the first stage, showed scarcely any difference in the number per stool, whether treated or untreated. On 24th February, however, there was a marked difference, most of the grubs by that time having reached the second or third stage. The first untreated plot that we examined gave fifteen grubs per stool, as has been noted in an earlier report, and there were very evident results in all of the treated plots, most of the larger grubs having been killed by the poison. By 11th March most of the cane in the checks was so badly injured that it fell out of the ground, while the treated plots, particularly the one with 200 lb. arsenic, showed results, though these decreased with the amount of arsenic that had been used. On 11th May we excavated a cubic yard of soil in several plots to determine definitely the effect upon the grubs; in the check plot, where we had found forty-five grubs per stool on 24th February, we were now only able to locate thirteen grubs full grown, and eight of these had been killed by the Metarrhizim fungus; furthermore, powdery green dust was also observed in the soil, where other grubs had disintegrated. Hence this disease had probably destroyed 90 per cent. of them in this check plot; the roots of the plants were entirely eaten away, and even



[*From Bulletin No. 8, Division of Entomology.*]

SKETCH OF GREENHILLS ESTATE.

Grub infestation indicated by degree of shading. White, immune area.
Arrows show direction of prevailing winds.
+++ = Feeding trees of the beetles.
═══ = Roads and headlands.
+++++ = Tramlines.

the stalks gnawed badly. A similar excavation in the plot treated with 200 lb. arsenic disclosed only two large grubs, and these were about a foot away from the drill, where the poison had been applied; the roots in this case were solidly in the ground and almost perfect, being 12 in. or more in length. In the plot treated with 100 lb. arsenic, the results were not so satisfactory; six large grubs were found, one of which had succumbed to the fungus. The roots of the plants, however, were still firmly in the ground, and the cane in fair condition. Since the cane in the plots with less than 100 lb. of arsenic showed little or no improvement over that in the checks, we did not take time to excavate in these.

I think we may conclude from these results that, to be effective, the poison should be placed about the plants near the surface. It is a heavy chemical; hence has a tendency to work downward during cultivation, and with the action of water.

In former years, when the whole of the cultivated ground on the Greenhills Estate was planted to sugar cane, there was a rather well-defined so-called immune area (see sketch); most of the infested fields at that time were along the border, next to the timber, especially on the windward side. Last year, however, for the first time these infested fields (the shaded area on sketch) were thrown out of cultivation. It would appear, now, that this was responsible for the general infestation of the balance of the estate, the beetles being simply compelled to travel further in order to secure suitable conditions for ovipositing.

BEETLE BORER TROUBLESOME.

The publication of the beneficial results from the introduction of parasites of the beetle-borer (*Rhabdocnemis obscura*) at Babinda has brought numerous letters from growers in various parts of the State, some of them even writing from districts outside the range of this pest. The latter, of course, mistook the work of the widely distributed moth borer (*Phragmatiphila truncata*) for it.

Unfortunately, the wet weather has seriously interfered with the continuation of our collection and breeding of the parasites (*Ceromasia sphenophori*), and since I must give up the work before it is completed, let me urge growers, especially in the nearby districts, to make their own arrangements for getting material from Babinda. Since the flies are widely distributed in the whole area south of the mill, especially around Moolaba, it will not be difficult for anyone to secure borer-infested cane, cut up in short lengths, so that it can be put into a bag for shipment. To place this parasitised cane in the borer-infested field, I would advise preparing the soil between the rows, so that each stalk could be covered with about 1 in. of finely pulverised soil. This should be done only in a field which is to stand for two months or more, so as to give the flies a chance to escape, reproduce, and spread into other fields before the cane is cut. Let me also urge, again, the importance of a continuous supply of standing cane in each locality, so that these valuable flies can maintain themselves. Since a generation only requires five weeks, cutting all the cane at one time gives them no chance to find borers; hence the flies naturally die out without being able to reproduce. It is not necessary, however, to leave cane in every field, a small area, every mile or so, is quite sufficient to keep them going in the district. Under normal conditions of harvesting, this need cause no waste, for such cane may be cut late in the season after the other fields have come on again.

THE "FIJI DISEASE" OF SUGAR CANE.

The Bureau of Sugar Experiment Stations has received from the Imperial Bureau of Mycology through the Department of Agriculture, Queensland, the following report of R. J. Haskell, Plant Disease Survey, Washington, D.C.

