QUEENSLAND AGRICULTURAL JOURNAL

VOL IX. MARCH, 1918. PART 3.

Agriculture.

CULTIVATION OF THE POTATO.

(Continued from February, 1918.)

BY THE EDITOR.

CROSS FERTILISATION.

Mr. Findlay, the celebrated raiser of so many new varieties of potatoes, in the course of a lecture before the Glasgow and West of Scotland Agricultural Discussion Society, spoke as follows on cross-fertilising and raising new varieties from seed:—

In the first place, I am distinctly of opinion that natural cross-fertilisation never took place in any part of the world at any period of the world's history. The blossom of the potato has a faintly sweet smell, yet it secretes no honey or nectar, and the pollen seems to be a bit too sharp and tasty to suit the palate of even the most voracious insect. In fact, it is highly poisonous, and I daresay that is where their objection comes in. I have seen now and again a bumble bee, no doubt attracted by the sweet smell of the blossom, alight on the edge of the petal, but never saw one explore the bloom, as is their habit where they expect to find either nectar or pollen. As the most casual observer will have noticed, the potato is an early closer, shutting up its blossoms between 2 and 3 o'clock in the afternoon, and, by reason of a certain twisting process, puts it out of the power of any nocturnal moth or other insect to gain access to either nectar or pollen, even though they both were there. In the second place, I hold it is utterly impossible for the pollen of one blossom to be wide-borne, and so fertilise another, even on the same plant, one reason being that it is too heavy, and another, and more important one, being that it is a bi-sexual plant. Both the sexual organs are in the same bloom, the anthers or pollen cases being the male parts, and the pistil representing the female. And it further appears to me that, for some reason which I have not been able to discover, the potato plant is by nature opposed to cross-fertilisation, for, immediately the pollen in the anthers is matured, the bloom twists itself up harder than ever round the pistil, and no longer opens out to greet the sun. The bloom then no longer stands erect on its stem, but begins to hang down, swaying in the breeze. The pollen falls down into the narrow space formed by the twisting of the petals, all around the bulbous point of the pistil. The bloom thus remains for the matter of two days, and then falls off. Strange to say, the pistil only absorbs a very limited portion of the pollen. Yet what is left, so far as I have been able to discover, is perfectly inert. The potato, as I have already said, is, in my opinion, opposed to cross-fertilisation.

HOW HE RAISES FROM THE SEED.

Continuing, Mr. Findlay said, dealing with his method of working:—First I get a shallow seed pan, such as gardeners use, attend to the drainage, fill it up, or nearly, with well-decomposed leaf mould, to which has been added a little fine sand. I take a flat piece of wood, and beat it down fairly firm and level, and sow the seeds thinly and evenly over the flat and firm surface. That done, I take and sift, after adding more sand, some more of this leaf mould. The sifting will remove all grit and stones. Now sprinkle a small portion over the seeds, but see that you do it evenly and not over-thick—as near to an eighth of an inch as you can; give also a slight beat down. If the mould is fairly moist, you need not give any water for at least two days. Set your tray, to be out of the way of mishap, into the sunny corner of a cold frame. Put a piece of old newspaper or other paper over the tray, covering up with a piece of glass. Your great care now is to see that you do not allow the earth or mould to get dry; at the same time you must guard against making it too wet. In a week or ten days your seed should begin to braird. You must then give them more light and air. With average care, in a very short time you will have nice plants. When about an inch high, put them out in small pots singly. In another three weeks or so, if the weather is suitable, and the season far enough advanced, plant them out in the open where you mean them to be permanently. After this, your work is all in the ordinary course; only, remember this, you must take care when you harvest them to keep the produce of every plant by itself—I mean those you intend to grow again. Fifty per cent. or more will be of no use to go further with; and this 50 per cent. left year by year, you, if wise, will further reduce, until at the end of four years you have only one or two left as the sole representatives of your labour and care.

I am not aware that any attempts have been made by Queensland potato-growers to raise new varieties from seed. The potato plant flowers freely in this State, although the flowers usually drop off before the fruit or "apple" is formed. Where, however, the "fruit" as distinct from the "tuber" comes to maturity, there is no other reason why Australian growers should not evolve a prolific disease-resisting potato equal to some of those lately raised from seed in England and sold at such enormous prices. A correspondent of the "Agricultural Gazette," London, has, through the inquiry column of that journal, elicited the following instructions for raising new varieties from seed:—

Those who desire to produce new varieties of potatoes must first practise the art of cross-fertilisation, and must possess abundant patience. Like many other species which are not habitually multiplied by seed, the potato has a remarkable tendency to revert to the wild form. It may be necessary to cultivate 100 or even 1,000 seedlings, before finding one which is really worthy of a place among the better varieties already existing. M. Vilmorin says that in France the raising of seed potatoes has been proceeded with in a somewhat haphazard manner; whereas in England, on the other hand, a more systematic method has been followed, richness in starch, excellence of flavour, power of resisting disease, with little tendency to develop haulm, being the characters we on this side of the channel generally seek. With regard to cross-fertilisation, it is rather a delicate operation, and needs time and attention to details. Directly the flower begins to open, the anthers must be removed carefully with a pair of fine-pointed scissors. This is necessary to prevent its own pollen from falling on the stigma and self-fertilising the ovary. It is well also to tie a piece of soft muslin round the emasculated flower. You have now to examine the flowers of the other variety which is to act as the male or husband. You may have to examine dozens of flowers before you will find one with its anthers bearing the precious pollen in a powdery form, as some varieties are exceedingly shy pollen-bearers, owing to the energies of the plant being occupied in producing tubers at the expense of full development of its masculine attributes. When you find the pollen dust, collect it carefully on the point of a clean, dry camel-hair brush, and gently brush it on the point of the stigma or female organ that you had previously protected by means of muslin. You must, however, not do this prematurely, but wait till you observe the point of the stigma covered with a viscous-looking fluid. Then, and then only, the stigma is ready for the nuptial rites to be performed. Do not remove the muslin; this will serve to prevent the berry when ripe from falling and scattering its precious seeds. It will easily be ascertained when the berry is ripe, and then the latter should be gathered, placed in a box in a room to become thoroughly dry, after which remove the seeds, place then in a packet, and store them away safely till spring. But, when the seed has been saved after much pains and trouble, it will require some humouring when it is time to sow. Then the seeds should be sown in pans or shallow boxes 3 in. deep, containing an inch of drainage, then a layer of moss, and sufficient compost, equal parts of light loam and leaf-mould, to fill the box or pan to the top. Press the compost down firmly with a piece of board, and sprinkle some fine sand over it. Sow the seeds thinly, and then cover with an inch of finely sifted mould.

The soil must not be too moist or too dry, as the seeds may die in one case or rot in the other. The seedlings should appear in about ten days, and they must have abundance of fresh air. Some writers suggest that the soil should be baked before sugaring it over the seeds, as the damping-off fungus is rather to be dreaded.

JUDGING POTATOES AT SHOWS.

Because a potato has a high-sounding name, and because it is a new variety, judges are satisfied to examine the interior and exterior of the raw potato and award it a prize or disqualify it according as its symmetry and healthy appearance appeal to their judgment. But does this examination satisfy the public? What the farmer wants to know is, its cropping power and its powers of resisting disease, and its early or late appearance on the market. What the housewife wants to know is, what are its cooking properties. It is of little importance that a certain potato exhibit has obtained first prize, for a crop must be a very poor one if, out of 5, 10, or 20 acres a bag or two of tubers cannot be obtained which will satisfy a judge in all that concerns the eye. But there are splendid-looking potatoes which will not stand the cooking test. Some, when cooked, smell of the earth; others show none of that beautiful mealy appearance which is the characteristic of a good cooking potato. One that bursts its jacket when properly cooked, and shows a beautiful dry mealy exudation is surely preferable to one that is soapy or waxy. The market price of potatoes depends largely on the quality of the cooked tuber. At some shows the judges are supplied with a plate of hot cooked potatoes of each variety exhibited, and thus are able to determine what, after all, is the only true test of the value of a potato—its cooking qualities. Size is certainly not everything. It would be a move in the right direction if all potato exhibits at shows were accompanied on judging day by a dish of each variety cooked by an artist—for to cook a potato properly is a work of the culinary art not understood by all cooks.

QUANTITY OF SEED POTATOES REQUIRED TO PLANT AN ACRE OF LAND.

Those farmers who have been planting potatoes year after year do not require to be told how many hundredweights or tons they require to plant a given area, but there are many taking up farming nowadays for the first time, and not being brought up to the business, have a very little, if any, idea of the quantities of any kind of seed required per acre for field crops. To such amateur farmers the following advice will be acceptable:—

The quantity required to plant an acre of land with potatoes is, of course, regulated by the size of sets and the distance apart they are planted. There is a great difference of opinion as to the size of sets to use. Generally, when potato-growers are discussing the size of sets to use, if they are asked what weight the sets should be they don't seem to know what is meant. One man says he prefers a good big set, another man prefers a small set—neither man seems to know the weight of the sets he is advocating. It will perhaps be a guide to some growers to know that a potato as large as an egg weighs as much as the egg, and an ordinary hen egg weighs 2 oz. Some growers consider a potato as large as a hen's egg will make two sets—this would be 1 oz. for each set. With potatoes planted 2 ft. from row to row and 1 ft. apart in the rows, it would take 21,780 sets, and the sets weighing 1 oz. each it would take 12 cwt. 0 qr. 17 lb. 4 oz. of seed to plant an acre; this is about the distance apart generally adopted in small gardens. On the farm potatoes would require to be planted about 2 ft. 6 in. by 1 ft.—this would take 9 cwt. 2 qr. 25 lb. of seed; with 1 oz. sets at 2 ft. 6 in. by 1 ft. 3 in. it takes nearly 8 cwt. of seed. The size of sets is one of the most important things the farmer that has to buy his seed has to consider. Seed potatoes the size of hen eggs are the most economical to buy; each potato will make two sets, and each set will grow as good a plant as a whole potato the size of an egg.

DISEASES OF POTATOES.

It is perhaps not stating too much to say that a very large percentage of disease is due to two specific causes, both of which could be prevented.

Unfortunately, the means of prevention do not generally commend themselves to the majority of Queensland potato-growers. An important fact which has been observed is, that when diseased potatoes are planted, after the crop has been lifted, the remains of the old seed potatoes, when brought to the surface of the ground, will produce a crop of fungus bearing myriads of spores. If such old seed potatoes are kept buried in soil until the following season, and then exposed to light under favourable conditions, fungus fruit is still produced, and continues to grow so long as a scrap of the old potato remains. One often sees in horticultural periodicals statements to the effect that, say, 10 acres of badly diseased potatoes were ploughed in, not being considered worth lifting. Now, in the face of this, it is not difficult

to understand where the germs that first infest a crop come from, and with the well-known necessary conditions of moisture and warmth, an epidemic breaks out at once. If the necessary conditions are wanting, however, the fungus, although present, cannot attack the potato leaves; but the absence of disease does not necessarily prove the absence of the fungus, but only the absence of the conditions necessary to enable the fungus to attack its host. In all probability, the fungus is always present in land where potatoes are grown at short intervals, as in this State.

It is just as important to collect the old "sets," or the whole crop of diseased potatoes, as it is to gather the sound ones. "But," says the farmer, "such work would never pay." It might not appear so, but eventually it would more than pay.

A second very fertile source of disease is due to planting infected potatoes. Perhaps no farmer would plant obviously diseased potatoes, but the danger arises when the potatoes exhibit none of the external signs of the disease, but, when cut, just show indications of the discoloured patches characteristic of the fungus. The obvious check to this source of danger is to cut all potatoes used for planting, refusing those suspected of being diseased.

POTATO SCAB.

This disease, characterised by the presence of scurvy or scab-like patches on the skin of the potato, is very prevalent during certain seasons; and, although the edible portion of the potato is not injured, the market value is much depreciated. There is also another form of scab superficially resembling the one described, caused by an organism called *Oospora scabies*. The disease is prevented in both cases by steeping seed potatoes for two hours in half a pint of formalin mixed with 15 gallons of water.

Another remedy is said to be efficacious, and that is, to dissolve 2 oz. of corrosive sublimate in 16 gallons of water; when fully dissolved, put the seed potatoes in a bag and immerse them in the mixture, not leaving them to soak, but only long enough to ensure that all the seed is thoroughly wetted. Corrosive sublimate is highly poisonous, and must be handled carefully, a wooden vessel being used to dissolve it in. A potato affection was, in 1899, brought under the notice of the Queensland Department of Agriculture as occurring in the Gramzow and Alberton districts of Beenleigh, and it was found to be identical with the new disease of the potato plant whose nature and cause were first made known in 1894 by Mr. Henry Tryon, Government Entomologist. The disease was probably brought into the Beenleigh district many years since in seed potatoes.

The symptoms of the disease are as follows:—

When the potato plant is in process of vigorous growth, and exhibits every evidence of health, it suddenly commences to droop as if lacking moisture; after a few hours it generally becomes flaccid, its branches bend downwards, and its leaves have their edges turned inwards so as to expose their under surface. These events happen in a few hours, and the plant thus smitten never revives, but gradually succumbs. On examination, the roots and tubers will be found, to all appearances, perfectly sound. But careful examination reveals a faint, ring-shaped line, which is seen on the section of a healthy tuber at a short distance within and parallel to the surface. This ring of the healthy tuber is more evident than usual from having become darkened in colour. Later on, an opaque, thick, white, tenacious fluid exudes in minute quantity from the eyes of the tuber; and it is this which causes the earth to strongly adhere to these points when the tuber is taken from the ground and permitted to dry. If kept perfectly dry, the tuber usually undergoes no destructive changes; but if left in the soil, or placed in a damp atmosphere, destructive changes occur and eventually the whole potato becomes a mere mass of corruption. Mr. Tryon has described minutely the whole course of the disease in the issue of this Journal for July, 1899, to which I refer my readers.

TREATMENT.

As soon as the disease is recognised, every part of the affected plants should be removed, leaving not a particle behind. Then the ground should be opened up and lime applied to kill the plant-microbe. Once the disease has shown itself, potatoes should not be again planted for the succeeding crop on the same land, but two or more crops of, say, maize or brown millet, should be taken off. It should be noted that no plants of the same order should be planted on the infected ground, especially not tomatoes.

THE IMPORTANCE OF SPRAYING POTATOES.

A few experiments conducted by the University College of North Wales in spraying potatoes clearly emphasise the importance of conforming to this modern innovation in farm practice. These trials were carried out on different farms in the counties of Anglesey, Carnarvon, Denbigh, and Flint. In every single instance

spraying gave good results, in some cases markedly so. In the matter of marketable potatoes the average in the unsprayed crops was 7 tons 19 cwt. 96 lb. per acre. When sprayed once there was an increase of 1 ton 8 cwt. 91 lb.; sprayed twice, 2 tons 1 cwt. 26 lb.; but the late spraying did not effect such a large increase. There were fewer small potatoes by the use of the sprayer, and less than half the diseased tubers when twice sprayed. The following directions have been issued by Professor Winter, indicating how the operations may be carried out:—

Directions for Spraying Potatoes.

