ANNUAL RATES OF SUBSCRIPTION.

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VOL. XLVIII. 1 MAY, 1937. PART 5

Event and Comment

Anzac.

THROUGHOUT the Commonwealth the Anzac Anniversary was observed with appropriate ceremony. At first regarded as an exploit, the landing on Gallipoli on Sunday, 25th April, 1915, has grown into a great and glowing tradition—a tradition shared by Australians and New Zealanders with the other forces of the Empire that took part in the hazardous adventure. How a position—an impossible position according to all the text-books of war—was held through eight long months of continuous fighting is now history. The men who made that history established a standard of courage, fortitude and devotion that inspired every Australian who fought in the later campaigns.

The spirit of Anzac, however, means something more than the mere exaltation of physical courage and other qualities that go with it. It typifies all the master virtues embodied in the highest ideals, the striving after which endows a nation with soul and character. Of the men by whose invincible valour and conquest of circumstance a standard was set and an ideal created, what more can be said? These beautiful lines of Alexander William Mair's "In Memoriam" give the answer:—

Though of their glory all the earth is haven,
And though their grave is under every sky,
Here lies their youth; here let their name be graven,
Who, dying, taught men how to die . . . . . .

Grave then their name, that so their name engraven
Shall be remembered to the end of days,
Who won in home or alien soil their haven—
For tomb an altar and for pity praise.

Agricultural Organisation.

"QUEENSLAND is destined to become the greatest agricultural State in the Commonwealth," said the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, in the course of a recent radio address on "The March of Agriculture." To fulfil this destiny, he added, it was necessary to develop together the cultural, scientific, and economic sides of the agricultural and pastoral industries.

In its endeavour to serve the producers in each of these phases the Queensland Department of Agriculture had taken a leading part. On the cultural side the departmental officers were in intimate touch with the producers, seeking to be their counsellor and friend, giving immediate service in emergencies.

One of the present Premier's (Mr. W. Forgan Smith) finest achievements was his establishment of the Chair of Agriculture in the University of Queensland, which was a very important influence in the progress of the science and practice of agriculture in this State.

Queensland had, in some matters, commodity marketing particularly, given a lead to the world in rural economic policy, Mr. Bulcock continued. The commodity pool organisation, of which the Premier and the late Mr. W. N. Gillies were the fathers, had given the farmers control of their products from the farm to the consumer. Because of this organisation the cost of living in Queensland was lower than in any other Australian State, yet the farmers were better off as a whole than farmers anywhere else in the Commonwealth. The Commonwealth rural debts investigation disclosed that the debt per farmer was less in Queensland than in any other State. This was because the pool organisation kept the Queensland producers out of the depths of the depression.

In all branches of its work, cultural, scientific, and economic, Mr. Bulcock concluded, his department was anxious and happy to co-operate with the man on the land in dealing with the problems with which every primary producer, at one time or another, was confronted.

Subsidised Juvenile Rural Employment Scheme—An Appeal to Farmers.

TO encourage unemployed city boys to accept farm jobs in the country, it is proposed to subsidise the wages paid in certain cases. The usual wage paid to the inexperienced farm lad is 10s. a week, which is increased, as a rule, to 12s. 6d. a week at the end of six months if the lad shows satisfactory progress in farm work. It is not proposed to alter this ruling wage as paid by the farmer, but to subsidise it from Unemployment Relief Funds by such an amount as will raise the total wage to 17s. 6d. in the case of the lad 16 to 18 years of age, and to £1 per week if he is 18 to 21 years of age. This subsidy will be paid only to inexperienced or partly experienced lads (those who have not had more than six months' farming experience) of these age groups.

No subsidy will be paid in the case of the lad who has had more than twelve months' experience on a farm. It is also stipulated that a "son or relative residing with a farmer cannot be allotted to that

farmer.'' The farmer will be required to pay his proportion of the wages not less frequently than fortnightly; the subsidy will be paid direct to the lad by cheque posted monthly.

For the convenience of farmers who wish to employ lads under the scheme, advantage is being taken of the State school organisation. Farmers should apply to the local school for the necessary forms.

In making the foregoing announcement, the Minister for Labour and Industry, Mr. M. P. Hynes, stated that the scheme represented a further effort on the part of the Government to encourage the unemployed youth in the city to take up farm work. According to the Council of Agriculture there is a great scarcity of juvenile labour in the country and this scarcity of juvenile farm labour has been used as an argument in favour of the resumption of assisted immigration. ''I refuse to think of that,'' said Mr. Hynes, ''as long as our own boys are unemployed. A demand for their labour exists in the country. Surely we can discover the root causes of their objection to farm work, and endeavour to remove them. That is the main purpose of this scheme. We are attempting to meet what I believe has been the main objection in the past—the low wages offered. The scheme is an experiment and its application is, therefore, limited, but we shall review it after it has been in operation for twelve months, and extend it or amend it in the light of our experience.

''I am appealing to every section of the community to help to make the scheme successful. I appeal to parents, especially to mothers, to encourage their lads, if they are unemployed, to at least give the scheme a trial. Every job will be carefully investigated before it is approved. Parents can rest assured, therefore, that their boys will go to good homes. I am appealing also to farmers. They can do much to remove the prejudice against farm work which, without a doubt, exists in the minds of city dwellers. The great majority of farmers are good employers, but there is an occasional bad employer who is a hard taskmaster, and he is responsible for this prejudice. I would ask farmers to think what the change from city to country conditions must mean to the lad who is probably leaving home for the first time. I ask them to make allowances, to be understanding, considerate, and encouraging. The city lad will, as a rule, respond to such sympathetic treatment, and will settle down to farm life and develop into a competent, capable farm worker.''

In Brisbane, boys seeking employment under the scheme should register at the Rural Section of the Juvenile Employment Bureau in the Treasury Buildings (hours 10 a.m. to 1 p.m. and 2 p.m. to 4 p.m. daily). In country centres registrations may be lodged at the local technical college or at the local State school, where the necessary forms are now available Where it is inconvenient to register locally, applications for registration may be posted direct to the Chairman, Board of Juvenile Employment, Box 1438T, G.P.O., Brisbane.

Plate 160.
THEIR MAJESTIES KING GEORGE VI. AND QUEEN ELIZABETH.

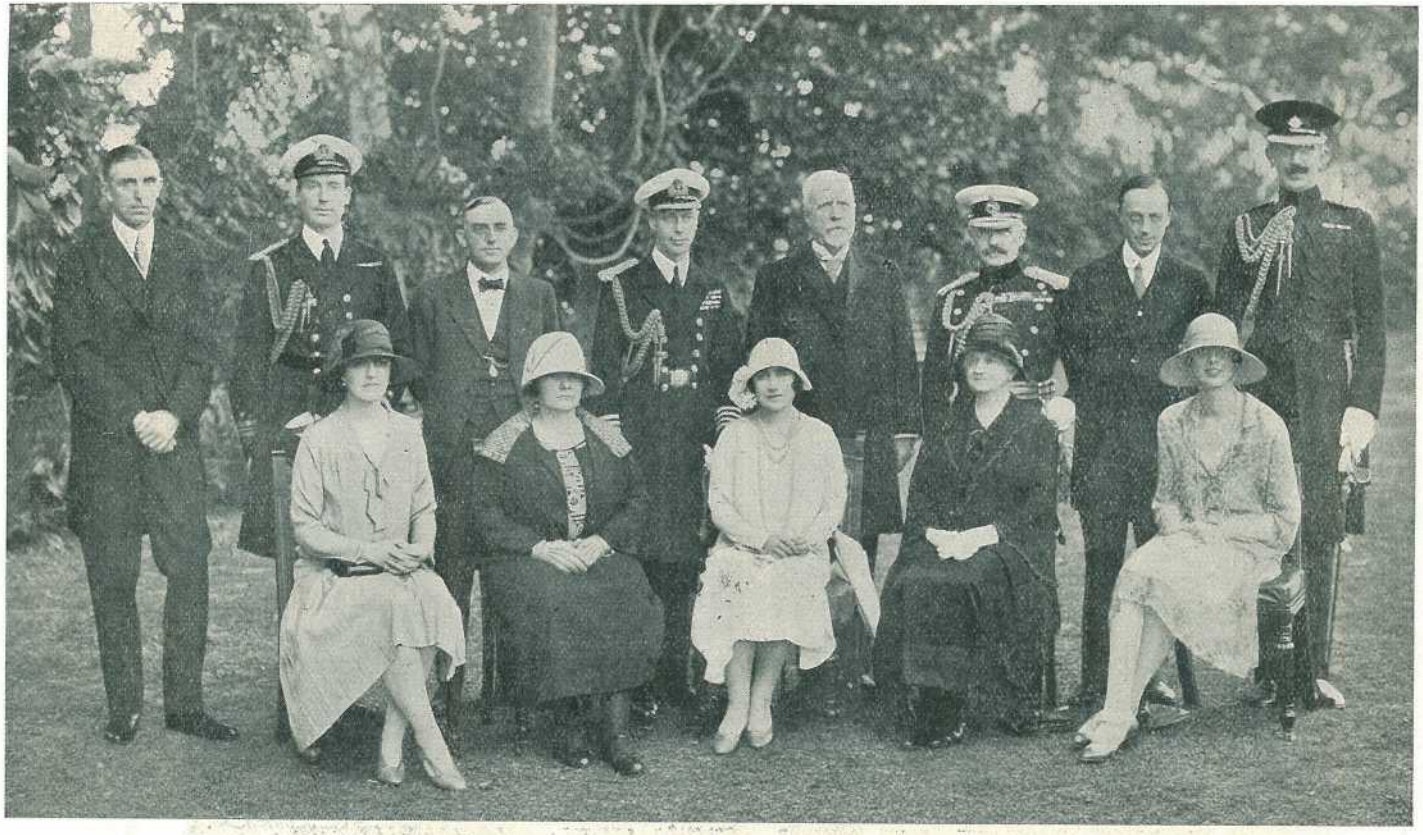


Plate 161.

THE KING AND QUEEN AT GOVERNMENT HOUSE, BRISBANE.—Group taken when Their Majesties, then Duke and Duchess of York, were visiting Queensland in April, 1927.

Seated (left to right).—The Countess of Cavan; Mrs. W. Forgan Smith; Queen Elizabeth; Mrs. W. Lennon; The Hon. Mrs. J. Little-Gilmour.

Standing (left to right).—Mr. H. F. Batterbee, C.M.G., C.V.O.; Lt. Commander Buist, R.N.; Hon. W. Forgan Smith, L.L.D., Premier of Queensland; The King; Hon. W. Lennon (then Lieutenant-Governor); General The Earl of Cavan, K.P., G.C.B., G.C.M.G., G.C.V.O.; Mr. P. K. Hodgson, C.M.G., O.B.E.; Major T. E. G. Nugent, M.C.

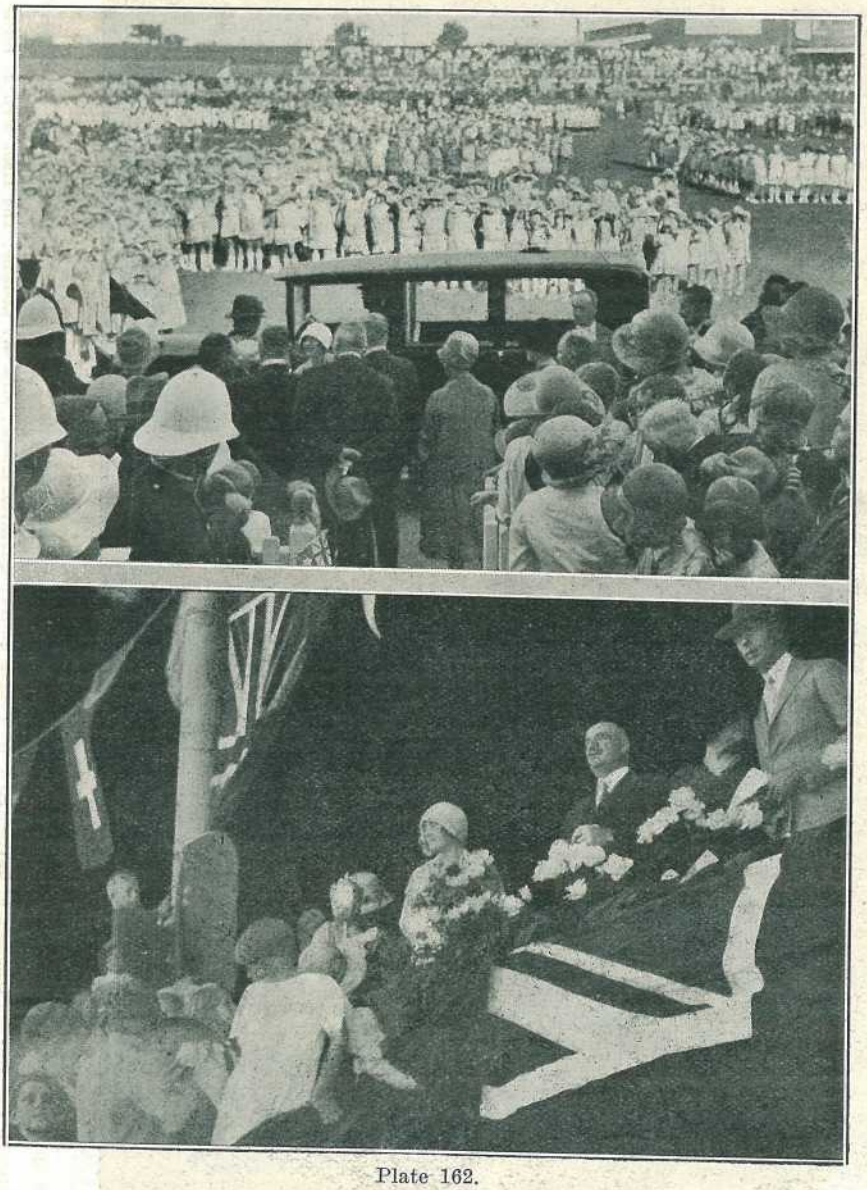


Plate 162.

WHEN THE KING AND QUEEN VISITED BRISBANE, APRIL, 1927.—Children's Display at the Exhibition Ground.

Plate 163.
THEIR MAJESTIES GREETING COUNTRY PEOPLE AT THE BEAUDESERT SHOW, 1927.

Plate 164.

IN QUEENSLAND CATTLE COUNTRY.—The King and Queen were keenly interested in the Camp Drafting at Beaudesert (9th April, 1927).

The Grasshopper Outbreak in Queensland. 1934-35.

J. A. WEDDELL, Entomologist.

[*Continued from p. 364, Part IV., Vol. XLVII.—April,* 1937.]

SECTION III.

CONTROL.

In the early stages of the outbreak control recommendations that would be economical and practical and would use readily available material had to be rapidly formulated. In the choice of an insecticide, the points to be decided were, firstly, whether a spray or a poison bait would be more suitable, and, secondly, which of the arsenicals would be most useful for the purpose. Experimental trials to elucidate these points were therefore carried out. The formulæ used in both the baiting and spraying trials were, of course, modelled very closely on those that are standard for the control of grasshoppers in other Australian States and in other parts of the world.

Baiting Trials.

At the moment limited quantities of several arsenicals were available, and small-scale tests were carried out. Accordingly, adjacent plots were pegged within the boundaries of a fairly large hopper swarm that was commencing to invade a wheatfield in which the plants were about 1 foot in height. Each plot included a section of grassed roadway, a strip of headland, and a portion of infested wheat. The various bait mixtures that were provisionally listed for trial were measured out in the following quantities:—

Bait No. 1—1¼ oz. white arsenic
2½ lb. bran

Bait No. 2— ½ oz. sodium arsenite
2½ lb. bran

Bait No. 3—1 oz. arsenic pentoxide
2½ lb. bran

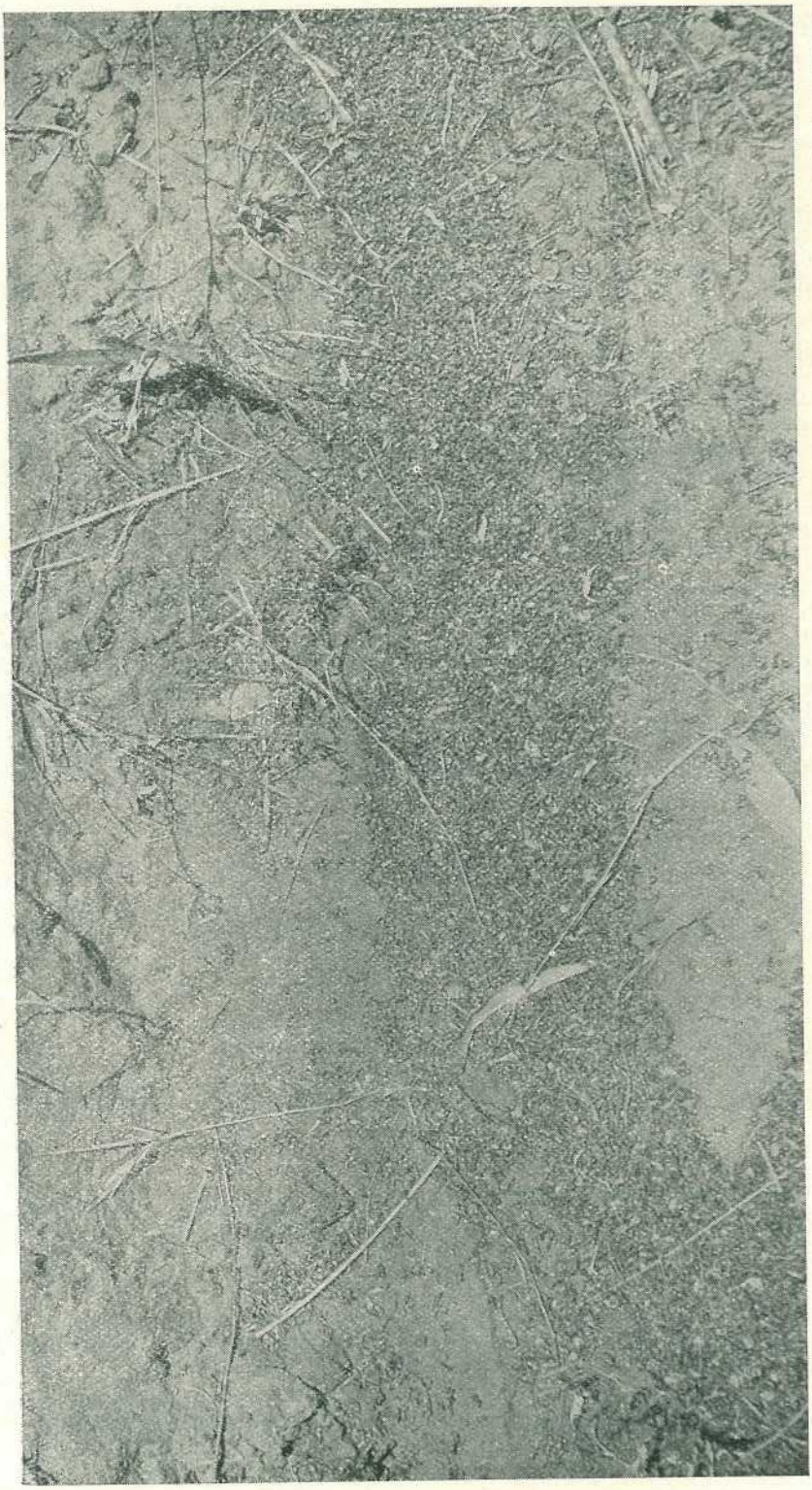
Bait No. 4— ½ oz. sodium arsenite
2½ lb. wheatmeal

Bait No. 5—1 oz. arsenic pentoxide
2½ lb. wheatmeal

Bait No. 6—1 oz. arsenic pentoxide
¼lb. molasses
2½ lb. bran

Wheatmeal was included in the trials, as a plentiful supply was available in the Kooroongarra area. As anticipated, the wheatmeal became a doughy mass on wetting and proved quite unsuitable for broadcast distribution. Mixtures No. 4 and 5 were therefore rejected.

Baits Nos. 1, 2, 3, and 6 were applied and adjacent areas were regarded as controls. The materials were broadcast, perforce, at 5.0 p.m. on 20th September, 1934—a rather unsuitable hour for the purpose. Almost twenty-hours elapsed before results commenced to show, but by 8.0 a.m. on 22nd September the kill on all plots was very satisfactory.



[*Photo. N. A. R. Pollock.*

Plate 165.

A small portion of a heavy accumulation of dead hoppers in a gutter in a road cutting, following normal baiting.

Quantitative results were not possible, but careful observations failed to show any marked difference in the toxicity of the baits. However, an examination of surplus baiting materials indicated that the mixture containing the molasses remained sticky for a longer period than the others. In later baiting work the quantity of molasses present appeared to have a marked effect on the durability of attraction of the baits, particularly in dry weather.

Larger areas were then laid down with a slightly modified bait mixture which was finally standardised by empirical methods, as follows:—

½ lb. arsenic pentoxide
4 lb. molasses
2½ gallons water
24 lb. bran

Applications of this bait were made on various types of infested country, including bare ground, pasturage, in rough gullies containing dense weeds and tufty grass, and in wheat and other crops. On bare ground and in the presence of relatively sparse feed the kill was practically 100 per cent. Where succulent feed was available, some survivors persisted, but the swarms were definitely broken up and reduced to harmless numbers. Even swarms invading young wheat having 6 inches of growth were represented only by a few living stragglers, the remainder forming a fairly dense layer of dead on the ground.

Scavenging insects, particularly the meat ant *Iridomyrmex detectus* Sm., reaped a harvest among the dead. From baited areas there were continuous streams of ants, each carrying a young dead hopper. Nests were seen that were literally covered by the garnered dead.

In a baited area very heavy accumulations of dead were generally found at the bases of posts, trees, logs, &c., within the area, beneath weeds, and among grass tufts and in small depressions. Apparently, poisoned but still surviving hoppers climbed as usual at dusk, but the lethal effects of the bait took effect during the night. The dead hoppers fell to the ground, accumulating in heaps. Similarly, poisoned hoppers that fell or were blown into cracks and holes in the ground were unable to escape. As a consequence, many of the baiting results were very spectacular. (Plate 165.)

During the course of several baiting trials at Kooroongarra it was found during the spring weather that the most satisfactory results followed the applications made between 10 a.m. and 3 p.m. The nights were cold, mornings and evenings were noticeably cool, and the hoppers did not show any marked activity until about 9 a.m.

For the swarm of average density, satisfactory results were obtained when the bait used per acre contained about 1½ bushels of dry bran. Actually, an area approximately 48 yards long and 6 yards wide was baited with 2 lb. dry weight of bran—a fairly close approximation to the average dosage. Following a good kill of hoppers on this area, some particles of bran still remained on the ground.

In practice, the best method of dealing with a particular swarm was first to determine roughly its dimensions and boundaries, making note of any guide marks such as logs or stones, or even, if necessary, inserting pegs. The broadcasting of the bait could then be carried out

by traversing the area in a regular manner up and down as in sowing grain, and an adequate space beyond the swarm could also be baited. Without some such indicators or guides, it was easy, on the one hand, to miss portion of a swarm in baiting, or, on the other, to waste materials by double baiting or by working further beyond the swarm than was necessary.

With swarms of young hoppers the treatment of the area occupied and of an uninfested strip 10 feet wide beyond the swarm was sufficient, but when the hoppers were older experience showed that the extra marginal strip could be increased up to 30 feet wide with advantage.

Towards the end of the outbreak a trial was made substituting pinewood sawdust for the bran, bait being made up with each material as filler, but otherwise identical. A rather large swarm was selected for the work, one-half being treated with bran bait and the other with sawdust bait.

When the baits were applied, a few hoppers here and there were seen to nibble somewhat at the sawdust flakes. Unfortunately, heavy rain prevented observation the following day, and forty-eight hours elapsed before the plots could be examined. The sawdust bait gave results markedly inferior to those from the bran; there was a much lower kill as indicated by the dead on the ground, and there were sufficient survivors to allow a return to definite swarm formation, small bands of hoppers being scattered over the patch. The results did not warrant any further attempts to use sawdust in the bait mixture. In any case, it became obvious that any suitable materials used as a substitute for bran would need to be collected, packed, and transported to the infested districts at considerable expense.

Mass Bait Distribution.

On large holdings carrying extensive swarms, the ordinary method of distributing the bait—broadcast by hand—was rather slow. Mass baiting was successfully carried out in the following way:—The bait was mixed at a central spot and taken in a utility truck to part of the holding that meantime was being searched by one or two horsemen. The truck was then driven at moderate pace over the swarms that had been located, while two men in the back of the truck cast out the mixed bait. By using a tin plate as a scoop and making a vigorous cast, quite a large area could be effectively covered. This method needs careful supervision of the workmen, as patches of swarms here and there can easily be missed. Equally serious is the danger to stock where careless work is done, for the bait may sometimes fall in small heaps, which cattle or sheep are liable to consume.

Spraying Trials.

Coincident with the early baiting trials, some small experiments with spraying materials were carried out. The pump used was the ordinary knapsack spray pump of 4 gallons capacity. Two spray mixtures were tried, the first consisting of 4 oz. sodium arsenite in 4 gallons water, the second of 4 oz. arsenic pentoxide in 4 gallons water. Small swarms on short grass were chosen for these sprays, and an attempt was made to cover the swarms, regardless of the amounts of spray materials used. The sprays were applied at 3 p.m. on 20th September, 1934. At 8.30 a.m., 21st September, no living hoppers were found on either of the patches, the ground being thickly sprinkled with dead.

The hoppers not only ate the poisoned foliage, but also imbibed the fluid while droplets were still present on the grass a short time after spraying. It seems likely also that the soluble arsenicals would have a direct contact effect on the hoppers.

The amount of spray necessary for the work was then checked. Using a single nozzle on the spray pump, an area of approximately 8 yards by 6 yards was sprayed with 1 gallon, this being equivalent to a rate of about 100 gallons per acre. Using a double nozzle on thickly-infested headlands of a wheatfield, a strip 50 yards long by 2½ yards wide was sprayed with 4 gallons. This represented a rate of 160 gallons of spray per acre, but it must be pointed out that the area carried a fair growth of weeds and grass, and this was rather thoroughly drenched with the spray. Later, in a further measured trial, 4 gallons of fluid were spread over a circle a little over 18 yards in diameter, and a satisfactory kill of hoppers was obtained; this spraying represented a rate of approximately 75 gallons to the acre.

Modified Spraying Method.

An ingenious spraying equipment was tried in certain localities. It consisted of a small engine driving a pump, the whole outfit being mounted on the running-board of a car. The pump was linked by a hoseline to a spray tank also carried in the vehicle. A delivery hose then ran forward to a pipeline about 9 feet long clamped to the front bumper-bars of the vehicle, the pipeline being fitted with a series of nipples, each giving a flat spray directed forwards and downwards. With the pump working and the car moving, a strip about 12 feet wide was sprayed. The outfit was limited in its use to the country over which a car could travel, and it could not be directed to swarms among fallen timber or in rough country. The engine was small and low-powered, both for portability and on the score of costs, and it was found that the spray delivery did not allow of the vehicle moving more than about 4 or 5 miles per hour if a satisfactory spraying were to result.