The name "Fiji Disease" has been applied to this serious malady because it was first reported from the Island of Fiji. Further study of the disease will doubtless lead to a better and more appropriate name.

The disease has been known in Fiji since 1905 at least. Although observed by many people, it has not been thoroughly investigated, and the only published accounts that we have thus far been able to find, by men who have studied the disease first-hand, are those of H. L. Lyon and F. Muir, both of the Hawaiian Sugar Planters' Experiment Station. Their articles are published in the "Hawaiian Planters' Record," a journal that is not widely distributed. An account has also recently been given by Otto A. Reinking ("Diseases of Sugar Cane in the Philippines"—Fiji Disease, "Sugar News," 1: 17-19. Nov. 1920), who used the published matter of Lyon as a basis for his note.

This disease occurs in the Fiji Islands, New Guinea, New South Wales, and has just been discovered in the Island of Mindoro of the Philippine Islands. The disease was found in Fiji by F. Muir in the early part of 1910, and reported on by him (''Ha. Pl. Rec.'' 3: 197. 1910). It was also reported on from Fiji by H. L. Lyon (''Ha. Pl. Rec.'' 4: 230-232. 1911), who made a special study of the disease as it occurred in that locality. The disease was reported on from New Guinea by Mr. D. S. North, of the Colonial Sugar Refining Company of Australia, who wrote to Lyon that one of the Sugar Company's men had found the disease to be very prevalent in parts of New Guinea (Lyon, H. L., ''Fiji Disease in New Guinea,'' ''Ha. Pl. Rec.'' 12: 200. 1915) on native cane. In view of this discovery, Lyon expressed the opinion that the original home of the disease was very likely New Guinea, from which place it had spread to Fiji and Australia.

The occurrence of the disease in Australia is indicated by Lyon (''Ha. Pl. Rec.'' 2: 200. 1915) and has been reported by D. S. North as appearing on experimental plots of New Guinea cane, and by A. H. Haywood (''Agr. Gaz., New So. Wales,'' Nov. 1920, pp. 773-780) who states that it is now a problem with which growers will have to contend.

The presence of Fiji Disease in Mindoro, Philippine Islands, has been suspected for the last three years. W. H. Weston, of the U.S. Department of Agriculture, in 1919-20 learned of this suspicion from C. W. Hines, of the Bureau of Agriculture at Manilla, and a published note on the possible occurrence of the Fiji disease in Mindoro has appeared in the report of the Pest Control Section of the Bureau of Agriculture (''Phil. Agr. Rev.'' 12: 93. 1919). During the Christmas vacation (1920-21) Prof. Otto A. Reinking, of the College of Agriculture at Los Banos, went to Mindoro and found the Fiji Disease there doing great damage. According to one of the planters, it was present on the island as early as 1916. Prof. H. A. Lee, of the Bureau of Agriculture at Manilla, reports that Mr. Medalla, his assistant, also visited the island and returned with specimens of the Fiji Disease. Letters from both Reinking and Lee, telling of the discovery, reached Washington at the same time. These are the first authentic reports by pathologists of the presence of the Fiji Disease in the Philippines. Just how widely the disease occurs in the Philippines will have to be determined, but it probably does not occur in Negros, the most important cane-producing island.

IMPORTANCE OF THE DISEASE.

Regarding the seriousness of this trouble, F. Muir (''Ha. Pl. Rec.'' 2: 197. 1910) writes as follows:—''The worst disease in the Fijian canefields is one known as Fiji Disease. . . . This disease has spread over the whole island, but is worst on the northern side, especially on rich soils. This disease is strongly hereditary; when the stool looks perfectly healthy and the galls are seen only on one stalk, and in very small numbers, every stalk from that root will produce diseased cane if used as seed.'' Again, H. L. Lyon (''A New Cane Disease Now Epidemic in Fiji'' ''Ha. Pl. Rec.'' 2: 205. 1910) writes: ''It is certain that the Fiji Disease is one of the most serious diseases yet recorded on sugar cane.''