The following dressing is sufficient for 1 acre:—24 lb. sulphate of copper (98 per cent. pure), 30 lb. pure washing soda, 120 gallons of water. Washing soda is recommended in preference to lime. As in practice it will usually be difficult to dissolve the above quantity at one operation, we would suggest that the mixture should be prepared in a wooden vessel which will hold 25 gallons of water. First wash out this vessel thoroughly, and pour into it 15 gallons of clean water; then take 4 lb. sulphate of copper broken to a fine powder; place it in a canvas bag and stir it about in the water until the sulphate of copper is all dissolved. Next dissolve 5 lb. of washing soda in 5 gallons of water in a separate tub; then pour the washing soda solution into the sulphate of copper solution, and stir well. The mixture should then be tested with blue litmus paper; if the litmus is turned red more washing soda should be dissolved, and steadily added until fresh litmus paper put into the solution remains blue. The quantity of material thus prepared is sufficient for one-sixth of an acre. As the nozzles of spraying machines are easily choked, the mixture should be poured into the machine through a canvas cloth. Spraying should be done twice, three weeks apart.

PREPARATION OF THE SOIL.

In regard to ordinary tillage cultivation, it is indisputable that land intended to bear a good yield can scarcely be brought to too fine a tilth. The rootlets will spread with greater rapidity, and be enabled to take up their nutriment better, if the soil is well pulverised.

If forest land is to be operated on, the first work necessary is, of course, stumping and clearing off the growing timber at least two months before the land is to be broken up. If the soil is black and heavy, as it is in many parts of the State, notably in the Lockyer district and on the Darling Downs, it should be broken up in the autumn, and allowed to lie fallow until the end of June, when it should be harrowed down as fine as possible, and then well rolled. Then the land should be ploughed a second time, crossways, to a depth of 8 in. or more. By so doing the sour soil is turned to the top, and the soil which has been mellowed by sun and rain will be laid under.

Now let the land lie till the end of July. At that time, scarify it with a cultivator, and then give it a final ploughing and harrowing, when it wil be in fit condition to be planted in September.

If new scrub land has to be dealt with, when the scrub has been felled and burnt off, the stumps will remain in the ground for some three years, when most of them will have rotted out or can more easily be removed than when they were green. But although the whole of the land is permeated with a network of roots, potatoes may be planted by breaking it up in rows 2 ft. wide with a strong hoe, which easily cuts through the soft roots of the scrub trees. There is no danger in this case of stagnant water collecting in the rows, as the porous scrub soil will drain off the superfluous moisture; hence potatoes can endure far more rain in such soil than if planted on forest land or on black-soil plains.

The season for planting having arrived, the next thing to consider is whether whole potatoes or cut sets should be planted. This will all depend upon the season, whether the autumn or the spring sowing. For the winter crop whole seed is preferable, whilst cut sets are usually planted for the summer crop. I have already given the quantity of seed potatoes required per acre as varying from 8 to 12 cwt., according to circumstances, distance between rows and plants, and the use of whole or cut potatoes being the chief factors determining the quantity needed. When the seed is cut, it is well to sprinkle the sets with dry ashes, which will have the effect of hardening the cut surfaces and preventing the possibility of rotting should the seed lie over long in the ground before coming up. If, however, the seed has been properly sprouted before planting, there is little danger to be apprehended. The seed should be carted to the field in bags and placed at convenient distances along the rows, which are now being drawn to a depth of about 5 to 6 in., at a distance of 2 ft. 6 in. apart. The sets are laid in the furrow at from 12 to 14 in. apart, cut side down. The planted rows may be covered with the harrow.

GROWING POTATOES ON THE SURFACE.

Very good crops of potatoes have been produced without putting the set underground. The tuber itself is not the root of the plant, but merely an excrescence which contains plant food. The roots themselves, which are fibrous and branched, are produced below the tubers; and, provided they have a suitable soil to enter, the plant will flourish, and tubers will be produced, if certain conditions are observed. The method is as follows:—Break up the soil, and work it down fine, manuring it with stable manure or chemical fertilisers. Plant the sets on the surface, and press them into the soil until half buried, or just cover them with a little light soil; then cover the plot with straw, grass, or similar material to a depth of from 2 to 3 ft., and keep it moist. The potato stems will grow up through the straw, and produce tubers in the lower layers. The straw must be just kept nicely moist. An old method of producing a constant supply of tubers is described as follows:—Place the sets about 6 in. apart each way; build round the plot a pen with rails several inches apart, cover with straw to a depth of 3 ft. or more, and throw over it a few buckets of water occasionally. The tubers produced can be removed as far as the arm will reach through the crevices, from time to time, without seriously disturbing the plants. A large quantity of smooth, clean potatoes of good quality can be raised on a comparatively small area by this means.

GROWING BY IRRIGATION.

Where irrigation is adopted it is possible to ruin a whole crop by unscientific watering. The potato certainly delights in a cool moist soil; but it is one thing to apply the right amount of moisture and another to saturate the soil. As a general rule, the haulms should be allowed to attain a good degree of growth and be well in blossom before water is applied.

Some varieties require more water than others, and, some soils being porous and others retentive, varying quantities of water will be needed. Water applied too soon will often turn the vines yellow, and permanently check their growth. On the other hand, if the ground is very dry at the period when the potatoes are setting, as we term the formation of the young tubers, it often happens that no after application of the water will remedy the matter, and a short crop is the result. When the ground gets very hot and dry, and the vines turn dark-coloured and cease to grow, water becomes necessary at no matter what season, unless the crop has already matured. If the subsoil is lacking in warmth, it will be found fatal to apply water, even if the soil is very dry. One good watering will often mature a crop of potatoes, but, if the growth of vines is heavy and shades the ground well, two or even three waterings will increase the yield, and can, in no ordinary case, injure it. Thorough cultivation should follow each application of water, otherwise the water furrow will dry and cake, and this is most detrimental to the crop. As in the irrigation of other crops, the irrigation furrows should not be too long, because the water takes some time to go through, and the upper end, by the time the lower end has sufficient water, will have had far too much. In sandy soil water may be run for three or four hours, while in tenacious soils the irrigation may continue for eight or ten hours.

There is one very important point to note in connection with potato-growing by irrigation. Once watering has been begun, the ground should never be allowed to become dry. If this is neglected, the growth of the potato stops. Then growth is started again by a succeeding watering, with the result that the tubers will be irregular in size, or a second crop will be set, thus giving a large quantity of small or ill-shaped potatoes. This we have amply proved in a small crop of Sir John Llewellyns and Northern Stars we took up in December. The watering had been done fitfully, the ground being sometimes allowed to become quite dry. The result was that there were large numbers of small Sir Johns besides a second crop just set, whilst the Northern Stars resembled nothing so much as miniature dumb-bells, some taking the form of stumpy carrots. If potatoes are irrigated before the setting of the tubers, a greater number will be formed than the plant can properly support, few of them becoming large enough for market. On the other hand, if irrigated after the tubers have formed, there will be fewer tubers but a large crop of uniform marketable size. Deep cultivation, and thus keeping the ground mellow, is most important. The field should never be flooded, nor should the water be allowed to reach the crown or stem of the plants. The tuber is not the root of the plant, and it is the roots, not the tubers, which have to be watered. When the plants are 5 or 6 in. high, the roots are several times that length, and no more deep cultivation should be given them. It is sufficient to use some form of cultivation which will keep about 2 in. of the surface thoroughly pulverised.

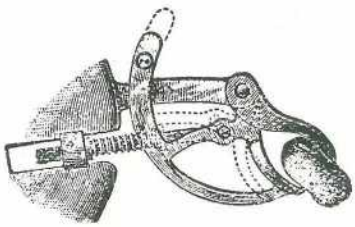
As soon as planting is done, the land having been previously well flooded if the weather is dry, harrow with the row, using bull tongues set to run as deep as possible next the row, the outside ones being set shallow. As the potatoes begin to grow,

reverse the shovels, running the outside deep and the inside ones shallow, so as not to disturbe the roots. Cultivation should be continued as long as the row can be seen. It should be understood that, with irrigation, the land must be well drained or so porous that the superfluous water can easily escape. Stagnant water is fatal to any crop except rice, and especially fatal to potatoes.

Where irrigation is out of the question owing to want of sufficient water supply or to the undulating nature of the land, deep and constant cultivation and thorough pulverisation of the soil will go far towards making a heavy crop.

POTATO PLANTING MACHINES.

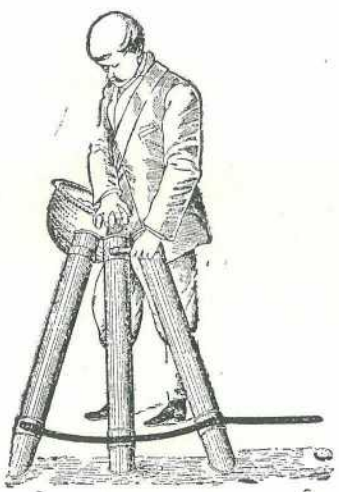
In America and in many parts of Europe, potatoes are now, and have been for some years, planted by machines drawn by horses, which make the drills, drop the sets into them, and cover them. In some machines, the sets are picked up by revolving spikes; in others, there is a finger-and-thumb action, which avoids piercing the sets



in the hopper. The fingers pick up the potato, hold it as the disc revolves, when a cam opens the fingers, and the potatoes drop into their places as though put in by hand. The machine will plant ordinary seed potatoes with only 5 per cent. of missed plants. The weight of the planter is about 7 cwt.

A HAND PLANTER.

This apparatus was invented in 1902 by the Hon. Cecil Jervis, Nottinghamshire. It is remarkable more for its simplicity than intricacy. The accompanying block shows at once the principle of the implement. By the old system of hand planting, 1 acre a day was very hard work for a man; but, with the Jervis Potato Planter, a man can comfortably plant 2 acres a day. Emerson says: "There would be more



tillers of the soil if the work could be brought breast-high," and the doctrine of the eminent essayist finds practical application in this appliance. Stooping is done away with, uniform work is assured, and the labourer can plant at walking speed. Three potatoes are taken at a time from a hopper slung over the shoulder, and dropped into the planter. The hopper is hollowed on one side to fit the body. The planter deposits the seed with great accuracy.

AFTER CULTIVATION.

Cultivation follows planting very closely, but interference is not needed, if the land is clean, until the haulms begin to show above the ground; then it is necessary to run a light, one-horse harrow over them, which can be safely done until the stalks are up some 2 in. above the ground, without any injury to the aftergrowth. This method will save a great deal of labour with the hoe, of which, however, there will be plenty needed before the potatoes are fit to hill. The more work that is done among the roots in the way of loosening the soil, either with hoe or scuffler, between the rows, the more likely is the farmer to get a fair return for his labour, provided always that the season be favourable. But even if the weather be dry, cultivation will be a great help to the plants by preventing evaporation of what moisture may be present in the soil. The farmer must, however, be careful to avoid disturbing the plant after the tubers are formed on the rootlets, and, therefore, he should not cultivate too closely.

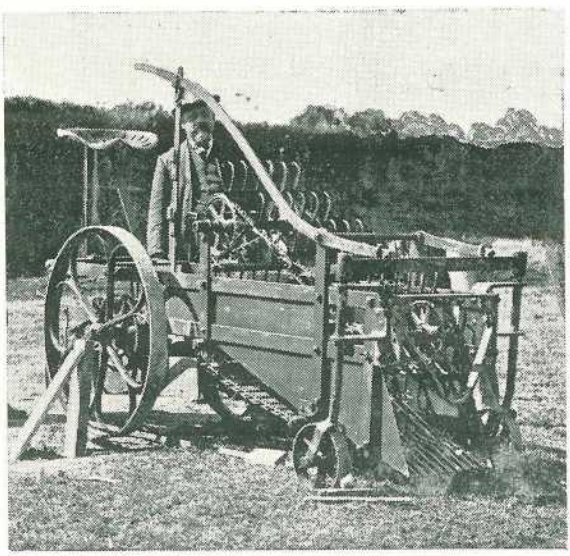
As the haulms grow higher, fresh soil must be drawn around them; in other words, they must be hilled up as the plants grow. This provides fresh plant food, supports the haulms, and keeps off superabundant moisture.

HARVESTING.

The first thing to make sure of before digging the crop is whether the tubers are sufficiently ripe to be lifted. The surest signs of maturity are the drying off of the haulms, and the firm setting of the potato skin. The winter crop may safely be left in the ground until the tubers are dead ripe, as there is little fear of any damage being done to them by flies and other insects; but the summer crop runs great risk from the potato fly and from sun heat. It is therefore advisable to take the latter up as soon as the haulms begin to wither and turn brown. The skin will not be so firmly set, and hence the potatoes will have a ragged appearance, and will not keep so well as if they had been allowed to remain in the ground until perfectly ripe.

Potatoes may either be taken up with a digging fork, with a long-handled shovel, with an ordinary plough, with a potato-digging plough, with the potato-digging machine, of which latter there are several in the market, and two—the Daniels and the Jackson—lately invented and perfected in Queensland by the inventors whose names they bear.

In the early days of potato-growing in the light scrub soils, I found the long-handled shovel a better implement than the fork, no potatoes being left in the ground; the labour also being less back-breaking. One ton a day was a fair day's work with this implement, and none of the potatoes were injured by a tine of the fork being stuck into them. A swing plough will do the work more expeditiously, of course, and without the same risk of damage, but still there is always some damage done by



THE DANIELS MACHINE.

scratching the tubers; and, if the ground is at all weedy, many potatoes will be left behind, which will have to be picked up by hand when cultivating for the succeeding crop.

In the absence of a regular digging machine, perhaps the cleanest way to take up a potato crop is to strip each side of the rows and then run a light plough down their centre, turning up all the potatoes.

Of the digging machines, the lightest and easiest worked by two horses are the two abovementioned. The Jackson machine simply digs the potatoes, but does not grade them. Both machines are equal to digging 5 acres a day.

Where the land is free, and there are no weeds, such as fat-hen and thistles, the machines do excellent work, and are a great saving of labour. To make the best work, the dry top of haulms and all weeds and rubbish should be removed prior to the machine being put to work. Since the advent of the blight, even if the digging is to be done by hand, it is advisable to clear the "shaws" off, and burn to stop further infection by their coming in contact with the sound tubers after they are brought to the surface. In old times it was customary to make use of the haulms for covering heaps of roots that had to be left in the field over night. But as it is almost impossible to be certain that no small spores of disease are lurking in the haulms, even in what are considered clean crops, it is advisable to run no risks and have the tops destroyed right away, fire being the best thing if the weather will allow.