Attempts to control swarms by merely spraying a ring of the arsenical mixture around the margin were unsuccessful. This ingenious spray arrangement in practice showed many limitations, in addition to those inherent in spraying methods generally.

Other Methods of Control.

During the grasshopper outbreak many alternative suggestions were put forward by the interested farmers and others for the control of the hoppers. These alternatives usually had little or merely temporary merit, but a brief discussion of some of them may not be out of place.

BURNING.

One burning method gave surprisingly good results so long as suitable materials were available. An old hessian bag was tied with wire to the end of a short pole and partly dampened with kerosene. After lighting, the blazing bag was then waved close to the ground as the operator moved to and fro through the swarm. The kill was excellent, and the method would be valuable early in the control operations, pending the arrival of baiting materials. The most ardent advocates of this method had no hesitation in changing to the bait method when practicable, as the burning method was unquestionably hard and very

uncomfortable work. As supplies of old bags or hessian at a reasonable price are very limited, this method of control is suitable only for emergency purposes.

An alternative method—that of stringing several bags together—was tried. The string of burning bags was then dragged by two men, the bags between them, and a wide strip was thus treated at the one time. The results obtained by this modification of the burning method were very variable.

Where a hopper swarm invaded areas of dry herbage a grass fire could be very useful, but, unfortunately, the opportunities for adopting this practice were only too few.

It was not possible to test a flame-thrower at the time; so an opinion on this method of control used elsewhere cannot be given.

Milling Stock over Swarms.

Some graziers claimed that by milling stock, particularly sheep, over a swarm of hoppers a good kill would be obtained. There is some reason to doubt the claim, as it cannot be reconciled with the following observation:—One of the egg-laying sites at Kooroongarra in May, 1934, had been located in a patch of heavy black soil near a gate used by dairy stock. When seen in September, it was hoof-pitted and obviously heavily trampled by stock. In spite of this, a hopper swarm of apparently normal dimensions emerged. Large numbers of eggs must have survived the heavy trampling of the beasts; the hoppers were, in turn, little affected.

Ploughing Egg-beds.

It has often been suggested that the emergence of hoppers can be prevented by ploughing the egg-beds. Cases were seen which gave the writer grave doubts as to the value of this method. Eggs were laid in an old cultivation paddock in May, 1934, and just before the September emergence the land was ploughed, cross-ploughed, and harrowed. Even following this treatment a hopper swarm emerged. In another area a single ploughing certainly had damaged large numbers of eggs, but sufficient survived to give rise to a dense swarm of hoppers. In any case, the ploughing of egg-beds is frequently impracticable, as they are often located in areas where implements cannot be used—for example, on land scattered with logs or stumps and on roads. A method of control involving considerable difficulties would be expected to yield better results than those in the examples cited.

Comparison in Control Methods.—Baiting v. Spraying.

At the outset there was some doubt as to the relative merits of baiting and spraying methods of control, but experience showed that the former was by far the most convenient and that there was a negligible amount of risk from the method.

The cost of the bran for large-scale baiting operations at inland centres is considerable, and the thorough mixing of the bait requires a fair amount of time. However, the preparation and application of the bait presented few difficulties. On a one-man farm the mixing could be done when temperatures were unsuitable for spreading the bait. On larger holdings where several men were employed in grasshopper destruction, some of the staff would mix and transport the bait to others who would be kept busy distributing it.

For a given area, the weight of bait required was much less than the weight of fluid needed for spraying. For example, sufficient bait for 1 acre would contain 36 lb. bran, ¾ lb. arsenic pentoxide, 6 lb. molasses, and 37½ lb. water—a total of 80 lb. approximately, while the spray required for 1 acre would weigh 815 lb., made up of 5 lb. arsenic pentoxide, 10 lb. molasses, and 800 lb. water. Transportation difficulties in spraying are thus much greater than those involved in baiting. A power pump is indispensable for spraying large areas, and the method is only economically feasible in thoroughly cleared country. Hand-spraying by means of knapsack pumps was slow and arduous compared with baiting.

The relative danger to stock of spraying and baiting control measures is of some interest. Approximately ¾ lb. arsenic pentoxide would be incorporated into the average amount of bait used per acre; in the spray 5 lb. arsenic pentoxide would be used on the same area. Portion of the bait is eaten by the hoppers, and most of the remainder settles to ground-level, out of reach of grazing stock. In contrast, most of the spray lodges on the foliage and constitutes a distinct danger until leached away by the rain.

Practical Control Difficulties.

In contral operations, locating the hopper swarms was a major difficulty. Even on the more closely settled areas hopper swarms could easily be missed, and this difficulty increased considerably in ring-barked country or open forest land. Hoppers are frequently concealed by surface litter and coarse, tufty grass. Further, if feed is scarce, they are more quickly dispersed over a wide area.

Interactions of Natural and Artificial Controls.

It has already been mentioned that Scelionid parasites were the most important agents of natural control during the outbreak. Fortunately, baiting methods of control of the hoppers could be applied anywhere at any time without affecting the Scelionid population; whereas a poison spray, burning, or comparable methods applied to young hopper swarms or over egg-beds would almost certainly kill numbers of Scelionid adults. The bait thus acted independently of the parasites, which would be quite undiminished by the artificial control and would be available for later parasitism.

Any method of hopper destruction must inevitably destroy internal Tachinid parasites. Nevertheless, while baits have no harmful effects on adult flies that may be working over the swarms, sprays or burning methods would actually destroy considerable numbers of the free-living insects.

The risk of killing insectivorous birds which might feed on poisoned hoppers was by no means ignored, but at no time during the campaign was there any observed mortality. Some domestic poultry died on one occasion when inadvertently allowed to feed over ground as it was being baited, but personal observation of the occurrence was not possible. It seems highly probable that in this instance a heavy application or an uneven scatter of the bait was made, this, indeed, being a characteristic of some of the earlier work.

The results of experiments published by F. E. Whitehead (Bulletin No. 218, Oklahoma Agricultural Experiment Station, June, 1934, "The Effect of Arsenic, as used in poisoning Grasshoppers, upon Birds") are reassuring. An abstract in the "Review of Applied Entomology," 22, pp. 687, 688, includes the following sentences: —

"In Oklahoma, domestic fowls and quail confined without food for twenty-four hours and then supplied with bran poisoned with 4 per cent. white arsenic (As_2O_3), which was scattered about the pens at the rate of 100 lb. per acre, showed no indications of poisoning after twenty-four hours. . . . . From a series of experiments in which 144 birds of various species were fed on grasshoppers, the following conclusions were drawn:—Fowls discriminate between poisoned and unpoisoned grasshoppers and eat less than half as many of the former; the amount of arsenic consumed by them in eating only poisoned grasshoppers averages less than half the toxic dose, and their weight and growth after sixty-six days is not materially affected; quails eating a normal number of grasshoppers would, if the latter were poisoned, receive only from 1 to 7 per cent. of a toxic dose of arsenic; there is practically no danger to adult wild birds from eating poisoned grasshoppers, though there might be slight danger to nestlings. Chemical analysis of the bodies of fowls that had eaten many poisoned grasshoppers showed that they could safely be used for human consumption."

The interactions between natural and artificial control measures appear to be very important, and the essential points seem worthy of emphasis:—

1. The poison bait method of control does not interfere with the operation of the egg parasites—the most valuable natural control agents.

2. Poison sprays (having contact properties), burning, and comparable methods used on young swarms inevitably kill scelionid adults.

3. To a lessened extent, this superiority of baiting over the other methods is maintained, even if other parasites are considered.

4. Insectivorous birds are not adversely affected by the correct use of the recommended control measures.

Organisation of Control Operations.

As the preliminary experimental work demonstrated that any one of the arsenicals would give satisfactory control, it was naturally decided to use the cheapest available. Arsenic pentoxide is sold to the farming community in Queensland for weed or pest destruction purposes by the Prickly-pear Land Commission at a specially reduced price of 5s. per 20-lb. tin, free on rail at the nearest railway station. Several farmers throughout the grasshopper-infested country were already in possession of some of this poison for weed destruction and tree-killing, and as further supplies could be easily obtained, arsenic pentoxide was generally recommended for baiting purposes.

During the spring generation of hoppers it was practicable for the landholders in the more affected localities to co-operate in control measures. Stocks of baiting materials were purchased by the several organisations, and these were subsidised by the Department of Agriculture and Stock by donations of equal quantities of materials. When, however, the adults from this generation developed and the local insects were supplemented by invaders from the South, it was realised that greater efforts were needed.

On 15th November, following a visit to the Goondiwindi area by the Secretary for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.), a special regulation under "*The Diseases in Plants Acts,* 1929 *to* 1930," containing the following main provisions was gazetted:—

1. The Shires of Waggamba, Inglewood, Pittsworth, and Millmerran were proclaimed quarantine areas on account of plague grasshoppers.

2. Every occupier or owner of land within the quarantine area was required to destroy larval plague grasshopper swarms by baiting or spraying in an approved manner.

3. All public bodies controlling roads, stock routes, reserves, or commons within the area were similarly required to apply control measures.

4. The ingredients used in the control measures were made available free to all interested parties. Applicants were required to declare that the materials were to be used solely for grasshopper destruction.

Central depots for the distribution of bran, molasses, and arsenic pentoxide were established in a number of centres scattered throughout and somewhat beyond the quarantine area. Public bodies assisted considerably by storing materials and issuing them to applicants. Employees were released from their normal duties to carry out baiting on lands under their jurisdiction.

Control work was taken up very enthusiastically in most localities, and numerous hopper swarms were wiped out, with a corresponding saving of much pasture. One of the motives behind the scheme of thus making bait materials available over a wide stretch of country was to provide a large scale demonstration of the value of the recommended control measures.

The official recommendations for the use of the bran bait were drafted following experience with the spring generation, but it was an allowable alternative to spray. Most of the landholders elected to bait, however, as this method of control is better suited to the varied requirements of the average holding.

The directions issued for mixing and applying both bait and spray were as follows:—

"DIRECTIONS FOR BAITING.

"BAIT FORMULA.

½ lb. Arsenic Pentoxide,
2½ gallons Water,
4 lb. Molasses,
24 lb. Bran.

"METHOD OF MIXING.

"Weigh the required quantity of poison and dissolve it in 1 pint of boiling water in one container. Mix the molasses with 1 pint of boiling water in another container. Stir each thoroughly. Divide the balance of the 2½ gallons of water—*i.e.*, 2¼ gallons—cold, between the two containers and stir. Add the molasses solution to the arsenical, and stir.

"Spread the required amount of bran on a mixing board or large sheet of iron or other impervious surface. Add the solution prepared as above and mix the whole to a moist, loose mash, making sure that no bran remains unmoistened.

"Keep the mixed bait in a loose state during transport to the field. Cover bulk supplies of bait to prevent loss of moisture.

"METHOD OF APPLYING.

"The limits of a swarm of hoppers, if not clearly defined, should be roughly determined. A strip 30 feet wide should be allowed in front of the swarm. The whole area occupied by the swarm and the strip in front should then be baited by broadcasting the poisoned bran in a finely divided state, as in the hand-sowing of grain. The bait should be thinly and uniformly applied. A quantity of bait representing 36 lb. of dry bran should be spread over 1 acre of baited ground.

"The application of the bait should be carried out in the warm part of the day, preferably between the hours of 9 a.m. and 3 p.m. A supply of bait sufficient for the day's requirements should be prepared in the early morning, so as to enable full use being made of the best hours for baiting.

"GENERAL COMMENTS.

"(1) The arsenic should not be touched, but should be manipulated with tin scoops, &c. Mixing should not be done by hand. Prior to applying the bait the hands should be coated with vaseline, petroleum jelly, or axle grease, particularly well around the nails. As soon as possible afterwards the hands should be thoroughly scrubbed.

"(2) Domestic animals, such as poultry, dogs, and so on, should not be allowed access to bulk supplies or mixing sites.

"(3) The bait should be applied fresh.

"(4) The effects of the baiting are evident after not less than twenty-four hours have elapsed.

"(5) The danger to stock roving over ground *properly baited* is negligible, owing to the small amount of poison involved and the thin distribution of the bait.

"(6) The baiting materials may be estimated sufficiently accurately as follows:—

2 2-lb. jam tins molasses = 4 lb.

2½ kerosene tins of loose dry bran = 24 lb.

"(7) It is essential that the grasshopper swarms be baited in the larval or 'hopper' stage, preferably during the first two or three weeks after emergence. Older hoppers will feed on and be killed by the bait, but, owing to the spread of the insects from the egg-beds, wider areas need to be baited. Grasshoppers in the flying stage cannot be controlled. Flying swarms should, however, be carefully watched so that egg-beds may be marked to enable the early baiting of the next generation of hoppers.

"DIRECTIONS FOR SPRAYING.

"SPRAY FORMULA.

1 lb. Arsenic Pentoxide,

2 lb. Molasses,

16 gallons Water.

"METHOD OF MIXING.

"Weigh the required quantity of poison and dissolve in 1 quart of boiling water in one container. Mix the molasses with 1 quart of boiling water in another container. Stir each thoroughly. Add these two solutions to the balance of the water required—*i.e.*, 15½ gallons water, cold, and stir.

"METHOD OF APPLYING.

"The spray should be applied by means of a spray pump with a fine nozzle. The infested area should be sprayed lightly with a fine mist so that approximately 80 gallons of spray solution are applied per acre infested with hoppers.

"GENERAL COMMENTS.

"As before, all precautions should be taken in handling and applying the poison.

"The spraying method is not officially recommended, but it is offered as an alternative to those who desire to use it. Any person using the spraying method does so at his own risk in respect to the possible danger of poisoning stock on the treated area."

As regards the best periods of the day for baiting, it was found that, for greater efficiency in the spring, baiting should not commence before about 9.0 a.m., and might continue until about 2.0 p.m. In the summer, however, it was found preferable to start earlier in the morning and to allow a break of about two hours at midday, continuing in the afternoon until about 3.0 or 4.0 p.m.

ACKNOWLEDGMENTS.

During the course of the grasshopper outbreak there were many who assisted in various aspects of the work, and thanks to all who collaborated are gratefully tendered. Particular reference may be made to Messrs. W. Dixon, Stock Inspector, Goondiwindi; W. Serisier, Shire Clerk, Goondiwindi; W. J. Tomkins, Whetstone; V. W. Gagen, Shire Clerk, Inglewood; G. Mabbet, Kooroongarra; H. McBean, Stock Inspector, Millmerran; F. C. Coleman, Stock Inspector, Pittsworth; to the members of the several local grasshopper committees at Rocky Creek, Kooroongarra, and Goondiwindi; to Mr. N. A. R. Pollock for a number of excellent photographs included amongst those illustrating this report; to Mr. I. W. Helmsing for the illustration of the life history of *C. terminifera*. Several reports by various officers of the staff have been freely used in compiling this report. Thanks are especially due to the Chief Entomologist (Mr. Robert Veitch) for his helpful interest in the work.

APPENDIX I.

A later outbreak of *Chortoicetes terminifera* was reported by Stock Inspector McBean in September, 1936. Adults first appeared as migrants in the Millmerran district about 1st September and commenced to lay immediately along the headlands of wheatfields and on roads. Mr. A. W. S. May, Assistant to Entomologist, visited the district and observed the conditions while oviposition was still in progress.

Hatching commenced on 6th October, thirty-five days after egg-laying was first observed, and hopper emergence continued for several weeks. Hopper emergence and egg-laying were both taking place on 6th October, but the insects now covered a wider area. The egg-beds were very extensive and were sufficient to initiate another large-scale outbreak. However, in common with the whole of South-eastern Queensland, the affected district was experiencing very dry weather when the hoppers emerged. In the absence of succulent herbage, the swarms of insects dispersed rapidly and most of them died within a few days.

It is interesting to note that, compared with the 1934 invasion, this outbreak showed what might be regarded as an inversion of generations. In 1934 the adults entered the district as migrants in March, oviposition occurred during April and May, and the nymphs emerged early in September. In 1936 the adults appeared in the district early in September, oviposition commenced immediately, and the nymphs emerged in October. Their behaviour on this occasion suggests that the grasshoppers had either over-wintered as adults or else climatic conditions had not been sufficiently severe to prevent development through the winter months.

APPENDIX II.

During the months of December, 1936, and January and February, 1937, the presence of *Chortoicetes terminifera* was reported from several localities, including Gatton, Toogoolawah, Thangool, near Callide, and Yarranlea.

A large swarm of hoppers was seen at Thangool, in Central Queensland, near Callide, during January. The pest had apparently

bred in the heavy dark brigalow soils, but it was impossible to find the egg-beds. The swarms showed a tendency to break up when they reached the adult stage. A few fields of maize were severly damaged, but the injury was not widespread. The insects showed no tendency to invade cotton, merely defoliating a few plants along the edges of fields. Couch and Rhodes grass were preferred.

The Yarranlea report evidently referred to progeny of the survivors of the spring generation discussed in Appendix I.

At Toogoolawah small egg-beds and hopper swarms were noticed towards the end of last year, but more recently dispersed swarms of adults have been flying in the district. Owing to the dry conditions that have prevailed in the locality for many months past, there was practically no herbage, but the adults defoliated what little there was, including small plants of the bullhead weed, *Tribulus terrestris* L., a species taken by stock in dry weather. The flying swarms fed on various crops, maize in particular, and also cotton, tomatoes, and pumpkin. The flag of the maize was stripped; quite frequently the midrib also was taken, while patches were seen in which plants up to 3 feet high were eaten down to stubble. The stalks of pumpkin vines were barked, causing in some instances the death of the younger foliage. The total loss due to grasshoppers in the district was not heavy.

Towards the end of April another generation had developed to the adult stage, and during a recent visit some rather extensive swarms of adults were seen. Small areas of certain crops such as oats, potatoes, and lucerne were damaged, but, as yet, the total losses in the Esk-Toogoolawah district were not heavy. Greater concern was felt with regard to the prospects in the spring as a number of moderately sized egg-beds were quite easily located. However, careful examination of these beds showed that they carried a large population of Scelionid egg parasites, and these parasites were found on egg-beds spread over a strip of country 20 miles long. The parasites were busily working on the surface of the ground locating egg-pods, and numbers of the latter showed signs of having been entered. The activity of these parasites suggests that they may destroy most of the eggs that have recently been laid and thus prevent a large scale emergence in the spring.

Parasites were collected and these have been kindly identified by Mr. A. P. Dodd. Of a large series of some hundred specimens collected in the Toogoolawah district, all except two specimens were *Scelio fulgidus* Crawf., the two others being *S. bipartitus* Kieff. A series collected in the Esk district was wholly *S. fulgidus*.

ERRATUM.

Since the publication of Section II. last month it has been found that the Scelionid material, referred to on p. 364, consisted of *Scelio fulgidus* Crawf., the record of *S. chortoicetes* Frogg. being introduced in error.

Harvesting Cotton.

R. W. PETERS, Cotton Experimentalist.

THE harvesting, or picking of cotton as it is commonly termed, is the most expensive single operation connected with the production of cotton. At present cotton is picked extensively by hand, which makes the harvesting a slow process.

The methods adopted in picking cotton have a decided effect on the quality of the resultant lint produced. Investigations in the United States of America have shown that the fewer cleanings cotton receives during the process of ginning the less damage will be done to the fibres. It has also been shown in England that the fewer cleaning operations the fibres are subjected to, the more suited they will be to the economical production of yarn of high quality. The harvesting of cotton, therefore, should be carefully carried out and every factor affecting the quality of the lint adversely should be guarded against.

Picking Cotton.

Picking should be commenced as soon as sufficient bolls are open to allow a moderate daily tally being obtained. An important point to observe is not to pick cotton when it is wet from either exposure or rain, or when it is green, a term used to describe fibres that have not dried out thoroughly following the opening of the boll. Not only is it difficult to clean leaf and trash from wet or damp cotton, but during ginning operations the saws cut the wet fibres very severely and tend to leave them in a twisted ropey state. Lint of this nature is easily detected and buyers penalize it heavily, for much waste is obtained from cotton during the spinning operations. In the wetter districts of the U.S.A. apparatus has been devised to dry the seed cotton before ginning, and the quality of the lint obtained from cotton treated

in such manner is raised at least a whole grade. In most seasons in Queensland no difficulty should be experienced with wet cotton, for the usual climatic conditions are suitable for the harvesting of dry cotton after the dew has dried up. Where picking is done while the dew is still present the wet cotton should be spread out in the sun during the forenoon, after which it can be baled with the rest of the picking of the day.

In the earlier years of the present phase of cotton growing in Queensland, the ginneries were equipped with cleaning apparatus which was not so efficient as that now installed, and it was necessary to pick the cotton rather cleanly in order to obtain high grade lint from it. As the premiums between grades were then rather high most growers endeavoured to send clean cotton, and this tended to slow up the rate of picking. With the present more efficient machinery it is not necessary to have the cotton as nearly "snow white" as many growers used to send it in order to obtain the best grades. This is particularly true where the farmer and his family pick the crop, and it is suggested in such cases that it would be better to pick the cotton slightly less cleanly, and thereby faster, for not only could greater tallies be obtained in the time available for harvesting the crop, but larger acreages could be grown and still be harvested without employing labour.

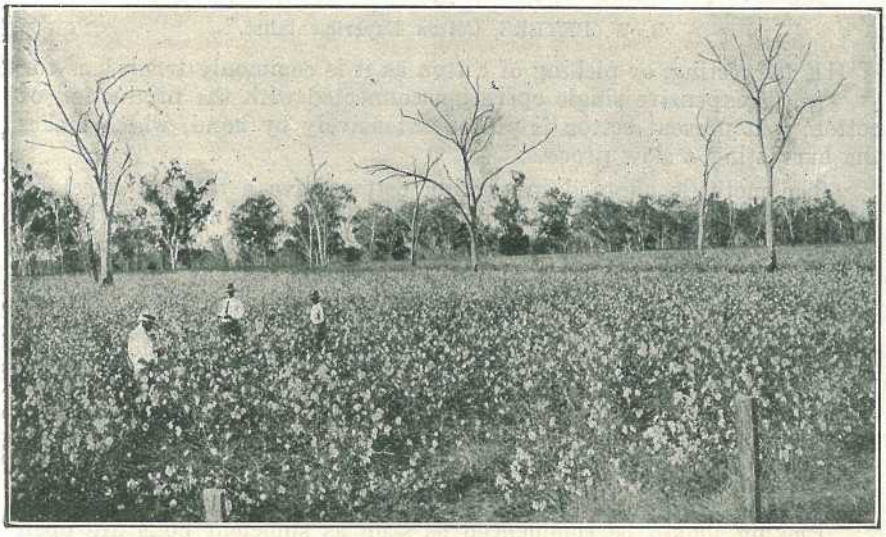


Plate 166.

COTTON CROP FULLY OPENED.—Cotton in this condition should not be left for any length of time, for exposure to the elements may result in serious damage and general deterioration of the crop.

In this respect, it is pointed out that in a normal season, in cotton picked prior to the occurrence of heavy frosts, the bracts and pieces of leaf are fairly tough and pliable and do not break up into small pieces as happens after they become brittle from the effects of frosts. Early picked cotton can thus contain a fair amount of big leaf and still yield lint of high grade, for the cleaning machinery removes the big leaf without breaking it to any extent. It is a mistake, therefore, either to pick so carefully as to have little leaf, or, worse still, to roll

the cotton between the hands to break up the large leaf. It is the small pieces of leaf which are difficult to remove from cotton, and seed cotton containing fine pieces of leaf or "pepper" leaf as it is termed have to be graded lower than cotton with big leaf. This is the reason the grades usually drop off after heavy frosts occur—the dead leaves and bracts are so brittle that they break into small pieces when picked with the cotton, and while the improved cleaning machinery eliminates much of this leaf, it is impossible to remove all; hence the necessity of grading the seed cotton lower than if the leaf was large and not brittle.

The most difficult matter to remove from the cotton lint is grass and weed seed, especially spear grass seed, and every effort should be made to clean the fields at the last cultivation so that no seed will be produced. On old cultivations even where good farming practices have been followed there is always danger of tall growing weeds setting seed late in the season, and it pays to chop out such weeds before the harvesting commences, especially if pickers are employed.

Plate 167.
RIPE FOR THE HARVEST.—A Field of Cotton, Mundubbera.

Another important point to guard against when harvesting cotton is not to leave the cotton exposed too long to the weather. Cotton, when bolls first open, has a nice richness of colour, or "bloom" as it is called, and it is necessary for a sample of cotton to have this "bloom" before it can be graded into the higher grades of the regular universal standards, although it may be free of trash. When cotton is left unpicked for several weeks the bloom is lost through the bleaching action brought about by the wetting of dews and the subsequent drying by the sun. This changes the colour to a chalky, dead white and also destroys the lustre of the fibres. The effect of storms on cotton is worse than the dews—the colour changes to a dull greyish tinge and even to a light bluish tinge when rains lasting several days are experienced. When rains do occur cotton should not be picked for several days, for the bleaching action of the dews and sun greatly improves the

colour, while the wind and heat of the sun fluffs out the fibres from the matted condition caused by the rain. The grower thus benefits in two ways by delaying picking after a storm until the cotton has improved in appearance—the cotton is of more value and no payment is made for picking moisture.

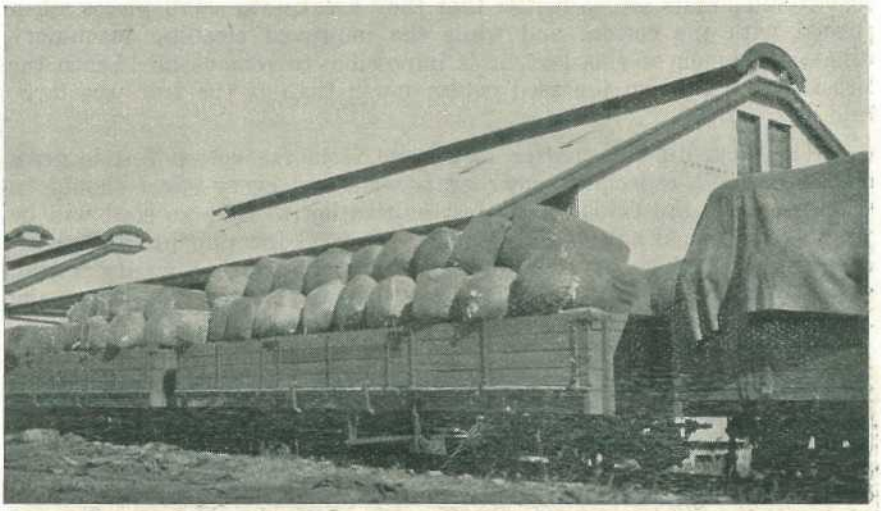


Plate 168.