The report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association, 14th October 1911, says (''Ha. Pl. Rec.'' 5: 323, 1911):—''Dr. Lyon's researches say that the so-called Fiji Disease is the most to be dreaded of all known maladies of the sugar cane.'' In Mr. Reinking's letter he says:—''The disease is one of the most destructive plant diseases that I have ever observed in the Philippine Islands.'' In view of the above quotations, and also from other reports on the importance of this disease, it seems that this is one of the most serious of sugar-cane diseases, and one to be feared in sugar areas where the disease does not now occur.

SYMPTOMS.

Mr. F. Muir (l.c.) states that the most constant symptom of the disease, as pointed out to him by Mr. North, of the Sugar Refining Company, is the presence of small galls on the undersides of the leaves and in the softer tissues of the cane tops, sometimes extending a long way down the stalk. A more noticeable character is the dying of the tops and the growth of lateral branches, the tops of which also sometimes die, and, in turn, give off lateral growths.

H. L. Lyon ("Ha. Pl. Rec." 4: 300. 1911) describes the disease as follows:—"The most conspicuous symptom of Fiji Disease to be noted in the field is the shortening and crumpling of the last leaves to unfold from the spindle. This peculiarity will attract the attention when one is still a considerable distance from the affected cane. The shoot may have attained considerable length and be clothed with many healthy-looking leaves of the usual length and colour, but all of a sudden it loses the power to produce normal leaves, throws out a few bent and twisted stems, and then ceases to grow altogether. Some of the eyes may start, but the resulting 'lalas' soon repeat the antics of the main stem. The stalk may remain alive for months, or it may die soon." He also mentions the characteristic galls usually to be found on most of the healthy-looking leaves and on all of the deformed and blighted ones. The appearance of these galls is the first outward symptom by which the disease may be detected, but the cane may be infected for months before any galls appear. In other words, the galls mark a well-advanced stage of the disease. According to Lyon's photographs, affected plants are very much stunted and dwarfed and die early.

CAUSE.

The Fiji Disease is apparently caused by a Myxomycete somewhat similar to *Plasmodiophora brassicae*, the cause of the club root of cabbage. A study of the etiology of the disease was made by H. L. Lyon, and a preliminary report given out by him ("Ha. Pl. Rec." 3: 200-205. 1910). Lyon found what appeared to be the plasmodium of an organism in the cells of the leaf galls, but apparently has not proved the pathogenicity of such organism. He thinks that the swarm spores may gain entrance to the cane tissue by penetrating the roots and then following up the vascular bundles to the leaves. He also thinks that the organism can live over in the the soil for a considerable length of time, as does the organism of club root of cabbage. Plants grown from cuttings taken from diseased cane are sure to be infected. The organism is also readily carried from field to field by the transfer of bits of trash.

VARIETAL SUSCEPTIBILITY.

According to Lyon and Muir the disease shows marked differences in varietal susceptibility in Fiji and New Guinea. On account of this fact, and because of the danger of the appearance of the disease in Hawaii, the Hawaiian Sugar Planters' Experiment Station sent a large number of cuttings of various Hawaiian varieties to Fiji to be propagated there, and to ascertain their relative resistance to the Fiji disease.

AUGUST SHOW DATES.

Lower Burdekin P.A.I.A., Ayr: 5th and 6th August.
National A.I.A., Brisbane: 8th to 13th August.
Bowen P.A.M.A., Bowen: 10th and 11th August.
Belmont A.H.I.S., Belmont: 20th ugust.
Horticultural Society of Queensland, Brisbane: 20th August.
Herbert River P.A.A., Ingham: 26th and 27th August.
Balmoral District H.I.S., Balmoral: 27th August.

ACKNOWLEDGMENT.

In the June Journal, p. 247, we reproduced a plate depicting a new parasite on sheep maggot flies to illustrate Professor T. Harvey Johnston's paper on "The Sheep Maggot Fly Problem in Queensland." The plate was taken from an article in a previous issue of this Journal by Mr. Walter W. Froggatt, F.L.S., Government Entomologist of N.S.W., and to whom we are indebted.

General Notes.

DESTRUCTION OF PRICKLY-PEAR BY MEANS OF ARSENICAL POISON.

By J. C. BRUNNICH, Chemist to the Department of Agriculture and Stock.

Scattered plants of prickly-pear are best destroyed by *injecting* the poison. This may be done by means of any of the powder or liquid injectors, or by making a longitudinal incision in the second or third "leaf" of the plant and placing therein either about a teaspoonful of the dry powder (*a*), or a wineglassful of the concentrated solution of the poison (*b*).