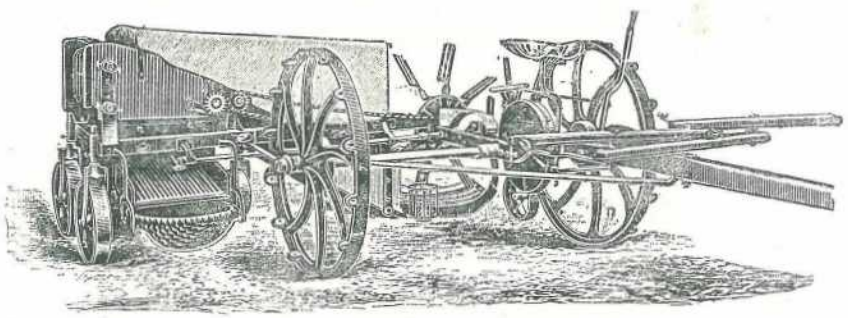
STORING POTATOES.

When handling potatoes for storing, treat them as eggs, careful handling means much as to the keeping qualities of potatoes. When extra labour has to be employed in raising potatoes, the greatest trouble is not slovenly digging; that can be rectified by after cultivation with harrow and plough. After the cleanest of diggers there will be some left, so that it is only a question of a few extra bags to be picked up when ploughing. It is in getting men to sort them as they should be where the trouble lies.

There are several methods in practice in the matter of storing potatoes; one is effected by putting a covering of some 6 in. of straw on a prepared heap of potatoes, and, on the top of the straw, laying another 6 in. of dry earth. But experience has shown that such a covering is too air-tight, causing fermentation and decay. The method I adopted was to place potatoes in a heap upon a high and dry patch of land and cover well with blady grass. By this plan, I succeeded in saving all my seed potatoes in the sixties, at Oxley Creek, when heavy rains culminated in high floods. There is another way, which is to lay them on the barn floor and cover them with straw. This covering, whether out of doors or indoors, is necessary to keen them in serviceable condition. To heap up the summer crop, when first lifted, is a great mistake, as they are sure to heat and decay. In any case, potatoes should not be heaped up whilst in a damp condition, as they will very quickly become valueless. Stored potatoes should be carefully sorted a week or so after they are taken out of the ground.

POTATO GRADER.

The accompanying illustration shows a device for rapidly and easily sorting potatoes as they are taken from the ground. The upper incline has, crosswise, rounded strips with spaces between as a flooring. As the potatoes pass down the incline, the small ones fall through the openings into the lower incline, the large tubers falling into one basket and the smaller into the other. The strips being rounded do not bruise the potatoes.



AN ENGLISH POTATO GRADER.

A DISEASE-RESISTING POTATO.

When the new varieties of potato, such as the Northern Star, Sir John Llewellyn, Up to Date, Evergood, and others were placed on the market about five years ago, as absolutely disease-proof, and as being enormously prolific, at exceedingly high prices (as much as £50 being paid for a single tuber), high hopes were entertained that disease in potatoes would be, for a series of years, at least, a memory of the past. But, alas for delusive hopes! Disease became much in evidence, especially in Northern Stars. In 1906, however, at a meeting of the Royal Horticultural Society, Edinburgh, a wellknown specialist in potato-breeding exhibited tubers of what is said to be a disease-proof potato. It was not a new variety, rather a very old one, and was supposed to be lost to cultivation; but Mr. T. A. Scarlett discovered it and brought it to light. It is said, in connection with this potato, that there is documentary evidence to show that, though grown since 1745, it has never shown the least sign of disease. It is a black, Scotch kidney, called "Trochie Grant." I have, so far, heard nothing further about this potato, either as to its cropping powers or edible qualities. The colour, of course, is not quite what is wanted in these days; but it is something to hear of a variety that has never been known to take the disease; and, with this potato to work on, hope is given that a disease-resisting variety of modern type may yet be raised. Such a potato would come as a boon to farmers and others who suffer more or less every year with disease in this important crop.

THE ALGAROBA AND LOCUST BEANS.

Mr. W. Leslie, Inspector under the Plant Diseases Act, sends us the following useful remarks on an article we published, in the February issue of this Journal, on "Algaroba, Carob, or Locust Beans." He also sent a photograph of a bean-bearing tree—the *Pithecolobium saman*, which has a spread of branches of 300 ft., the area covered by it being 1 acre 2 roods 19 perches, which arrived too late for reproduction in this month, but will appear in the April number of the Journal.

Mr. Leslie writes:—

"With reference to article in February issue, page 71—Algaroba and Locust Beans—it may be useful to note that *Pithecolobium saman*, commonly called the 'Saman Tree' in the West Indies, is favoured there above all others as a shade and pasture tree. It possesses the following admirable qualities for this purpose:—

1. It shades a very large area.
2. The shade is not heavy enough to prevent a healthy growth of grass.
3. It roots deeply, and instead of impoverishing the surface soil it enriches it by its copious deposit of nitrogen-bearing matter in the form of decayed leaves and flowers. (It is largely due to this 'incidental increment' that grass grows richer under its shade.)
4. The leaves close up at night and admit a deposit of dew on the grass underneath.
5. The large beans (7 in. by 1 in.) are plentifully produced in the dry season and form valuable feeding for stock, their sugar-content being high.

"A photo. taken by the writer in the West Indies shows a Saman tree covering 1 acre 2 roods 19 perches."

MANGO CHUTNEY.

The following is a good West Indian recipe for making Mango Chutney:—3 lb. mangoes (turned, but not ripe), 3 lb. tamarinds, 2 lb. raisins (weighed after stoning), 8 lb. brown sugar, ½ lb. chillies, 2 lb. green ginger, ¼ lb. garlic or 1½ lb. onions, ¼ lb. mace, 1 oz. mustard seed, ¼ oz. cloves, ¼ oz. pimento, and ½ lb. table salt.

Soak the tamarinds in 2 quarts of the best vinegar; stir them about with a wooden spoon to get the pulp off, and take out the seeds and the leathery part in which they are enclosed. Cut the raisins small. Peel the ginger and grate it. Pound the chillies, garlic, and mustard seed in a mortar, using a little vinegar to moisten. Mix all together thoroughly; it is then ready for use.

Pastoral.

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—BEEF AND DAIRY CATTLE.

The following revised list of breeders of purebred cattle is published for the purpose of informing those who desire to improve their stock where the best cattle can be obtained in the State. The Department of Agriculture and Stock takes no responsibility in relation to the entries in the list; but, when inquiries were first made, the condition was imposed that the entries were to be only of stock that had been duly registered, or that were eligible for registration in the different herd books. The entries received were, in some cases, somewhat too confusing for proper discrimination, it has, therefore, now been decided that only such cattle as have been registered will be included. The lists previously published in the *Queensland Agricultural Journal* have now been withdrawn for revision.

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
P. Young	Talgai West, Ellinthorp	2	42	Milking Shorthorn Herd Book of Queensland
L. H. Paten	"Jeyendel," Calvert, S. & W. Line	8	21	Ayrshire Herd Book of Queensland
F. C. G. Gratton ..	"Towleston," Kingsthorpe	2	14	Holstein Cattle Club Herd Book
T. Mullen	"Norwood," Chelmer	3	20	Queensland Jersey Herd Book
J. H. Paten	Yandina	6	21	Ayrshire Herd Book of Queensland
Queensland Agricultural College	Gatton	4	38	Ayrshire Herd Book of Queensland
		..	2	Ayrshire Herd Book of Scotland
		2	9	Holstein-Friesian Herd Book of Australia
		2	31	Jersey Herd Book of Queensland
J. W. Paten	Wanora, Ipswich ..	10	42	Ayrshire Herd Book of Queensland
M. W. Doyle	Moggill	4	12	Queensland Jersey Herd Book
G. A. Buss	Bundaberg	1	15	Herd Book of the Jersey Cattle Society of Queensland
W. Rudd	Christmas Creek, Beaudesert	2	10	Milking Shorthorn Herd Book of Queensland
M. F. and R. C. Ramsay	Talgai, Clifton ..	5	27	Herd Book of the Jersey Cattle Society of Queensland
George Newman ..	Wyreema	12	47	Holstein-Friesian Herd Book of Australia
R. Conochie	Brooklands, Tingoora	9	21	Queensland Jersey Herd Book

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—*continued.*

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
W. J. Barnes	Cedar Grove ..	10	37	Queensland Jersey Herd Book
T. B. Murray-Prior ..	Maroon, Boonah ..	2	37	Queensland Shorthorn and Australian Herd Books
W. J. Affleck	Grasmere, N. Pine ..	6	31	Queensland Jersey Herd Book
A. J. McConnel ..	Dugandan, Boonah	19	36	Australian Hereford Herd Book
A. Pickels	Blackland's Stud Farm, Wondai	4	62	Illawarra Dairy Cattle Herd Book of Queensland
G. C. Clark	East Talgai, Ellinthorp	3	7	New Zealand Herd Book
H. D. B. Cox	Sydney (entered brother's name)	3	16	Commonwealth Standard Jersey Herd Book
J. T. Perrett and Son	Coolabunia	2	36	Illawarra Herd Book of Queensland
State Farm	Kairi	4	8	Ayrshire Herd Book of Queensland
		1	2	Holstein-Friesian Herd Book of Australia
E. M. Lumley Hill ..	Bellevue House, Bellevue	45	127	Australian Hereford Herd Book
W. T. Savage	Ramsay	2	22	Illawarra Herd Book of Queensland
Tindal and Son ..	Gunyan, Inglewood	50	400	Australian Hereford Herd Book
J. N. Waugh and Son	Prairie Lawn, Nobby	3	28	Queensland Jersey Herd Book
J. H. Fairfax	Marinya, Cambooya (2)	9	55	Ayrshire Herd Book of Queensland
C. E. McDougall ..	Lyndhurst Stud, Warwick (2)	25	100	Queensland Shorthorn Herd Book
J. Holmes	"Longlands," Pittsworth	6	20	Ayrshire Herd Book of Queensland
P. Biddles	Home Park, Netherby	1	20	Illawarra Dairy Cattle Association
A. Rodgers	Torran's Vale, Lanefield	1	9	Milking Shorthorn Herd Book
R. S. Alexander ..	Glenlomond Farm, Coolumboola	1	..	Holstein-Friesian Herd Book of Queensland
		2	..	Holstein-Friesian Herd Book of Australia
State Farm	Warren	3	83	Ayrshire Herd Book of Queensland
S. H. Hosking	Toogooloowah ..	2	15	Holstein Cattle Club Herd Book
W. J. H. Austin ..	Hadleigh Jersey Herd, Boonah	2	11	Queensland Jersey Herd Book
Ditto	ditto	..	6	Commonwealth Standard Herd Book
H. M. Hart	Glen Heath Stud, Yalangur	7	21	Ayrshire Herd Book of Queensland
C. Behrendorff ..	Inavale Stud Farm, Boonah	3	9	Holstein-Friesian Herd Book of Queensland
F. A. Stimpson ..	Ayrshire Stud Farm, Fairfield, South Brisbane	25	77	Ayrshire Herd Book of Queensland
M. L. Cochrane ..	Paringa Farm, near Cairns	5	21	Ayrshire Herd Book of Australia

BREEDERS OF PUREBRED STOCK IN QUEENSLAND—*continued.*

Name of Owner.	Address.	Number of Males.	Number of Females.	Herd Book.
Albert Cook	"Greenmount," Mackay	1	8	A.-A. Stud Book, New Zealand
Thomas Brown ..	"Bellgrove," Kingaroy	1	14	Do.
Higgins Bros. ..	Sandy Creek, Leslie, Q.	6	2	Do.
Calcino Bros.	"Summariva," Charleville	3	4	Do.
W. M. McKelvie ..	"Undulla," Miles ..	5	4	Do.
James Connors ..	"Glen Erin," Nanango	1	2	Do.
J. A. Mackintosh ..	"Yundah," Warwick	2	8	Do.
M. J. Luff	Kaimkillenbun ..	1	1	Do.
A. Spencer	Brisbane	2	1	Do.
Beak Pastoral Co. ..	Rockhampton ..	2	10	Do.
E. Swayne, M.L.A. ..	West Plane Creek ..	1	2	Holstein-Friesian Herd Book of Queensland
Godfrey Morgan ..	"Arubial," Condamine	3	6	Queensland Shorthorn Herd Book
John Anderson ..	"Fairview," Southbrook	7	34	Ayrshire Herd Book of Queensland

HOW MUCH DOES A RABBIT EAT?

Mr. R. G. Skelton, of Otley, Inverell, writing to "Sydney Stock and Station Journal," gives some interesting, not to mention astounding, figures on rabbits. They look all right on paper, but it is a matter of conjecture as to how they work out in practice. He writes:—

"Does anyone know how much feed a rabbit eats? This is my experience:

"My children caught a young one, and were playing with it in the garden, and he got under the house, and used to come into the garden at night to feed. Result was that if we hadn't laid wait and destroyed it quick and lively, the garden would have been wiped out in a week. His large appetite struck me so much that I decided to test what a rabbit would really eat.

"I caught a young one, and kept him for a few days till he settled down to feed in his box, then weighed him, and he went 6½ oz.; then I kept the feed (radish tops and lettuce) up to him for twenty-four hours, and he ate 15 oz. in that time. (No mistake about this, and he wasn't prepared by starvation for the test either.) That is, he ate more than twice his own weight in twenty-four hours. Now, does this mean that a full-grown rabbit (which I find averages about 4 lb.) eats more than, or even twice, his own weight. If it does, then I lose 26,071 tons of feed per year by rabbits, because I reckon I have been carrying 20,000 rabbits on Otley. I consider this right, because I put a man on poisoning for a few months, and he got 7,000 full-grown skins, and easily lost another 3,000 full-grown rabbits that died off the trail. And I reckon he only got half the rabbits.

"According to this theory, I've lost 26,071 tons of feed per year by rabbits. Valuing this at least £1 10s. per ton means that on this place of 12,600 acres rabbits have eaten at least £39,106 worth of feed per annum. Makes one think a bit, doesn't it? And I hope it's enough to make rabbit-breeders swallow and digest.

"Now for another matter that might be interesting to rabbit-breeders. I came here four years ago, and I reckon the rabbits are no thicker now than they were then. As I've said, I've been feeding 20,000 rabbits, which I suppose means there were 10,000 does (females). Now, supposing each doe has at least five kittens a year, that means an increase of 50,000 rabbits per annum. Well, where have the 50,000 increase been going to? In my opinion they are destroyed by natural enemies, such as foxes, cats, &c.

"Well, there it is, gentlemen, and if you think these figures are worth driving down the throats of rabbit-breeders you are at liberty to do so."

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1918.