QUEENSLAND COTTON ARRIVING AT THE GINNERY.—Second-hand wool packs are used for sending in the bulk of the crop. On an average 500 to 550 lb. of seed cotton is packed in each bale.

Another reason for not delaying the picking of cotton too long is the effect of winds on a well opened crop. With the continuous movement of the plants in windy weather the locks tend to hang out of the bolls in a long stringy condition. This not only allows the cotton to dry out excessively, thus losing weight and adversely affecting the character of the fibres, but also makes the cotton difficult to gin properly owing to a considerable proportion of the locks being in a twisted rope-like condition. Cotton left exposed to windy weather also usually gathers up bits of broken bracts and leaves, especially in frosted cotton. It is difficult to clean such trash in the ginneries, for the smaller pieces are generally twisted in amongst the fibres. In addition to these disadvantages much greater loss of cotton occurs during heavy storms by blowing cotton onto the ground Where the harvesting is done by the grower and his family it will pay to make several pickings in a good crop, depending on the season. Where labour is employed to harvest the crop it has to be remembered that sufficient bolls have to be open to allow the picker to make a reasonable tally, otherwise the cost of picking will be high. Generally speaking it has been found satisfactory when employing labour to make one good picking and then a clean-up in fields of light to medium yield, and two pickings and a clean-up in good crops. The grower should be guided by the conditions as they exist. Sometimes it is better to allow a heavy picking to open and thus get it picked cheaper, than to seek a higher grade by an earlier, lighter picking.

Snapping.

Cleaning machinery is now installed at the ginneries for treating "snapped" cotton. "Snapped" cotton is obtained by snapping or jerking the whole burr and contents from the plant and should be practised only after heavy frosts have been experienced. The method originated in sections of the U.S.A. during a season of labour shortage, and the cheaper harvesting costs obtained quickly brought about the general use of the system, especially in places and seasons with high picking rates. Cleaning machinery was soon evolved to remove the burrs, extra leaf and parts of the plant gathered in the snapping operations. Undoubtedly the method is of decided value in many conditions, and especially so in Queensland in harvesting the top crop. It is pointed out, however, that "snapping" should not be substituted for picking cotton that has not been well frosted. Snapping unfrosted bolls tears the plant badly and the cotton when packed in containers for forwarding to the ginnery "sweats" so badly that it is difficult to clean and gin. In addition to this, freight is paid for green wet burrs, leaves and bits of the plant instead of light dead material. Snapping mature cotton undoubtedly lowers the grade to the point where the full value of the lint cannot be obtained. On the other hand, snapping the top crop of bolls which usually contains cotton of the lower grades not only does not lower the grades materially, but enables a considerable amount of cotton being harvested cheaply which would often not have been picked. Only bolls containing marketable cotton should be snapped, however. During the past season a considerable percentage of dry, hard diseased bolls or "hickory nuts," as they have been termed, were forwarded in the late snapped cotton. As these contain no cotton and are removed in the cleaning machinery before the seed cotton is weighed, the grower pays the pickers for nothing of value, and the Cotton Board pays freight on it as well, thereby reducing the amount of the later payments. Snapping is of value to Queensland cotton growers, but should be used properly.

Packing Cotton.

Owing to the distance of the cottonfields from the ginneries in Queensland the crop is forwarded by train either in bags or wool packs containing around 80 to 100lb. and 500lb. of seed cotton respectively. The growers of small acreages generally use second-hand corn bags, etc., while those with more than 5 or 6 acres usually purchase once used wool packs for their crop. It is cheaper to use the wool packs, for each grower's individual packs are returned for a small fee and may be used again. The fee is charged to cover the cost of sterilizing the packs and the cost of return to grower.

It is pointed out that before filling a container it should be cleaned carefully to remove everything that might affect the grade of the cotton; and wool packs which have had cotton in them should be especially cleaned in order to protect the purity of the seed. Growers should pay particular attention to this feature, for undoubtedly much contamination of pure seed varieties can be brought about by the admixture caused through bits of seed cotton sticking in the corners of bales and attached to strands of the sewings along the edges, etc.

When packing a container every care should be taken to have only the one grade and staple of cotton in it. A bale of lint is sold on the basis that it contains cotton of uniform grade and staple length. If

there is any variation of content encountered it is purchased on the basis of the lowest grade and the shortest staple contained. It is necessary, therefore, for the growers to assist in every way possible in obtaining uniformity of contents of the bale of lint. Very careful mixing has to be done of some wool packs received, owing to the layers of cotton of different grades pressed in them. Many large growers have the pickers empty their picking sacks directly into the wool packs, and where this is done layers of markedly different grade often result,

Plate 169.

UNLOADING WOOL PACKS OF SEED COTTON ON ARRIVAL AT THE GINNERY.—During the peak period of arrivals as much as 120,000 lb. of seed cotton is received in a day. Growers should therefore forward cotton in wool packs only in order to assist, as much as possible, the grading and receiving of the crop.

owing to some pickers picking more trashy cotton. It is recommended that the contents of each bag should be roughly graded by the grower and an endeavour made to segregate the different grades in his cotton into separate wool packs. The grading at the ginneries could then be done more quickly, in that it would not be necessary for the grader to stop and estimate the true value of a wool pack containing different grades of seed cotton, as is now frequently done, and in addition more uniform cotton would be fed to the gins, thus enabling the production of bales of lint containing only one grade in each. This matter is of the greatest importance, and it is again emphasised that more care must be exercised by growers in seeing that the contents of any one container are even in colour and quantity of trash.

Forwarding Cotton.

Every grower has a registered number and should include this with his initials and railway station in a brand for identifying each container he sends. The brand should be placed in a conspicuous place on the side of the container in black that will not rub or wash off.

Each season a number of wool packs are received at the ginnery which have no identification marks, or the brands are so indistinct that they are not legible, and it is only through checking up the advice notes which a grower despatches to the Cotton Board when forwarding his cotton that the ownership can be established. This slows up the work at the ginnery and should not occur, for it is a simple matter to brand the cotton carefully.

Labelling.

It is necessary to know the variety of seed cotton in each container that arrives at the ginnery in order to determine the estimated percentage of lint contained therein. The grower is paid on the basis of the amount of lint he forwards and the grade and staple thereof, and to arrive at the lint content it is necessary to know the variety grown. Where a grower has only one variety, no label is necessary as this fact is recorded at the ginnery, but in the case of more than one variety tags for each should be used. When more than one variety is grown on a farm, great care must be exercised to prevent mixture or loss of identity of the varieties and each container should be carefully labelled with the proper tag for the variety contained in it. The label should be sown on in the usual cross diamond method which protects it from being torn off.

Careful attention to the main factors discussed in this article should result in the farmer obtaining the maximum value for this crop, and the industry as a whole will benefit by marketing lint of a higher value which the spinners will purchase with full confidence.

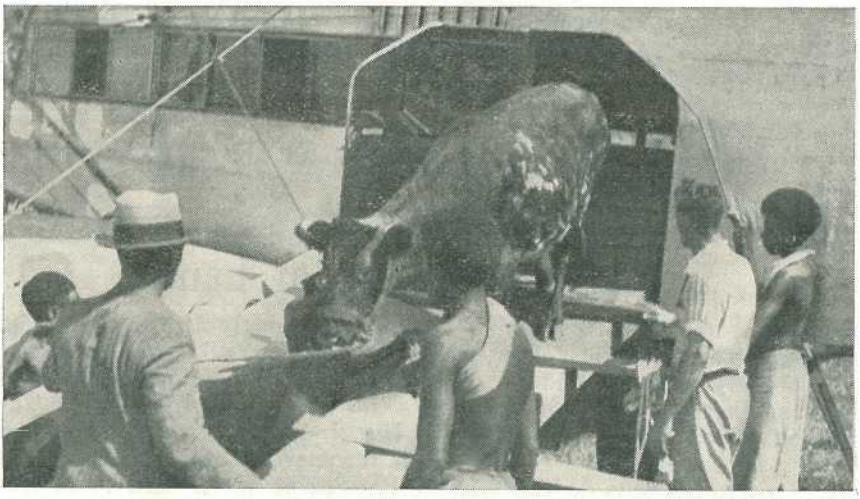


Plate 170.
DELIVERING DAIRY CATTLE BY AEROPLANE, NEW GUINEA GOLDFIELDS.

COTTON.

Very favourable climatic conditions have mostly ruled throughout all districts during the past month, and good progress has been made in harvesting the earlier-sown crops. Receivals at the Glenmore Ginnery reached peak period volume at mid-month, but were of only moderate amount at Whinstanes. The general quality of the consignments to both ginneries is definitely of higher grade than usual for the first of the season. The total yield likely to be obtained is still problematical and depends on the nature of the rest of the season.

Following on the March rains, good progress is being made in the development of the top crops; also the December plantings are fruiting promisingly. Late frosts will be required, however, to ensure a good yield from the latter as a whole.

SUGAR.

Except for beneficial rains which were experienced in the far northern areas early in the month, April has been dry in all districts. Though the crop has not been severely checked as a consequence, absence of vigorous growth will be reflected in the final crop returns if these conditions persist.

At the present juncture a sugar crop of about 700,000 tons is forecast.

Preparation of Wheat Land.

Where the initial ploughing was effected shortly after harvest and sheep have access to the fallow, weeds will not be troublesome; but elsewhere every effort should be directed to the eradication of all weed growth, thereby conserving moisture for the succeeding crop. The method of working the land after the first ploughing will depend largely on the rainfall received, but it is generally accepted that rigid time cultivators will do the best work. Spring tooth cultivators and harrows are also useful in preventing the formation of a hard crust, so that all rains in excess of 30 points should be followed with a light harrowing or cultivating.

As a firm seed-bed is required it is important to progressively reduce the depth of working as seeding time approaches. Sheep are particularly valuable in consolidating the seed-bed, besides making good use of any available weed growth. Well prepared land should be ready for sowing at the correct time, according to the variety selected, as ample subsoil moisture will bring about a satisfactory germination. On the other hand hurriedly prepared land may have to wait for additional rain to effect germination, which is a great disadvantage, as early or seasonably sown crops invariably give the best average returns.

During the 1935-36 and 1936-37 wheat seasons average yields have been considerably reduced owing to the lack of adequate rains during the growing period of the crop, resulting in some instances in complete failure. However, in every instance where early ploughing was carried out, followed by the requisite workings after all substantial rains, profitable yields were secured.

In view of the example set by farmers who regularly practise the summer fallowing of their land, it is not surprising to note the gradual improvement in cultural methods now taking place. As the heaviest rains usually occur between harvest and sowing and only one third of the average annual rainfall is received during the growing period of the wheat crop, the necessity for fallowing is self evident.

Every year progressive wheat growers are proving the value of effective cultivation, although much remains to be done, particularly in the control of weed pests such as black oats.

Economies in seed, harvesting machinery, and wages can be obtained where a bigger return is produced from a smaller well prepared area of the farm.

H. W. BALL, Assistant Experimentalist.

Onion-growing.

Although the onion is not cultivated extensively in this State, many farmers in the Lockyer Valley regularly produce satisfactory crops of high-grade bulbs which meet with a ready sale in metropolitan and, occasionally, in the interstate markets. Onions are also being successfully grown in the Brisbane Valley, Kingaroy, and Darling Downs areas, while trial plots have indicated that good-quality marketable bulbs can also be grown in the Rockhampton and Mackay districts. However, the average aggregate area under crop throughout the State rarely exceeds 500 acres, the total production from which is insufficient to meet local requirements, necessitating the annual importation of heavy supplies from the Southern States.

As sowings are usually effected during April and May, the incidence of the rainfall received during the winter months is of the utmost importance, and, when deficient, has to be supplemented by irrigation. Owing to its deep-rooting habit, the onion can withstand limited dry spells, but the best results are obtained where the growing period is fairly moist, with drier conditions towards maturity and during harvest.

Rich, well-drained, sandy loams, friable and easy to work, have proved the most suitable, producing onions of good appearance and better keeping qualities than where grown on heavier soil types. Sandy soils tend to produce bulbs of good size but low keeping quality, while heavy soils will induce thickened or bull-necked plants.

The preparation of land intended for onion cultivation will now be nearing completion, and it must be remembered that deep cultivation should be avoided as the sowing period approaches.

The seed may be broadcast in seed-beds from which the plants are transplanted to their permanent positions in the field. Alternatively, the seed may be sown in the permanent drills. The latter method is usually adopted in Queensland, utilising the "Planet Junior" type of hand seeder, and placing the seed in drills 12 inches to 15 inches apart, which will be found to call for 2 to 3 lb. per acre. The seed should only be lightly covered with not more than ½ inch of soil, as deeper sowings germinate very poorly.

When the young plants are 4 inches to 5 inches high they are thinned out to a distance of 4 inches to 6 inches in between plants, a practice usually carried out with the aid of a 2-inch chipping hoe.

In the southern districts sowings may be commenced late in March, continuing until May, while in the central and northern districts the period can be extended to July. If sown too early losses may result from flowering, while if too late the bulbs may be small owing to insufficient time in which to mature before the hot weather causes scalding. Sow late-maturing varieties early and early-maturing varieties late. Only freshly grown, tested seed should be utilised, as onion seed deteriorates rapidly, and it is therefore preferable to buy seed from reliable sources.

The Brown Spanish type, including "Early Hunter River Brown Spanish," is the most popular, the onions being of good appearance and flavour and possessing good keeping qualities.

The hand cultivators of the "Planet Junior" type are useful for inter-row cultivation, as all weed growth must be kept in check. The soil should not be thrown up against the bulbs, the object being to draw the soil away rather than towards the plants, thus inducing the formation of bulbs. If the soil is not drawn away, bending over the tops with a twisting motion will assist in the formation of bulbs. When the seed-bed has been thoroughly prepared it will be found that very little hand weeding is necessary. Information on harvesting, &c., can be obtained on application to the Department of Agriculture and Stock, Brisbane.

H. W. BALL, Assistant Experimentalist.

Johnson Grass.

Johnson grass is gradually spreading in some of the agricultural areas in North Queensland, and farmers should become familiar with the plant, as it can be eradicated from small patches if dealt with efficiently. Once established over a large area no known method of eradication can be economically applied. The plant is very much like Sudan grass, and can be easily mistaken for it, but may be distinguished from this valuable fodder plant by its thick and spreading underground root stocks. Cattle have occasionally suffered from prussic acid poisoning when allowed to graze on the grass.

The roots of Johnson grass are carried from one part of the farm to another during agricultural operations and on the feet of animals. Being very thick and pithy, the rootlets may lie dormant in the soil for long periods in dry weather. When rain falls shoots are thrown out from the joints, and in a very short time a fresh area of the pest is well established.

When first noticed, every attempt should be made to prevent its spread. The infested area should not be cultivated and when possible it should be fenced off from the remainder of the paddock until the Johnson grass can conveniently be destroyed.

As pigs are fond of the thick succulent roots of Johnson grass, success has been achieved on many farms where the infested areas are small by securely fencing them off and turning pigs into the paddock. If the enclosure is handled in this way for a number of years, the pigs may destroy every vestige of the grass.

A quicker but probably a more expensive method of eradicating Johnson grass is by using a non-poisonous weedicide. Sodium chlorate may be applied, but commercial weedicides usually contain calcium chlorate as the killing agent. These substances are soluble in cold water, and are most economically applied as a light spray, for which the ordinary knapsack sprayer pump or some form of atomiser will be found suitable.

To get the best results Johnson grass should be sprayed when the plants are well out in flower. Further spraying may be necessary at a later date to kill out any regrowth.

Sodium chlorate is dissolved in water at the rate of 1 lb. per gallon. Commercial weedicides should be used according to the manufacturers' instructions.

O. L. HASSELL, Senior Instructor in Agriculture.

Sour Grass or Yellow Grass.

Within recent years the intrusion of sour grass into paspalum pastures in Queensland has been causing dairymen a good deal of concern. Sour grass is closely related to paspalum and is a native of tropical South America, now widely spread in moist tropical areas. It is a perennial grass, reaches a height of 1 to 2 feet, and spreads rapidly by means of creeping stems. Its foliage has a rather characteristic yellow tinge.

Sour grass is common on the Atherton Tableland and in wet coastal districts in North Queensland. Recently it has commenced to invade paspalum areas south of Gympie. As a fodder grass it is held in very low favour. Like the common mat or carpet grass, it has some value on poor soils, but when it invades paspalum pastures a decrease in the carrying capacity of the land is noticed.

Sour grass is similar in many respects to mat grass, and its control and eradication may in all probability be effected by the employment of measures which have proved efficacious in the handling of mat grass. The following recommendations are made:—

(1) Whenever small patches of the grass occur on a farm they should be dug out and the weed burnt.

(2) Where the invasion is too rapid to be stemmed by digging, a system of pasture management should be instituted which will allow the paspalum to grow sufficiently vigorously to keep the sour grass in check. This would involve subdivision of large paddocks, periodical renovation by the plough or pasture harrows, encouragement of clovers, and, possibly, topdressing.

(3) Cultivable pasture land invaded by sour grass could be ploughed and utilised for animal crops for two or three years prior to resowing with a pasture mixture.

(4) Smothering grasses, such as kikuyu and giant couch, may be grown in suitable areas with the object of keeping the sour grass in check.

(5) Where large patches of sour grass are involved the use of poison sprays would not be economical; small areas could no doubt be treated satisfactorily with sprays which are non-poisonous to stock (*e.g.*, chlorate sprays).

C. W. WINDERS, Assistant Agrostoligist.

SUPPLEMENTARY FEEDING OF STOCK.

Good foundations and framework are essential prerequisites to an elaborate building, and the same is true of a living organism. The skeleton or bony material must be well formed if it is to support the intricate mechanism of an active body. The skeleton is largely mineral matter, and of this material over 90 per cent. is composed of lime phosphate. During the intra-uterine period of its life and in the early sucking period, the young derives the whole of its mineral requirements from the mother. She in turn derives her supplies from the food she eats. When this is deficient in the required elements, nature enables her to draw upon her own reserves. Such is the overpowering force of maternity that a cow has been known to deplete her own body stores by 20 per cent. of their lime and phosphate content for the sake of the calf.

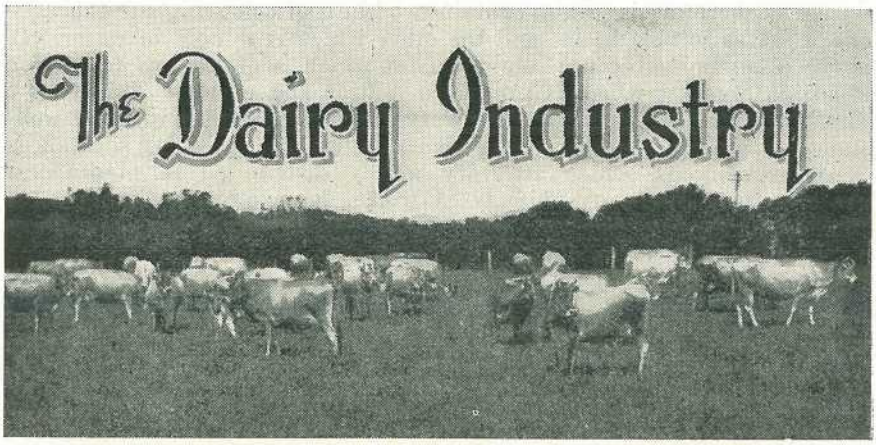
The growing animal and the producing mother require relatively large amounts of lime and phosphate to meet development on the one hand, and lactation or the needs of the unborn young on the other. The mature male or the unproductive female require much less.

As the mineral content of good pasture closely resembles that of animals themselves there is rarely any need to feed supplementary minerals when green grass is available. When the grass dies much of the inorganic (mineral) matter returns to the soil, and is unavailable to the animal. At this time the palatability of the grasses is affected, and stock are less inclined to eat all they require for maximum production. This reduced intake means a reduced mineral intake, and may lead to a temporary mineral deficiency. On certain types of country the soil, and consequently the vegetation it supports, is deficient in some minerals, and stock grazed thereon are in a constant state of malnutrition.

Under these conditions supplementary feeding becomes an economic necessity.

This has long been understood by the producer, but there has always existed some uncertainty as to the minerals required and the amount to be fed. On farm lands where the animals are under constant observation, and where the composition and palatability of the feed is known, the question presents little difficulty. On open grazing country complications arise. Apart from the requirements of the stock the difficulty of administration must be considered. The grazier cannot afford the individual attention to animals that farm stock get. He must aim at a mineral composition which corrects the deficiencies, and at the same time automatically limits the intake to the required amount. The problem is different for each locality, and results must largely depend upon the intelligent observation of the owner. In general, a mixture of well-graded steamed bone meal and coarse salt makes an efficient and palatable lick. The salt content should not exceed one-third of the composition, and where water analyses indicate it, the salt may even be excluded. A little appetiser must then be added to the bone meal. Price will govern which is to be used. The attraction which it holds for stock will determine the amount to be added. The quantity consumed will determine how often the material is exposed. When very fibrous food is being used it may become necessary to incorporate a purgative—5 per cent. sodium sulphate (Glaubers salt) is recommended.

Steamed bone meal should be fine, uniformly graded and of good analysis. The Department of Agriculture and Stock will report on samples submitted. Salt should be clean butcher's quality. On no account use second-hand material.—Dr. M. WHITE.



The Colour of Butter and Cheese.

O. ST. J. KENT, Research Laboratory, Dairy Branch.

IN controversies on butter quality, the subject of colour invariably arises, and much ado is made about the variation in appearance that sometimes occurs in butter from different districts or at different times of the year. The following notes are given in the hope that the colour of butter and cheese, and the factors influencing it, may be more fully understood.

A discussion on the colour of butter and cheese requires first of all a brief description of milk and its colour, since it is from this raw product that butter and cheese are made. Milk is composed of water and solids. In 100 lb. of milk there are 87 lb. of water and 13 lb. of solids. The solids are made up of fat 4 lb., milk sugar 5 lb., casein and albumin 3¼ lb., and minerals ¾ lb. Some of these solids are dissolved in the water in milk, whilst others are suspended in it just as clay is suspended in muddy water. All the milk sugar and albumin dissolve, whilst the fat, casein, and some of the minerals are suspended in the water portion of the milk. It is to the presence of these solids in suspension that milk owes its white or milky appearance, the milky appearance being caused by the scattering of reflected light by these suspended solids.

If different samples of milk are placed side by side and examined, it will be noticed that some are more tinged with yellow than others. This colour is due to the presence of a yellow colouring substance dissolved in the fat of milk. The yellow colour becomes more noticeable when the fat globules are concentrated in cream. It becomes still more apparent when the cream is churned into butter, and is most evident when one views the melted butterfat itself.

Skim milk also contains a yellowish colouring substance, which cannot be observed, however, until the milk is coagulated. When the curd separates from the whey, the colour of the whey is seen to be yellow with a distinct greenish tinge. This colour is caused by a colouring substance called lactochrome which dissolves in the watery portion of the milk.

Milk therefore is seen to contain two kinds of colouring substances—one which is soluble in fat and the other which is soluble in water. It is the colouring substance soluble in fat which is of interest to us, for it is this pigment which is present in butter and cheese. This yellow pigment found in butterfat is a very interesting and important substance. It is called carotin. It belongs to a group of colouring substances called carotinoids, which are very widely distributed in plants and are also found in many animals. Carotin, for example, is responsible for the yellowish colour of the fatty tissue and skin secretion of dairy cattle, especially Jerseys and Guernseys. Another carotinoid, which is very closely related to carotin and which is called lycopin, causes the red colour of tomatoes, watermelons, and other fruits, but has not been shown to occur in animals and certainly not in milk.

Carotin is found in all green plants, being manufactured by the plant itself, but it is not manufactured in the body of animals. The presence of carotin in milk fat is therefore due to a direct transfer of this colouring substance from the food eaten by the cow. This has been proved quite definitely by feeding experiments, which have shown that the amount of carotin in the fat increases or decreases, according to the amount of carotin present in the food. When cows are fed on such foods as cottonseed meal, timothy hay, white corn and yellow corn, the amount of carotin found in the milk fat is very low compared with that obtained from cows fed on green lucerne hay, green crops, fresh pasture grass, and similar foods.

Another interesting feature about this colour is that, of all mammals whose milk is commonly used for human food, cows alone give milk which has a pronounced yellow colouration of the fat. Milk fat from the goat, ewe, camel, and water buffalo is practically colourless, if not entirely devoid of colouring matter. The fat of human milk, however, is at times distinctly tinted by carotinoids. The reason why such differences occur is not known.

There is also a striking difference between the various breeds of dairy cattle with respect to the amount of this yellow colouring substance found in butterfat. Guernseys and Jerseys rank first in this respect, with Ayrshire, Shorthorn, and Friesians lower down on the scale.

In cow's milk the yellow colour will only be found provided that the food contains an abundance of carotin. This fact explains the seasonal variation in the natural colour of butter and also explains why butter from some districts is more yellow than butter from other districts. In those districts with a good annual rainfall, and consequently a plentiful supply of green pasture the colour of the butter is always brighter than that produced in the drier parts of the State. The colour of butter does not depend entirely on its carotin content, because there are many ways in which the colour may be altered. The pale creamy-coloured butter which is so well known in every household is the product of modern manufacturing methods. The butter-maker can control the colour within certain limits by altering his methods of manufacture. The temperature at which the cream is churned, the temperature of the water used for washing butter, the size of the butter grains, the length of time that the butter is worked, and the light of the factory, all have an influence on the appearance of the finished article. In some countries butter is artificially coloured, but in Queensland this practice is not carried out.

The consuming public have peculiar tastes for colours so far as dairy products are concerned. Queensland people at the present time demand very pale butter and look askance at any butter that has a bright yellow colour; yet on the other hand they seek highly coloured cheese, and look somewhat suspiciously at pale-coloured cheese. Generally speaking, there is nothing wrong with brightly coloured butter. In Queensland it usually signifies that the butter has been produced in a district where green pastures have been particularly abundant and is therefore a sign of goodness rather than a defect. In this respect the relationship between carotin and vitamins is of great interest. It has been shown recently that carotin can be transformed into vitamin A by the cow itself. The yellow colour of butter, such as is often seen in spring and summertime, is therefore suggestive of richness in vitamins, and the slogan "There is Sunshine in Australian Butter" is apt as well as attractive.

Occasionally butter develops quite abnormal hues. Green-tinted butter was reported a little while ago, and quite often butter with an extremely deep yellow colour is known to occur. These phenomenal butters can generally be traced to some unusual food consumed by the cows. It is well known that certain pumpkins will readily produce a deep rich yellow-coloured butter. Pale-coloured butter is also obtained from milk of cows approaching the end of their lactation period.

In the laboratory, colour of butter can be determined and colour values expressed in numbers. Furthermore, certain defects in butter are signalled by outstanding colour change. For example, a defect known as tallowiness is accompanied by a bleaching of the yellow colour of butter. Tallowiness is brought about by the oxidation of butterfat, and carotin on oxidation is known to lose its colour completely.