With small plants one injection is generally sufficient, but with larger plants two or more "leaves" may have to be treated.

Large clumps of pear consisting of many plants, and denser pear generally, may be more economically destroyed by first lightly *spraying* with the diluted spraying solution (*c*), then mutilating or slashing the pear with billhooks, spudbars, or any suitable mechanical contrivance, and then again spraying.

In any case it is advisable to burn off the poisoned pear as soon as it has become dry enough to burn readily, as this operation destroys most of the young growth of seedlings, &c., which is usually found under the clumps, and which is often not destroyed by the poison.

The mixtures are prepared as follows:—

(*a*) DRY POWDER FOR INJECTION.

Take—

Fifteen (15) pounds of common salt,

Ten (10) pounds of arsenic,

Four (4) pounds of caustic soda,

and mix these ingredients thoroughly. All the ingredients should be in powder. The mixture must be kept in air-tight tins or packages, otherwise it absorbs moisture from the air, and is inclined to set into a hard lump.

(*b*) CONCENTRATED SOLUTION FOR INJECTION.

The mxture of the dry powder (*a*) consisting of 15 lb. of common salt, 10 lb. of arsenic, and 4 lb. of caustic soda, is placed in a suitable vessel, and to it is added slowly and carefully, with constant stirring, cold water until the total volume is eight (8) gallons.

Should it be found that all the arsenic has not dissolved (which is shown by the fact that it appears as a sediment on the bottom of the vessel), it will be necessary to boil the mixture for a few minutes.

Certain brands of arsenic are more readily soluble than others, and we found "Red Rose" arsenic to be the most readily soluble of many tested.

(*c*) DILUTED SOLUTION FOR SPRAYING.

To eight (8) gallons of the concentrate (*b*) add cold water until the total volume of the solution is one hundred (100) gallons.

This strength of solution is the weakest which can be used economically for spraying, and at certain seasons it may be necessary to use the spraying solution somewhat stronger.

The addition of saltpetre, copper sulphate, or other compounds to the spraying liquid cannot be recommended. They are either useless or worse than useless.

On account of the highly poisonous nature of all arsenical compounds, great care must be taken in the preparation of the solutions, and, particularly, the vapours of the boiling solutions and the spray-laden atmosphere (when spraying) should never be inhaled. To prevent possible absorption of the poison through the skin, it is advisable always to rub vaseline or other grease on the hands and arms before commencing operations. There is, however, little danger if reasonable care is exercised.

Cattle must be kept off country on which pear is being poisoned either by spraying or by injection. The grass will generally grow again after a few weeks in favourable seasons, and cattle may then be allowed to graze with safety on the treated area.

PUBLICATIONS RECEIVED.

The Journal of the Ministry of Agriculture (United Kingdom). In the May number R. C. Punnett, F.R.S. (Professor of Genetics, University of Cambridge) continues an interesting review of results of research in animal breeding, and discusses further simple Mendelian inheritance in respect to coat colours in cattle. "Pollination in Fruits" is another leading feature. Another phase of agricultural education is covered by a paper on "Rural Bias" in Secondary Schools, which, incidentally, describes the work at Sexey's Foundation School in Somerset. "It does not," says the author, "require any special gift of vision to see in secondary schools with a 'rural bias' a prospect that may go far to change the outlook of those who work on the land. . . . It is admitted on all sides that no class of our population has done better work for the country or has received less return for it in years past than the agricultural labourer."

The Journal of Agricultural Research (U.S.A.) for April contains a very informative leading article on "Observations on the Body Temperature of Dry Cows."

The Agricultural Gazette of Canada (March-April) has among its leading topics a survey of "The Financial Benefit of the Work of the Department of Agriculture." A paper on "Marketing and Distribution of Fruit" contains a plea for closer co-operation and co-ordination among growers. Agricultural education in secondary schools is also discussed.

The International Review of the Science and Practice of Agriculture (Rome) for February covers much general agricultural intelligence. An original article on "The Rearing of Donkeys and Their Crosses with Horses in Italy and her Colonies" by Professor Mascheroni (Royal Higher School of Veterinary Medicine, Turin) is of special interest to stock breeders.