Another very unfavourable month for egg production has been passed through. Almost continuous rain has prevailed throughout the month. The number of eggs laid for January was 6,092. E. Chester again leads in the light breeds with 144 eggs. In the heavy section R. Burns and Mars Poultry Farm are equal for first place with 113. A large number of the birds are moulting. Broodiness had not been so prevalent during the month, but the total cases amongst some of the birds, and the time taken to get over each period do not leave much time for laying. In thirteen pens in the six-hen test, forty individual birds have five or more cases of broodiness against them, whilst three birds have been broody ten times each. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS.			
E. Chester ...	White Leghorns	144	1,384
G. Chester ...	Do.	123	1,205
Oaklands Poultry Farm ...	Do.	116	1,176
W. R. Crust	Do.	122	1,172
*G. H. Turner	Do.	100	1,160
F. W. Leney	Do.	97	1,164
W. Becker...	Do.	99	1,157
*J. M. Manson	Do.	71	1,149
Kelvin Poultry Farm	Do.	110	1,128
T. Taylor ...	Do.	103	1,111
D. Fulton ...	Do.	109	1,091
*A. T. Coomber	Do.	89	1,090
*J. R. Wilson	Do.	90	1,089
T. A. Pettigrove, Victoria	Do.	81	1,089
Chris. Porter	Do.	80	1,076
*J. Zahl	Do.	70	1,063
Moritz Bros., S.A.	Do.	73	1,061
Quinn's Post Poultry Farm	Do.	83	1,042
J. G. Ritcher	Do.	106	1,041
*Mrs. J. D. R. Munro	Do.	72	1,025
T. B. Hawkins	Do.	88	1,013
A. H. Padman, S.A.	Do.	79	1,006
J. L. Newton	Do.	92	1,005
*Dixie Egg Plant	Do.	70	1,005
A. Shillig ...	Do.	60	1,004
J. Holmes ...	Do.	105	988
C. Knoblauch	Do.	94	985
Mars Poultry Farm	Do.	76	979
*A. W. Bailey	Do.	77	978
Mrs. W. D. Bradburne, N.S.W.	Do.	77	976
F. Clayton, N.S.W.	Do.	69	969
Mrs. S. J. Sears ...	Do.	87	967
E. Cross ...	Do.	89	966
L. G. Innes	Do.	98	962
*T. Fanning	Do.	53	961
S. J. White	Do.	85	958
C. H. Singer	Do.	75	941
S. C. Chapman	Brown Leghorns...	81	935
C. P. Buchanan	White Leghorns...	69	930
E. A. Smith	Do.	82	916
J. Ferguson	Do.	72	913
R. Holmes	Do.	55	912

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
	LIGHT BREEDS—*continued.*		
*A. E. Walters	White Leghorns ...	75	911
Geo. Williams	Do.	62	908
Miss M. Hinze	Do.	85	907
S. Howard	Do.	55	903
Mrs. J. Carruthers	Do.	84	885
*Dr. E. C. Jennings	Do.	91	859
*C. C. Dennis	Do.	37	822
	HEAVY BREEDS.		
*R. Burns	Black Orpingtons ...	113	1,272
*Mars Poultry Farm	Do.	113	1,196
W. Smith	Do.	63	1,114
E. A. Walters	Do.	65	1,101
*E. F. Dennis	Do.	94	1,065
W. S. Hanson, N.S.W.	Do.	87	1,046
F. A. Claussen	Rhode Island Reds ...	80	1,020
Mrs. J. H. Jobling, N.S.W.	Black Orpingtons ...	97	993
*E. A. Smith	Do.	82	979
H. Jobling, N.S.W.	Do.	88	966
D. Kenway	Do.	76	951
Cowan Bros., N.S.W.	Do.	72	937
P. C. McDonnell	Do.	80	934
King and Watson, N.S.W.	Do.	90	911
C. B. Bertelsmeier, S.A.	Do.	90	908
*Miss M. Hinze	Do.	92	907
*Oakland Poultry Farm	Do.	85	896
R. Burns	S. L. Wyandottes ...	81	871
J. M. Manson	Black Orpingtons ...	79	862
E. Morris	Do.	65	851
*Kelvin Poultry Farm	Plymouth Rocks ..	66	808
C. C. Dennis	White Wyandottes ...	75	804
*F. W. Leney	Rhode Island Reds ...	50	703
F. Clayton, N.S.W.	Do.	49	682
Totals	...	6,092	72,723

* Indicates that the birds are engaged in single hen test.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
			LIGHT BREEDS.				
G. H. Turner	160	170	215	223	184	217	1,169
J. M. Manson	184	209	158	175	199	224	1,149
A. T. Coomber	178	123	213	198	198	180	1,090
J. R. Wilson	200	178	169	195	164	183	1,089
J. Zahl	205	110	215	123	215	195	1,063
Mrs. Munro	224	170	143	153	129	206	1,025
Dixie Egg Plant	158	193	178	200	85	192	1,006
A. W. Bailey	36	174	198	196	192	182	978
T. Fanning	130	172	181	146	135	197	961
A. E. Walters	120	130	152	185	153	171	911
Dr. Jennings	120	100	166	155	188	130	859
C. C. Dennis	176	89	77	154	162	164	822

EGG-LAYING COMPETITION—*continued.*

DETAILS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	187	162	231	170	234	288	1,272
Mars Poultry Farm	180	218	195	198	207	198	1,196
E. F. Dennis	221	196	183	231	198	36	1,065
E. A. Smith	162	166	134	188	171	158	979
Miss M. Hinze	161	136	128	162	164	156	907
Oaklands Poultry Farm... ...	204	134	125	113	197	123	896
Kelvin Poultry Farm	127	128	131	179	97	146	808
F. W. Leney	121	132	104	105	114	127	703

THE TRAP-NEST.

Mr. R. T. G. Carey, the well-known poultry-breeder of the Pindora Poultry Farm, at Beerwah, North Coast Line, sends us the following interesting and valuable information concerning the advantages of trap-nesting, which will doubtless prove useful to those of our readers who are engaged in poultry-farming. He writes:—

"With your kind permission I thought a few lines upon trap-nesting would be suitable for readers of the *Queensland Agricultural Journal;* hence my object in penning these few lines and the remark upon the important subject of trap-nesting would not be out of place.

"In poultrydom there are a vast number of aspirants engaged in poultry-raising. Some have made it a profession; some have failed, while others have become actual experts or scientists. Yes, poultry-breeding to-day is a scientific craft, wherein the many essential details that crop up have to be performed with the same degree of exactitude as a surgeon's work in a hospital. Care, cleanliness, attendance, rationing, watering, and coping against mites, diseases and parasites, &c., have to be all studied; hence the poultry-breeders of to-day are scientists, using the new and modern inventions of appliances for hatching, foster-mothering, fattening, and trap-nesting; the last-mentioned employment, though tedious, is essential for the betterment of poultry-farming.

"Trap-nests reveal the doings of individual hens, the identification of 300, 200, 100, 50, or 30 egg hen become known thereby, and drones if any. They prevent the egg-eater by disclosing the culprit, thereby allowing her to be fattened for the table. The trap-nest also demonstrates which members of the flock lay large-sized eggs and likewise the percentage of infertile eggs, and the bad shape, too long or very small egg layers.

"By the aid of the trap-nesting system, breeders can vastly improve their laying strains. It is the only certain test (far outstrides Hogan's system, or Zarl's test, which are only presumptive problems that amateur fanciers would be wise to leave alone).

"Trap-nesting is the only certain test, far in advance of the majority of systems of selection in points of accuracy. It is a long and trying job, a 365 every-day task throughout the year, records taken of tabs on fowls, eggs laid, &c., in all kinds of weather—wet, fine, floods, or drought.

"As an illustration of the benefits of trap-nesting, I will quote the records of two of my pens during the month of January. Pen No. 1: Six yearling hens whose output for the month was 135 eggs, their individual record being as follows:—24, 23, 23, 22, 22, 21. No. 2 pen was composed of three hens and three pullets, their total score being 95 eggs. Of this number the hens laid 56 eggs as follows:—19, 14, 23. Two of the pullets laid an egg each on the first day of the month, and from that date to the 31st only gave 13 and 20 eggs respectively. The other did not start until the 6th, and finished by producing only half a dozen tiny eggs by the end of the month.

"Thus, when the trap-nest is used, the good layers can be noted at a glance, and the undesirables and drones are speedily detected. Also, every egg being marked according to the leg band number of the hen that laid it, it can readily be noted which birds produce the greatest number of fertile or infertile eggs.

"It is through this detective service branch of our business that all the not-up-to-standard egg-producers and layers of infertile eggs are culled. As a result, none but the best are retained; hence the success of breeders must follow.

"Therefore, the detective service branch of poultry-farming is as essential for the maintenance of fruitful productions as is the detective service of our metropolitan towns for its useful work in repressing undesirables. We must thank our trap-nests for this faithful service.

UTILITY *V.* FANCY.

By J. BEARD, Poultry Instructor.

I have put this heading with utility first because just now the fancy is taking a back seat, but the utility side is very much to the front. No one will deny the fact that between the two sections there is a wide difference, and yet the two are inseparably connected. The utility breeder has much to thank the fancier for. You can hardly point to any new variety which was brought into being for the utility side alone, unless it is the Sussex fowl, but this has been improved wonderfully since the fancier got hold of it.

On the other hand, the fancy breeder has evolved many new varieties which to-day hold high places in the realm of utility.

For pride of place, I might mention the Orpingtons, Wyandottes, and Rhode Island Reds. These were brought out as all-round fowl, which would please the fancier, and yet do credit to the utility side because of their usefulness in producing eggs and their qualities as table fowls. These birds were first seen on the exhibition bench, and they created quite a sensation, and so popular have they become that one cannot find a town in any part of the State, and I might add the world, without seeing these birds. Some of them may be crude-looking creatures, but that is because they have been kept just for utility, without any knowledge of the show points. I am ready to admit that the type of some breeds is very different for the two sections. Take the Leghorn in its separate classes, while the

layer is a very active, business-looking fowl, that seen on the show bench is larger and longer in leg. But this same idea governs most breeds. If you want a good layer don't select the biggest, but take those of smaller size, which look like work, with a keen eye and sharp features.

I have known scores of men take up poultry-keeping for producing eggs alone, but the interest in the birds, and possibly a natural inclination, has soon made them into fanciers, who want to breed something better than they already possess. Such is the fascination of the fancy side, that when one gets a fowl, there is always the desire to have something better, and when breeding for show points the interest increases each season. When only producing eggs, the breakfast table is the first consideration, after which all interest ceases. The fancier goes on from year to year always hoping to improve. He watches the chicken from the shell, and sees its development, and wonders right through what it will turn out, whether just a killer of an exhibition winner. But the utility man is out for numbers, and the more he hatches the better he is pleased with himself; and then his only worry is, what will be the proportion of cockerels? True, that is poultry-keeping, but it is on a different plane from that of the fancier. The one is anxious for the moment, and then it is not important; but the keen fancier is interested all the way through, for after he has finished chicken-rearing there is the further development of the stock and the condition of them when fully feathered. The adult plumage is always interesting. A bird will be handled nearly every day to see how the feathers are coming, and whether the markings will be correct, or if the shade of colour is all right. To the fancier the whole year is one round of pleasure and fun of showing. One show the bird is a cup winner, and the next not a card. Then there is the curiosity to know what the judge was pleased with in the one case and what he did not like in the other.

The fancy world is not a bed of roses, but though we get pricked with the thorns we also get the scent sometimes. With so few shows about, the fancier has had a set-back, for some people have not the money to spare, and those who are now earning and would spend cannot find the time to devote to the birds. But it will all come back again; as soon as the Empire setties down, things will right themselves, and then the fancy will again thrive as it has done in the past.

All sections are needed, and if we work together for the common good, then it must be better for everyone.

It is idle to compare the prices of the two sections, for just now nothing is making very big figures; but in ordinary peace times the prominent fancier can make prices which would make the utility man's mouth water.

Last year several instances came before my notice of birds having been claimed in shows at prices ranging from £5 to £25, but this is only an ordinary amount in normal times. No doubt these were claimed with a view of winning at other shows, and if shows were plentiful this sort of thing would go on. Such sums in one lump are very useful, and the utility man would have to turn over a good many birds before he reached such amounts.

I may be pardoned for sticking up for the fancy, because I am an out-and-out fancier, but I also recognise that the two sections are needed to keep things going and supply the common needs of mankind.

LAYING STRAINS.

By J. BEARD, Poultry Instructor.

A fowl is a fowl, no matter whether it be just kept for producing eggs or whether it is capable of winning prizes at the leading shows of the State; thus some people sum up the position of poultry-keeping, and never seem to get beyond this idea. My friends all know that for over thirty years I have been a great exhibitor and won prizes at all the best shows in the State, so when dealing with this branch of the business I must be given the credit of knowing what's what.

The fancy side has many charms which the pure utility man knows nothing about, for the one is producing a fowl because it lays eggs while the other is breeding a bird for its beauty and what it is likely to do on the exhibition bench. Still, says the novice, all are fowls. But beyond all this there is much that both sections have done to improve their stock. While the one has gone in for beauty of plumage, brilliant colouring, and striking markings, the other has turned his

attention to seeing how many eggs he can get from each fowl, and, while his average one year may be only 120 per head, he looks forward to the time when this will reach 150; thus, to a very large extent both are working on pedigree, but with rather different ideas in view. Yet pedigree has made the industry what it is to-day. The best laying White Leghorn was not a freak found in an odd corner somewhere, but has been the result of careful mating for some years past. A stock of layers could be produced from almost any breed if the owner would care to go to the trouble. No one recommends the Indian Game as the ideal laying fowl, but in taking any six pullets of this variety some will lay better than others, and if these were persisted with, and the same idea followed of only breeding from the best layers, it would be possible to get a good supply of eggs even from the much-maligned Indian.

This is the principle which has been at the back of the Orpingtons, Wyandottes, Leghorns, and Rhode Island Reds, and brought some of these strains up to such a perfection as regards laying. Even in these one might get a flock of birds which would turn out very moderate or even poor layers. It is more a question of strain or that which is very like the pedigree, because not all are bred with the same care and accuracy. You could easily have two shorthorn cows, both nice to look at, but one will give nearly as much milk again as the other simply because she has been bred from a milking strain, and her pedigree warrants the assertion that she would turn out a good milker. The production of pedigree layers is worked out on very similar lines. One cannot breed from anything called a Leghorn and expect good results. An expert knows the difference between a good and bad layer at a glance, but there should be at the back of this the knowledge of what strain the stock is, then the thought is more convincing. I have very carefully followed the different habits of some of the same breed, and, just as there are drones in the beehive, so there are lazy fowls in the run. No two birds are exactly alike. One will be always busy looking out for any tit-bit about, and if on a paddock or run will soon eat its ordinary food and then be off to see what it can find.

The other will be always round the trough to pick up the last grain, and then may wander round to see what is about, but by this time the other bird will have caught the early worm. While the latter fowl may lay a fair share of eggs and do her part, it is the active little hen which is going to do a bit more than her share and earn you the extra profit which is to come in useful.

To breed from all fowls haphazard without considering what they have done is fatal, but the best layers should always be used for reproduction, though as soon as you do this you are building up a pedigree. If you would make sure of the number of eggs laid by each bird, the trap-nest or the single penning system is the only safeguard, for then it is easy to follow the weekly or monthly returns of each hen, and is a safe guide for next year's mating. One often unconsciously raises a strain of layers and builds up a pedigree without any special method, but there is usually a keen insight into the character of the birds, so that when mating up only the best layers are used.

Some breeders are quicker at discerning differences in hens than others. I have known people keep fowls for years, and though they get a certain number of eggs per day they could not tell you which birds laid the different eggs, nor even which ones were laying. Much can be done by ordinary observation, and anyone greatly interested in the industry will naturally find out things which another person would never see, and yet this does not imply lack of keenness to make headway. One has a natural aptitude for picking up things, and is able to grasp the conditions quicker than another; and, though the dull one may get there eventually, the other has seen through the position and made headway. Good laying fowls are bred on pedigree lines, and are not found easily from an ordinary stock at random.