The colour of cheese is particularly interesting. Most cheese, unlike butter, is artificially coloured. The cheese manufacturers have to cater for the consuming public, and they colour their cheese accordingly. Cheese that is exported to England has to be either very highly coloured or not at all, and, in shipments overseas, the colour of cheese is either approaching brick-red or white. For the Queensland consumer a cheese of colour half-way between these extremes has to be manufactured. The so-called white cheese (actually a pale creamy colour) is naturally coloured cheese. Many consumers, in choosing a highly coloured cheese, doubtless believe they are securing a richer article than the white cheese, but such is not the case. The difference in colour in cheddar cheese, generally speaking, is due to the amount of harmless artificial colouring substance added to it.

The colouring substance used in cheese-making is called annatto. It is quite a harmless substance which is obtained from the seeds of the annatto plant, which is largely cultivated in India and America. The seeds when ripe are coated with a reddish powder, and it is this powder dissolved in suitable solvents that constitute the annatto solution used in cheese-making. It is very strong and only small quantities ranging from 1 to 4 oz. per 100 gallons of milk are necessary to colour the cheese.

In Queensland, cheddar cheese is our most common cheese, but there are hundreds of varieties of cheese manufactured in different parts of the world. Some of these have their distinctive colours—*e.g.*,

the Dutch cheese or Edam cheese is known by its pink or red external coat. Some fancy cheeses, such as Stilton and Gorgonzola, have blue-green streaks running through them, and others are manufactured with many distinctive colour peculiarities.

Cheese, like butter, may have its appearance altered by contamination with yeasts and mould growths. On the exterior of cheese a great variety of colours, due to mould growth, may sometimes be seen, particularly in moist hot weather, but little harm is done provided the rind of the cheese is intact. On the interior of cheese, bacterial defects may give rise to multi-coloured sections according to the type of contamination.

The colour of butter and cheese may not have such a strong commercial appeal as the flavour and aroma of these products, but it certainly plays its important part in the distribution of these valuable articles of diet.

In conclusion, it is hoped that in future Queenslanders will not treat a bright-coloured butter or a pale-coloured cheese with any undue suspicion. It may be stressed again that in this State no colouring substance whatever is added to Queensland butter.

Paspalum Ergot.

Paspalum is still the most popular summer-growing pasture grass in the coastal dairying districts. The widespread occurrence of ergot in this grass is therefore of considerable importance, since its presence may lead to sickness in stock.

The disease is first seen as a dark sticky exudate on the heads oozing from the developing seed. This exudate is due to the activity of a fungus parasite and contains countless spores or minute seed-like bodies by means of which the disease is spread from plant to plant by animals and insects.

Under suitable conditions, the stage described above is followed by the formation of resting bodies or sclerotia on the seed heads. The sclerotia are globular, about $\frac{1}{8}$-inch in diameter, and consist of compact fungus tissue. They are yellowish grey in colour and give the infected paspalum head an irregularly swollen appearance.

Paspalum ergot is closely related to ergot of rye, and, like it, is poisonous. The summer stage characterised by the sticky exudate contains little, if any, of the poisonous principle. The poison is produced in the sclerotia, and becomes concentrated as they get older. The symptoms produced in cattle resemble staggers. The poisoning does not usually result in the death of the stock, but losses may occur due to bogging of cattle in their weakened condition or to starvation if they are unable to rise.

The eradication of a disease of this nature from pastures is a very difficult problem. It can be kept in check, however, by the adoption of intensive rotational grazing, thereby largely preventing the formation of seed heads. Where a mower can be used this provides a supplementary means of getting rid of the seed heads before they form sclerotia. If, in addition to mowing, a quick fire can be got through the

cut grass the disease may be eradicated—at least temporarily. If badly diseased grass gets out of hand it should be burnt over at the first opportunity. Where difficulty is encountered in dealing with this disease serious consideration must be given to the replacement of paspalum with kikuyu or other suitable grass.

R. B. MORWOOD, Pathologist.

Flushing the Separator.

The test or percentage of fat required in cream should be not less than 38 per cent. during the hot summer months and not less than 34 per cent. during the cooler months of the year. Whatever make of separator is used, during the process of separating satisfactory results can only be obtained when the cream screw is adjusted so that the driven speed of the separator conforms with the corresponding number of revolutions per minute recommended by the maker of the machine.

At the completion of separating, flushing with cold or warm water so as to remove the last of the cream from the patties is an undesirable practice. If the cream bucket is not removed during the process, some of the impurities and slime adhering to the bowl may be removed and deposited in the cream. This applies particularly if warm water is used. When separated milk is used for flushing, excessive milk solids are introduced into the cream and these will act as a starter and affect the quality. Thus the proceeds of flushing should be fed to the pigs or calves on the farm. The maintenance of cream quality is too important to be impaired by laxity in this respect.

T. DOUGLAS, Inspector of Dairies.

Cleanliness in the Milking Shed.

Observations during milking operations on dairy farms in many cases reveal unclean habits, dangerous from a viewpoint of infection from germs and bacteria. Bacteria in milk and cream are well-known causes of low-grade, inferior products, and safeguards against their introduction into dairy produce are essential.

The milking bucket should on no account be used to wash the udder and teats of the cow or the milker's hands. The act of washing the udder transfers innumerable bacteria with the dirt and loose hair to the bucket, and a simple rinsing in cold water is not sufficient to remove them all. The need for separate milking buckets and washing buckets is therefore very obvious.

Receptacles with water for washing the cow's udders and also the milker's hands before milking each cow, and cloths for wiping them, are a necessary adjunct to cleanliness. The dairyman may well ask himself the question: "Would he take his meals with hands unwashed after completing milking operations?" The answer would be an emphatic "No!" Yet the cleanliness of his hands during milking is at least as important, for milk and cream are readily contaminated foods. Clean hands are just as essential during milking as at meals, and it is therefore curious that many people who are scrupulously clean in the home are lamentably careless in the cowyard and dairy.

Another very common practice is the wiping of soiled, milky hands on the clothing. These same clothes, if worn throughout the day, soon acquire a most objectionable smell and attract flies. Sugarbag aprons, which are easily made, inexpensive, and long-wearing, should be used by all milkers and frequently washed to obviate the unpleasant presence of stale milk on the clothing.

The protection of milk against flies is also a matter for consideration. Most dairymen have in use the large, flat milk vat, and this should be provided with a lid in which an opening has been left for the milk strainer, or, if milking machines are in use, for the releaser. This lid keeps out dust and vermin, and also assists in maintaining the temperature of the milk prior to separating.

Hand milkers frequently moisten the cows' teats during milking from the milk in the bucket. This practice cannot be too strongly condemned, as the hands are usually soiled, and bacteria from the udder of the cow are transferred to the bucket.

The following points are all practised by the most successful dairymen:—

Wash the udders in buckets used only for that purpose.

Wash the hands after milking each cow.

Wipe the hands on a clean cloth, not on the clothes, and wear either an apron or overalls.

Aprons and overalls are easily boiled, so keep them clean.

Don't use an uncovered vat. A cover is required by the Dairy Produce Acts.

E. C. DUNN, Inspector of Dairies.

Inferior Grade Cream.

One of the most common sources of the contamination of cream, and one that is often overlooked, is the badly washed cream can.

More cream is spoilt by being stored or carried in a badly washed can than by most other ways. This applies to cans in good order as well as those that are dented and rusty.

The reason is not far to seek. Hundreds of cans pass through the same rinsing water of the mechanical can-washer at the butter factory daily, and although a final steaming is carried out in the last stage of the washing process, it is not of sufficient duration (nor is it practicable) to thoroughly sterilise all of the cans thus treated.

Cans that have contained second-grade cream due to bacterial activity, such as cheesy and rancid flavoured cream, may continue to spoil future consignments unless attended to. Many cream cans carry a definite tallowy smell and the defect is sometimes traceable to this cause.

In order to safeguard the quality of cream it is advisable to rinse all cans on their return from the butter factory with boiling hot water to which a little washing soda has been added. The cans should then be rinsed with clean boiling water to remove all traces of the soda.

Thoroughly cool and aerate the cans in a clean atmosphere before using again. Do not rinse with cold water or wipe the insides of cans under any consideration.

C. L. MORAN, Instructor in Dairying.

Feeding of Calves.

About 87 per cent of cows' milk is water. Of the remainder, nearly one-third is fat, and a good separator, if properly operated, will remove about 95 per cent. of this fat. Very little protein is removed. It follows that if the separated milk is to be made equal in feeding value to the original milk, either the fat or its equivalent must be replaced. There is no need to replace protein, and for this reason it is not good practice to feed such protein-rich materials as linseed meal in conjunction with skim milk to very young calves.

Dripping obtained from a reputable meatworks, or cod liver oil, may be incorporated in the milk, but they are rather expensive and difficult to mix properly. A better system is to use finely ground maize. Maize meal from good-quality grain contains as much as 5 per cent. high-grade oil and 70 per cent. of easily digested carbohydrate which, to some extent, serves the same purpose as fat.

The new-born calf should get whole milk for a fortnight if it is to be given a good start in life. For the first few days it may be fed three times daily; after that, twice daily is enough. A safe level to feed is 1 gallon to each 100 lb. liveweight. At the end of the second week a little maize meal is stirred into the milk and the change to separated milk begun. By the end of the third week the maize meal may be built up to a handful, and the change to separated milk completed. By the end of a month the calf begins to nibble grass, and can consume about ½ lb. of meal.

From now on to the eighth week the milk can be replaced progressively by water and a meal mixture. By the eighth week the calf will be able to eat up to 2 lb. daily of a suitable meal mixture.

Such a mixture may contain 35 lb. of linseed meal and 65 lb. of a cereal meal. Pollard and bran should not constitute more than one-half of the cereal meal. The remainder may be crushed oats, barley, or maize. About ½ lb. of salt and 2 lb. of sterilised bone meal should be included in the mixture.

As the animals take more grass or hay, the supply of the meal mixture is restricted. At six months, unless an adverse period is encountered, the calf should be able to fend for itself.

DR. M. WHITE.

MILK AND CREAM TESTING EXAMINATION.

An examination will be held for certificates of proficiency in milk and cream testing and milk and cream grading on Saturday, 24th July, 1937; and in butter making and cheese making on Saturday, 31st July, 1937. The examination will be held in convenient centres. Candidates should notify the Under Secretary, Department of Agriculture and Stock, Brisbane, not later than the 5th July.

Entrance fee 5s. for each subject should accompany the notification, with an additional 10s. 6d. if a special country centre is desired as the place of examination.

Candidates must not be less than 18 years of age on the day of examination.

Does Manuring Pay?

H. W. KERR and G. BATES.*

SO many of our canegrowers have long known the absolute necessity for the use of fertilizers, if they are to maintain the productivity of their land, that the above question would to them appear superfluous. But there are a number of farmers who have still to learn the true value of these sources of plantfood, as an aid in reducing costs of production, and in restoring fertility to the land; and it is to those growers that we would present the striking results obtained from a fertility trial conducted on the farm of Messrs. S. J. Page and Son, of Edmonton, North Queensland.

This trial has now been continued for four years, and full yield data are available for the plant and three ratoon crops. The soil type is rather poorly-drained schist loam, which was producing inferior crops at the time the present owner entered into occupation. The use of the mole-drainer and tractor-grubber, combined with good husbandry, has so improved the general condition of the land, that it is able to maintain good cane tonnages, *provided it is supplied with the plant-foods which it so seriously lacked in its initial state.*

The land was considered as suitable only for the growth of Pompey, which variety was planted accordingly. The block had received a thorough preparation prior to planting. The trash from the old ratoons was ploughed under, and crushed limestone was broadcast at the rate of 2 tons per acre. A heavy crop of legumes was subsequently grown and turned into the land. Finally, the field was deeply grubbed just before the cane was planted.

The fertilizers applied on the experimental areas consisted of combinations, in pairs, of the following:—

N—420 lb. sulphate of ammonia per acre.

P—270 lb. superphosphate per acre.

K—150 lb. muriate of potash per acre.

One series of five plots received the full fertilizer application, amounting to 840 lb. of mixed fertilizer per acre, while a further set was given no manure of any kind throughout the experiment.

The crop yields for the four years were as follows:—

Crop Yields, 1933-1936.

Crop.	No Manure.	Sulphate of Ammonia + Superphosphate.	Sulphate of Ammonia + Muriate of Potash.	Superphosphate + Muriate of Potash.	"Complete" Fertilizer.
	Tons.	Tons.	Tons.	Tons.	Tons.
Plant cane	28·2	31·3	34·4	34·8	37·0
First ratoon	13·4	22·6	26·8	17·5	29·6
Second ratoon	11·9	21·6	22·9	13·4	25·5
Third ratoon	13·2	23·1	29·9	15·9	32·9
Total yield—4 crops ..	66·7	98·6	114·0	81·6	125·0
Average yield per crop ..	16·7	24·7	28·5	20·4	31·3

* In "The Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations).

Discussion of Results.

The above results present certain striking features. Following good preparatory treatment of the land—not overlooking, of course, the green manure crop—the unfertilized land yielded quite well, though the benefits from the manure on the fertilized plots were already evident. The value of the early treatment had, however, entirely disappeared before the growth of the first ratoon crop. The serious lack of available nitrogen, in this humus-deficient soil, was a very potent factor in rendering the unfertilized ratoon crops almost a complete failure, while superphosphate and potash also exerted their influence on the "complete" manure plots.

This low level of productivity on the unmanured area persisted throughout the trials, though the fertilized plot yields reflected the seasonal climatic conditions. The beneficial growing season just experienced resulted in a third ratoon yield of almost 33 tons per acre, where the land was suitably fertilized, while the unmanured crop was but 1½ tons in advance of the second ratoon yield of 1935. The trend of yields due to the several treatments is strikingly illustrated in the accompanying graph (Plate 171).

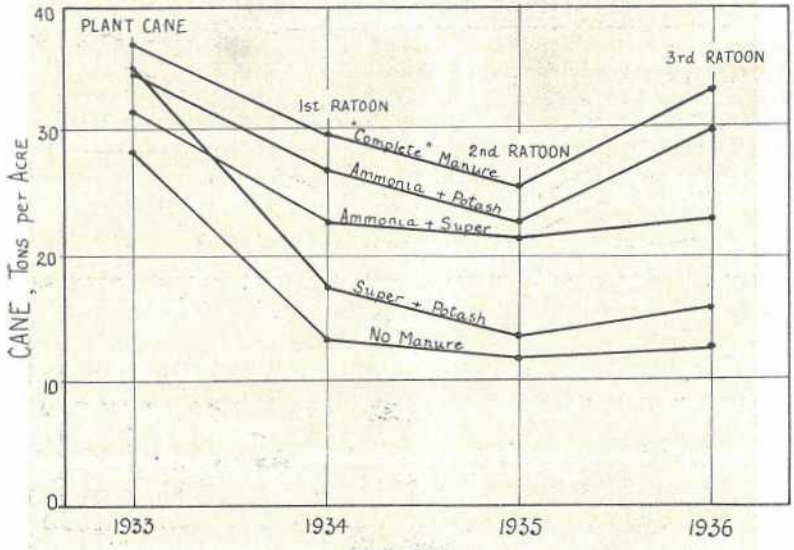


Plate 171.

A graphical presentation of the yield data for plant and ratoon crops.

Finally, a study of the average yields for the four crops show that the unmanured cane yielded 16·7 tons per acre, while the fully-fertilized crop gave an average of 31·3 tons per acre.

Recommendations.

The above returns indicate very clearly the natural deficiencies of the schist lands of North Queensland, where they constitute a major soil type. Profitable crop yields will be obtained only where due regard is paid to the plant-food applications given in the form of suitable artificial manures. An initial application of 4 cwt. per acre of Sugar Bureau

No. 2 or No. 3 Mixture provides the crop with an abundance of phosphate and potash, and subsequent top dressings of sulphate of ammonia (up to 4 cwt. per acre for ratoons), supply the necessary available nitrogen in which the land is so seriously lacking.

It should not be necessary to stress that on soils of this character, the benefits from green manuring during fallow are strikingly reflected in plant cane growth, and incidentally, eliminate the need for heavy manuring with sulphate of ammonia for that crop.

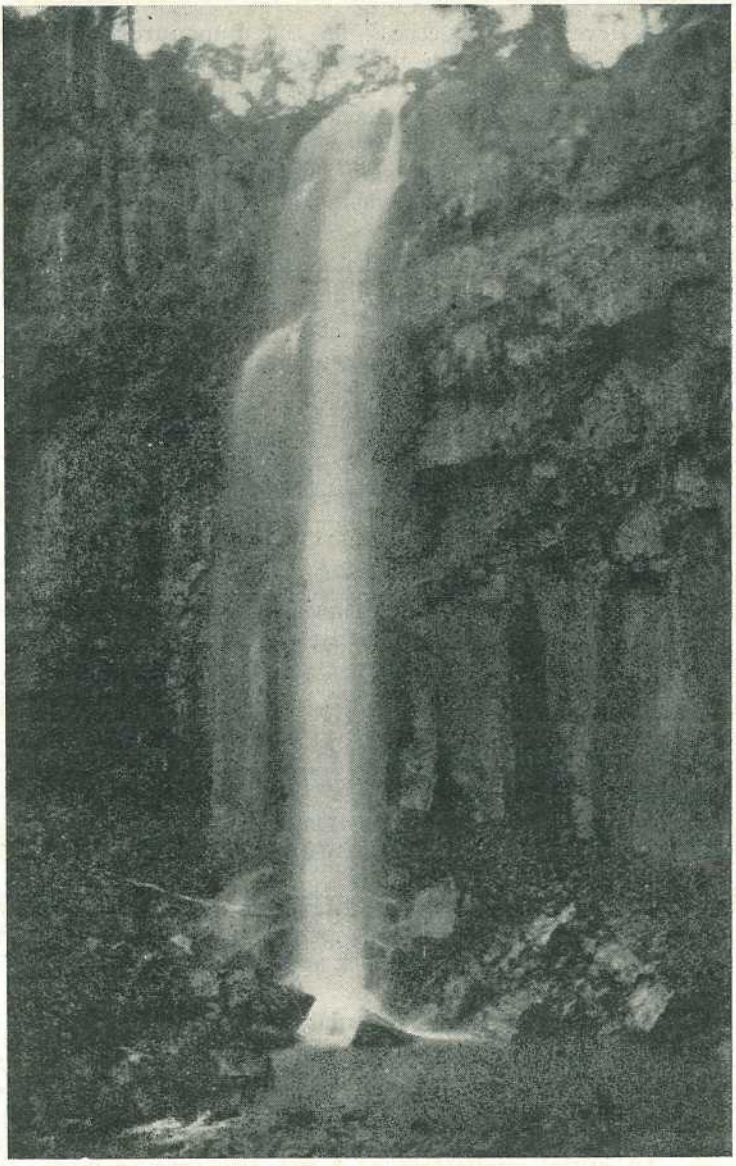


Plate 172.
Queen Mary Falls, near Killarney, South Queensland.

Does Cultivation Conserve Soil Moisture?

N. J. KING.*

THERE are four means by which moisture may be lost from the soil:—(1) drainage, (2) transpiration through the cane leaves, (3) transpiration through weeds and grasses, and (4) evaporation from the surface of the soil. The farmer has no control over the first two, and the third is attended to by cultivating and chipping until the cane is out of hand. It is the purpose of this article to discuss the fourth —evaporation losses. Farmers for generations have adopted the practice of preparing a surface mulch to prevent moisture losses, and a great many of our cultivation implements are designed to break up the first inch or two of soil and so produce the desired loose surface. This operation has a two-fold object—in destroying weeds and in creating the loose mulch with the idea of moisture conservation. But there are times of the year when weed control is not necessary, and yet after rain the grower scarifies the farm to mulch the surface and prevent undue evaporation of moisture.

The theory behind the practice is that moisture rises in the soil by capillarity and is evaporated by sun and wind on reaching the surface; the mulching, by destroying the capillary channels and forming a loose surface, thus prevents the moisture from arriving at the surface.

Some work carried out by the writer in 1933 had indicated that the upward movement of water by capillarity on the Woongarra soil was practically nil, and this observation prompted the investigation as to whether surface cultivation was of any value in preventing evaporation.

An experiment was initiated to obtain information on this point. Portion of a block under bare fallow was divided into four portions. Section (1) was hand hoed to a depth of two inches to maintain a surface mulch; section (2) was left bare—just as flattened down by the rains—but weeds were hand picked to maintain comparable conditions with (1); section (3) had a close cover of corn sacks in an attempt to prevent surface evaporation altogether; and section (4) had a cover of trash to measure its efficiency as a mulch as compared with the sack and soil mulches. Borings were carried out on these four sections every two or three days to a depth of four feet, and the moisture determined in 3-inch and 6-inch sections over the total depth. The experiment was started immediately after the April rains and continued until 2nd May, during which period no rain fell.

It is noticeable in examining the results (Plate 173) that the soil under the sack cover lost the least moisture by surface evaporation. The complete table of results obtained shows that very little difference exists between the bare surface plot and that which had a hoed surface. In fact the aggregate of all determinations proves that slightly less moisture was present in the hoed plot than in the other, due to the more rapid drying out of the surface two inches of mulch. The plot under the trash cover retained, on the whole, slightly more moisture in the surface two feet than that under corn sacks.

Two outstanding facts are discernible from this work. The first is that surface scarification as a means of conserving moisture is valueless on this soil type, and is uneconomical unless weeds are sufficiently

* In "The Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations).

bad to warrant removal. The second is the decided advantage of the trash mulch in moisture economy. It has been mentioned to the writer that after rain on this and other soils the sun tends to form a crust on the surface, and that scarification is necessary if only to break up this

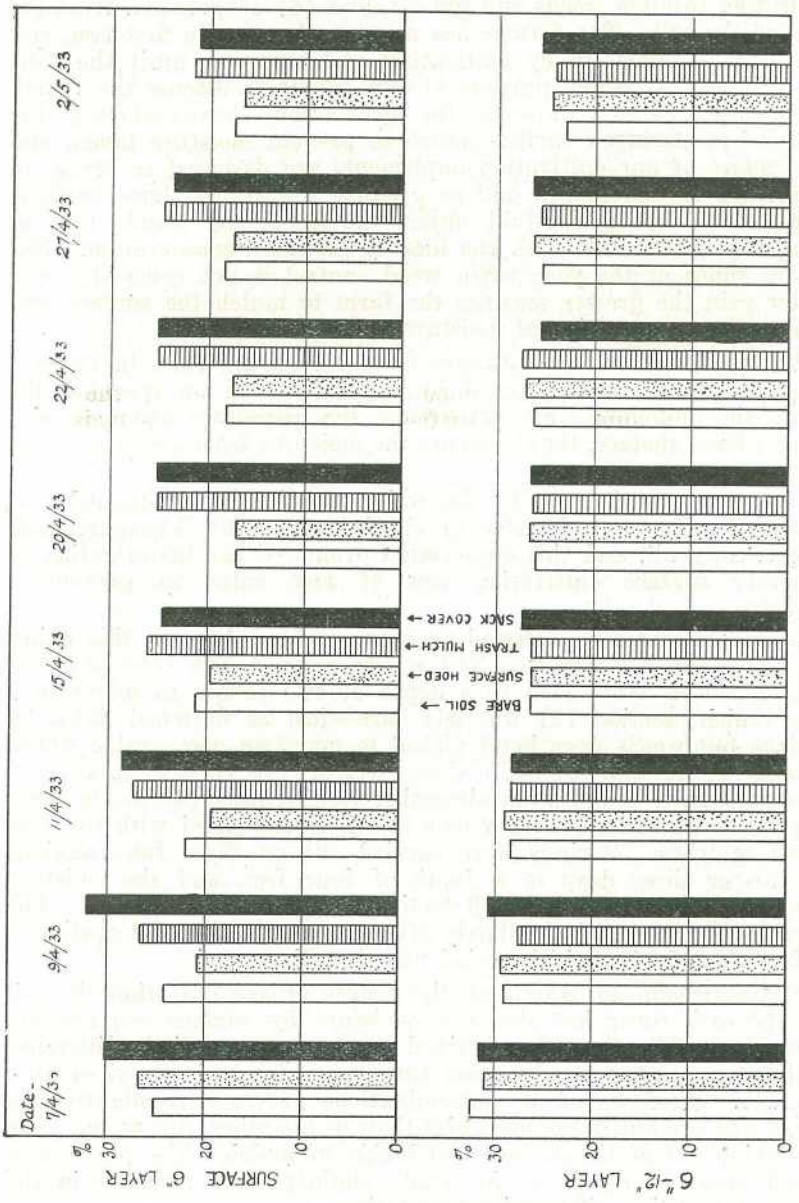


Plate 173.

A selection of the soil moisture data presented is graphical form. The influence of soil treatment is particularly noticeable in the surface 6" layer.

crust. In the writer's opinion the only harm this crust can do is to prevent or render difficult the coming through of young shoots after planting. It is certainly recommended that the crust be broken at this stage to allow young shoots through, but later on even the breaking of the crust would serve no useful purpose.

The results of this study were so directly opposed to popular belief that it was thought necessary to confirm them. Consequently the experiment was repeated in October, 1933, with exactly similar results. Since then publications from overseas have shown that identical conclusions have been reached in other parts of the world. The theory of mulching to prevent moisture losses by capillarity was supported strongly by F. H. King and E. W. Hilgard some 40 years ago. Since then Veihmeyer in California, Rohmstroff in Odessa, Call and Sewell in Kansas, and the Office of Dry Lands Agriculture in Washington have all found that the loss of moisture is practically the same from mulched as from unmulched surfaces; in some of the cases the mulched surfaces lost more moisture. The apparently contradictory results are explained as follows:—(1) It is found that where a water table exists within approximately six feet of the surface, capillarity effects, and consequently evaporation losses, are high. (2) Where the water table is below the six-feet level the effect of capillarity is not sufficient to cause large evaporation losses from the surface. In example (1) a surface mulch produced by cultivation implements would reduce the moisture loss, but in (2) the surface mulch would be useless.

Not many Queensland cane soils have a water table within the first six feet, so that scarification *for the sole purpose of conserving moisture* must be considered an uneconomical procedure.

QUEENSLAND SHOW DATES FOR 1937.

May.

Ipswich	11th to 14th
Roma	11th to 13th
Wowan—	
Show	11th and 12th
Rodeo	13th
Crow's Nest	Postponed to August
Gayndah	12th and 13th
Murgon	12th to 14th
Goomeri	18th and 19th
Mitchell	19th and 20th
Biggenden	20th and 21st
Gympie	20th to 22nd
Warrill View	22nd
Kilkivan	24th and 25th
Maryborough	25th to 27th
Charleville	25th to 27th
Gin Gin	28th and 29th
Toogoolawah	Postponed
Kalbar	29th
Childers	31st May and 1st June

June.