The Agricultural Journal of India (March) has an interesting note on "Prickly Pear as Fodder for Milch Cattle," containing the information that in India prickly-pear is used as cattle food during famine periods. "The cactus is roasted over a village forge and chopped fine before being given to the cattle in combination with *kaabi* (dry sorghum stalks) or cotton seed. . . . In reviewing the work Lieut. Col. G. K. Walker, Superintendent, Civil Veterinary Department, Bombay, remarked that 'there can be no doubt that cattle can be maintained on prickly-pear, when necessary, without harm.' It, however, appears from the following extract from the Journal of the Department of Agriculture, Union of South Africa (Vol. 1, No. 9), that prickly-pear is not merely an emergency fodder, but is considered a valuable foodstuff for milch cattle, which increases 'the quantity while maintaining the quality of the milk.' In Corsica and Sardinia a daily ration of about 50 or 60 lb. per cow, comprising prickly-pear finely cut up, mixed with bran or dry grass, was fed to impoverished cows, which had almost ceased their supplies, with good results. . . . In Mexico, milch cows maintained their yields, in spite of increasing coldness of season, when fed on prickly-pear."

The Rhodesia Agricultural Journal (April) features a lengthy report on "The Citrus Industry of California," which strongly emphasises the now generally accepted necessity of growers marketing a standard commercial article, keeping to a standard pack of consistently good quality; and sets out the essentials of success in this highly specialised branch of agriculture as (1) the production of the right class of fruit, (2) close attention to trees, (3) the use of every precaution known to be of value in picking, packing, railing, and shipping, (4) quick action at the right moment at the business end of operations, and (5) advertising propaganda.

Agricultural Gazette of New South Wales (June) contains full particulars of the remarkable milk and butter record of Melba XV. of Darbalara, a deep red, well-framed cow, showing good constitution and of the Milking Shorthorn type. Her official record for 365 days is: Milk produced, 21,635.5 lb.; butter fat, 954.472 lb.; estimated quantity of commercial butter, 1,149.966 lb.

Answers to Correspondents.

SISAL HEMP.

"J. A. C." (Beerburrum).—Your letter was referred to the authority named by you, who advises that it would be unwise, under existing marketing conditions, to devote any time to the culture of sisal hemp.

SEVILLE ORANGES.

J. T. ROWTHAN (Milton).—Your citrus samples are ordinary good commercial Sevilles suitable for preserving purposes. Their skins are bright and very clean. The land on which they were grown—sandy loam naturally drained (Park Ridge, Kingston)—is, according to your description, well suited for citrus culture.

CAROB AND ALGAROBA BEANS.

A Toowoomba correspondent notifies us that seeds of the carob or locust (*Ceratonia siliqua*) may be obtained from the Curator, Botanic Gardens, Toowoomba, where an old tree of this species bears fairly freely. The seed germinates readily if soaked in water for about a day before sowing. Our correspondent raised a few seedlings from this tree last year.

Another correspondent—W. Brotherton, of "Brotherton," Gladstone—states that his Algaroba tree shed all its pods in May, and at the time of writing (6th June) was a mass of blossoms. It is a *Prosopis juliflora*. He is willing to supply seeds at a nominal price to cover incidental cost.

RATS, MATCHES, AND FIRES.

W. A. NOBLE, Toowoomba, writes:—"Being especially interested in the subject of rats and matches now under discussion in your Journal, may I give my experience? Some time since, my buggy was brought into the coach-house during the evening and, inadvertently, a box of wax matches was left on the leather-covered cushion. In the morning I found the box lid had been nibbled through and the charred remains of the box and a number of burnt matches lying on the cushion which was also charred to the extent of about a 3-in. circle. Lying on the floor of the buggy also were several matches that had been nibbled but not ignited. The fact that in the building were bags of maize, also bran and pollard, proves to my mind that rats do chew matches and are very fond of them when accessible. Since the discovery I have not allowed wax matches into my house unless when kept in tin boxes."

TO PICKLE OLIVES.

INQUIRER (Bulimba).—Make a brine with coarse salt and a small piece of saltpetre (the size of a nut) of strength sufficient to float an egg. Place the olives selected, half ripe or ripe of full colour, in a jar. Pour in the brine to cover olives, keep them entirely immersed in the solution, and let them stand for from 4 to 6 weeks. Then pour off brine and replace with half strength solution for about 2 weeks, and then with quarter strength for, say, a similar period. Wash before serving.