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RETURNS OF COWS FROM 27TH DECEMBER, 1917, TO 26TH JANUARY, 1918.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Margaret ...	Ayrshire ...	28 Dec., 1917	829	5·1	49·74	
College Bluebell ...	Jersey ...	28 June ,,	682	5·2	41·02	
Iron Plate	,, ...	4 Oct. ,,	752	4·5	39·70	
Miss Edition ...	,, ...	12 Nov. ,,	810	4·1	38·40	
College St. Margaret	,, ...	9 Nov. ,,	604	5·3	37·25	
Miss Bell	,, ..	27 June ,,	594	5·3	36·85	
Sweet Meadows ...	,, ...	8 Aug. ,,	558	5·7	36·83	
Jeannie	Ayrshire ...	13 Dec. ,,	841	3·8	36·74	
Leading Lady ...	Jersey ...	26 Dec. ,,	755	4·2	36·64	
Hedge's Dutchmaid	Holstein ...	7 Sept. ,,	757	4·1	35·73	
Miss Edith... ...	Jersey ...	23 Dec. ,,	696	4·8	33·83	
College Damsel ...	Holstein ...	12 July ,,	738	4·0	33·77	
Lady Annette ...	Ayrshire ...	19 Oct. ,,	649	4·4	33·46	
Buttercup	Shorthorn...	2 June ,,	706	4·1	33·28	
Nina	,, ...	6 Sept. ,,	775	3·7	33·21	
Auntie's Lass ...	Ayrshire ...	5 July ,,	826	3·5	33·04	
Netherton Belle ...	,, ...	17 July ,,	675	4·0	31·43	
Netherhall Queen Kate	,, ...	30 June ,,	767	3·5	30·68	
La Hurette Hope	Jersey ...	22 Aug. ,,	511	5·2	30·66	
Lady Loch II. ...	Ayrshire ...	3 June ,,	615	4·3	30·64	
Miss Betty ...	Jersey ...	27 Mar. ,,	520	5·0	30·10	
Comedienne ...	,, ...	13 Dec. ,,	554	4·6	29·91	
Burlesque	,, ...	8 Oct. ,,	496	5·2	29·86	
Lady Dorset ...	Ayrshire ...	14 Aug. ,,	619	4·2	29·84	
College Mermaid ...	Jersey ...	21 Aug. ,,	492	5·1	29·52	
Glade	Shorthorn...	29 Mar. ,,	464	5·3	28·95	
College Ma Petite	Jersey ...	10 Nov. ,,	621	4·0	28 94	
Skylark	Ayrshire ...	24 May ,,	576	4·3	28·79	
Violette's Peer's Girl	Jersey ...	27 June ,,	566	4·4	28·41	
Songstress	Ayrshire ...	1 Oct. ,,	589	4·1	28·23	
Leonie	,, ...	4 Sept. ,,	602	4·1	28·09	
Lilia	,, ...	11 July ,,	644	3·7	27·87	
Thornton Fairetta	Jersey ...	30 June ,,	418	5·4	26·11	
College Cold Iron	,, ...	7 Dec. ,,	562	4·0	25·89	
Glow VI.	Guernsey ...	9 Nov. ,,	668	3·3	25·60	
Miss Security ...	Ayrshire ...	27 Mar. ,,	531	4·1	25·44	
Princess Kate ...	,, ...	28 June ,,	506	4·3	25·30	
Lerida II.	,, ...	2 June ,,	472	4·5	24·80	
Confidence ...	,, ...	25 June ,,	587	3·7	24·70	
Charity	Jersey ...	26 June ,,	362	5·8	24·23	
Lady Mitchell ...	Holstein ...	30 Sept. ,,	574	3 6	24·06	
Lady Doris ...	Ayrshire ...	2 April ,,	471	4·2	22·44	
Rosine	,, ...	21 June ,,	591	3·3	22·43	

The Orchard.

STRAWBERRY CULTURE.

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

As inquiries are received from time to time by the Department of Agriculture respecting strawberry culture, and as I have written nothing pertaining to this subject since my work "The Fruits of Queensland" was published in 1907, it is deemed advisable to revise what I then wrote, particularly as that publication was written more for the purpose of giving information on Queensland fruitgrowing in general, rather than specialising on any particular fruit or fruits.

THE SUITABILITY OF QUEENSLAND FOR STRAWBERRY CULTURE.

Although the strawberry is commonly considered to be better adapted to the climate of the temperate zone than to that of the semi-tropics, it is, nevertheless, the one berry fruit which can be grown to perfection in this State. Excellent fruit is produced in our Southern coastal districts and even under tropical conditions such as those existing at Townsville, when the plants are grown on alluvial soil and are well irrigated. This shows that the strawberry has a wide range in this State and that it can be grown successfully over the greater portion of our Eastern coastline and the tableland country adjacent thereto, provided there is either an adequate rainfall or, failing that, a supply of water for irrigation.

The commercial cultivation of the strawberry is, however, confined mainly to those districts possessing a regular rainfall, and extends from the Redlands Area in the South to Bundaberg in the North. When grown under suitable conditions in this district, the strawberry has proved itself to be an early and prolific bearer, able to stand a fair amount of hardship, in the shape of dry weather, and to resist the attack of insect and fungus pests to a greater or less extent.

There is a good demand for the fruit, either for immediate consumption in this and the Southern States or for conversion into jam, and, as few crops yield a quicker return, it frequently enables a beginner to make a living whilst more slowly maturing fruit crops are coming into bearing. Many a pioneer fruitgrower has to thank the strawberry for his start, as it enabled him to make a living where he would, in all probability, have failed otherwise, and what applied in the case of our pioneers still holds good with the beginners of to-day.

Many of our strawberries are of excellent quality and carry well, so that they reach their destination in the Southern States in good order when carefully handled and packed, provided the weather is not excessively warm or the fruit over soft on account of excessive rainfall. For jam purposes the fruit is excellent, and the product of some of our local factories is not excelled elsewhere in the Commonwealth.

SOILS FOR STRAWBERRIES.

Given suitable climatic conditions, strawberries will thrive in most soils, but the ideal soil for this fruit is a rich loam of medium texture, well supplied with humus, possessing perfect natural drainage, and capable of retaining moisture during dry spells—and the nearer one can get the soil to this ideal the better the results. Heavy, cold, badly-drained subsoils are not suitable, but any good loam or sandy loam, whether of scrub or forest origin, can be made to produce good berries if properly treated.

PREPARATION OF THE SOIL.

There is only one way to prepare soil for strawberry culture, and that is, *thoroughly*. Nothing else will do. In the case of virgin scrub or forest land, which is, as a rule, fairly rich in humus, the land, after it is cleared, should be broken up deeply and brought into a state of as nearly perfect tilth as possible. On virgin soil, except it is of the poorest nature, it is not necessary to apply any manure for the first crop, as there is usually an ample supply of available plant-food and humus present in such soil, but for subsequent crops, or old land, systematic manuring is very important. Old land that is at all deficient in humus should have that deficiency made good, either by the application of a heavy dressing of farmyard or stable manure, such as a load to every 4 perches, or if this cannot be obtained, then by growing a green crop such as cowpeas or other legume which has been well manured with phosphatic and potassic manures and ploughing it in. The green crop so ploughed in should be allowed to rot and, when rotten, the land should be reploughed and worked down fine. If the green crop has received a generous dressing of phosphatic and potassic manure, then there will be no need to apply any further fertilising material to the land, as a complete manuring has been given; but if not, then the soil should be treated as recommended later on.

The surface of the land should be kept as even and level as possible, and, as already stated, it should be worked down fine, so that when the young plants are set out they will take hold of the soil at once and become firmly established.

Planting strawberries on raw land, sour land, or land that has been indifferently prepared, is only courting failure, whereas, when the planting is carried out as advised, there is every chance of success.

SELECTION OF PLANTS.

Always obtain strong runners from healthy, prolific plants. The first runners next to the parent plants are to be preferred, as they are usually the most vigorous and best rooted, and, further, they come into bearing earlier; but, failing these, any well-rooted, strong, well-grown runners can be used, and although they will not fruit as soon as the first runners they will give a good yield later on, and frequently continue to bear when the earlier fruiting plants have ceased.

PLANTING.

Having secured suitable plants, trim the straggling roots with a sharp knife and plant as shown in the illustrations herewith, which are

No. 1.

No. 2.

No. 3.

No. 4.

self-explanatory. Careless planting is responsible for many failures, especially too deep planting, as no strawberry will thrive if its crown is buried under the soil.

The distance at which to set out the plants varies somewhat in different districts, but it is not advisable in any case to overcrowd the plants, but to allow plenty of room. Personally, I favour planting strong plants at from 20 in. to 2 ft. apart each way, so that when planted the land can be worked all round the plant; or if row planting is desired, then the rows should be about 30 in. apart and the plants set out at from 15 to 18 in. apart in the row. The illustration of a strawberry garden at Mooloolah shows the manner of planting adopted by one of our most successful growers, and it will be noted that the plants have plenty of room and are in no way overcrowded.

CULTIVATION.

Strawberry plants must only be surface-worked whilst growing or bearing fruit. The object is to keep down weed growth and to prevent the surface of the soil caking; but the cultivation must never be so deep that it will injure the roots. The best implement to use is the Planet Junior hand cultivator or similar machine; or, failing that, a good Dutch hoe of any type that may be preferred.

Weed growth must be kept down and the surface of the soil must not be allowed to become hard and set.

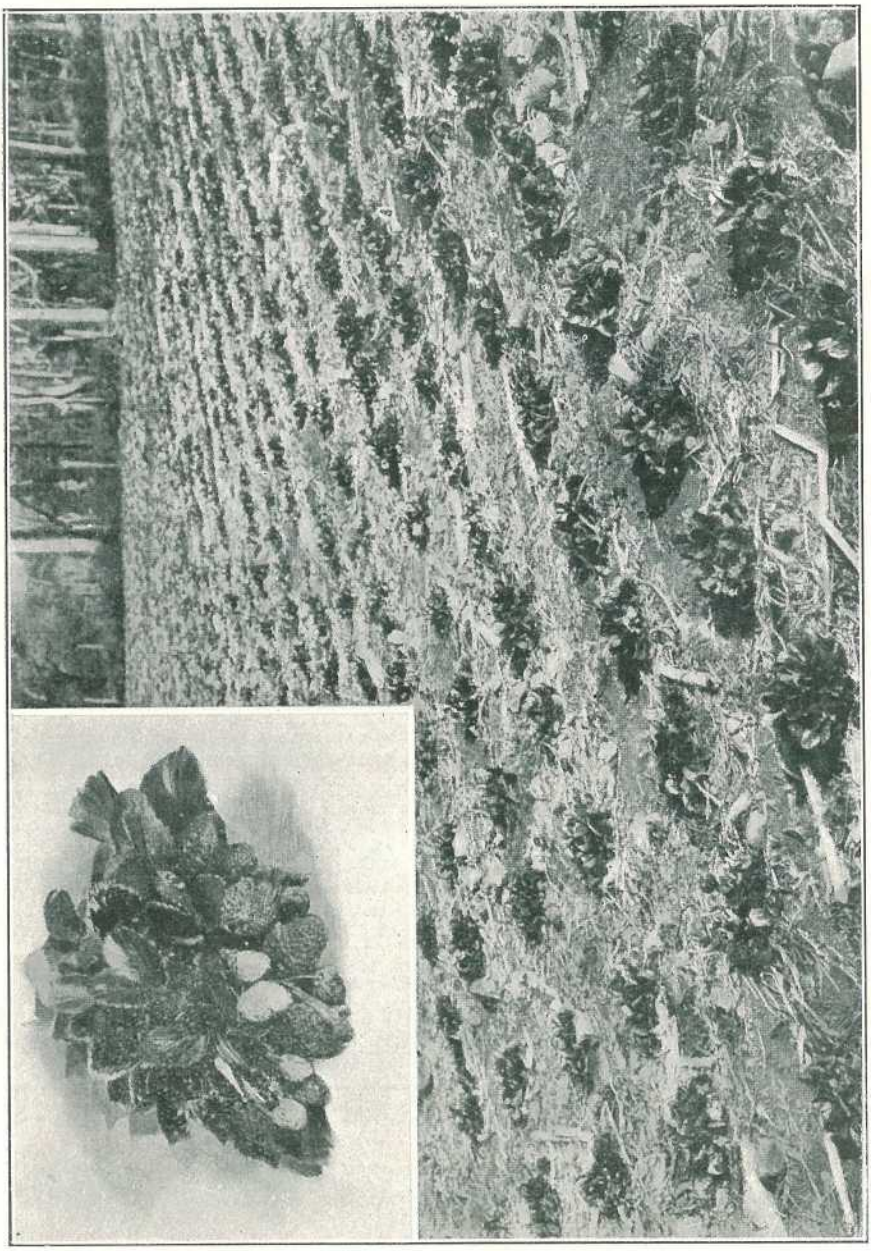


PLATE 6.—A STRAWBERRY GARDEN AT MOOLOOLAH.

If the plants are to be kept over for a second or third year, then the whole of the runners, other than those required to make good any losses in the original plants, must be removed, and the ground between the original plants must be well broken up and manured in late summer or early autumn, so that the plants will be in good nick for producing the following season's crop of fruit.

If the plants have been badly attacked by leaf blight it is a good plan to cut off all the leaves and burn them prior to working and manuring the land, as numerous fungus spores are destroyed thereby. The burning off is best done by scattering a little loose dry straw over the plants when the leaves have been cut off and have dried, and then setting fire to the lot. A light burning does not injure the plants, but is decidedly beneficial.

MULCHING.

This is seldom practical in this State, and it is of very doubtful value under our local conditions, a light surface soil mulch, such as that produced by working the land with a Dutch hoe or Planet Junior hand cultivator, being all that is necessary.

MANURING.

The strawberry is a fruit that requires an abundance of readily available plant-food, and one that pays well for systematic and judicious manuring. In the 1917 edition of his pamphlet, "Complete Fertilisers for Farm and Orchard," the Agricultural Chemist to this Department gives the following advice, which it will pay to follow:—

"Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilisers, particularly such containing potash, is very marked.

A complete fertiliser for strawberries should contain 7 to 8 per cent. phosphoric acid (water soluble), 8 to 10 per cent. of potash, and 3 per cent. of nitrogen, and should be used at the rate of 5 to 9 cwt. per acre.

The following fertiliser mixture may be found useful:—

3 to 5 cwt. basic or ordinary superphosphate
1½ to 2 cwt. sulphate of potash
1 to 1½ cwt. sulphate of ammonia, or nitrolim, or nitrate of soda
} per acre;

or,

1 cwt. fine bonemeal
4 cwt. superphosphate or basic superphosphate
2 cwt. sulphate of potash
1½ to 2 cwt. nitrate of soda
} per acre;

the latter applied by two or three top-dressings, at the rate of 1 cwt. per acre, when fruit is first forming, and thereafter at intervals of 2 weeks."