Bundaberg	3rd to 5th
Biloela	3rd to 5th
Lowood	4th and 5th
Boonah	9th and 10th
Gladstone Jubilee Show	10th and 11th
Marburg	18th and 19th
Rockhampton	22nd to 26th
Mackay	29th June to 1st July

July.

Kilcoy	1st and 2nd
Bowen	7th and 8th
Ayr	9th and 10th
Rosewood	9th and 10th

July—*continued.*

Pine Rivers	9th and 10th
Cleveland	9th and 10th
Townsville	13th to 15th
Nambour—	
Show	15th and 16th
Campdraft	17th
Esk	16th and 17th
Charters Towers	20th to 22nd
Laidley	21st and 22nd
Maleny	22nd and 23rd
Cairns	27th to 29th
Gatton	28th and 29th
Emerald	28th and 29th
Caboolture	30th and 31st

August.

Crow's Nest	4th and 5th
Home Hill	6th and 7th
Royal National, Brisbane	16th to 21st

September.

Imbil	3rd and 4th
Ingham	3rd and 4th
Pomona	10th and 11th
Tully	10th and 11th
Rocklea	11th
Innisfail	17th and 18th
Malanda	22nd and 23rd

October.

Ravenshoe	8th and 9th
Millaa Millaa	1st and 2nd

November.

Murwillumbah	3rd and 4th

Charcoal for Pigs.

DIGESTIVE efficiency in farm animals depends largely on their capacity for grinding the food in small fragments. Thorough mastication is therefore linked with ease of digestion. Some animals may eat food rapidly without ill-effects. Thus the domestic fowl swallows quickly, but it has a remarkable mechanism in the gizzard for grinding the food to a fine state for subsequent digestion and absorption.

The pig is not so well equipped as the fowl to handle rapidly-eaten food, yet under most farm conditions fast eating is the rule. The pig can be helped to make better use of its foods in the following ways:—

(i.) By feeding easily digested material;

(ii.) By grinding the less digestible foods;

(iii.) By ensuring the animals sufficient feeding room;

(iv.) By arranging for some open grazing where the animals may eat at their leisure;

(v.) By feeding aids to digestion.

It is the last with which this article is concerned.

Charcoal and coke are extremely cellular materials and possess a great number of surfaces. At these surfaces rapid digestion of food can take place. By feeding either of them in powdered form, coarse lumps of food become coated with a film possessing an actively digesting surface.

An alternative and cheaper method is to throw coarse charcoal or coke into the pig sty and let the animals grind and eat as they feel inclined.

DR. M. WHITE.

Passion Fruit Growing on the South Coast.

J. McG. WILLS, Fruit Branch.

[*Continued from page* 419, *April*, 1937.]

WHATEVER method of cultivation is adopted, it is essential that the surface soil be broken up thoroughly at least once each year.

Where horse or tractor-drawn implements are used it is a simple matter to maintain a high standard of cultivation. On the steeper and rough locations, as well as on land which has not been stumped, cultivation, must, of course, be done by hand.

The soil should be well broken up to a depth of at least six inches, and this is best achieved by the use of mattocks or pronged forks. Light chipping with hoes will keep surface weed growth under control, but is of little assistance in maintaining the soil in a good state of tilth. This soil condition is essential for sucessful fruit production. By maintaining a good state of tilth moisture is conserved, the land is aerated, plant food is made more readily available, natural drainage increased, and control of pests and disease greatly assisted.

Vines must be kept growing and well cultivated from the start. They will then develop rapidly and come into bearing early. Vines insufficiently cared for when young become checked and subsequent development lacks vigour and does not produce the growth necessary to carry a profitable crop of fruit, while a greater amount of time must elapse before the vines commence to bear fruit. Older vines will also be retarded during hot dry spells and unfavourable seasonal conditions if cultivation is neglected. Under such conditions, weed growth becomes a serious competitor with the vines for the available soil moisture.

During the hot dry period of the year keep the soil well worked and weed growth in control. This will assist the vines materially to withstand the dry season, the whole supply of soil moisture will be available and should be ample to satisfy the plants' requirements.

On very stony ground cultivation will probably be confined to hand-pulling the weeds and chipping any clear spaces.

Plate 174.
A vigorous young vine two months after transplanting.

Cover crops, preferably legumes—such as cowpea, Poona pea, and vetches—should be planted between the rows in ample time to provide a good surface cover before the wet season sets in; or, if cover crops are not planted then, close-growing weeds should be permitted to remain until the heavy seasonal rains have passed. Such weed growth or cover crop will prevent the washing of surface soil, while if kept in check and not permitted to seed no harm to the vines will result, for at such a time there is ample moisture to support all the plant growth. After the wet season is over and the surface is dry enough to commence cultivation, all cover crop growth should be turned under, thus providing a valuable addition of humus and enriching the soil with valuable plant food.

FERTILIZING.

To be grown successfully, the passion vine, in common with most other vigorous growing plants, requires an abundance of readily available plant food.

If grown on good virgin scrub or forest land, ample plant food should be available for the first year or two.

On poorer soils and areas which have been under bananas for several seasons, a certain quantity of fertilizer will be required to provide plant food and maintain fertility.

Wherever farmyard manure is available, this should be collected for use in the vineyard, for even in small quantities it has a beneficial effect through the addition of humus and increase of the bacterial flora in the soil.

Use per acre in accordance with the quality of the soil a mixture of—

1 to 2 cwt. nitrate of soda;
4 to 8 cwt. blood and bone manure;
1 to 2 cwt. superphosphate; and
1 to 2 cwt. sulphate of potash.

With bearing vines, the manure should be broadcast and worked well into the soil. For younger vines, it should be applied close around the plant and well worked under.

Quick-acting nitrogenous fertilizer in the spring, or after pruning, will quicken new growth in the vine. Nitrate of lime or nitrate of soda applied at the rate of 1 cwt. per acre would be suitable for the purpose. The fertilizer is best applied in two dressings during the year—one, say, in July or August, and another in December or January.

PRUNING.

It cannot be guaranteed that pruning will increase the bearing capacity of the vine, but some control of growth must be practised if the vineyard is to thrive.

The principle reasons for pruning are:—

To keep the vine in good health.

To remove diseased, dead, and unprofitable growth.

To keep the growth in check on the wires in order to admit light and air and prevent congestion.

To induce the production of healthy, vigorous wood on which high-grade fruit is set.

To replace spent, bare leaders by the development of new ones.

To keep the lateral growth clear of the ground and properly spaced.

To regulate the time of bearing so that the highest market prices are obtained for the fruit.

To assist disease control and increase the life of the vine.

If left unpruned, vines soon become a tangled mass of wood and foliage in which fungus diseases may develop and rapidly shorten the life of the vine. It is essential, therefore, that an open habit of growth, admitting plenty of light and air, is maintained. All dead and diseased wood should be cut away and burnt so as to reduce risk of brown spot infection. Healthy, vigorous leaders and laterals produce the highest-grade fruit. The shortening back of lateral growth forces the vigour of the vine into the production of sub-laterals, thereby increasing the bearing surface and keeping the growth clear of the ground.

Plate 175.

A precocious young vines six months after transplanting. Note the fruits and twin stems.

Where laterals are permitted to trail over the ground the fruit may become scarred and otherwise blemished.

Pruning is a slow and tedious job, but if done well and carefully the grower will be repaid for time expended. Patience and intelligence are essential, for each vine may present a different problem to the pruner, and if the best results are to be obtained he will need to consider carefully its individual characteristics.

There is no hard and fast method of pruning for every grower's guidance. As a general recommendation, however, all dead, diseased, and weak wood, together with spindly, unthrifty, and non-bearing laterals, should be removed from the vine. Cut out all spent, long, bare leaders to induce the growth of healthy, vigorous ones in their place. Short, spindly laterals seldom bear fruit and only increase the density of foliage. Where laterals are shortened they should be cut back to a live, well-developed bud or shoot about 9 to 12 inches from the leader. Cutting back too severely is inadvisable, and may affect the new growth and bearing capacity of the vine. Where laterals are too numerous they should be thinned out to about 9 inches apart along the leaders.

All pruning tools should be sharp and in good condition and all cuts cleanly made.

Before attempting pruning or handling of the vines in any way precautions should be taken to prevent the spread of woodiness, in accordance with the recommendations of J. H. Simmonds, Senior Plant Pathologist, given in the pamphlet referred to at the end of these notes.

To enable the pruner to sterilize his hands and pruning tools readily and systematically, he should wear an apron with two pockets. In one pocket secateurs, knife, and other necessities can be carried, and in the other a piece of cloth soaked in 5 per cent. phenol or some equally effective sterilizing agent.

As soon as the operator has finished handling one vine and before commencing work on the next hands and pruning tools should be wiped thoroughly with the disinfectant. This action is soon performed almost subconsciously as a matter of course.

The passion vine should be pruned at least once each year, although two moderate prunings are preferable to one severe cutting. Some growers prefer to prune heavily during late winter and lightly after the main summer crop has been harvested, about February. Others prefer to reverse this procedure and prune lightly during the winter. Which method is adopted depends largely on local conditions, and is a matter for growers to experiment with. In any event it should be remembered that vines should never be pruned heavily during dry weather.

For the purpose of disease control, heavy winter pruning is preferable, as spraying is recommended by Simmonds during the summer months. It naturally follows that if the vines are well thinned out and cut back during the winter a better spray cover will be possible and the task made simpler and cheaper.

Light pruning at any time of the year will cause the vine to put forth new growth, and the development of this new growth regulates the production of fruit and its maturity according to the season in which it is performed.

When a summer crop is desired light pruning should be done during July and August, before the appearance of the spring growth. This

will cause the vine to burst forth into new growth on which the summer crop will set. Pruning done at this season means, however, the sacrifice of portion of the winter crop, for harvesting will not be completed and the fruit remaining when the laterals are cut back is lost.

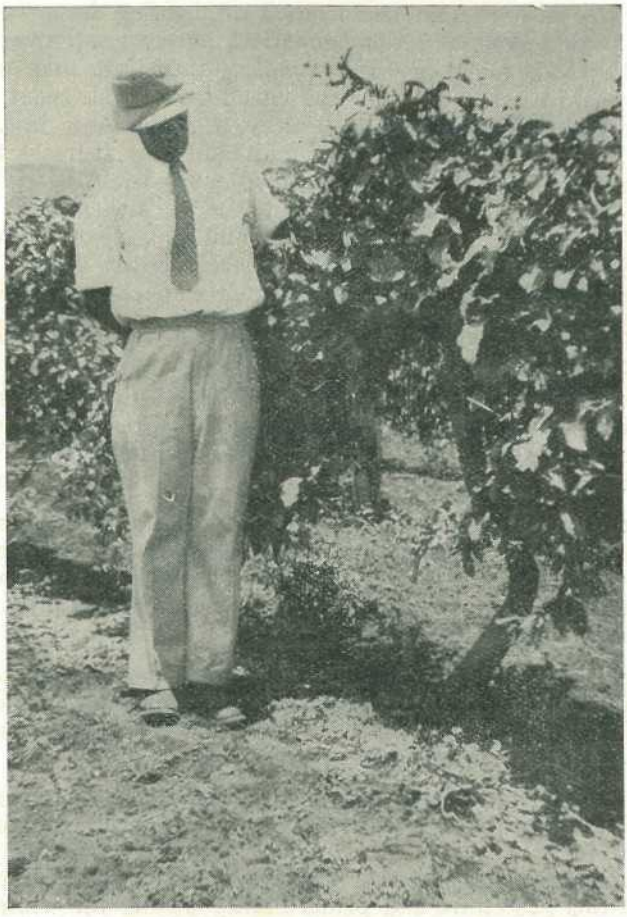


Plate 176.

A six-year-old vine two months after pruning. Note the dense growth of new fruiting laterals.

The intermediate or autumn crop is produced by shortening back the flowering laterals between October and the end of November. This action means sacrificing the bulk of the summer fruit, and is only warranted if weather conditions are favourable for an intermediate crop. A late winter crop will be produced if the flowers for the autumn crop are pruned off during February.

In warm localities the vine puts on vigorous growth much earlier than in exposed and colder parts of the district. The grower is advised to note carefully his own local conditions, and prune to suit that particular situation, as growth varies considerably between vines planted on lowlands and those in upland vineyards. Sound judgment

is an essential factor in pruning. The grower can only acquire this through practical experience and a careful observation.

REPLANTING.

As the commercially useful life of a passion vine is generally about four years, if a grower wishes to continue some provision should be made for continuity of production. This may be done by rotation and by replanting.

Under normal vineyard conditions the heaviest crops will be produced when the vines are from two to two and a-half years old, after which they gradually decline in production and quality of the fruit. In order, therefore, to keep up a supply of good-quality fruit, new vines should be coming into bearing every two years.

Young seedlings may be planted midway between the older vines, and after the summer crop has been harvested every second vine may be cut out and the new vines trained on the trellis in the vacant space. As they come into bearing the remaining older vines should then be replaced, in turn, by fresh seedlings.

Although this method gives a replanting every two years, and a fairly high grade of fruit is produced, it has the disadvantage of necessitating an increased amount of pruning and spraying, as the young vines become infected with brown spot and woodiness to a much greater degree than if planted out in a fresh area.

By rotation areas can be kept isolated from each other either by distance or natural vegetation. Young seedlings planted out do much better under this system. They are not so much exposed to infection from diseased neighbouring plants, are more vigorous in growth, and produce earlier and heavier yields.

Under rotation extra trellises and more extensive cultivation are necessary. This additional expense is offset, however, by the advantages already mentioned. Under this system, too, the land can be periodically spelled from passion vine growing, and the trellises more easily repaired or replaced as required.

Whatever method is decided on, it must be borne in mind that to obtain the maximum profits from passion fruit growing provision must be made for the setting out of new vines at regular periods to replace the older ones as their production falls in quality and quantity. Experience suggests that a two-year system of replanting or rotation is the most satisfactory. This would necessitate the planting out of young vines during the spring of every second year.

A three-year rotation or replanting could be adopted, provided the vines remain healthy, vigorous, and productive. Practice has shown, however, that either rotation or replanting must be done at a shorter period than every four years if quality and quantity production of fruit is to be maintained.

HARVESTING AND PACKING.

Harvesting, packing, and marketing is quite as important as production, and every grower should aim at presenting to buyers well-matured, properly graded, attractively packed fruit. Enhanced prices

received for well got-up fruit will justify the time and labour expended on its preparation for market.

Fruit should be gathered daily, preferably in the early morning or late evening, when the fruit is cool and is then not so likely to arrive on the market in a wrinkled or shrivelled condition. All dropped fruit should be picked up first, as a couple of hours in the hot sun is sufficient to cause severe scalding and, possibly, render the fruit unsuitable for packing.

Plate 177.
Top and lower wire system adopted on Russell Island.

The degree of maturity at which the fruit is picked from the vine is of vital importance, and judgment is required in order to obtain the right colour without the fruit being so far forward that it is likely to wrinkle. Good colour is very desirable, and during the cooler weather the fruit should be picked when it has assumed a deep purple. However, during hot weather fruit should be gathered when just a light purple shade has extended over half to three-quarters of the surface of the fruit.

When harvesting during wet weather allow the fruit to dry off thoroughly before being packed. All fruit should be carefully picked to prevent the skin being damaged. This is best achieved by grasping the fruit in the hand with the thumb and forefinger on the fruit stalk, then with a forward pressure of the thumb and a backward pressure of the forefinger, the fruit will be easily detached at a point where the fruit stalk joins the tendril just above the dead flower.

The picked fruit should be placed—not dropped—into the picking boxes or tins, which should be placed on the ground or slung on the

body. These, when filled and until despatched, should be kept as cool as possible and sheltered from high winds.

Bordeaux spray can be removed by immersing the fruit in a weak solution of hydrochloric acid for one and a-half to two minutes, afterwards washing off with fresh water and being allowed to drain before packing.

Passion fruit forwarded to the fresh fruit market should be packed in half-bushel dump cases, and full instructions for packing the different grades are contained in an illustrated booklet which may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Fruit intended for factory use need not be packed in cases, but may be forwarded to the canneries in sugar bags or similar containers.

DISEASES AND PESTS.

The passion vine does not usually suffer from any serious attack by insect pests. Spotting of the fruit results from the feeding activities of some minor sap-sucking insects, but little damage is done beyond a slight blemish of the outer skin. As the pulp is not affected the fruit is not harmed. Fruit flies have been known to attack the fruit in its green stage. The eggs, however, do not mature, but the skin surrounding the puncture becomes hard and detracts somewhat from the appearance of the matured fruit.

Fungus diseases such as brown spot and a virus disease known as woodiness or bullet, to which the passion vine is very susceptible, are the main causes for the premature failure in many vineyards. Powdery spot is a minor fungus disease which attacks the terminal growths and fruit during the cooler months of the year. Its attack is more serious on vines up to eighteen months old, since the proportion of the plant affected is then relatively greater.

Brown spot is the most troublesome disease affecting the vine. It attacks leaves, stem, runners, and fruit, causing considerable damage, and if neglected will result in the death of the vine within two years. Young vines are not so seriously attacked as older ones, as the more open growth admits light and air and permits most of the affected leaves to fall to the ground, carrying the fungal spores with them.

The recommended control for brown spot and powdery spot is to spray thoroughly with Bordeaux mixture of 4-4-40 strength. It must be remembered, however, that it is useless to spray a vine which has been allowed to become a tangled mass of runners and foliage. Correct pruning is a necessary practice in the control of these fungus diseases.

Woodiness is a serious virus disease, and growers are advised to exercise every care in an effort to prevent its spread. The following quotation from Simmonds summarises the precautions necessary for its control:—

> "Careful examinations of the plantation should be made towards the end of the winter, when woodiness will be showing up, and any plants exhibiting symptoms of this disease should be cut off at base so that the vine will have died and dried out before pruning time. Should a plant that has been missed be

met when pruning, the knife and hands, if used on a diseased vine should be washed well in methylated spirits or soapy water before passing on to a healthy plant."

J. H. Simmonds, M.Sc., Senior Plant Pathologist, has dealt with these diseases in a pamphlet, "Passion Vine Diseases," copies of which may be obtained on application to the Department of Agriculture and Stock, Brisbane.

[CONCLUDED.]

The Orphan Tree.

Many failures are noted where replacements are made in a bearing deciduous fruit orchard. Frequently, the young tree remains like an unwanted orphan and shows only stunted growth. If it is to catch up to the other trees and fill in an unsightly and unprofitable blank space in the orchard, careful attention must be given to all details in its management.

The main causes of failure are:—

1. The lack of natural plant food for the young tree.

2. If the old replaced tree died from the attacks of some particular diseases, the replant may be attacked in turn and suffer an initial setback.

3. Searching roots of adjacent trees may compete successfully with those of the young tree for the available plant food.

4. Lack of attention.

When digging out the unhealthy tree carefully remove and burn all the roots together with the tree. Leave the hole open and exposed throughout the winter, and just prior to planting in spring fill with a load of virgin soil to which may be added some well rotted animal manure. Virgin soil is obviously richer in plant nutriants than soil which has been cropped exhaustively for some considerable time.

The young tree is very often forgotten and does not get the necessary attention at the right time. Weed growth may tend to choke it, but this difficulty can be simply overcome by the use of an old fertilizer bag. The bag is opened out and, after making a cut in the middle, is slipped over the young tree. This makes an excellent mulch which keeps down weed growth in the vicinity of the tree and conserves the moisture so necessary for its progress.

A. M. RICHARDSON, Inspector, Diseases in Plants.

The Sugar Banana.

The sugar banana has been a profitable proposition for many years past on all the "bunch" trade markets in Queensland. Small, sweet and delicately flavoured, this fruit claims many staunch supporters.

For the production of this banana deep, warm alluvial flats, favoured with a generous rainfall or watered by irrigation, are most suitable. As with other varieties good drainage is essential. As the sugar banana possesses a slender stem, damage by wind must be guarded against, and where there is no permanent wind-break it is worth while establishing one at the time of planting. For this purpose double border rows of lady fingers or sugar banana plants may be planted 7 feet apart in the row and 7 feet between the rows. The spacings in the inner row should actually lie between the spacings in the outside row, i.e., planted according to septuple system. These two rows close quickly in towards each other and rapidly form an effective wind-break. Of course, the planting of a permanent wind-break of suitable trees would be far more valuable on account of their permanency, provided the cultivated area is reconditioned from time to time.

Prior to planting, the soil should be worked to a depth of at least 12 inches and reduced to as fine a tilth as possible. The holes for the young plants in the plantation area should be 14 feet apart, 15 inches deep, and 18 inches square. The rows should be lined out as straight as possible each way, thus allowing the greatest convenience in working horse-drawn cultivating implements.

Opinions differ somewhat in the matter of selection of planting material, but generally a vigorous young sucker about 4 feet high dug from a matured stool is most favoured. The top portion of the sucker should be removed, leaving a plant of 3 feet in height to place in the hole. The plant is placed in position within the hole and sufficient surface soil placed in around it to fill approximately two-thirds of the actual cavity. The rest of the cavity is filled in gradually, as the ground is culivated during the ensuing year. According to the quality of the soil one or two followers are allowed to come away, and, normally, the first bunches will be harvested seventeen or eighteen months after planting.

Farmyard manure applied judiciously to sugar banana plantations will repay the grower handsomely. Light horse-drawn implements are satisfactory for cultivating, and green crops, such as Poona and field peas, are excellent soil invigorators, provided they can be turned back into the soil at the correct time, i.e., when still very soft and succulent.

As the sugar banana is usually marketed in the bunch and the fruit possesses a thin, delicate skin special care in handling is necessary in order to obtain the best market returns.

E. P. WILLIAMS, Fruit Branch.

Water Blister in Pineapples.

Following on the recent rains numerous complaints have been made regarding the prevalence of water blister in pineapples arriving on the Southern markets.

Water blister infections occur only through freshly exposed tissue. Moreover, cuts, injuries, or skin cracks may become infected only so long as they remain moist. Consequently, water blister infections occur almost solely during picking and packing operations. In seasons of normal rainfall distribution infections take place chiefly through the cut or broken stem end, since—in fruit which has received careful

handling—exposed tissue is to be found only at this point. Such infections are classed as "stem end infections" in contrast to "side infections," which occur through breaks in the skin of the fruit caused by (*a*) careless handling or (*b*) climatic influences.

Stem end infections may be entirely prevented by strict adherence to the recommendations, which have been repeatedly given regarding plantation and packing-shed hygiene and the use of benzoic acid-kaolin powder. Growers are all doubtless familiar with these recommendations. However, side infections are more difficult to deal with. Apart from injuries resulting from careless handling, breaks in the skin of the fruit may occur in consequence of unfavourable climatic conditions during fruit development. A protracted period of dry weather while the fruit is developing results in it becoming "skin bound" as it approaches maturity. Should heavy rains occur at or about the time the fruit is ripening a rapid swelling of the tissues takes place, leading to the development of cracks and fissures in the tightly bound skin, particularly between the individual fruitlets or "eyes." Such growth cracks provide ideal points of entry for the water blister fungus, and side infections of this type have probably been chiefly responsible for the recent heavy losses on interstate consignments.

Obviously, side infections cannot be controlled by the benzoic acid-kaolin treatment recommended for the prevention of stem end infections, but losses from sided infections may be greatly minimised if not entirely avoided if the following additional precautions are closely observed at times when stem cracks are likely to occur:—

(1) When packing for distant markets discard all fruit showing abrasions or recent growth cracks, the presence of which is usually indicated by exuding juices. Ordinarily, such fruits are quite suitable for cannery purposes if processed without delay, or they may be disposed of through any local outlet which will permit them to pass into consumption quickly.

(2) Avoid packing fruit while still wet from rain or dew, and use only packing material which is thoroughly dry.

(3) Practise strict sanitation, both in the field and in the packing-shed. Tops and damaged or diseased fruit should not be left to decay in the plantation or thrown into a heap near the packing-shed, but should either be buried or removed to low-lying waste land where they are not likely to prove a source of infection.

(4) Spray the benches, walls, and floor of the packing shed with 5 per cent. formalin solution at weekly intervals throughout the summer crop.

H. K. LEWCOCK, Pineapple Research Officer.

Papaw Renovations and Planting.

The tops of many papaw trees, which suffered severely from the dry conditions prevailing during last year, died back and the plants are now making lateral regrowth from the stem. Properly handled, they may still be profitably worked for another year or two. A large number of side shoots will have developed from buds low down on the trees. Three or four of these should be selected and allowed to form a nicely balanced tree. The unwanted shoots should be cleanly cut off close to the trunk with a sharp knife.

The dry withered tops should be cut back to a solid partition or node, and covered with tins to prevent the entry of moisture into the hollow trunk. Otherwise, core rots may develop and ultimately extend right down to the base of the trees.

Where young papaws are to be planted, ample organic matter should first be worked into the soil. This is particularly necessary in forest soils, which may have been previously under papaws or other fruits for some years. Good dressings of fertilizer are also desirable, and the following mixture can be applied per acre:—1 cwt. nitrate of soda; 2 cwt. bone dust or Nauru phosphate; 1 cwt. superphosphate; 1 cwt. sulphate of potash; or 1 to 2 lb. per tree.

Where young seedlings are being planted it is advisable to place two or three plants in the one hole. Any male or unwanted tree which may grow can then be dug out after the plants flower, leaving only one female plant to each hole. A distance of 8 feet by 8 feet should be left between the plants so that there will be ample room for good development.

Only shallow working implements should be used amongst papaws to destroy weeds and grass growth. Deep working may injure the root system, which will retard the growth of the tree and affect the production of fruit.

E. F. DUFFY, Instructor in Fruit Culture.

Woodiness in Passion Vines.

The disease known to growers as woodiness or bullet is probably the most important trouble in passion vines. As it assumes greater proportions during the cooler months of the year, passion fruit growers are recommended to keep a strict lookout for symptoms of this disease if they wish to keep infection down to a minimum.

Woodiness is due to the action of an ultra-microscopic virus present in the sap of the diseased plants. It affects the terminal shoots, leaves, and fruit. Many growers have great difficulty in detecting diseased vines, as the foliage symptoms are rather obscure, and oftentimes recognition comes only with malformation of the fruit.

The younger leaves on diseased vines are usually crinkled and puckered in contrast to the smoothness of the leaves on healthy vines.

On leaves produced in winter the lobes may be drawn out into narrow, elongated, irregular shapes, and on close examination a faint light-green mottling may be seen. Badly diseased vines have a stunted and unthrifty appearance; the fruits are lumpy and misshapen, with thick hard rind, small fruit cavity, and very little pulp.

It is possible to spread this disease from infected vines to healthy ones during pruning, harvesting, &c., by transferring the sap from one plant to another on the hands or pruning tools, unless adequate preventive measures are adopted.

An inspection of the vineyard should be made at regular intervals, and about one week before pruning is commenced each vine should be carefully gone over, and any vine suspected of being diseased should be cut off at ground level, or pulled out of the ground, care being

taken not to disturb the aerial growth on the trellis. Then by the time pruning begins the diseased vines should be dry enough to remove without any risk of transferring the sap and so infecting neighbouring vines with which they may be entangled.