Another method:—Select half ripened or full ripened olives. Wash and place in jar (glass for preference) in layers covered by coarse salt. The olives may be pricked with a needle beforehand. When jar is filled with alternate layers of fruit and salt, top with salt and let stand until it liquefies and becomes wine coloured. This takes from 3 to 4 weeks. Then wash olives and replace in weak brine or water, and let stand until required for table. Wash before serving.

Another recipe:—Pick olives when turning from green to ripened colour, though ripe fruit may also be used. Cover for the first time with a solution containing 2 oz. caustic soda and 3 oz. salt to each gallon of water, and allow to stand for 24 hours. Then change solution to 3 oz. salt to 1 gallon of water for 24 hours. Then, in order, 4, 5, 6, and 8 oz. to gallon, keeping each solution in use for 48 hours or longer. After the last immersion, pickling is complete. Olives must be kept entirely immersed at all times.

The Markets.

PRODUCTION AND MARKETS.

The following survey is an abridgment of weekly departmental summaries of conditions, prospects, and prices (21-6-21).

AGRICULTURE.

Early in June, fairly widely distributed rainfalls were reported from the Southern Coastal districts. The Downs also reported good falls. Goondiwindi had 2¼ inches, and Allora, Inglewood, and Dalby each over 1 inch. Several other registrations, ranging from 20 to 90 points, were reported. Only light precipitation was recorded in the Lockyer; Laidley with 86 points being the most fortunate. The Boonah district had only 55 points for the first week of the month. Light frosts were reported in some localities.

The formation of a Canary Seed Pool is expected to generate a more active spirit of co-operation among growers.

Good accounts of the new maize harvester, invented by Mr. George Free, of Nobby, which is capable of harvesting, threshing, and bagging maize direct from the standing crop, continue to be received.

Heavy supplies of maize had the effect of keeping prices reduced. Lucerne and oaten chaff was plentiful, but the demand was light. Potatoes were marketed in large quantities to an improved demand. Broom millet was not plentiful, and production generally appears to be light this season. The price of prime hurl remained at the same figure; other qualities declined £2 per ton.

In the second week of June exceptionally heavy rains were almost State wide in precipitation. All the Southern Queensland agricultural areas were favoured, floods occurring in many localities. Many of the farms on the Barambah Creek frontages in the Murgon district (South Burnett) were more or less inundated, a considerable crop loss resulting. Heavy losses of maize and potatoes were reported. The North Coast district, where previously heavy rains had fallen, suffered much in this respect. Part of the Goondiwindi country was flooded, but, owing to dry conditions previously prevailing, not much wheat had been planted, otherwise crop losses would have been more serious.

In many districts, particularly the Lockyer, Downs, and Boonah regions, the winter rains proved timely and of immense benefit. The general seasonal outlook is most promising. The season to date has been very mild in temperature, and should the localities which have been eaten bare escape frosts for the next few weeks, young grass and herbage will make good headway. Deliveries of cotton continue at the departmental ginnery, Brisbane, which is in active operation. Maize supplies were light, probably due to the heavy conditions of country roads. Potatoes sold to 6s. 6d., with supplies plentiful and demand fair. Lucerne chaff was plentiful and topped at 10s. 6d. Supplies of oaten chaff were fair. Pumpkins and sweet potatoes were fairly plentiful. Only one line of barley was offered. Brown Millet supplies improved. Prime hurl sold to £26.

For the week ended 21st June, the weather was fine generally. Scattered showers were reported. The heavy rains of the previous week were generally most beneficial, and reports from agricultural and pastoral areas were most encouraging. Maize supplies were light, but improved as the week advanced. The price, 4s. 1d., was better. Lucerne chaff came forward heavily and sold to 9s. Oaten chaff consignments were fair. Potatoes were plentiful. Most of the pumpkin lines were passed in. No sales of skinless barley were made.

DAIRYING.

Production is shrinking gradually, in keeping with seasonal conditions.

For three weeks ended 21st June, 26,934 boxes of butter (each 56 lb.) and 137 crates of cheese (each 142 lb.) were graded. Dairy produce in cold store (18-6-21) was 16,193 boxes butter and 43 crates cheese. 14,886 boxes butter were shipped oversea, and 14,846 boxes butter and 20 crates cheese were shipped interstate.