MARKETING.

Fruit for immediate consumption should be gathered whilst still quite firm. It should be carefully handled and packed in boxes or trays containing a single layer of fruit. The use of punnets is not so satisfactory, as the fruit is more likely to be bruised, and it is doubtful if the methods of marketing the fruit in single layers can well be improved upon. Fruit for factory use is stemmed, placed in casks or other suitable receptacles, and forwarded as quickly as possible to the factory. Care in handling, picking, grading, or packing, always pays.

DISEASES.

The most serious diseases of the strawberry in this State are those of fungus origin—viz., leaf blight and mildew.

The former can be controlled by the use of Bordeaux or Burgundy mixture applied as a spray, combined with the burning off of affected leaves, as previously mentioned; and the latter can be kept in check by means of sulphur applied in a similar manner to that employed for the treatment of oidium in grapes, or by spraying with sodium or potassium sulphide or a weak solution of lime sulphur. Insect pests seldom do any very serious injury, but when leaf-eating beetles or other leaf-eating insects are present they can easily be destroyed by spraying with arsenate of lead.

VARIETIES.

Although most of the standard varieties of strawberries have been grown in Queensland at one time or another, experience has shown that no one variety has proved permanent, but that it has been necessary to either raise new kinds from seed or to introduce them from elsewhere. Varieties producing perfect flowers have proved more profitable than pistillate sorts and are therefore most commonly met with.

After being grown in this State for a few years most varieties become weaker in growth, more liable to disease, and less prolific, so that they have to be discarded. The introduction of new sorts is thus essential, and there is no better way of doing this than by raising local seedlings. Some of the best sorts ever grown in the State have been locally raised seedlings, of which the *Aurie Anetta* and *Phenomenal* are good examples, and there is no reason why sorts equal or even superior to these should not be produced. Of the well-known standard varieties, such as *Marguerite, Trollop's Victoria, British Queen, Pink's Prolific, Federation, Melba,* and *Edith,* and several others that have been grown from time to time in this State, few are now planted, and those kinds that are now being grown, such as *Phenomenal, Usher's Special,* and *Auric,* will probably be replaced by newly raised seedlings in course of a few years. The type of strawberry best suited to this State is a vigorous healthy grower—that is, a good bearer and producer of good coloured fruit of good, firm texture and fine flavour; a fruit that keeps and carries well, and that meets the requirements of both the fresh fruit trade and of the jam maker.

ORANGE-GROWING AT CAIRNS.

Mr. Ben Mills, of Freshwater, near Cairns, has made a speciality of growing Navel oranges in his citrus orchard, and apparently has been very successful in the business. He has 13 acres under this variety of the citrus family, on which a thousand Washington Navel trees are thriving, and which are now from four to five years old. No. 1 photo. represents a general view of the orchard, and in No. 2 is depicted one of the five-year-old trees. The oranges on the box were picked on New Year's Day, and

each fruit measures 3¾ in. in diameter. There is only a small crop this year, as the trees are rather young. We wish Mr. Mills every success, as he is in the right locality for citrus culture, and has wisely chosen a most valuable and marketable variety for export.

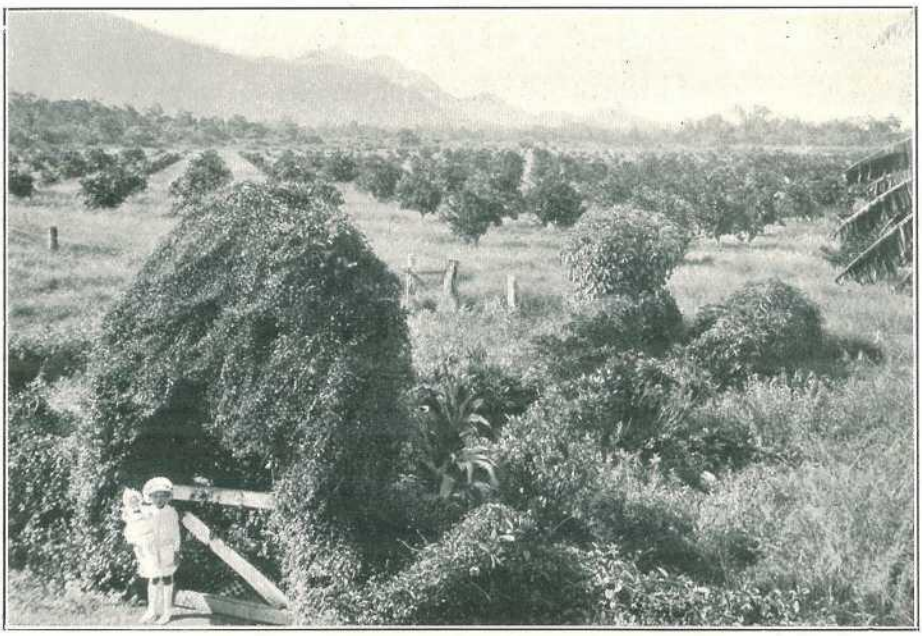


PLATE 7.—GENERAL VIEW OF ORCHARD.

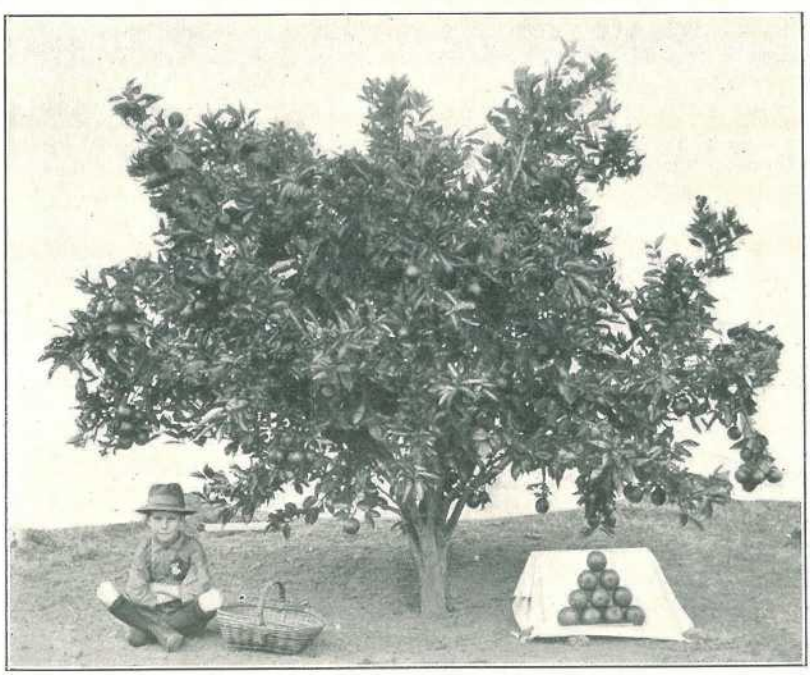


PLATE 8.—FIVE-YEAR OLD TREE.

Viticulture.

HINTS TO GRAPEGROWERS.

BY C. A. GATTINO.

(Continued from February, 1918.)

SUMMER PRUNING.

This is a systematic operation, just as is the winter pruning; however, it is not sufficiently understood, and enough importance is not given to it by grapegrowers. For the better guidance of my readers, I will describe this operation in its several phases, starting with the most important.

Green Pruning.—This is the main practice, and has to be performed when the shoots are about 6 or 8 in. long, when all the small buttons or bunches can be plainly seen. The main principle of this practice consists in pinching off the barren shoots growing on the fruit-bearing branch; also all the young shoots growing on the main stem below the first fruit-bearing branch. The development of such barren shoots is not only useless, but is detrimental to the fruitful ones. By pinching them off, we not only encourage the useful growth of the plant, but lead the sap into those channels where it will benefit the development of the young bunches and the wood destined to be fruit-bearing next year.

The *pinching back* of the fruit-bearing branches, so as to prevent an excessive and useless lengthening, is a good practice for concentrating all the sap into the bunches of fruit. These branches can be pinched back to within two leaves if the shoot bears more than one bunch, and to four leaves if it only bears one. The pinching back also is effective to spurs designed to be fruit-bearing the following year. Their growth may be stopped when they are about 3 ft. long. This stoppage of growth will concentrate all the vigour into producing a strong, healthy wood for the next season's crop.

The *stripping off* of the leaves is a very useful operation, especially when the autumn temperature is very low; it would, however, be dangerous in very warm climates. This operation consists in stripping off the leaves near the bunches, and thus allowing the beneficial action of the air and light on the fruit. The time for stripping is when the leaves turn yellow, that being a sign that they have ceased to function. If time and labour are available, I would recommend that any suckers that may have grown since the first pinching off be also pinched back, as they will only develop into useless shoots.

[TO BE CONTINUED.]

Forestry.

KILLING GREEN TIMBER WITH ARSENIC.

Of late we have had many inquiries from our subscribers and others interested in clearing land expeditiously as to the method of destruction of trees by means of arsenic, and of dead stumps by acids. We are pleased to be able to give clear directions on the matter. The "Farm Bulletin" for January, 1918, published the following paper on the subject, by C. W. Burrows, Assistant Inspector of Agriculture, New South Wales, which comes at a most appropriate time:—

In this country, where large areas of land are available for occupation, and are heavily timbered, it is of primary importance to remove the timber, either wholly or in part, in order to increase the productivity of the land, and the quickest means is usually the best.

Ordinary ringbarking is effective if done at the right time for the particular district, for it must be conceded that seasons vary considerably from year to year, making the operation an adjustable one. But ordinary ringbarking has one disadvantage—it is slow, often taking twelve to eighteen months before the trees can be burnt off.

Of late years, the action of arsenic has been introduced with marked success in hastening the killing by the ringbarking process, and trees that ordinarily would take months to kill by the old method are now killed in a few weeks, and frequently in a few days, by the application of arsenic.

Arsenic—the ordinary white arsenious oxide of commerce—costing about £1 6s. per cwt., is not soluble in water to any great extent, so that soda, either the ordinary washing soda at about 5s. per cwt. or caustic soda at about £1 8s. per cwt. has to be used in conjunction with it, in order to make it soluble.

Should the ordinary washing soda be used, the proportion should be three of soda to one of arsenic, and boiling is necessary to bring about complete solubility. By using caustic soda, the proportion of which is two of caustic soda to one of arsenic, the mere addition of water in reasonable quantity generates enormous heat, doing away with the necessity of boiling for the dissolving of the arsenic.

When large amounts of the solution are required, washing soda will be the cheaper, but for small quantities of solution, caustic soda will possibly be found the handiest, as boiling is unnecessary.

In dissolving the arsenic, whether for washing or caustic soda solution, there is one point worth remembering: Do not tip the whole of the arsenic into the solution in a dry state, but mix it to a paste slowly and carefully, in the same way as the housewife treats her cornflour, then pour it slowly into the soda solution, stirring it all the time, and be careful to stand on the side away from the fumes, as they are poisonous. When once the soda and arsenic are dissolved and chemically combined the bulk may be made up to the required dilution by the addition of water.

A useful strength for quick and effective work in all kinds of timber is as follows:—

Arsenic, 1 lb.
Washing soda, 3 lb.; or caustic soda, 2 lb.
Water, 4 gallons.
Whiting, ½ lb.

The addition of this whiting is merely that it may serve as an indicator on trees treated, as it turns white on slightly drying, making it quite certain what trees have been operated on. An empty kerosene tin makes a useful measure for dissolving in, as it holds 4 gallons.

The time to carry out the work of poisoning is when the tree is dormant—that is, when the sap movement is at its minimum and the sap right down in the roots and lower portion of the trunk. This occurs in the winter months from, say, March to July, according to the district, and must necessarily vary between these limits in a State like New South Wales which embraces such a wide variation of climate. On parts of the North Coast ringbarking has been carried out to the best advantage as late as June and early in July in certain years, whereas in the most central parts of the State, late February and March have found the sap movements at their lowest.

The main object in catching the sap to season is to prevent suckering. Trees can be killed by arsenic or ringbarking at practically any time of the year, but to prevent this suckering it is highly important to operate when the sap is down, or just completing its downward course.

Having decided on the season and dissolved the poison, we are ready to "frill" the trees. By "frilling" is meant a succession of downwards axe cuts completely round the tree, and each cut well overlapping the adjoining ones so as to leave no unsevered section of bark up which the sap can flow. There is no doubt that "frilling" alone would kill timber if allowed time, but the poison does it in a fraction of the time; in fact, trees have been killed in a few days. These cuts must be through the bark and well into the wood proper, and as close down to the ground as is convenient to cut them consistent with the shape of tree, say, from 6 to 10 in. up.

For trees of 4 ft. diameter about a quart of solution is poured into this frilling, right round the tree, using an old teapot or kettle, as the spout makes pouring easy and less is wasted by spilling needlessly round about. Smaller trees naturally need less solution.

Saplings may be cut off low down, and with a swab-stick the solution may be dabbed on to kill and prevent suckering.

It is very important that this frilling and the applying of the poison be consistently and thoroughly carried out, and not in any way scamped or slummed, if good results are to be looked for.

There need be no fear about stock being poisoned by eating the fallen or dead leaves from poisoned trees; for when is considered the comparatively small quantity of solution used, the likelihood of the leaves absorbing any free arsenic is very remote.

Nor is there much danger from stock grazing on areas frilled and poisoned, though it would be desirable to keep all stock off for three or four weeks, when all possible chance of danger would have disappeared.

At the time of writing the prices of materials for cwt. lots are:—

Caustic soda, £1 8s. per cwt.
Washing soda, 5s. 6d. per cwt.
Arsenic (grey), £1 4s. per cwt.
Arsenic (white), £1 6s. per cwt.

Prices are somewhat inflated at the present time, and, of course, a slight increase on the figures quoted will have to be paid for smaller quantities.

Although arsenite of soda is obtainable as such from drug merchants (the price quoted being £2 2s. per cwt.), its use in that form cannot be recommended for the poisoning of green timber, as it is not a definite chemical compound, and its content of arsenic and soda varies in accordance with the methods of manufacture.

The cost of the work will differ considerably in different districts. It is worthy of mention, however, that a recent report of the Manager of the new Condobolin Demonstration Farm records that poisoning was adopted there with success and economy. The work was done by day labour at a total cost of 1s. 5d. per acre. This must be considered very low, as the country was fairly heavily timbered, and the wages paid were from 1s. to 1s. 4½d. per hour. Said the manager: "The timber has all died, and mostly within forty-eight hours from the time of ringing." The liquid was distributed by means of 1½-gallon watering-cans with spouts made specially long, and having exit holes of about the size of a No. 8 wire.

DESTROYING STUMPS WITH ACIDS.

An impression has persisted among farmers for many years that tough stumps can be got rid of, or at least rotted so that they will burn freely, by treating them with some strong acid, such as sulphuric or nitric acid, and waiting a few weeks. In order to test the matter properly, a series of experiments was designed by Mr. F. B. Guthrie, chemist, in 1913, and deep auger-holes were bored in selected stumps of tough timbers, some green and some dry. Quantities of the chemicals named, separately and together in varying proportions, were poured into different stumps. The results were noted regularly for six months, at the end of which time an examination showed that in the case of both green and dry stumps the acid had no appreciable effect. The average cost per stump worked out at 1s. 9d., which included labour at the rate of 7s. per day; it is an open question whether men could be found who would use two such dangerous acids at that figure.