After handling a diseased vine and prior to commencing work on a healthy vine the hands, pruning tools, &c., should be freed from the virus by washing them in soapy water.

As an added precaution this act should be performed at all times when working among the vines, as soon as work on one vine has been finished and before proceeding to the next. This is advisable since, owing to the possibility of recent infection and the symptoms not being very pronounced, a diseased vine may escape the operator's notice.

The wild white passion flower is very subject to woodiness, and the symptoms are more easily recognised in this variety than in the purple passion fruit.

It has been noted that a large proportion of the wild plants are infected, thus forming a source from which the disease can spread to healthy vines in the vineyard probably per medium of the feeding activities of insects. Therefore the necessity for destroying all vines of this wild variety growing in the vicinity of the vineyard will be readily understood.

J. McG. WILLS, Fruit Branch.

IS BUTTON GRASS POISONOUS TO SHEEP?

Button grass is one of the best known and most widely spread grasses in Western Queensland. It comes away freely after the summer rains and soon dies off, but, like Flinders grass, is readily eaten by stock in the dried stage.

Recently this grass has come under suspicion as the cause of sheep-poisoning. The animals were yarded overnight preparatory to dagging. The sheep left untreated on the following day were then allowed the use of three small yards and a pocket with access to water. Early next day more than half were dead.

The stomach contents of two of the sheep were examined, and consisted almost entirely of leaves, stalks, and seed-heads of button grass. The sheep had fallen without any sign of struggle, most of them close to the water. The cause of death was uncertain, but it appeared that a large feed of fresh green button grass, plus a heavy drink of water, caused the sheep to bloat and die. They were, of course, quite empty when turned into the grazing yards.

A few years ago button grass was suspected of causing the loss of a number of rams untrucked after a train journey in the Richmond district. It has also been reported from Jundah that some sheep penned overnight in a yard that had not been used for many months, and in which there was a green and luxuriant growth of button grass, showed symptoms of poisoning next morning. Most of them recovered, but a few died.

Repeated tests of button grass for a prussic-acid-yielding glucoside have always given negative results, but in view of these records it would appear unwise to turn hungry sheep on to fresh button grass.

The symptoms do not, in all cases, point to bloat, and it must also be remembered that some grasses very closely allied to button grass are known definitely to be highly poisonous.

C. T. WHITE, Government Botanist.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

MARKET conditions during April were normal. Supplies of grapes and apples from Stanthorpe were considerably reduced. The quality of Granite Belt grapes this season has been excellent. Bananas have dropped off in quantity and quality, as a consequence of the dry weather during the period of development. At the present time consignments are not quite equal to demand so values should remain firm. Market prices for the month:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish—Sixes, 8s. 6d. to 13s.; sevens, 8s. 6d. to 15s. 3d.; eights and nines, 11s. to 15s. Lady Fingers, 3d. to 8½d. doz.; Sugars, 4d. to 7d.

Melbourne.—Sixes, 13s. to 14s.; sevens, 15s. to 16s.; eights and nines, 17s. to 18s.

The first consignments of fruit packed in bushel cases were sent to Melbourne on 30th April.

Sydney.—Cavendish—Sixes, 14s. to 17s.; sevens, 17s. to 19s.; eights and nines, 19s. to 21s.

For the present the cluster pack is not advised for use. Information is being given to Southern retailers with a view to its future adoption.

Pineapples.

Brisbane.—Smoothleaf, 4s. 6d. to 9s. per case, 1s. to 6s. per dozen loose; Ripleys, 7s. to 9s. per case, 4s. to 7s. per dozen loose.

Melbourne.—10s. to 15s. per case. Green fruit unsaleable.

Sydney.—8s. to 15s. per case.

With cooler weather the fruit should be permitted to advance to a riper stage than in summer.

Papaws.

Brisbane.—Yarwun, 8s. to 10s. a tropical case; local, 4s. to 6s. a bushel case; Gunalda, 6s. 6d. to 7s. 6d. a bushel case.

Melbourne.—12s. to 18s. a tropical case.

Sydney.—10s. to 15s. a tropical case.

Avocados.

Supplies of this fruit were received on the Brisbane market from the North. The quality was excellent, but an improvement could be made in the packing. Growers are advised not to send consignments to arrive on holiday week-ends, for to clear the fruit greatly reduced prices have to be taken.

Brisbane.—5s. to 9s. a half-bushel case.

Sydney.—12s. to 14s. a half-bushel case.

Melbourne.—12s. to 15s. a half-bushel case.

Granadillas.

Some good quality fruit from Magnetic Island was inspected. This fruit was harvested slightly too soon. The best indication of maturity is when the flower end of the fruit changes slightly in colour. There is a good demand for good quality granadillas, prices up to 10s. per case for best quality fruit being realised.

Custard Apples.

Heavier supplies are now coming on the market, with a consequent easing of prices.

Brisbane.—2s. 6d. to 3s. 6d. a half-bushel case.

Sydney.—4s. 6d. to 5s. 6d. a half-bushel case.

Melbourne.—3s. to 5s. a half-bushel case.

Immature fruit is unsaleable on the Southern markets, as it turns black and hard in appearance.

CITRUS FRUITS.

The supply of oranges has been irregular, with prices unsteady. The poor primary crops, due to the drought, have no doubt been the cause of the irregularity.

Brisbane.—Commons—Gayndah, 11s. to 13s.; Howard, 8s. to 11s.; locals, 8s. to 10s. Navels—Gayndah, 11s. to 14s.; locals, 10s. to 12s.

Melbourne.—Queensland Navels, 10s. to 18s.

Sydney.—Local Valencias, 5s. to 10s. Mandarins.—*Brisbane.*—Glens—Gayndah, 15s. to 17s.; locals, 9s. to 11s. Fewtrells, 8s. to 9s.; Emperors, 8s. to 11s.; Scarlets, 9s. to 10s.

Melbourne.—12s. to 16s.

Sydney.—10s. to 12s.

Lemons.—Gayndah Specials, 13s. to 16s.; standards, 12s. to 13s.; locals, 8s. to 11s.

Sydney.—Lemons, 14s. to 16s.

Grape Fruit.

Brisbane.—7s. to 9s.

Sydney.—6s. to 10s.; cured to 15s.

Melbourne.—10s. to 14s.; a few specials higher.

Passion Fruit.

Brisbane.—First grade, 9s. to 10s., Specials to 10s. 6d.; second grade, 5s. to 7s.

Some nicely packed lines of this fruit are now on the market, and, as the prices show, are definitely reaping the benefit of the care taken.

DECIDUOUS FRUITS.

The grape season is now practically closed in so far as Stanthorpe is concerned. Experiments in obtaining a suitable packing filler for cold storing grapes have been successful. A sawdust has now been obtained which, after processing, is free from dust and taint and comparing favourably with cork.

Prices.—Waltham Cross, 6s. to 8s. per half-bushel case; Purple Cornichon, 7s. to 9s.; Muscatels, 3s. to 5s.; Ohanez, 5s. to 6s.

Apples.

Some excellent Granny Smiths and Jonathans have been seen on the market.

Prices.—Granny Smith, 7s. to 9s.; Jonathan, 6s. to 7s.; King David, 5s. to 7s.

Pears.

Excellent quality Winter Coles have been obtainable, ripening perfectly; other varieties show better quality than usual.

Prices.—Parkham's Triumph, 6s. to 8s.; Winter Nelis, 7s. to 8s.; Winter Cole, 7s. to 10s.

Persimmons.

Good quality fruit is saleable; small undersigned fruit is not wanted.

Prices.—5s. 6d. to 6s.

Tomatoes.

Good packing is still a great factor in effecting sales.

Prices.—Ripe, 3s. to 6s.; local green, 3s. to 6s. Stanthorpe and New South Wales, 7s. to 8s.; Specials higher.

Vegetables.

Beans, 5s. to 7s. a sugar bag; peas, 6s. to 9s. a sugar bag; lettuce, 6d. to 1s. a dozen. Greatly improved packing methods have added to the quality of lettuce now obtainable. A leaflet showing how the packing is done is obtainable, on request, from the Under Secretary, Department of Agriculture and Stock, Brisbane.

LEAF SCALD OF PINEAPPLES.

During the autumn, young pineapple plants frequently suffer considerable disfigurement from a conspicuous disease known as leaf scald. The disease derives its name from the fact that on drying out, affected tissues commonly take on a bleached or scalded appearance to produce large elongated whitish or straw-coloured spots which sometimes extend right across the leaves. The spots may be found in almost any pineapple field during the autumn months, and at times they become exceedingly numerous. They are usually most prevalent on vigorous young plants which have made rapid growth since planting. The disease is rarely found on hard-leaved stunted plants.

The spots vary considerably as regards size, shape, and colour. Many are large and white, and are noticeable from a long distance, while others may be small and inconspicuous. Typically the spots are characterised by an elongated straw-coloured central area surrounded by a dark margin. The typical light colour of the spots makes its appearance only on leaves that are exposed to sunlight. Spots developing in the shade are usually blotched or streaked with brown.

The parasitic agent responsible for leaf scald is probably the same fungus which causes soft rot (water blister) of pineapple fruits and base rot of newly-planted suckers or slips. It attacks the leaf-tissues through abrasions made by the sharp edges and serrated tips of neighbouring leaves. The extent to which the leaf tissues may be attacked and, consequently, the size of the spots which subsequently develop, is determined largely by weather conditions. Muggy, showery, or cloudy weather favours the development of the disease, while dry sunny conditions have the opposite effect. When plants are well shaded, whole leaves may sometimes be destroyed. The disease is purely a seasonal one, and rarely occurs after the middle of May.

Owing to the rapidity with which the spots may develop under favourable conditions, growers not infrequently become greatly alarmed by the occurrence of this disease in their young plantations. However, it should be remembered that the injury to any individual plant is comparatively slight, and does not warrant special measures for its prevention.

Except in the case of an exceptionally severe attack of leaf scald, it is unlikely that the vitality of affected plants will be appreciably impaired.

Some Fodders, Pasture and other Plants Reputedly Poisonous to Stock—Symptoms and Suggested Treatment.

CONSIDERABLE correspondence has in the past been handled by the Department of Agriculture and Stock relative to livestock poisoning due in many instances to the consumption of certain fodder plants and grasses which, whilst valuable as fodder, are, under certain conditions, apt to cause digestive and other troubles.

The droughty conditions which obtained during the 1936-37 period were responsible for increased attention to this subject, and numerous enquiries were made in connection therewith, whilst a request was received from a certain farmers' organisation that a publication be prepared for the use of farmers and stockowners in which a list of fodders and pasture plants known to possess certain deleterious characteristics, together with the antidotes and treatment suggested for such, be given. In this connection the combined services of the Veterinary, Chemical, Stock Foods, Botanical, and Agricultural Branches were enlisted, and the following information compiled for the benefit of all stockowners.

PLANTS CAUSING PRUSSIC ACID POISONING.

Perhaps the most important of the fodders likely to cause trouble to stock are those belonging to the sorghum family, which includes—

Sudan grass
Johnson grass
Wild sorghum (*Sorghum verticilliflorum*)
Saccharine sorghums—
- Imphee or Planters' Friend
- Saccaline
- Orange cane
- Amber cane
- Early orange
- Black sorghum
- Honey sorgho

Grain sorghums—
- Kaffir corn (red and white)
- Feterita
- Milo

Broom corn (broom millet)

and any other sorghum, all of which, irrespective of name, contain prussic-acid-yielding glucosides in their young stages. However, the amount diminishes with the degree of maturity of the plant. Whilst under normal climatic conditions a certain tolerance is enjoyed by stock, dry periods are frequently responsible for attention being drawn to the risks incurred by injudicious grazing management.

Although not now extensively grown, the old variety of sorghum known as Black Sorghum (*Sorghum nigrum*) was responsible for considerable trouble, but the risk of poisoning has been greatly reduced by the introduction of varieties such as Imphee or Planters' Friend, Amber Cane, Early Orange, and Saccaline.

The popularity that has been attained by Sudan grass is no doubt due to its many good qualities, including its suitability under normal conditions to grazing without any extensive troubles arising from the practice.

Under droughty conditions the performance of sorghums and Sudan grass is apt to become uncertain, and in cases where cattle have been grazing for a long period without ill-effects fatalities have occurred and have invariably been associated with plant immaturity and the presence of hydrocyanic acid (prussic acid) yielding glucosides.

The similarity of Sudan grass to Johnson grass is, in many instances, responsible for the inclusion of the latter in a crop of the former, resulting in more or less hybridisation and subsequent danger to stock if seed from such should be permitted to germinate and a crop therefrom subsequently eventuate. Johnson grass yields prussic acid to a much greater extent than Sudan grass and therefore is so much more dangerous. Due to the ease with which members of the sorghum family hybridise or cross-fertilise, the greatest of care should be exercised in the selection of seed, taking into consideration the possibility of such hybridisation.

Generally speaking, it is safe to say that members of the usually accepted fodder sorghums are quite suitable to feed once the plant has reached the flowering stage, but even under these conditions cattle should not be given access to a growing crop if in a starved or empty condition. Allowing the plants to wilt after cutting renders them safer to feed, and, further, prevents animals that are ravenous from eating too fast and too much—a frequent cause of trouble.

Broom Millet, also a member of the sorghum family, although not generally classed as a fodder, is sometimes utilised for grazing and is possessed of the same disabilities as other sorghums in regard to the danger of its indiscriminate use as fodder.

Johnson grass (*Sorghum halepense*) is a robust perennial grass three to five feet high, its chief characteristic being the possession of numerous well-developed white underground stems or runners. Pieces of these runners are capable of developing into fresh plants. The spikelets or seeds are barely a quarter of an inch long and are densely covered with silky hairs. The commercial seed, however, owing to the threshing process, does not carry these characteristics.

Wild Sorghum (*Sorghum verticilliflorum*) is common in Queensland and is probably more abundant than Johnson grass, with which it is often confused. It is a taller, more robust grass than Johnson grass, growing 6 to 8 feet high. The leaves and stems are often stained a purplish red. It does not produce runners as does Johnson grass. The spikelets or seeds are a quarter of an inch long and covered with silky hairs.

Several other common plants may be responsible for prussic acid poisoning of stock. The plants referred to are as follows:—

Frost-resistant Rhodes grass, winter-growing Rhodes grass, or evergreen Rhodes grass (*Chloris distichophylla*).—This grass, which is a

native of South America, has been of recent years sold as a fodder grass. It is characterised by its heavy broad leaves and a large number of spikes in the seedhead. These latter number from forty to fifty, and the brown spikelets or seeds are covered with fine silky hairs.

Guinea grass (*Panicum maximum*).—Guinea grass, which is a native of tropical Africa, is now widely spread over eastern Queensland, and contains prussic-acid-yielding glucosides in small quantities, though no definite case of poisoning has been noted. It is a robust, tall grass with rather broad leaves and showy, wide-spreading seedheads. It is not cultivated to a great extent in Queensland, but is nevertheless fairly common.

Birdsfoot Trefoil (*Lotus corniculatus*).—This is a rather small legume with yellow flowers. It is characterised by having, in addition to the three leaflets of the ordinary clover, two extra leaflets at the base of the leaf stalk. The flowers, which resemble miniature pea flowers, are born in small heads at the end of a slender flower stalk. The flowers are followed by round pods an inch or so in length. This legume is occasionally sown in Queensland for grazing purposes.

SYMPTOMS AND TREATMENT.

The poisonous principle derived from the above mentioned plants is hydrocyanic acid (prussic acid). The symptoms and treatment of prussic acid poisoning are as follows:—

Acute Cases.

Prussic acid being such a rapidly fatal poison if taken in sufficiently large quantity, there are few or no visible symptoms to describe, but where sudden deaths occur for no apparent reason among healthy animals, prussic acid poisoning should be suspected. The post mortem examination of an animal immediately after death has occurred shows congestion of the lungs, fluid, black, and oily blood, the cavities of the heart contain bubbles of gas, and all parts of the corpse have a faint smell of bitter almonds. There may also be varying degrees of inflammation of the stomach and intestines.

Subacute Cases.

These cases occur when the animals concerned have not taken sufficient quantity of the plant to cause instant death. There is usually a period of excitement with great salivation, quick pulse and breathing, then the abdomen becomes enlarged due to the formation of gas in the paunch (in cattle) followed by diarrhoea. Later, convulsive spasms occur with dizziness and staggering and gradually paralysis, leading to loss of consciousness and death.

Treatment.

Keep the animal as quiet and warm as possible by covering with rugs in a dry stall, and, if possible, remove the poison from the stomach by passing the stomach tube. The best treatment, and for which the drugs should always be kept on hand, is the administration of a drench of ferrous hydrate which must be freshly made by mixing carbonate of soda (washing soda) and sulphate of iron. The mixture is made by dissolving one ounce of washing soda in one pint of water, dissolving half-an-ounce of sulphate of iron in a separate pint of water, and then

mixing the two together. This quantity should be sufficient for a cow, and about half a pint for a sheep. If drenching cannot be done it is advisable to pour the mixture into the paunch of the cow through a canula, inserted as for bloat, a hand's breadth forward of the hip bone behind the last rib on the near side.

Sulphate of iron may be bought for about 3d. per lb., and washing soda for slightly less. A few pounds of each kept on hand for emergencies might obviate a serious loss.

Molasses, diluted sufficiently for drenching, has also been recommended by various people, a quart being considered sufficient for a cow.

PASPALUM ERGOT POISONING.

Following widespread outbreaks of ergot disease in the common paspalum grass in the 1935-36 and 1936-37 growing seasons, numerous cases of stock poisoning as a result of infected seedheads being eaten were experienced. The trouble is likely to recur in paspalum-growing districts in seasons favourable to the development of the fungus causing the disease in the seedheads. Paspalum is a densely tufted grass with broad green leaves and two to seven spikes of seed at the top of each seed stalk. The poisonous substance is present in the fungus on the seedheads.

Symptoms.

It will be noticed in dairy cows that milk production suddenly drops, and the affected animal loses condition rapidly, and though it will move about and graze to a certain extent, its movements are those of a sick beast reluctant to move. Some disturbance of the digestive system is present, usually impaction, but scouring may be seen. No marked fever with increase of temperature, pulse, and respiration is manifested.

Typical lesions are noticed on the muzzle and teats, which become red and sensitive, and gradually the skin of these parts becomes cracked and peels off, leaving a raw exposed surface. A discharge from the eyes and nose is usually present, and the animal may show varying degrees of lameness, from slight stiffness to staggering of hind limbs, with sometimes muscular twitchings and shivering.

Contrary to popular belief, abortion in cattle is uncommon in the disease as manifested in Queensland.

Treatment.

This must be applied in the early stage if loss of milk production is to be avoided. Drench at once with any purgative in order to get rid of the offending matter. A mixture which has been found useful is 1 lb. of Epsom salts and 1½ oz. of ginger dissolved in a quart of warm water. If recovery is slow a tonic should be given as:—

Ferri. Sulph. Exsic.	2 drachms.
Pulv. Nux. Vom.	1 drachm.
Mag. Sulph.	2 ounces.
Pulv. Gentian	2 drachms.

Give one powder night and morning in treacle for three days.

Vaseline or any soothing ointment should be applied to the sore teats.

To prevent the trouble, the affected grass should be mowed and burned where practicable, and arrange to graze on fodder crops during the dangerous stage (late summer and early autumn). Adopt any method of management which will prevent the animals from eating the affected pasture.

POISONING BY POTATO TOPS.

The feeding of tops of the English potato to stock often results in poisoning. The poisonous principles are the alkaloids solanine and solanidine.

Symptoms.

Gradual and progressive sleepiness followed by coma with eyes staring and glassy.

Treatment.

Keep the animal as warm as possible by covering the body with a rug and attempt to rouse the animal by douching the head with cold water, slapping, shouting, &c.

Give stimulants such as brandy, whisky, ammonia, and follow with a purgative.

PHOTOSENSITISATION CAUSED BY CLOVERS.

Various clovers may produce a condition known as photosensitisation. Probably the worst offender is the Burr Trefoil (*Medicago denticulata*) commonly known as Burr Clover, an annual plant very abundant in Queensland during late winter and spring. The leaves are borne in three's at the end of a common leaf stalk and are toothed at their margins. The flowers are yellow and borne in small heads at the end of a flower stalk. The small flowers are followed by twisted, spiral pods armed with numerous spines with a minute hook at the end. The burrs or pods cling to clothing, the hair of animals, &c.

Symptoms.

Intense irritation of exposed skin or nonpigmented skin, i.e., skin covered by white hair. Swelling of such areas accompanied by a watery exudation and sloughing of skin.

Treatment.

Place affected animals out of direct sun's rays. Cover susceptible parts of animal with a mixture of crude oil (waste engine oil) and blacking as a protection against the sun.

HOVEN OR BLOAT.

A number of fodder plants, particularly the clovers and lucerne, are capable of causing hoven or bloat of ruminants, when succulent green material is ingested in fairly large quantity.

Symptoms.

Great distress. Suppression of rumination. Acute abdominal swelling of a tense and drum-like nature, particularly between the last rib and thigh. Breathing accelerated and laboured. Nostrils distended. Eyes staring.

Treatment.

Mild cases.—Exercise, with massage and kneading of the left side. If animal can swallow give one ounce of turpentine oil in one pint of raw linseed oil.

Severe cases.—Release pressure by passing a trocar and canula into rumen (paunch). Position of entrance of trocar and canula is in triangle between last rib, backbone, and first part of pelvis. It is necessary to secure the animal firmly before operation. The oil drench, as given above, or a mixture containing either a teaspoonful of lysol or Condy's crystals in a quart of warm water, is then poured into the rumen through the canula after the trocar has been withdrawn.

AUTUMN SPRAYING FOR CITRUS IN COSTAL AREAS.

Citrus growers in the coastal belt should now be making preparations for the autumn spraying against scale insects. Owing to adverse weather conditions little or no spraying was attempted in the spring. As a result infestation by scales in this region is more severe at present than would have been the case had the normal programme of scalicide application been carried out.

Pink wax scale is, of course, the dominant species. White wax is of importance in some orchards, while severe infestations of mussel scale have been observed on several occasions. As the lastnamed scale occurs on the fruit as well as on the leaves and woody parts of the tree its removal at this stage is particularly desirable.

The correct time for spray application is extremely important. Generally speaking, sprays should be directed against the young stages of the scales. The time will usually be determined by the behaviour of the dominant species, usually pink wax scale. With this insect sprays are best applied under normal conditions when the average young scale is about the size of a pin's head. Hatching is then reasonably complete, and further migration of young scales into the orchard from outside breeding sites is unlikely. Occasionally a protracted hatching occurs, and it may be necessary to delay spraying until a considerable number of the young scales are appreciably larger than a pin's head. Under no circumstances, however, should spraying be delayed until any significant percentage is twice that size.

If control operations are being directed against either of the two other species the time when the greatest number of young are present should be noted. Mussel scale breeds practically continuously and white wax scale has a rather protracted breeding period.

The resin-caustic-soda-fish oil spray is most useful at this time of the year. It is the only spray which gives satisfactory results against young pink wax scales appreciably larger than a pin's head or against well-grown mussel scale. Consequently it is the most efficient spray to use against pink wax scales when spraying has been delayed, either by protracted breeding or unsuitable weather conditions. It is also valuable when the control of both pink wax and mussel scales is required, as the optimum time for the control of these two species may not exactly coincide.

An oil-soap, soda spray may sometimes be used with advantage against pink wax scale associated with a light infestation of mussel scale. It is not as efficient as the resin-caustic-soda-fish oil against the latter scale, but it is much better than straight oil, which cannot be recommended unless young are present to the practical exclusion of other stages—a rather unlikely occurrence for this species. Of course, if pink wax is unaccompanied by any other species, and the hatching has been fairly even, soap-soda sprays alone may be used if applied at exactly the right time.

Excluding lemons, bearing trees which are carrying a considerable infestation of red scale will always be found to be in a poor state of health. They should receive cultural attention at once, for vigorously-growing trees do not normally suffer severely from the pest. If artificial control is necessary it should be established at this time of the year by the use of straight oil.

Are Our Seasons Changing?

N. J. KING.*

THE above question, frequently discussed amongst growers and others, influenced the writer to enquire into records for the Bundaberg area, with a view to finding an answer. Much of the credit for the large crops cut off the Woongarra and other soils in the early years of cane-farming is given to the favourable rainfall conditions then allegedly existing in the district.

It was found that rainfall figures from January, 1883, were available, and these are given in monthly precipitations from that date to December, 1935.

RAINFALL AT BUNDABERG POST OFFICE.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1883	752	461	126	128	307	0	29	109	30	352	24	191	2,509
1884	317	553	502	182	492	161	201	9	12	124	1,048	230	3,831
1885	237	288	343	46	194	595	4	38	515	48	119	490	2,917
1886	690	608	101	271	211	682	381	181	401	300	493	1,084	5,393
1887	706	1,152	1,336	674	42	29	527	512	440	64	611	371	6,464
1888	184	1,965	36	139	89	133	0	50	13	141	194	516	3,460
1889	77	224	783	891	398	58	757	247	179	76	545	561	4,796
1890	797	468	1,398	263	447	188	190	45	181	123	250	372	4,722
1891	774	72	249	389	367	1,331	152	297	126	217	311	795	5,080
1892	727	11	1,259	344	488	206	82	160	45	690	150	1,353	5,515
1893	2,270	3,210	965	223	207	1,479	186	420	52	89	156	31	9,288
1894	1,992	271	948	403	505	434	0	37	201	227	162	348	5,528
1895	2,280	731	79	459	150	1	204	10	304	174	265	1,106	5,770
1896	603	2,516	108	76	231	112	74	103	10	53	416	220	4,522
1897	547	343	392	30	248	174	792	51	333	464	111	588	4,073
1898	2,754	941	2,044	39	204	198	16	413	276	181	270	344	7,680
1899	1,131	726	376	413	292	142	233	262	167	160	6	762	4,670
1900	463	86	186	115	397	146	520	114	156	305	106	128	2,722
1901	234	261	317	1,027	114	74	201	559	180	218	128	0	3,313
1902	633	75	199	43	2	0	7	13	31	124	65	138	1,330
1903	97	260	605	38	1,155	33	598	88	355	43	325	997	4,594
1904	318	85	426	564	132	86	51	62	48	332	16	516	2,636
1905	1,667	217	335	631	426	110	71	17	95	237	95	674	4,575
1906	692	992	190	117	844	201	3	186	1,090	157	97	385	4,954
1907	329	390	1,281	38	308	449	87	43	0	170	290	299	3,684
1908	477	438	576	413	67	36	71	156	110	239	73	334	2,990
1909	652	370	506	154	67	151	565	166	98	41	355	299	3,424
1910	1,181	243	920	31	19	617	210	16	233	70	821	158	4,519
1911	2,105	975	431	246	56	0	37	115	0	236	130	298	4,629
1912	396	247	651	0	133	1,023	175	78	22	474	314	101	3,614
1913	4,575	429	673	501	531	345	126	2	152	18	183	522	8,057
1914	139	340	560	255	96	289	62	36	84	636	53	213	2,763
1915	386	1,281	7	44	182	58	103	131	28	80	108	312	2,720
1916	130	507	326	396	145	333	215	236	423	581	617	663	4,572
1917	907	846	1,071	199	184	4	22	114	354	239	648	302	4,888
1918	1,790	562	308	481	101	2	40	122	47	4	146	138	3,741
1919	16	322	537	153	655	13	0	48	0	228	63	5	2,038
1920	1,147	32	171	153	301	267	190	45	194	329	217	1,056	4,205
1921	741	72	338	881	204	448	288	885	35	80	168	1,614	4,954
1922	754	960	107	50	51	157	333	110	52	80	17	479	3,150
1923	822	48	48	660	0	410	90	80	180	34	134	378	2,884
1924	148	985	784	137	32	79	363	50	203	175	403	362	3,721
1925	1,366	596	570	56	59	792	45	102	57	61	129	645	4,478
1926	290	141	284	76	995	117	18	0	87	74	13	1,696	3,791
1927	2,580	530	926	383	18	326	106	122	100	301	528	584	6,604
1928	277	1,318	93	1,354	86	525	96	25	15	45	149	119	4,102
1929	421	1,073	249	725	31	336	4	39	18	239	238	624	3,997
1930	1,592	500	177	98	337	876	132	264	154	197	57	225	4,609
1931	279	2,377	691	134	439	117	64	90	83	147	349	944	5,714
1932	52	61	12	215	209	28	49	23	98	623	56	268	1,694
†1933	893	411	68	784	83	218	460	139	97	602	647	1,098	5,500
†1934	241	2,109	228	1,175	108	223	157	115	64	289	893	488	6,090
†1935	330	534	124	629	254	74	529	61	285	165	2	926	3,913

† Rainfall at Sugar Experiment Station.