FRUIT AND VEGETABLES.

Mild spring-like conditions produced a heavy growth of vegetables. Strawberries are yielding very heavily. Pineapples and bananas continued to make growth, and excellent pines reached the market. Southern prices for bananas were very satisfac-

tory. Citrus fruits came forward in much better quality, and practically free from fly. The heavy mid-month downpour proved most beneficial, soil and subsoil receiving a thorough soaking. The rain, accompanied by warm weather for the time of the year, has produced very vigorous growth in all crops. The good growing conditions favoured the development of Irish blight, and tomatoes were somewhat affected. Mango trees in blossom in the Brisbane district show evidence of extraordinary seasonal mildness. If the blossom sets, an exceptionally early crop may be expected. Pawpaws are ripening fast, and custard apples are in good supply.

FAT STOCK.

Prime bullock beef realised from 20s. to 30s., and cow beef from 15s. to 27s. Prime mutton reached 4½d.; good trade mutton ranged from 2¾d. to 4d.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

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

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1921.	May, 1920.
North Coast.	In.		In.	In.
Atherton	2·22	20	2·53	2·84
Cairns	4·71	39	6·50	11·78
Cardwell	3·78	49	6·51	11·36
Cooktown	3·20	45	2·18	12·68
Herberton	1·76	34	2·92	4·62
Ingham	3·75	29	4·20	12·07
Innisfail	12·98	40	16·87	29·58
Mossman	3·39	13	5·41	15·56
Townsville	1·42	50	2·05	5·27
Central Coast.				
Ayr	1·27	34	1·45	5·57
Bowen	1·41	50	0·99	4·48
Charters Towers ...	0·85	39	1·30	3·34
Mackay	4·05	50	1·41	7·47
Proserpine	5·45	18	5·44	7·89
St. Lawrence ...	1·93	50	1·61	4·19
South Coast.				
Biggenden	1·92	22	2·73	1·39
Bundaberg	2·84	38	2·04	3·01
Brisbane	2·89	70	0·76	2·02
Childers	2·41	26	2·62	2·89
Crohamhurst ...	5·00	25	3·91	5·18
Esk	2·20	34	0·92	2·41
Gayndah	1·61	50	2·63	1·86
Gympie	3·10	51	1·59	1·79
Glasshouse M'tains	3·86	13	..	3·26
Kilkivan	2·02	42	1·18	2·41
Maryborough ...	3·17	50	1·96	3·61
South Coast—continued:				
Nambour	5·15	25	3·78	2·69
Nanango	1·67	39	1·31	1·82
Rockhampton ...	1·64	34	1·25	1·94
Woodford	3·07	34	2·34	3·80
Darling Downs.				
Dalby	1·37	51	1·96	1·95
Emu Vale	1·28	25	0·98	2·32
Jimbour	1·26	33	1·47	1·57
Miles	1·62	36	1·31	0·52
Stanthorpe ...	1·99	48	3·05	2·20
Toowoomba ...	2·38	49	1·23	3·48
Warwick	1·69	34	0·88	2·19
Maranoa.				
Roma	1·52	47	0·59	0·35
State Farms, &c.				
Bungeworgorai ...	0·78	7	0·53	0·95
Gatton College ...	1·95	22	1·17	3·26
Gindie	1·13	22	1·44	0·57
Hermitage ...	1·45	15	1·06	2·44
Kairi	2·35	7	3·50	3·76
Sugar Experiment Station, Mackay	3·81	24	1·76	7·87
Warren	1·46	7	0·94	4·61

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

GEORGE E. BOND,
State Meteorologist.

Farm and Garden Notes for August.

This and the following two months are about the busiest periods of the year so far as work in the field is concerned; and the more activity now displayed in getting in the summer crops, the richer will be the reward at harvest time. Potatoes should be planted, taking care to select only good, sound seed that has sprouted. Preventive measures should be taken to spray young and growing crops to check Irish blight, using "Bordeaux" or "Burgundy" mixtures. Full particulars on this subject are obtainable on application to the Department of Agriculture. This will ensure an even crop. Yams, arrowroot, ginger, sisal hemp, cotton, and sugar-cane may now be planted. Sow maize for an early crop.