Saltpetre has also been said to be useful in preparing dead timber for burning off, but numerous private experiments go to disprove the theory.

Entomology.

CANE GRUB INVESTIGATION.

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

The flight of the grey-back beetles, though long drawn out, has been comparatively small this year in the region about Meringa Station. A few beetles are still emerging (14th January) and are to be found on the feeding trees, nearly two and a-half months after the first emergence in November. We are already finding second-stage grubs of this species in the field, resulting from these earlier emergences.

DESTRUCTION OF FEEDING-TREES.

As pointed out in the publications from this office, the grey-back beetles show a decided preference for feeding upon the foliage of the Moreton Bay ash. Since these trees are commonly distributed through the forest and often in the vicinity of grub-infested canefields, it would appear to be a profitable procedure to have them all cut out within a circumference of about a mile of such fields. Moreover, these trees also appear to be the favourite food-plant of both *Lepidiota frenchi* and *L. rothei*. In the region immediately around Meringa, all of these beetles appear to travel about half a-mile back into the forest, though no doubt they would travel double this distance if feeding-trees were scarce. There is also the possibility that beetles forced thus far from their breeding-ground to feed would not be likely to return to the canefield to lay their eggs, but would probably place them at the roots of native grasses in the forest, as they did before sugar-cane was introduced.

TRAP-TREES.

It might be well to keep a few trap-trees about the buildings on each farm, so that the beetles could be shaken off each morning for the fowls. We have found the weeping fig work well for this purpose, for it is usually covered with beetles every morning. The fowls feed very greedily upon the fresh beetles, with no ill effects, though they do not seem to care so much for them when dried and ground up into a meal. Of course, the natural instinct is to break up the insects themselves. The cases reported of poisoning fowls by feeding them collected beetles were evidently the result of letting the insects stand too long before they were used; hence, decay had set in and ptomaine poisons developed. Beetles to be used for food of birds and so forth should be quickly dried, and in this form they might be an important article of diet for both fowls and insectivorous animals and so on in public gardens. We have had a call for this kind of food during the last two years from zoological gardens.

LEPIDIOTA FRENCHI AND *ROTHEI*.

Both these beetles are still much in evidence; the mating pairs hanging on the low bushes every evening indicating that they are still emerging. After mating they feed for several days before they are ready to deposit their eggs.

In the fields, mentioned in the last report, infested with *frenchi* grubs, conditions have improved since the continuous heavy rains; the cane is greener and in some cases throwing out fresh roots. Extensive digging shows that the number of grubs is materially less and that many of them have been killed in the soil, for we often find them decayed or, if near the surface, dried up. Of course, many are carried away by ants soon after they die. Since these fields have been literally swarming with the parasitic wasps for a month or more, we naturally conclude that they have been responsible for much of this mortality among the grubs.

Experiments with poisons in this same field proved very encouraging. Arsenate of soda mixed with megass and applied in a furrow along the sides of infested stools apparently killed all the grubs, for none were to be found in the treated section three weeks after application, though they continued abundant in the remainder of the row, an average of three being found under each stool.

Experiments with repellents, on the other hand, have given but negative results. Creosote sprayed on megass and placed in furrows alongside the stools failed to retard the grubs, though the odour was very strong in the soil after three weeks. Furthermore, any roots that came in contact with the creosote fumes were killed, and the plants showed a decided yellowing.

BREEDING OF PARASITES.

Breeding experiments with regard to Scoliid parasites are being attended with marked success, and at present we are working out the life-history and metamorphosis of our two most useful species of digger-wasps—*Dielis formosus* and *Campsomeris radula*.

A specimen of the latter insect that was captured in a canefield at Meringa last September lived for seventy-five days in confinement, during which period it laid twenty-five eggs upon third-stage grubs of *Lepidiota frenchi*.

A single egg is laid on each grub and hatched after an interval of about three days, when the tiny larva at once buries its head in the body of the paralysed grub and proceeds to imbibe its juices.

So rapidly does it develop at this stage that nine days later those destined to produce female wasps have become plump white maggots nearly an inch in length and have ceased feeding.

Larvae of male wasps, although much smaller than those of the opposite sex, take just as long to mature. The shortest periods recorded by us, however, are seven days for the male and eight for the female; while nine days appears to be the average time for both sexes.

Having withdrawn its head from the shrunken, distorted body of its victim, the maggot, after resting a few hours, spins an oval, parchment-like cocoon of tough brown silk, in which it gradually changes to a pupa and finally into the perfect wasp, which escapes by breaking through a circular trap-door forming one end of the cocoon.

The average time passed in the pupal stage is thirty-six days for the male and thirty-nine for the female wasps.

We have found that *C. radula* will deposit eggs upon second-stage grubs of the grey-back beetle, but apparently will not oviposit on third-stage grubs of *Dasygnathus australis* or even paralyse them.

Data obtained recently at Meringa would lead us to suppose that this digger-wasp plays an important part in the control of *L. frenchi*.

At the present time individual females bred from cocoons at the insectary are laying two to three eggs per day. A single wasp of the above species was confined with six large grubs of *frenchi* in a cage containing 72 cubic in. of soil, and when examined twenty-four hours later two grubs had eggs on them, two were paralysed, and the remainder killed.

On the preceding day, however, the same wasp paralysed twelve grubs, laying an egg upon one; she left only three uninjured of the original fifteen placed into the cage.

Upon several occasions during early morning after rain we have observed great numbers of male wasps of *C. radula* and *D. formosus* flying energetically over the surface of land supporting young cane plants injured in places by larvæ of *frenchi*. Few or no females were noticed on the wing at such times, but upon digging beneath affected stools several were unearthed together, with grubs they had paralysed.

We may therefore conclude that, although not much in evidence above ground, the females, nevertheless, are usually well represented in the field.

Such conclusion is amply borne out by our laboratory tests, since out of eighteen wasps of this species—obtained from eggs laid by a female caught at Meringa on 26th September—nine proved to be males and the same number females, and all of these parasites emerged practically together.

The male wasps have a habit of congregating in numbers at sundown, particularly during wet weather; and pass the night resting, side by side, on dead twigs, so that on certain spots one can easily collect them by handfuls.

Zoology.

A RARE MARSUPIAL.

BY HEBER A. LONGMAN (Queensland Museum).

There are a number of small marsupials which are often spoken of as pouched mice or pouched rats. These belong to the same family as the well-known "native cat" or "tiger cat," *Dasyurus maculatus*, the family name being *Dasyuridæ*. They are mostly very small animals, and some of the species are very uncommon. The pouch is quite unlike the large purse-like structure of the kangaroo, and is merely a circular pit, being more prominent at breeding time. Most of the species have eight mammæ or teats. The young are born in a very immature state, and subsequently they are attached to the mammæ in the pouch area. Through the kindness of Mr. Henry Tryon, the Queensland Museum recently received two specimens of what is probably the rarest of these pouched mice—*Sminthopsis virginiæ*. These were found in scrub land, at Hampden, near Mackay, by Mr. W. A. Hussell, and were forwarded by Mr. W. Macartney. The species was first described in 1847 by De Tarragon, a French scientist, but his type is now lost. In 1883, Dr. Lumholtz found a single specimen, which was dug out of the ground at Herbert Vale, North Queensland. This is now in the Christiana Museum, and was the only example in any scientific institution until Mr. Tryon obtained these recent ones from Mackay. The plate which illustrates this article is a reproduction of Lumholtz's specimen, which appeared in the "Proceedings of the Zoological Society of London." The animal is blackish, grizzled with silver-white, and the head is reddish-grey, with a black stripe from nose to between the ears, and trace of another on the side of the snout. The head and body are about 5 in. long, the length of the tail being about the same.

Sminthopsis virginiæ has no less than forty-six teeth, and is thus readily distinguished from an ordinary true rat or mouse, in which there are only sixteen. The canine teeth are remarkably long for the size of the head. The other proportions of the animal may be gauged from the illustration.

Although this little marsupial is so rare, certain other species of *Sminthopsis* and *Phascologale* (an allied genus) are not infrequently found. A specimen of the smallest of these, *Phascologale minutissima*, was recently forwarded alive, with six young, from the Pittsworth district, by Mr. P. M. Bayley, M.L.A. The mother and her family could be accommodated within an ordinary fowl's egg-shell.

During the few days in which the mother remained alive in the Museum she accounted for a surprising number of cockroaches and beetles which were given to her. The young were just old enough to leave their mother occasionally, and they would also cling at times to the fur on her back, holding on by the mouth whilst she scrambled about. Unfortunately they all died within a week.

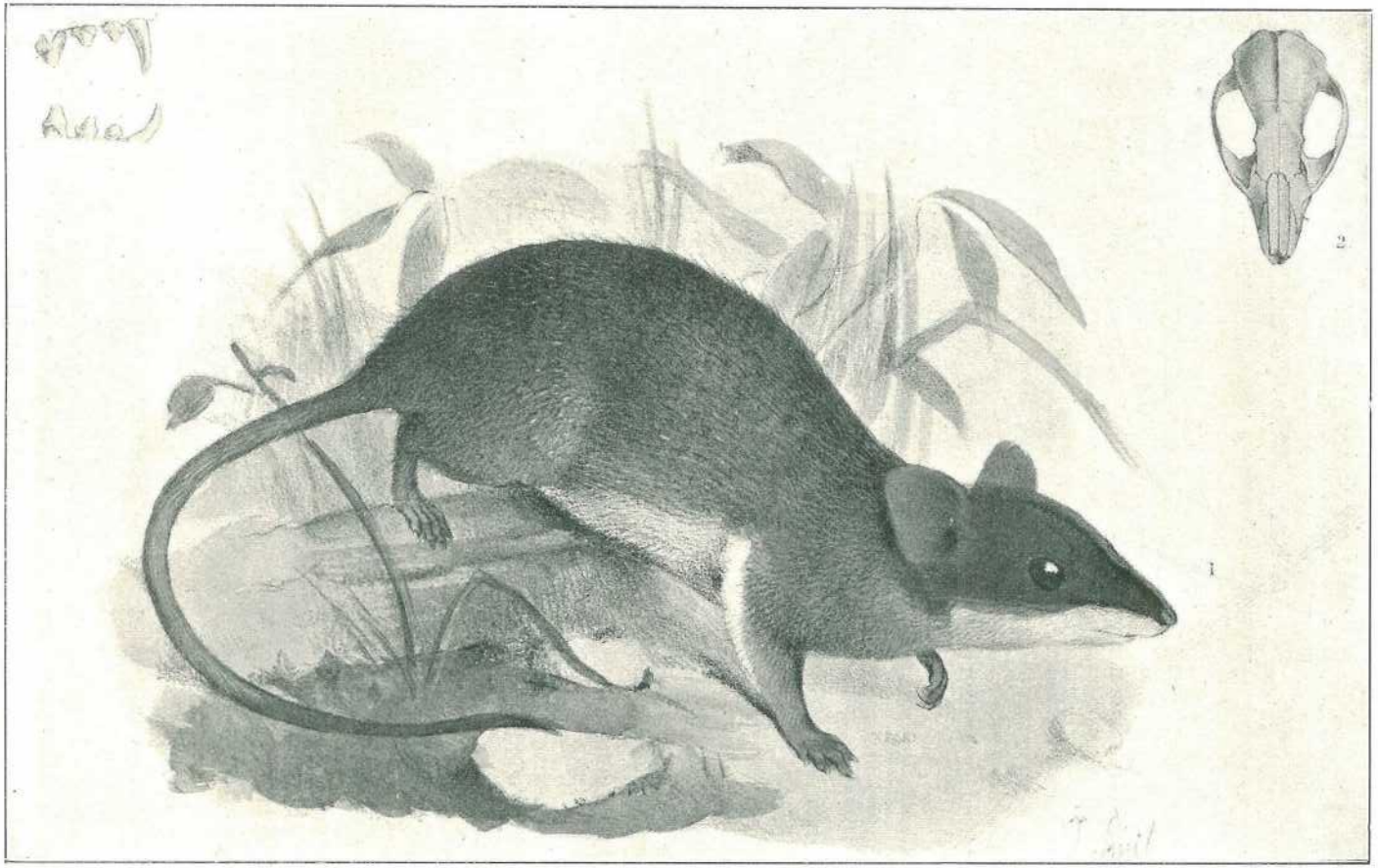


PLATE 9.—SMINTHOPSIS VIRGINIÆ, *De Tar.* (A POUCHED MOUSE.)

So long ago as 1896, Mr. H. Tryon pointed out, in the annual report of the Agricultural Department, that these pouched mice are of economic interest because of their insect-eating habits. He also suggested that if the common species could be bred in captivity, and liberated in numbers, they might even serve as valuable allies in the campaign against the cane-grub. Anyone who has noted the large appetites of these marsupials in captivity will realise that there is some ground for Mr. Tryon's remarks, but it seems doubtful whether successful breeding could be carried on, and in their wild state they are probably preyed upon by a number of enemies.

The largest species of *Phascologale* is the so-called brush-tailed pouched rat, the head and body of which are about 10 in. in length. The tail is long and thick, with a terminal brush. This marsupial apparently feeds on small birds and mammals, and is also accused of destroying poultry. Certain other species have curious enlarged tails, which probably contain reserve fats.

The species of *Sminthopsis* may be characteristically distinguished from those of *Phascologale* by the possession of very slender and delicate feet.

PRICKLY-PEAR AS A FODDER.

By R. J. O'SULLIVAN.

The following paper on the feeding of stock on prickly-pear was published some time ago in this Journal, and attracted considerable attention, but we have not of late heard of any general adoption of the methods here given.

"*Re* the above, I have pleasure in relating my experience, which, although only on a small scale, will prove that the prickly-pear is excellent for feeding cattle, and has the additional merit of being cheap. In the beginning of the big drought of 1902-3 I was living at Corinda, and a friend of mine, who is a surveyor in the Railway Department, suggested that we try prickly-pear for feeding our cows. I agreed, and we got two of the local men to join in with us. We got a truckload of pear, as we wanted it, by rail from Nudgee, and divided it between us. To feed my cow, the course I adopted was as follows:—I put as much pear as I could cram into a kerosene tin and then filled the tin with water; I then put the tin on the stove, and after allowing the water to simmer for a couple of hours I poured the liquid into another kerosene tin which contained about a quart of bran and one-third of a tin of lucerne chaff. Next morning I gave this to my cow, with the leaves, which were boiled, and although I experienced some trouble in inducing my cow to taste it, still once she tasted it she ate it afterwards most willingly. When I first started I used to cut off the big spikes, but I found some I overlooked, and which after being boiled were quite soft. After that I boiled spikes and all. I gave a similar feed every evening. My share of the pear lasted me over a month, and I am certain it did not cost me 10s. for the pear I used. I particularly noticed that—although I doubled the quantity of lucerne when I ran out of the pear—if I had to wait a week or so for the fresh supply my cow fell away in the milk, and came up again when I returned to the pear. A gentleman whom I casually met in the train informed me that he was feeding quite a number of cows on boiled prickly-pear; but, as he believed it would form a ball in the stomach, he intended selling them when the drought was over. With regard to the 'ball in the stomach' theory I am quite satisfied there is nothing in it, as I kept that cow for years afterwards, and I am certain it would have been hard to have found a more healthy cow.