* In "The Cane Growers' Quarterly Bulletin" (Bureau of Sugar Experiment Stations).

In considering these records it is noticed that if the total annual rainfall be averaged for each five years from 1883 to 1932 the following figures are obtained:—

Period.	inches.	Period.	inches.
1883–1887	42.21	1908–1912	38.35
1888–1892	47.15	1913–1917	46.00
1893–1897	58.16	1918–1922	36.18
1898–1902	39.43	1923–1927	42.96
1903–1907	40.89	1928–1932	40.23

The 1893 to 1897 period is abnormal on account of the 1893 flood year, when the rainfall totalled 92·88 inches. Similarly, if we take each ten-year period and separate the very dry from the very wet years, we arrive at the following:—

Period.	No. of Years under 30 inches rain.	No. of Years over 60 inches rain.
1883–1892	2	1
1893–1902	2	2
1903–1912	2	0
1913–1922	3	1
1923–1932	2	1

It must be obvious from these authentic records that the seasons have not changed radically since 1883. Reference to the table will show that the monthly incidence of rainfall is also much the same now as fifty years ago.

We are frequently reminded of the large crops then harvested as compared with the present-day production. An endeavour was made to obtain figures of cane tonnage per acre for the earlier years, but lack of records defeated this effort, and comparison with present-day acreage returns is therefore not possible. Some records for the whole of the sugar-producing area of the State are, however, obtainable since 1900, and these are shown in the accompanying graph (Plate 178).

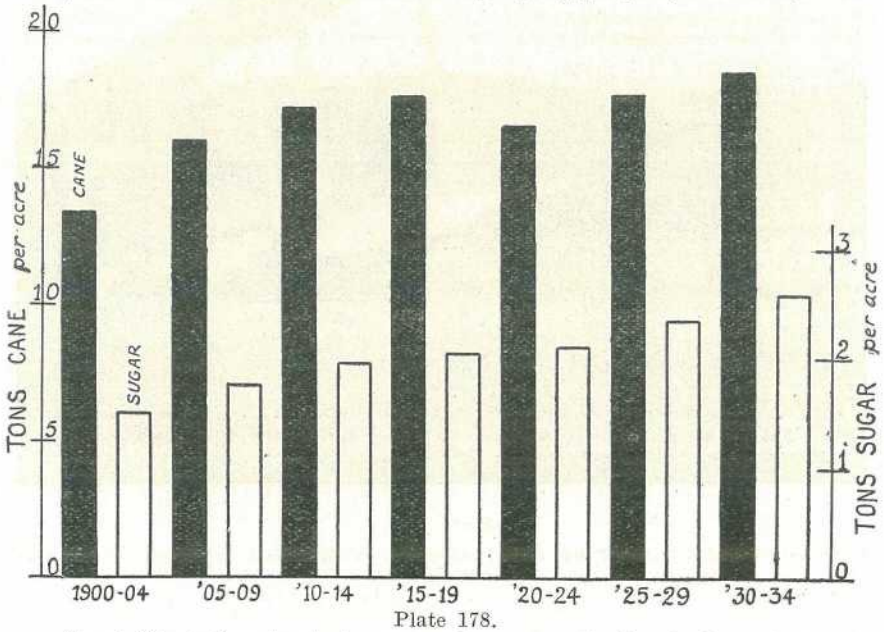


Plate 178.

Graph illustrating trends in cane and sugar production in Queensland.

This exhibits a definite upward trend of cane per acre since 1900. In seeking an explanation of the reputed large yields one can only conclude that during the first two or three years of cane-growing on new land occasional very large crops were harvested, but the reduction in crop returns must have been very marked after that period. Artificial fertilizers were not then used, and soil depletion would advance at a very rapid rate. What, then, was the reason for this decline in crop returns if seasons have not changed? It should not be forgotten that other major factors besides climatic ones were operating at that time. Firstly, the virgin nature of the soil with its ideal physical condition to a depth of many feet; secondly, the richness and fertility of that same soil after centuries of luxurious scrub growth, and the ultimate burning-off of the felled timber; thirdly, the natural subsoiling through the medium of the tree roots. The absence of implements in the early days kept the original soil under ideal conditions of tilth, and this condition existed for some years after farming began. It must also be remembered that mechanical planting was unknown as a farm practice, mechanical cultivation was not used, and the entire farm routine involved the use of far less implements than are utilized in recent times. All of these factors continued to keep the soil in a better state of tilth than exists at present; less soil packing then developed from implements, and plough and cultivation pans must have been virtually unknown.

Plate 179.

DELIVERING DAIRY CATTLE BY AIR TRANSPORT, AUSTRALIAN MANDATED TERRITORY, NEW GUINEA.

Irrigation Waters of the Burdekin Delta.

N. G. CASSIDY.

THE underground water of the Burdekin delta is a subject of everyday interest, as well as of vital importance, to cane growers of the area. Many strange statements are made regarding the underlying drifts, and queer theories are often held as to the replenishment of them. Growers will, therefore, appreciate a short account of what is definitely known about the water-bearing beds and what conclusions can reasonably be drawn from a knowledge of the facts.

The gravel or sand "drifts" in which the water occurs cannot be mapped out in any simple way on account of the variety of conditions existing. At one particular spot a band of clay may separate streams which are shown by analysis to be quite unlike each other, and, contrary to expectation, the top supply may be more salty than the lower one. However, on proceeding from district to district, certain tendencies are evident, and it is possible to divide the area into three zones. The inland districts of Airedale, Maidavale, Pioneer, Dick's Bank, Klondyke, as well as most of Home Hill, comprise the first zone. The waters obtained under these districts have a "family" resemblance to one another, and are similar in composition to the flood waters of the Burdekin River. The second zone of the Delta is made up of the coastal districts, Seaforth, Rita Island, and lower Home Hill. Here the mineral content of the waters is much greater, and it is similar in type to that of sea water. The third zone is made up by the intermediary districts, McDesme, Ivanhoe, Kalamia, where the waters encountered have their own peculiarity of a high content of free alkali. The second and third zones thus yield less suitable irrigation waters than the first.

The evidence concerning the distribution of waters of different types gives a clue to the origin of the whole supply. It suggests that, in the main, replenishment of the supply takes place by flood waters moving along old river channels which have been covered up but are still very pervious to water. In the intermediate zone some obstruction to free flow of water occurs, and the water takes up considerable amounts of mineral matter. In the coastal districts sea-water penetrates the drifts in places, the connection between the two bodies of water being clear from the rise and fall of level which take place with the tides.

These conclusions are well supported by evidence of the rise in level of bores, subsequent to flooding in the river. The immediate response in the first zone of the area is contrasted with the lesser sensitiveness of bores situated elsewhere. Since neither the extent nor the time of the rise in level after rain is uniform, it follows that direct penetration of rainfall is not responsible for the renewal of underground supplies, particularly when the quality of the water is found to vary from district to district. It should be pointed out that the underground supplies could not possibly be derived from the sea, as the brine could not be removed by any natural process of filtration. Everything indicates that river flooding is the principal source of replenishment and, moreover, the evidence available does not point to any permanent depletion of the supply.

* In the current "Cane Growers' Quarterly." Reprinted by courtesy of the Director, Bureau of Sugar Experiment Stations.

It is of interest to compare the quality of Burdekin waters with that of rivers and irrigation waters in other parts of the world. Such a comparison shows that Burdekin waters in general have an unfavourably low ratio of "hardness" to "salt." In other words the mineral matter of the waters contains too small a proportion of calcium, or "lime." This may cause grave damage in extreme cases, especially when regular water-logging of the soil is allowed to take place. Recent investigations show that even when the chemical action of salty water on the soil has only proceeded to 30 per cent. of the maximum extent possible, the soil has already suffered the maximum damage to its physical condition that it can undergo. All this illustrates the need for care in the use of the right kind and amount of irrigation water. A bad supply may possibly be improved by sinking deeper, or by lifting the spears. At all times of doubt a sample may be sent to the Bureau for analysis and for comparison with any previous tests. Except near the sea-coast any particular bore generally yields water of very constant quality from year to year.

For a fuller discussion of this subject growers may obtain, free, on application to the Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, Brisbane, the original article published as Technical Communication No. 1 (1937).

LETTUCE-GROWING.

Lettuce is one of the most popular vegetables, and with regular sowing and care in cultivation it may be grown the whole year round. In Queensland the best times for planting are the late summer, autumn, and winter.

Lettuce is a vegetable that must be grown quickly to ensure crisp leaves. If a check is received during growth the leaves acquire a slightly bitter taste, which tends to decrease the market value of the plants. This defect is more prevalent during the late spring, early summer, and autumn plantings.

The soil must be well cultivated, and it is desirable that where possible large quantities of well-rotted farmyard manure be incorporated with the soil. Should fresh manure be used some time should elapse before planting.

Lettuce may be grown in a seed-bed and transplanted into rows, allowing 12 inches between the plants. The seed may also be sown directly into the row and the plants later thinned out to the required distance.

Sow the seed thinly and cover lightly with fine soil, and then firm the ground gently.

During the growing period the soil around the plants must be kept cultivated, but care must be taken not to allow any soil to get on or into the hearts of the plants. Constant watering is essential and the soil should never be allowed to dry out. Should the plants appear to be growing slowly an application of liquid manure would be beneficial, or, failing this, a top dressing of nitrate of soda or sulphate of ammonia at the rate of 1 to 2 cwt. per acre. These fertilizers should be spread lightly over the ground, but under no circumstances on the plants.

Lettuce should be marketed as soon as possible after cutting, as they deteriorate in quality very quickly.

The cabbage type of lettuce is the popular one in Queensland, and should be cut for market as soon as possible after hearting. For home use they may be used earlier.

Popular varieties for planting are:—

New York or Neapolitan.—A very large variety, best suited for planting in the cooler months.

Iceberg.—A large, good-hearting variety, with crinkled leaves and pink tips, suitable for summer planting.

A pamphlet on packing of lettuce for market is obtainable free on application to the Department of Agriculture and Stock.

The Tropics and Man

Radiation.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

No. 5.

MEDICAL knowledge, just as any other branch of learning, has had to undergo a very gradual and painful development from the humblest beginnings. Many conditions which appear fairly well understood to-day were quite imperfectly understood a few years ago. This process of development is going on still at what appears to be an ever-increasing rate. There is this possible difference, however, that to-day man will admit a little more readily than he used to do, that he does not know or understand something. It is a natural impulse to conceal ignorance, and medical minds are just as human as others. A number of the effects of tropical residence were, until recent years, not properly understood, and were ascribed to such mysterious and mythical agencies as miasmata, lack of air, and so on. Many of these have been stripped of their camouflage and intrepid investigators deal with the most intimate details in the private lives of the malaria protozoon, the Weil's disease spirochaete, and the typhoid bacillus. The "debunking" of other mysterious influences, such as that of the radiations, and particularly the sun's radiations, is of more recent occurrence still, and so well ingrained are the old ideas that a hankering after the old superstitions is still widely manifest. Nevertheless, there is nothing mysterious about these radiations, and they can be dissected and classified with greater ease than the more popularly recognised organisms.

Radiations at Home.

The first family of radiations is that of the *wireless waves*. As far as we know, they have no effect upon the human body (until transformed into crooning or speeches), which is just as well in this wireless era.

The next family is a very extensive one, often divided into three parts for convenience, although one would be hard put to it to say where one part begins and another ends. The longest chaps in this family are the *heat or infra-red rays*. When they fall upon the human eye they do not excite it to vision, but they do affect a photographic plate, a fact which has recently revolutionised aerial photography. When they fall upon the body they are absorbed and give rise to increased temperature of the part they fall upon. (A glowing fire of red coals often heats more than a blazing fire.)

The medium-sized chaps are the *light waves*. They also affect a photographic plate, but more rapidly than the heat waves. They too tend to raise the body temperature, but not nearly so much. The light waves, particularly the shortest ones, have another property, that of burning the skin. Their outstanding property, of course, is that of exciting the eye and producing the sensation of sight.

The smallest chaps in this family are the *ultra-violet waves.* Their chief properties are those of affecting photographic plates, and of burning the skin. They are not visible and give rise to very little heat in the body. They are somewhat peculiar amongst radiation in being able to penetrate only the tiniest way into the skin, but in this distance they can do a lot of damage, as anyone with bad sunburn will testify.

The third family of radiation is that of *X-rays and radium rays.* These are very short, but penetrate the body very well, affect photographic plates and produce burning in the part of the body upon which they fall.

The last family is that of the *cosmic rays.* About these we know very little, but so badly did Professor Picard want to know more about them, that he engineered the first strato-sphere balloon ascent—truly an epic adventure—to measure and investigate them before they got lost in the world's atmosphere.

Radiation in the Tropics.

Introductions have now been effected, and, as is usually the case with introductions, you are probably very little the wiser. However, you are spared the embarrassment of asking them their names, since you can look back surreptitiously now and then, to refresh your memory. You have met them at home; now see them at work.

The first family of wireless waves and the third family of X-rays we can ignore since they are artificial and not specially active in the tropics. The last family of cosmic rays may turn out to be of importance, but they are so aloof, that, in spite of their mysterious and intriguing character, we cannot say anything very definite about their incidence or possible effect in the tropics. There is, so far, nothing to indicate that they have any special effect in the tropics.

The important family is, therefore, that large and complex second one. There is no doubt that the total amount of this radiation received in the tropics is greater than that occurring in greater latitudes. We need nothing to tell us that the heat is greater, and one is quite prepared to believe that the light is more intense. It is popularly supposed, and I for one believed it until shown otherwise, that the ultra-violet radiations in the tropics are much more intense. No wide survey has been made of ultra-violet light in the tropics, but some very careful estimations made on the African coast have shown that the ultra-violet radiation there is no greater than that in the German countryside. Why this is so is not fully understood, but it is generally accepted that the high humidity of the atmosphere absorbs these radiations as they pass through it on their way from the sun to the earth. On a clear day in the hot desert, ultra-violet radiation is almost certainly high, but on a dusty day, the greater proportion of it is absorbed by the dust in the air.

Effects of Tropical Radiation.

A dear lady once solemnly assured me that the sun on the southern side of Port Said was very different, and in some mysterious way much more malignant than on the north side of Port Said—a matter of a hundred miles at the most. Some fifteen years ago in Malaya, it was the custom for children to be kept indoors until three or four in the

afternoon with windows shuttered *and topees on,* as though some solar hobgoblin were darting about seeking some forgotten and tortuous path of attack. (That is completely altered now, with great benefit to the children.)

It seems reasonably clear that there is nothing mysterious about tropical radiations. They are the same radiations as occur in temperate countries, but some of them are more intense. The effects of this increased intensity of radiations are as follows:—

1. Sunburn readily occurs through the agency of the light and ultra-violet rays. Wind, rain, and blowing sand materially aggravate the effects of sunburn.

2. There seems to be a definite tendency to more frequent occurrence of rodent ulcers and skin cancers on the exposed parts, particularly in the fair-skinned type of person who does not go brown. Chronic irritation of any description is a well-known cause of cancer, and it is highly probable that the constant irritation of sunburn in these people acts as the stimulus.

3. A condition known as "glare asthenopia" is very common, and again, is said to be commoner in blue-eyed persons. There is tenderness of the eyes, inability to stand any kind of a glare, and frequent intense headaches.

4. Cataract is rather common in the tropics, but diet probably plays an important part there.

5. "Heat effects." These are the most important effects. They include heat exhaustion, heat hyperpyrexia, and heat cramps. They are all due to interference with the necessary loss of heat from the body as described in earlier articles. Heat radiations may participate directly in this interference or light rays may join in by giving rise to heat when absorbed by the skin. The actual part exposed to these radiations may be a little hotter than the rest of the body, but usually the heat created locally by these radiations is quickly carried all over the body and helps to raise the general body temperature.

You will notice that I have said nothing about "sun-stroke." This was the name given to all sorts of sudden collapse occurring in people who happened to be exposed to the sun at or about the time of the collapse. It was supposed to be due to a mysterious effect of the sunlight falling upon the head and neck. We now know that the causes of these cases of collapse were very varied—malaria, alcoholism, heat exhaustion, hyperpyrexia, &c., and such cases can occur just as readily in hot mines, where no sunlight exists. Sun-stroke is no longer a suitable medical term. As a matter of fact, the most intense sunlight falling on the head and neck will produce very little, if any, rise in temperature of the brain above that of the body in general, which was the supposed mechanism at work. In a later article I hope to deal a little more fully with these effects of heat. Next time I propose to run over some of the other atmospheric conditions which may have an effect upon man or have been blamed for certain effects at different times.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of March, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter. Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Morden Pansy 2nd	R. Mears, Morden Farm, Toogoolawah	9,585·25	411·918	George of Nestles
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Fairy Bower Shamrock	E. O. Jeynes, Raceview	12,455·06	511·781	Blacklands Peer
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
Mabreen Heartease II.	F. G. Haldane, Wolvi, Gympie	8,771·25	333·994	Springdale Surprise
Mabreen Princess	F. G. Haldane, Wolvi, Gympie	8,731·6	313·098	Numbawarra Headlight
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Sunnyview Thelma (365 days)	J. Phillips, Sunnyview, Wondai	16,411·45	702·2	Lovely's Commodore of Burradale
College Stately 4th	Queensland Agricultural High School and College, Gatton	10,420·78	407·643	College Robin
Morden Nora 14th	R. Mears, Morden Farm, Toogoolawah	9,172·00	372·45	Jupiter of Morden
College Stately 6th	Queensland Agricultural High School and College, Gatton	8,320·08	352·308	College Robin
Rocklyn Colleen	T. A. Strain, Wondai	8,090·95	305·662	Oakvilla Champion's Prince
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Rocklyn Connie	T. A. Strain, Wondai	6,257·95	260·833	Kurrajong Reddie's Beau
JERSEY.				
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Oxford Best's Dolly	S. H. Caldwell, Walker's Creek, *via* Bell ..	5,205·91	266·055	Oxford Best
Wyreen Cress	J. B. Keys, Gowrie Little Plain	5,595·86	371·497	Lyndhurst Majesty

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Wild Millet.

W.L.S. (Komine, Q.)—

The specimen represents the wild millet, *Echinochloa crusgalli*, a fairly common grass in most warm-temperate countries. It is represented in Queensland by a number of forms. The one you send occurs mostly as a weed of cultivation or growing in damp places, rather than in the ordinary pasture. It is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum. Seed is not stocked by nurserymen, but where it grows Japanese millet can be grown for the same purpose, namely green feed for dairy cattle.

Water Weeds in Reservoirs.

K.M.C. (Winton)—

Most of the weeds in earthern tanks are algae and the drying and scraping of the sides would have no effect on these. The usual method of ridding tanks of submerged water weeds is using copper sulphate, which may be put into a coarse sack and dragged backwards and forwards from the bank until it it is all dissolved.

To be safe for drinking purposes the copper sulphate must not exceed one part in a million parts of water by weight, that is, 1 lb. to every 100,000 gallons of water. You probably know the contents of your tank and so could calculate the quantity of copper sulphate required. As it is a poison, of course it must not be made too strong. The usual practice is to make an application and then a second in about a fortnight's time.

Water Couch.

E.G.T. (Dawson Valley)—

Your specimen represents the water couch, *Paspalum distichum*, a very common grass in Queensland, and, away from the coast, generally found in melon-hole country, or along the banks of creeks and in similar wet situations. In such situations it is a very valuable grass, has a high fodder value, and is much relished by stock. It is a native grass, but is widely spread over most warm temperate and sub-tropical countries. It is easily spread by roots and is probably introduced into fresh localities by water fowl.

"Mackie's Pest."

L.B.S.R. (Mirriwinni, via Babinda)—

The grass is *Chrysopogon aciculatus*, a grass widely spread over the tropical regions of the world, and known in North Queensland as grass seed, or Mackie's pest. The seeds are apt to produce irritating sores, which may last for months.

We think the only way of dealing with the grass would be to plant the school play-ground with some grass of a more smothering nature, and would try any of the following:—

(1) Kikuyu.

(2) Para grass, or giant couch. This is often known in North Queensland as *Panicum muticum*.

(3) Buffalo grass.

All these grasses are grown from cuttings, and the land would have to be dug over, before planting, as they do best in ground that has been worked. Roots of all three should be obtainable at Cairns.

Wild Sorghum.

J.B.A. (Radford)—

The grass is *Sorghum verticilliflorum*, commonly known as wild sorghum, a native of South Africa now very common as a naturalised weed in Queensland, particularly along roadsides, railway embankments, or, in fact, anywhere where the ground has been disturbed. As you know, most of the sorghums possess a prussic-acid yielding glucoside and must be regarded as dangerous. The present species is one of the worst in this respect, and if fed to stock caution should be observed in not letting them gorge themselves on it on an empty stomach, and preferably the grass should be cut and allowed to wilt before being fed to stock.

Plants from the Mid-west Identified.

A.C.McA. (Drillham)—

1. *Dichanthium sericeum*, blue grass; one of the best of the native grasses.
2. *Cyperus fulvus*, a sedge, not a true grass.
3. *Panicum Buncei*, a native panic grass. Most of the native panic grasses are very useful in the average mixed native pasture.
4. *Sporobolus Berteroanus*, Parramatta grass or rat's tail grass, generally regarded as a grass of very poor quality.
5. *Brachiaria piligera*, an excellent pasture and hay grass. Although a native grass generally seen in old cultivation lands, or in places where the ground has been broken, rather than in the ordinary pasture.
6. Seed heads required for determination.
7. *Aristida leptopoda*, a 3-pronged spear grass. On the whole, 3-pronged spear grasses are of poor quality, but this is the best of the species, and makes a fair amount of bottom feed suitable for sheep.
8. *Sporobolus pallidus*, sometimes called fairy grass. A very short-lived grass during the summer months; probably useful in the mixed native pasture, but not of any particular merit.
9. *Eragrostis cilianensis*, stink grass. This grass mostly occurs as a weed of cultivation, although in some places it has run out into the ordinary pasture. Generally speaking it is not touched by stock, although we have heard that stock will sometimes eat it in the form of hay.
10. *Tragus racemosus*, small burr grass.
11. *Aristida personata*, a wire grass or 3-pronged spear grass.
12. *Dactyloctenium radulans*, button grass. A short-lived summer grass, but an excellent fodder both for sheep and cattle, very much relished both in the green stage and when dried.
13. *Cyperus gracilis*, a sedge, not a true grass.
14. Looks like *Digitaria marginata*, ordinary summer grass, but seed heads are required to be certain.

In reply to your query as to how to keep your collection, grasses look very well if pressed flat between sheets of newspaper for some little time and then mounted with gum strips on to thick paper or thin cardboard. The name should be attached and a few notes on the properties of the grass, where collected and the date. If you prefer it, the grasses could be made up into small sheaves and tie-on labels attached.

Vigna lanceolata.

A.C.G. (Cambooya)—

The specimen represents *Vigna lanceolata*, a native plant for which we have not heard a common name. It belongs to the same genus as cultivated cowpea, and is generally regarded as an excellent fodder. It becomes rather a pest in cultivation, owing to its habit of rooting very deeply, and parts of its underground system, when broken, being capable of sending out new shoots and forming new plants. No really satisfactory method of getting rid of it in cultivation, other than keeping the green growth down, is known.

French Millet.

W.E.J. (Mundubbera)—

The specimen is French millet, *Panicum miliaceum*. This grass is not known to be poisonous or harmful at any stage of its growth, although it has gone out of favour of recent years as a green food, as compared with other millets such as Japanese millet and white panicum. The seed of French millet is a common ingredient of mixed birdseed.

Lawn Grasses and Hedge Plants in Western Queensland.

A.F.H. (Longreach)—

Buffalo Grass (*Stnotaphium secundatum*). On the whole, experience has shown this to be perhaps the best all-round lawn grass for Western Queensland. It is rather hard grass to cut, and must be kept fairly short, but seems to stand the western conditions much better than other lawn grasses.

Couch Grass (*Cynodon dactylon*). There are some quite good lawns of this grass in Western Queensland, and in most western towns where there is a bowling green, the sward is composed of this grass.

Blue Couch (*Digitaria didactyla*). We do not remember seeing any lawns of this grass in the West, and are inclined to think it would be rather soft for the purpose, unless water is plentiful.

Roots of the three grasses may be obtained through any nursery channel.

Blue couch and buffalo grass are grown from roots only, but the common couch is sometimes grown from seed.

Water or Swamp Couch (*Paspalum distichum*). We have had no experience with this grass as a lawn grass. It is a great pest in cultivation, and has overrun some of the cultivation paddocks at the Farm School, St. Lucia, near Brisbane.

Regarding plants for hedge-making, here are some suggestions:—

Vitex trifolia variegata. We have seen some splendid hedges of this in the far West.

Common Olive (*Olea Europeae*). The common olive is sometimes used as a hedge in the southern States, but we do not remember seeing any hedge of it in Queensland, although we have seen a very beautiful avenue of it. We should think the objection to it would be that it would be rather slow growing.