Sow pumpkins. Swede turnips and lucerne may still be sown in temperate districts, but they will have to contend with weeds which will begin to vigorously assert themselves as the weather gets warmer; therefore keep the hoe and cultivator constantly going in fine weather. Tobacco may be sown during this month. If vines are available, sweet potatoes may be planted towards the end of the month. In this case also it is advisable to avoid too frequent planting of cuttings from the old vines, and to obtain cuttings from other districts or raise "shoots" n a hotbed from tubers selected from heavy yielding plants. Sugar-cane crushing will now be in full swing, and all frosted cane in the Southern district should be put through the rollers first. Plough out old canes, and get the land in order for replanting. Worn out sugar lands in the Central and Northern districts if not intended to be manured and replanted will bear excellent crops of sisal hemp. Rice and coffee should already have been harvested in the North. The picking of Liberian coffee, however, only begins this month. Orange-trees will be in blossom, and coffee-trees in bloom for the second time. As this is generally a dry month in the North, little can be done in the way of planting.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

August is to be regarded as a period for activity in all matters appertaining to cultivation.

In the coastal districts plant life becomes active earlier than in other and more temperate parts of the State, consequently judgment should be used in respect to the planting and sowing of seasonable crops in keeping with local conditions. Vegetable growers in favoured localities should make every effort to cater for the early market trade and endeavour to obtain enhanced prices for their produce. Succession sowings are advisable to keep up a continuity of supplies throughout the season. Special attention should be paid, however, to the spraying of crops to check the insidious attacks of insects, which are more prevalent in mild seasons like the present one.

Success in all matters connected with crop production depends largely on the thorough preparation and manuring or fertilising of the land beforehand to bring it into the best possible tilth for planting. This is very necessary when artificial supplies of water are limited.

Crops of all kinds which establish themselves in the cooler part of the season and have the opportunity of developing a good root system will produce in greater abundance.

Mulching, by means of well-rotted farmyard manure, will do much towards the retention of moisture in the soil, by checking evaporation. Where supplies are not available, the constant stirring and movement of the surface soil by cultivation may be substituted.

Orchard Notes for August.

THE COAST DISTRICTS.

The remarks that have appeared in these notes during the last few months respecting the handling and marketing of Citrus Fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the Spring growth. All heavy pruning should be completed previous to the rise in the sap; and where Winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy) be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during Spring. This is a very important matter, as Spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, pawpaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You only want one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. Just as the buds of the vine begin to swell, but before they burst, all varieties should be dressed with the sulphuric acid solution—viz., three-quarters of a pint of commercial sulphurie

acid to one gallon of water; or, if preferred, this mixture can be used instead—viz., dissolve 5 lb. of sulphate of iron (pure copperas) in one gallon of water, and when dissolved add to it half a pint of sulphuric acid. This is the winter treatment for the prevention of anthracnose or black spot, and for downy mildew, and should on no account be neglected.

Fruit-fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvæ, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit-flies early in the season is the surest way of checking this serious pest.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the granite belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear, or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphis, as, if the insects which have survived the winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphis should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the warmer parts of these districts the pruning of grape vines should be completed, and they should receive their winter dressing for black spot and downy mildew, as recommended for the coast. In the granite belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

SUSPECTED POISON WEED IDENTIFIED.

A specimen forwarded by the Prisons Department is identified by Mr. C. T. White, F.L.S., Government Botanist, as *Stachys Arvensis*, a weed variously known as Stagger Weed, Sweet Nettle, Hedge Nettle, Wild Mint, &c.

It is one of those plants about which there is some doubt as to its qualities. It is looked upon almost universally by stockmen in Australia as a plant causing "shivers" or "staggers" in horses, working bullocks, and travelling stock, but is almost or quite harmless to resting stock such as milking cows and calves. This is very remarkable, as the weed is common in Europe and America, but no bad reports are heard of it from those countries.

However, quite recently a closely allied plant (*Lamium amplexicaule*) has been shown to be able to produce "staggers" or "shivers" in travelling or working stock, so it is more than likely that the popular belief regarding *Stachys Arvensis* is founded on fact.

Stock suffering from shivers or staggers usually recover if rested and taken off paddocks containing the plant responsible for the mischief.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE AND SUNSET.
AT BRISBANE.

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

PHASES OF THE MOON, ECLIPSES, &c.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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