"I advised a well-known Sandgate milkman, who had the pear growing up against his fence, to try my method of using the pear, and he told me afterwards that he found it good. I may say that this man thought he would improve on my way, and also save water, by putting it through the chaffcutter, but he found his idea not feasible, as the pear, being greasy, clogged his machine. It often occurred to me, when I noticed the excessive, in fact, almost prohibitive, price of lucerne chaff, to publish in the Press my experience, but I refrained from doing so, as I dislike publicity; however, at a time like the present, I consider it is the duty of everyone to publish any information which may be useful."

General Notes.

SHOW DATES, 1918.

Gayndah.—Pastoral, Industrial, Agricultural, and Horticultural Association. Show dates: 2nd, 3rd, and 4th July, 1918.

Philpot Creek.—Philpot Farmers' Society. H. J. Brown, Secretary.

Rockhampton.—Rockhampton Agricultural Society. Show dates: 20th, 21st, and 22nd June.

Kilkivan.—Kilkivan Agricultural, Pastoral, and Industrial Association.

Kilcoy.—Kilcoy Pastoral, Agricultural, and Industrial Society. A. R. Hooper, Secretary.

Charleville.—Central Warrego Pastoral and Agricultural Association. Show dates: 7th and 8th May. L. O. Easton, Secretary.

Wallumbilla.—Wallumbilla Agricultural and Pastoral Association. James H. Fitzpatrick, Secretary.

Herberton.—Herberton Mining, Pastoral, and Agricultural Association. —Brownlee, Secretary. Show dates: 1st and 2nd April.

Mount Gravatt.—Mount Gravatt and District Agricultural, Horticultural, and Industrial Society. Show date: 14th September.

Wellington Point.—Wellington Point Agricultural, Horticultural, and Industrial Association. E. Becklup, Secretary. Show date: 20th July.

Beerwah.—Beerwah and Coochin Creek District Fruitgrowers and Farmers' Progress Association. E. F. Jones, Secretary.

Charters Towers.—The Towers Horticultural Society. Show dates: 21st and 22nd

Ipswich.—The Queensland Pastoral and Agricultural Society. Show dates: 22nd and 23rd May, 1918.

The Secretary of the Biggenden Agricultural and Pastoral Society of Southern Queensland notifies that the Annual Show fixed for the 27th and 28th of June, 1918, has been abandoned.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1918.

Article.		FEBRUARY.
		Prices.
Bacon	lb.	9d. to 10d.
Barley	bush.	2s. 6d. to 3s.
Bran	ton	£5 10s.
Broom Millet	,,	£32 to £33
Butter (First Grade)	cwt.	149s. 4d.
Chaff, Mixed	ton	£4 10s.
Chaff, Oaten	,,	£6 to £6 5s.
Chaff, Lucerne	,,	£3 to £4 10s.
Chaff, Wheaten	,,	...
Cheese	lb.	9½d. to 10d.
Flour	ton	£12
Hams	lb.	1s. 3d. to 1s. 10d.
Hay, Oaten	ton	£6 10s. to £7.
Hay, Lucerne	,,	£2 10s.
Hay, Wheaten	,,	...
Honey	lb.	2½d. to 3d.
Maize	bush.	4s. to 4s. 11d.
Oats	,,	2s. 6d. to 2s. 10d.
Onions	ton	£7 10s. to £8
Peanuts	lb.	2d. to 5d.
Pollard	ton	£7 5s.
Potatoes	,,	£2 10s. to £6.
Potatoes (Sweet)	,,	£2 5s. to £3.
Pumpkins (Cattle)	ton	£3
Eggs	doz.	1s. to 2s. 1d.
Fowls	per pair	3s. to 7s. 5d.
Ducks, English	,,	2s. 9d. to 3s. 6d.
Ducks, Muscovy	,,	4s. to 7s. 3d.
Geese	,,	8s. 9d.
Turkeys (Hens)	,,	10s.
Turkeys (Gobblers)	,,	16s. to 21s.
Wheat (Milling)	bush.	4s. 1½d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Cabbages, per dozen	1s. 6d. to 4s. 6d.
Cauliflowers, per dozen	...
Celery, per bundle	...
Beans, per sugar bag	3s. 6d. to 7s.
Peas, per sugar bag	10s. to 11s.
Carrots, per dozen bunches	1s 3d. to 1s. 8d.
Beetroot, per dozen bunches	6d. to 9d.
Lettuce, per dozen	1s. to 1s. 6d.
Parsnips, per dozen bundles	6d. to 1s.
Sweet Potatoes, per sugar bag	2s. to 2s. 6d.
Table Pumpkins, per dozen	1s. 6d. to 2s. 6d.
Marrows, per dozen	1s. 6d. to 1s. 10d.
Tomatoes, per ¼-case	2s. to 7s. 5d.
Cucumbers, per dozen	...

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Queensland), per crate ...	9s. to 12s.
Bananas (Tweed River), per crate	14s.
Bananas (Fiji), per bunch...	5s. to 6s.
Bananas (G.M.), per bunch	5s. to 7s.
Lemons (local), per bushel case ...	...
Mangoes, per case ...	4s. to 5s.
Mandarins, per case	...
Oranges (Navel), per case	10s. to 14s.
Oranges (Queensland), per case ..	6s. to 7s.
Papaw Apples, per half-bushel case	6s. to 7s.
Passion Fruit, per half case	4s. to 8s.
Pineapples (Queens), per double case	10s. to 14s.
Pineapples (Common), per double case ...	7s. to 9s.
Tomatoes (Queensland), per half-bushel case	1s. 6d. to 3s.
Cucumbers, per bushel case	...
Strawberries, per lb.	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	FEBRUARY. Prices.
Apples, Eating, per case ...	2s. 3d. to 4s. 6d.
Apples, Cooking, per case...	2s. 6d. to 5s.
Apricots, per case ...	...
Bananas (Cavendish), per dozen ...	3d. to 5d.
Bananas (Sugar), per dozen	3½d. to 4d.
Cape Gooseberries, per quarter-case	...
Cherries, per box ...	...
Citrons, per hundredweight	10s.
Cocoanuts, per sack	15s. to 25s.
Cumquats, per quarter-case	...
Grapes, per lb.	...
Lemons (Lisbon), per quarter-case	8s. to 12s. 6d.
Mandarins, per quarter-case	...
Mangoes, per quarter-case	2s. to 7s. 5d.
Oranges (Navel), per quarter-case	...
Oranges (Seville), per hundredweight	...
Oranges (other), per case ...	...
Papaw Apples, per quarter-case ...	1s. 9d. to 2s. 3d.
Passion Fruit, per half-bushel case	2s. to 5s.
Peaches, per half-bushel case	2s. to 3s. 6d.
Pears, per half-bushel case	...
Peanuts, per lb.	3d. to 5d.
Persimmons, per half-case	1s. 6d. to 3s.
Pineapples (Ripleys), per dozen ...	9d. to 2s. 3d.
Pineapples (Rough), per dozen	6d. to 1s. 6d.
Pineapples (Smooth), per dozen	...
Plums, per quarter case ...	4s. to 8s. 6d.
Rockmelons, per dozen	...
Strawberries, per dozen boxes	...
Tomatoes, per quarter-case	2s. to 7s. 6d.
Watermelons, per dozen ...	...

TOP PRICES, ENOGGERA YARDS, JANUARY, 1918.

Animal.	JANUARY. Prices.
Bullocks	£21 15s. to £27 2s. 6d.
Cows	£16 10s. to £18 5s.
Cows (Single)	...
Merino Wethers	49s.
Crossbred Wethers	48s.
Merino Ewes	41s.
Crossbred Ewes	44s.
Lambs	37s.
Pigs (Backfatters)	...
Pigs (Baconers)	74s.
Pigs (Porkers)	50s.
Pigs (Slips)	19s. 6d.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, 1918, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1918 AND 1917, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Jan.	Average Rainfall. No. of Years' Records.	Total Rainfall. Jan., 1918.	Total Rainfall. Jan., 1917.
North Coast.	In.		In.	In.
Atherton	13·63	15	15·94	3·75
Cairns	17·17	34	13·73	5·57
Cardwell	17·24	44	25·07	10·01
Cooktown	15·32	40	8·53	7·23
Herberton	10·02	29	14·81	6·78
Ingham	16·84	24	27·25	11·02
Innisfail	21·83	35	16·48	10·31
Mossman	16·75	5	17·08	6·21
Townsville	11·52	45	27·75	20·97
Central Coast.				
Ayr	11·70	29	31·13	21·80
Bowen	9·59	45	46·57	12·76
Charters Towers ...	5·53	34	12·07	14·72
Mackay	14·02	45	85·09	10·26
Proserpine	16·37	13	58·90	19·95
St. Lawrence ...	9·38	45	49·44	4·28
South Coast.				
Biggenden	5·51	17	9·32	...
Bundaberg	9·45	33	17·90	9·05
Brisbane	6·51	67	7·70	9·07
Childers	8·37	21	13·89	5·28
Crohamhurst ...	13·02	25	20·20	10·32
Esk	5·60	29	7·54	7·01
Gayndah	4·84	45	9·83	6·77
Gympie	6·75	46	11·17	4·48
Glasshouse M'tains	9·43	8	...	7·56
Kilkivan	5·76	37	13·06	4·27
Maryborough ...	7·46	45	14·07	5·90
South Coast—continued:				
Nambour	9·44	20	15·14	5·43
Nanango	4·52	34	7·69	7·98
Rockhampton ...	9·05	29	34·36	5·27
Woodford	7·13	29	15·79	9·90
Darling Downs.				
Dalby	3·28	46	5·13	3·64
Emu Vale	3·25	20	4·17	5·09
Jimbour	3·88	28	5·09	4·01
Miles	3·99	31	4·74	3·72
Stanthorpe ...	3·70	43	3·72	3·20
Toowoomba ...	5·12	44	6·15	4·76
Warwick	3·73	29	3·17	3·90
Maranoa.				
Roma	3·44	42	8·93	3·01
State Farms, &c.				
Bungeworgorai ...	2·62	5	8·76	2·58
Gatton College ...	4·43	17	7·36	4·81
Gindie	3·28	17	21·59	4·50
Hermitage ...	2·76	10	3·79	4·50
Kairi	9·49	5	18·30	4·06
Kamerunga ...	18·41	26	9·08	3·60
Sugar Experiment Station, Mackay	14·82	19	78·17	11·80
Warren	8·53	5	34·31	5·33

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January this year, and for the same period of 1917, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Officer.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systematic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat Mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry planting may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will now be ready for a first or second hilling up. The last of the maize crop will now have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots. Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against bunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediatte use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, penstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE AND SUNSET AT BRISBANE.

1918.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·46	5·21	6·41	5·41	6·19	5 58	5·46
2	4·58	6·46	5·22	6·41	5·41	6·18	5·59	5·45
3	4 59	6·46	5·23	6·40	5·42	6·17	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·16	6·0	5·43
5	5·0	6·46	5·25	6 39	5·44	6·15	6·0	5 42
6	5·1	6·47	5·25	6·39	5·45	6·14	6·1	5·41
7	5·2	6·47	5·26	6·38	5·45	6·13	6·1	5 39
8	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
9	5·3	6·47	5·28	6·36	5·46	6·11	6·2	5 37
10	5·4	6·48	5·29	6·35	5·47	6·10	6·3	5 36
11	5·5	6·48	5·29	6·35	5·47	6·9	6·3	5 35
12	5·6	6·47	5·30	6·34	5·48	6·8	6·4	5 34
13	5·6	6·47	5·31	6·33	5·48	6·7	6·4	5 33
14	5·7	6·47	5·32	6·32	5 49	6·6	6·5	5·32
15	5·8	6·47	5.32	6 32	5·49	6·5	6·5	5·31
16	5 9	6·47	5·33	6·31	5·50	6 3	6·6	5·30
17	5·9	6·47	5·34	6·30	5·50	6 2	6·6	5·29
18	5·10	6·47	5·35	6·29	5·51	6·1	6·7	5·28
19	5·11	6·47	5·35	6·28	5·51	6·0	6·7	5·27
20	5·12	6·46	5.36	6·28	5 52	5·59	6·8	5 26
21	5·13	6·46	5·37	6·27	5 52	5·58	6 8	5 25
22	5 13	6·46	5·37	6·26	5·53	5·57	6 8	5 24
23	5·14	6·45	5·38	6·25	5·53	5·56	6 9	5·23
24	5·15	6·45	5·38	6·24	5 54	5·55	6 9	5·23
25	5·16	6·45	5·39	6·23	5 54	5·54	6·10	5·22
26	5·16	6·44	5·39	6·22	5·55	5·52	6·10	5·21
27	5·17	6·44	5·40	6·21	5·55	5·51	6·11	5·20
28	5·18	6·43	5·40	6·20	5·56	5·50	6·11	5·19
29	5·19	6·43	...	...	5·57	5·49	6·12	5·18
30	5·19	6·42	...	..	5·57	5·48	6·12	5·18
31	5·20	6·42	...	...	5·58	5·47	...	...

PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

			H.	M.	
5 Jan.	☽	Last Quarter	9	49	p.m
13 ,,	●	New Moon	8	36	a.m.
20 ,,	☾	First Quarter	12	38	,,
27 ,,	○	Full Moon	1	14	p.m.

The Moon will be at Perigee on 15th, Apogee on 3rd and 31st.

4 Feb.	☽	Last Quarter	5	52	p.m.
11 ,,	●	New Moon	8	5	,,
18 ,,	☾	First Quarter	10	57	a.m.
26 ,,	○	Full Moon	7	35	p.m.

The Moon will be at Perigee on 12th, Apogee on 28th.

6 Mar.	☽	Last Quarter	10	44	a.m.
13 ,,	●	New Moon	5	52	p.m.
19 ,,	☾	First Quarter	11	30	,,
28 ,,	○	Full Moon	1	33	,,

The Moon will be at Perigee on 13th, Apogee on 27th.

4 April	☽	Last Quarter	11	33	p.m.
11 ,,	●	New Moon	2	34	,,
18 ,,	☾	First Quarter	2	8	,,
26 ,,	○	Full Moon	6	5	,,

The Moon will be at Perigee on 10th, Apogee on 23rd.

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 and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 18 m., 30 m., 38 m., and 49 minutes, respectively, later than at Brisbane.

At Roma the times of sunrise and sunset may be roughly arrived at by adding 17 minutes to those given above for 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.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

For the sunrise and sunset at Rockhampton, Townsville, Cairns, and other places in Queensland, readers may be referred to the "Queenslander" to which newspaper monthly astronomical notes will be supplied.—D.E.