Cypress Pine. Horizontal *Cyperus, Cupressus lambertiana horizontalis*, is the best of all the cypresses for making hedges. We think it would do quite well at Longreach, but do not remember seeing any hedges of it, or individual trees in the Central West.

Oleander. The oleanders make quite suitable plants for hedges, but it is sometimes difficult to get them leafy right to the base. As you know, they can be had in various colours. There is one rather showy species with a variegated leaf.

Hibiscus. These shrubs make quite good hedges, but it is sometimes difficult to get them leafy right down to the base.

Tecoma capensis. This makes quite a good hedge, particularly for a high hedge, say 8 to 10 feet, in which case it flowers profusely. When in bloom, with its red, tubular flowers, it is rather a showy sight.

Guinea Grass. Blue Panic.

R.C. (Mundubbera)—

1. *Panicum mamimum*, Guinea grass. This grass occurs in several forms in Queensland. The one sent by you has been distributed under the name of green panic, or green panicum, and this particular form is an excellent grass, without the coarse, hard stems, commonly developed by the ordinary type of Guinea grass. It is well worth growing for fodder, but is only suitable for cultivated areas. A small paddock of it would be, however, an excellent stand-by to any dairyman.

2. *Panicum antidotale*, blue panic. This grass has been widely advertised as a fodder. It is fairly drought-resistant, but is more a grass for growing in small cultivation paddocks rather than in the ordinary pasture. As such, it would be an excellent stand-by. The stems are rather caney, but they have the habit of sending out tufts here and there along their length, and these tufts provide a good bulk of leaf foliage for stock, particularly cattle.

General Notes

Staff Changes and Appointments.

The following transfers of inspectors of stock, slaughterhouses, and dairies in the Department of Agriculture and Stock have been approved:—Messrs. R. J. O'Sullivan from Allora to Killarney, J. Cattanach from Beaudesert to Allora, and P. McCallum from Brisbane to Gladstone.

Mr. J. P. Lee, Court House, Mossman, has been appointed Chairman of the Mossman Local Sugar Cane Prices Board—vice Mr. T. W. Foran, transferred—and also an Agent of the Central Sugar Cane Prices Board for the purpose of making enquiries under Section 5 (2A) of the Regulation of Sugar Cane Prices Acts in regard to sales and leases of assigned lands.

Constable D. C. McQuaker, Proserpine, has been appointed also an inspector under the Brands Acts.

Mr. C. E. Ellis, District Inspector of Stock, Warwick, has been appointed also District Inspector of Brands.

Mr. K. D. Hoffmann, Inspector, Diseases in Plants Acts, and Banana Agent, has been transferred from Nambour to Dayboro'.

Mr. C. E. Scott, Brookfield, Yeulba, has been appointed Acting Inspector of Stock at The Canal Dip, Yeulba.

Mr. G. Johnson, Mia Mia, via Mirani, has been appointed millowners' representative on the North Eton Local Sugar Cane Prices Board, vice Mr. S. H. Scougall, resigned.

Mr. R. L. Hunter, Freshwater, Cairns, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. A. E. Beak, manager of Salisbury Plains Station, Bowen, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Arrowroot Board.

Nominations in connection with the election of five growers' representatives on the Arrowroot Board have been received at the Department of Agriculture and Stock from Messrs. Robert Stewart, Ormeau; Carl Brumm, Woolgoolba; Alexander Rose, Norwell; George R. Walker, Upper Coomera; and Leslie R. Oxenford, Oxenford.

The first four mentioned persons are at present members of the Board, Mr. J. F. Cassidy, the other member, did not renominate for this election. The new Board will be appointed for a further term of three years.

Animals and Birds Sanctuary at Coalstoun Lakes.

The National Park Reserve R. 94, Coalstoun Lakes, via Biggenden, has been declared a sanctuary under the Animals and Birds Acts, and it will be an offence to take or kill any animal or bird in this Reserve. Messrs. R. W. Martin and H. G. Bundock, of Coalstoun Lakes, have been appointed honorary rangers in connection with the sanctuary.

Grade Standards for Cavendish Bananas.

An amending regulation has been approved under "*The Fruit and Vegetables Acts, 1927 to 1935*," providing for an alteration in the "Standard" grade of the new grades "Standard" and "Large" for Cavendish bananas which were approved last month. The minimum length for "Standard" grade Cavendish bananas shall be six inches instead of six and one-half inches.

Sugar Levy Regulation.

A regulation passed in March under the Primary Producers' Organisation and Marketing Acts empowered the Queensland Cane Growers' Council to make a particular levy at the rate of one-halfpenny per ton of sugar-cane harvested during the coming season, such to be expended on matters of an economic, legal, or compensatory nature where such matters are of vital importance to the sugar industry.

The time for the receipt of a petition for a poll on the question of whether or not the levy should be made was set down as the 19th April, but an amending regulation extends the date for the receipt of such a petition until the 17th May, 1937.

Rural Topics

Border Line Cream.

Every factory manager must formulate a policy in regard to the lowest quality cream that can be manufactured into choice quality butter at his particular factory. Modern methods of manufacture and factory equipment have done much to enable the utilisation of cream which a few years ago would have been discarded. Nevertheless, the dairying industry still offers no exception to the general rule—that the quality of raw materials directly influences the character of the manufactured product. The addition of a few faulty cans of cream to a vat may thus cause the spoilage of otherwise choice quality butter. Only a thorough knowledge of the origin and nature of a given defect can help in determining the fate of doubtful cream.

There is a limit to the capability of machinery and manufacturing technique to offset defects in cream quality, and no factory can afford to slur over defects in the cream received. Any laxity in this respect is really doing the farmer a disservice, for he may remain unaware that better quality cream is required, and takes less, instead of more care on the farm.

First quality butter can only be obtained when the farmer realises that the remedy for cream defects is essentially his responsibility.

Seasonal Notes for Wheat Areas.

As a result of the recent rains the surface mulch has probably been destroyed on most of the early well-worked fallows intended for wheat, and will, of necessity, have to be restored by further cultivation. Weed growth will also require early destruction in order to avoid depletion of the moisture reserves in the soil.

The land should not be worked to a greater depth than 4 inches. Wheat requires a firm seed-bed for its successful development. Deep cultivation is consequently not essential, and if attempted at this time of the year may adversely affect the prospective crop, more particularly if it is intended solely for grain.

Deep working may also bring to the surface weed seeds lying dormant in the soil. These may germinate with the wheat, and actively compete with the crop.

When ordering seed purchasers should state whether the wheat is required for early or late sowing. This is essential, because early wheats, such as Florence and Seaspray, are suitable for late sowing. Late varieties, such as Currawa, Cleveland, Warren, and Ford, are slow maturing types adapted for early sowing.

Prairie Grass Seed.

Large quantities of prairie grass seed are now being purchased by stock-owners in anticipation of early sowings. It is well known that commercial prairie grass seed is not of uniform quality, and when purchasers of this seed are not certain of the germinating capacity of the seed bought, samples should be submitted to the Department of Agriculture and Stock for examination. Samples should be addressed to "The Officer-in-charge, Seed Laboratory, Department of Agriculture and Stock, Brisbane," and will be examined free of charge provided that following particulars are written in ink on the packet containing the sample:—

(1) The name under which the seed was purchased;
(2) The number of bags from which the sample was drawn, and the number of bags in the whole consignment;
(3) The marks of identification, if any, on such bags;
(4) The name and address of the sender, with date of sampling;
(5) The name and address of the sender's supplier, with date of delivery.

The usefulness of prairie grass for grazing and seed production purposes has been seriously impaired by the widespread occurrence of smut in the seedheads. Tests carried out by the Department of Agriculture and Stock have shown that the disease may be controlled by treating the seed before sowing with a mercury dust or with formalin solution. The mercury dust (Abavit B or Ceresan) should be applied at the rate of 3 oz. for every 20 lb. of prairie grass seed. The dust and seed should be thoroughly mixed by rotating together in a closed container. If a mercury dust is unobtainable the seed, on the day prior to sowing, should be spread out on a smooth floor or tarpaulin, and sprinkled with a formalin solution made up by adding 1 pint of commercial (40 per cent.) formalin to 30 gallons of water. About a gallon is required for each bushel of seed to be treated. The seed should be thoroughly moistened, covered with moist bags, and left overnight.

Orchard Notes

JUNE.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies will decrease. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly punctures, as there is always a percentage of damaged fruit which is liable to blue mould infection, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth and any winter green manure crops turned under, otherwise the trees may get a setback. Old worn-out trees may be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas, during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards, do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit-fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district, and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyards ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

RECORD WEIGHT LITTER.

A remarkably good performance was made by the litter of twelve Wessex Saddleback pigs owned by Mr. R. Turpin, Lowood, which was officially weighed at eight weeks old by the Department of Agriculture and Stock. The total litter weight of 624½ lb. at eight weeks old is the heaviest yet recorded by this Department.

LITTER RECORD.

Owner.—R. Turpin, Pensilva Stud, Lowood.

Dam of Litter.—Pensilva Ace 3rd., Wessex Saddleback.

Sire of Litter.—Long Park Champion (imp.), Wessex Saddleback.

Litter Born On.—8th February, 1937.

Total Litter Weight at Eight Weeks.—624½ lb.

Average Weight per Pig at Eight Weeks.—52 lb.

Farm Notes

JUNE.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrow-root will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

SHEEP LAND FOR SELECTION AT CUNNAMULLA.

Portion 6, parish of Jumna, comprising part of the resumption from Charlotte Plains Holding, situated about 25 miles east from Cunnamulla, will be open for Grazing Homestead Selection at the Land Office, Cunnamulla, on Monday, 10th May, 1937, at 11 a.m. The area of the portion is 21,000 acres.

The selection will be for a term of 28 years, and the annual rent for the first seven (7) years will be 2¾d. per acre.

The selection must be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years, and must be enclosed with a rabbit-proof fence during the same period.

The land is well shaded and is good breeding and fattening country. It is watered by two bore drains, but additional water will be required.

Free lithographs and full particulars may be obtained from the Lands Department, Brisbane, the Land Agent at Cunnamulla, and the Government Tourist Bureaux, Sydney and Melbourne.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

MALNUTRITION.

IT is unfortunately true that slight degrees of malnutrition pass unnoticed in very many little children. Nobody thinks very much about the children who are simply a bit "below par." It is most important that parents and others should know the signs indicating that a child is malnourished, and should be alert to seek advice and apply it at once.

SIGNS OF UNDER-NOURISHMENT.

An under-nourished child is usually below the standard weight for his age and height.

He does not gain in weight as he should, and is more or less soft and flabby.

His appetite is usually poor or erratic, and he is "finicky" about his food, habitually refusing certain articles of diet—usually some of those necessary for good health—milk or vegetables, for instance.

He gets tired easily, is inclined to be listless, has dark rings under his eyes, and stands badly.

He is more or less fretful and nervous, and "whiney" without apparent cause.

He lacks that indefinable air of joyous elasticity and buoyancy which is characteristic of the perfectly healthy small child.

It cannot be over-emphasised that the child who drifts along through the pre-school period in this condition enters the rough-and-tumble and the competition of school life *handicapped*. Unless something

is done to remove the causes of his poor condition the chances are that he will emerge from school days still handicapped for the battle of adult life.

Is your child "below par?" If so, parents should ask themselves these questions:—

What are the child's food habits?

Does he eat good, wholesome food suitable for his age? Does he "chew" it properly? Does he have three good meals a day only, or does he have sweeties and pieces between meals? Are meal times cheerful, happy times?

What are his habits generally?

Are the bowels regular or is he constipated? Does he have regular rest and sleep? Is proper cleanliness of body and teeth observed?

Does he get over-fatigued?

Are his activities too stimulating and too continuous? Does he have to walk beyond his powers?

Is he happy—"blithe, bonny, good, and gay"?

Is the home atmosphere such that personality as well as body may develop freely?

Has he any physical defects—decayed teeth, adenoids, ear or eye troubles, etc.?

Earnest examination of the child's habits and environment rarely fails to reveal the cause or causes of malnutrition. Regular periodical inspection by a trained person is the greatest possible help and protection to the health of the pre-school child.

IN THE FARM KITCHEN.

WAYS OF USING LEFT-OVER MEAT.

Potato Bridies.

Take 4 oz. scraps of cold meat, ¼ gill stock or gravy, 1 level teaspoonful flour, salt and pepper.

Mix the flour, seasoning, and stock. Bring them to the boil and add the finely minced meat. Re-heat the mixture and turn it out to cool.

Make a potato paste by kneading one level tablespoonful of flour with a little salt into each heaped tablespoonful of finely mashed potato, and when smooth roll it out thinly. Cut the paste into rounds, about the diameter of a breakfast cup. Put a little of the meat mixture into each round, damp the edges, fold over the paste, and fix the edges securely together. Fry them in deep, hot fat.

Bengal Mince.

Take 4 oz. rice, 2 oz. butter, ½ lb. onions, 10 oz. cold meat, 2½ gills stock or gravy, 3 teaspoonfuls curry-powder, 1¼ oz. flour, seasoning.

Wash the rice and cook it in boiling water until tender, then drain it in a colander. Pour cold water through to separate the grains, and drain it again. Peel and mince the onions, fry them until slightly browned in the butter. Lift out half of them and put them into a saucepan. Stir two teaspoonfuls of curry-powder into the remaining onions and butter, and, when blended, add the rice and make it hot. Add a teaspoonful of curry-powder to the onions in the saucepan, cook them a minute, then add the stock (or gravy) and stir in the flour, smoothed in a little water. Boil for a few minutes, then mince the meat and add it. Season the mince and make it hot; if not brown enough add a few drops of browning. Heap the prepared rice in the centre of a hot dish, pour the mince round it, and garnish with sippets of toast. If the mince is too thick thin it down with a little more stock.

Meat Mould.

Take 10 oz. cold meat, 1½ oz. breadcrumbs, 1 small onion, 2 eggs, salt, pepper, and stock (if required).

Peel and finely chop the onion and fry for a few minutes, then strain off the fat. Boil one egg for about fifteen minutes, until hard, then remove the shell and chop up the egg finely. Mince the meat and mix with the onion and chopped egg. Make the breadcrumbs and add. Season well to taste and mix all well together. Beat up the remaining egg and bind the prepared ingredients. If any more moisture is needed a little stock may be added, but the mixture should be quite stiff. Put into a well-greased mould or pie-dish, pressing it down firmly. Cover with a greased paper and bake in a moderately hot oven for about thirty-five minutes. Turn out carefully and serve cold. If the meat is all lean, add a little melted butter to the mixture, in which case no stock would be needed. This is an excellent method of using up cold meat, more especially if the latter is rather underdone. Slices of the meat mould put between bread and butter will make tasty sandwiches.

Venetian Minced Beef.

Take 2 onions, ¾ oz. flour, ¼ lb. spaghetti, ½ pint stock (more if required), 1 small tin peeled tomatoes, 10 oz. cold beef, seasoning, butter, or dripping.

Peel and mince the onions, and fry them gently till golden in a little hot fat. Then pour off the fat that remains. Add the stock, and stir in the flour, smoothed in a little water. Bring it to the boil, and boil for two or three minutes, add a little browning as required. Meanwhile, cook the spaghetti in a pan of slightly boiling water. When it is tender drain it, and return it to the pan with the liquor drained from the tin of tomatoes. Simmer gently for a few minutes. Add the drained tomatoes to the gravy. Mince the meat and add it, together with seasoning to taste. Make the mixture thoroughly hot, turn it on to a dish, and serve it with a border of the prepared spaghetti.

Beef Rolys.

Take 3 oz. cold beef, 6 oz. cold potato, 1 dessertspoonful minced onion, 2 or 3 dessertspoonfuls thick tomato sauce, pepper and salt, ¾ lb. of short or flaky pastry.

Put the meat and potato through the mincer and mix them with the onion. Season to taste and moisten the mixture with tomato sauce. Divide it into eight portions and form each into a sausage shape. Roll out the pastry fairly thinly, and cut oblong-shaped pieces, the same width as the rolls and long enough to reach round them.

Windsor Croquettes.

Take ¾ lb. cold meat, 1 egg-yolk, ½ small onion, 1 level tablespoonful breadcrumbs, ½ oz. flour, ½ oz. butter, 1 gill stock, pepper, salt, crushed herbs, Worcester sauce.

Melt a tablespoonful of butter in a saucepan, add an equal quantity of flour, stir it till it is frothy, then thin it down to a thick sauce with any meat stock. Keep stirring till the sauce boils. Then mince the meat finely. Beef, lamb, mutton, pork, veal, or chicken are all equally good for croquettes. Add the minced meat to the sauce. Season it well with pepper and salt, Worcester sauce, minced onion, and crushed herbs to taste. Stir in the crumbs and egg-yolk. When well blended spread the mixture on a plate, and when it is quite cold shape it into croquettes. Coat each one with egg and breadcrumbs and fry in a pan of hot, smoking fat.

Beef Rechauffe.

Take ½ lb. cold beef, 1 small tin peeled tomatoes, 2 onions, 1 teaspoonful flour, 1½ lb. mashed potatoes, seasoning, milk, 1 or 2 fresh tomatoes, margarine.

Peel and mince the onions, put them in a saucepan with a little fat, and cook them until tender and just lightly coloured. Draw the pan aside and drain off the fat. Add the contents of a small tin of peeled tomatoes and thicken the mixture with the flour, smoothed in a spoonful of water. Boil it for a few minutes, keeping it stirred, then take off the gas and let it cool. Boil the potatoes in the usual way and mash them. Season with pepper, add a lump of margarine, and moisten with a little milk. Put a thin layer of the mashed potato in the bottom of a fireproof dish, which has been well buttered. Mince the beef and mix it with the tomato and onion, season it and turn it into the dish, then heap the remainder of the potatoes on top to form a border. Put the rechauffe into the oven and make it hot. Garnish the centre with quarters of lightly baked fresh tomato, and serve immediately.

Mould of Lamb.

Take some cold lamb, 1 level teaspoonful salt, 1 cupful finely shredded cabbage, 1 tablespoonful lemon juice, 1 hard-boiled egg, ½ oz. gelatine, ½ pint water, 2 dessertspoonfuls castor sugar, ½ gill vinegar, 1½ pimentoes (tinned), 1 tablespoonful cooked peas.

Dissolve the gelatine in hot water and add the lemon juice to it, with the sugar, salt, and vinegar. Strain it and leave to cool. When it is beginning to stiffen add the chopped pimentoes, cabbage, peas, and slices of egg. Turn it into a wet mould and allow it to set. Turn the jelly out on to a dish lined with lettuce leaves. Border with overlapping slices of lamb and more lettuce leaves. Serve with tomatoes and mayonnaise.

Beehive Pudding.

Take 3 oz. macaroni, 1 cupful breadcrumbs, 1 cupful cold meat (chopped), 1 sliced tomato, 1 egg, salt, pepper, ½ oz. flour, 1 oz. butter, ½ gill milk, tomato sauce.

Put the macaroni and salt into a pan of boiling water. Boil it for thirty minutes and strain it. Let the macaroni cool. Grease a basin and sprinkle breadcrumbs over the inside. Line the basin round and round with long pieces of macaroni, pressing it against the basin and adding a few breadcrumbs to make it keep in place. Fry the tomato in the butter for five minutes, and stir in the flour and chopped meat. Season to taste and add the rest of the breadcrumbs and macaroni. Bind with the beaten egg and milk, and fill the basin with the mixture. Cover with greased paper and steam for one hour. Leave for five minutes. Turn out carefully and serve with tomato sauce.

Tomato Sauce.

Take 1 lb. tomatoes, ½ onion, 1 bayleaf, 1 oz. butter, 1 oz. flour, ¾ gill water, pepper and salt.

Peel and chop the onion and slice the tomatoes. Melt the butter, put in the onion, bayleaf, and tomatoes, and simmer very gently for twenty minutes. Rub the sauce through a sieve. Mix the flour smoothly with the water. Put it with the tomatoes in a saucepan and stir till boiling. Boil for five minutes and season with pepper and salt.

POINTS FOR BEEKEEPERS.

In most beekeeping localities there are several nectar flows during the season, and at the termination of each flow there is a tendency for the bees to commence robbing each others' hives of their stores. Great care should be taken not to leave honey or pieces of comb lying about where bees can obtain access to them, nor should hives be left open longer than is necessary.

It is usually at the termination of the last nectar flow of the season that attempts by the bees to rob each other's stores are most marked, and attempts are then made to open hives for the purpose of extracting the last honey. The disturbance is sometimes so great that further work becomes impossible. At such times bees will enter the honey-house in thousands should the door have been inadvertently left open, and even the kitchen at home will be invaded if open vessels of honey be left exposed. When this happens the first thought is to close the door, but it is not to be recommended. It is far better to go inside and cut off the supply, and to see that all tanks, super-bodies, and tins are closed and made absolutely bee-proof. When all honey and other sweets are safe leave the honey-house door open until every bee is satisfied that there is nothing to be gained by going in. It takes a day for them to realise this, so that when darkness falls the honey-house should be closed.

If it is imperative that extraction should proceed the beekeeper should use a bee-escape fitted to a thin board the full size of the hive. On one side of the board slats are nailed to slightly raise the super from the brood chamber. A hole corresponding to the one on the escape is then bored through the centre of the board and the escape tacked over it. The bee-escape should be placed below the honey super, and the bees will pass through the escape to the brood nest below but are unable to return, and if the escapes are placed on the hives in the evening the supers may be removed practically free of bees early the next morning, and may be quickly carried to the extracting house without causing excitement among the other bees. It is useless, however, to attempt using a bee-escape if any brood is present in the honey super, as the bees will not leave.—H. HACKER, Apiary Inspector.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Mar. 1936.	No. of Years' Records.	Mar. 1937.	Mar. 1936.		Mar. 1936.	No. of Years' Records.	Mar. 1937.	Mar. 1936.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	8·76	36	7·45	10·36	Clermont ..	3·06	66	4·06	8·52
Cairns	18·10	55	15·80	12·76	Gindie	2·56	38	..	7·85
Cardwell	15·62	65	32·23	21·16	Springsure ..	2·87	68	3·64	5·55
Cooktown ..	15·26	61	17·75	14·48					
Herberton ..	7·76	51	6·38	11·16					
Ingham	15·69	45	33·74	28·51					
Innisfail	26·33	56	48·99	24·96					
Mossman Mill ..	18·08	24	19·98	19·39	*Darling Downs.*				
Townsville ..	7·16	66	9·74	9·44					
					Dalby	2·61	67	6·92	4·04
Central Coast.					Emu Vale ..	2·22	41	4·11	1·70
					Hermitage ..	1·95	31	..	1·38
Ayr	6·42	50	9·63	12·33	Jimbour ..	2·43	49	4·96	2·63
Bowen	5·76	66	6·98	26·16	Miles	2·60	52	6·79	5·15
Charters Towers ..	3·71	55	6·30	7·33	Stanthorpe ..	2·59	64	4·52	4·47
Mackay	11·93	66	21·19	31·53	Toowoomba ..	3·62	65	9·84	3·68
Prosperine ..	12·15	34	24·88	35·56	Warwick ..	2·41	72	6·94	1·92
St. Lawrence ..	5·11	66	10·59	4·47					
South Coast.									
					Maranoa.				
Biggenden ..	3·65	38	14·95	4·06					
Bundaberg ..	4·97	54	16·60	8·45	Roma	2·56	63	7·32	7·05
Brisbane	5·60	85	7·26	5·96					
Caboolture ..	7·44	50	9·15	10·93					
Childers	4·33	42	17·95	6·43					
Crohamhurst ..	10·93	44	14·17	18·80					
Esk	4·58	50	9·38	4·28					
Gayndah	2·96	66	5·36	2·49					
Gympie	6·03	67	16·87	7·83	*State Farms, &c.*				
Kilkivan	3·75	58	9·82	5·17					
Maryborough ..	5·76	66	13·03	5·32	Bungeworgorai ..	1·39	22	..	6·98
Nambour	8·99	41	19·77	14·34	Gatton College ..	3·03	38	7·12	2·84
Nanango	3·27	55	6·74	3·76	Kairi	7·88	21	..	11·63
Rockhampton ..	4·31	66	7·37	5·10	Mackay Sugar Experiment Station	10·93	40	18·03	36·97
Woodford	7·68	50	8·67	12·25					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Means Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·78	86	75	92	15	71	25	1,775	22
Herberton	..	78	64	83	19	56	29	638	15
Rockhampton	29·92	86	70	93	28	65	30	737	10
Brisbane	30·01	82	66	97	28	63	4	726	12
Darling Downs.									
Dalby	29·99	84	60	92	28	46	30	692	6
Stanthorpe	..	76	54	87	27	40	29	452	8
Toowoomba	..	78	58	90	28	56	30	984	6
Mid-Interior.									
Georgetown	29·82	89	69	94	8	60	30	1,079	10
Longreach	29·89	90	66	97	28	57	30	609	5
Mitchell	29·97	84	59	92	27, 28	43	30	426	4
Western									
Burketown	29·79	91	74	96	7, 29	66	17	229	4
Boulia	29·84	93	70	101	1, 8	58	29	108	2
Thargomindah	29·94	91	67	103	27	56	29	4	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May. 1937.		June. 1937.		MOONRISE. May. 1937.	June. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6.18	5·20	6.37	5·2	9.39	11·11
2	6·18	5·19	6·37	5·2	10·29	—
					..	a.m.
3	6·19	5·18	6·38	5·2	11·24	12·10
4	6·20	5·17	6·38	5·2	..	1·9
					a.m.	
5	6·20	5·17	6·39	5·2	12·22	2·11
6	6·21	5·16	6·39	5·2	1.20	3·18
7	6·21	5·15	6·39	5·2	2·20	4·25
8	6·22	5·14	6·40	5·2	3·23	5·35
9	6·23	5·14	6·40	5·3	4·31	6·39
10	6·23	5·13	6·40	5·3	5·39	7·42
11	6·24	5·12	6·41	5·3	6·50	8·36
12	6·24	5·11	6·41	5·3	7·59	9·23
13	6·25	5·11	6·41	5·3	9·3	10.6
14	6·26	5·10	6·42	5·3	10·3	10·44
15	6·26	5·10	6·42	5·3	10·47	11·25
16	6·27	5·9	6·42	5·3	11·31	11·51
					p.m.	p.m.
17	6·27	5·9	6·43	5·4	12·10	12·25
18	6·28	5·8	6·43	5·4	12·45	1·0
19	6·29	5·8	6·43	5·4	1·18	1·35
20	6·29	5·7	6·43	5·4	1·50	2·14
21	6·30	5·7	6·44	5·4	2·23	2·54
22	6·31	5·6	6·44	5·4	2·58	3·40
23	6·31	5·6	6·44	5·4	3·36	4·29
24	6·32	5·5	6·44	5·4	4·14	5·23
25	6·32	5·5	6·44	5·5	4·56	6·18
26	6·33	5·4	6·45	5·5	5·44	7·13
27	6·34	5·4	6·45	5·5	6·34	8.9
28	6.34	5·3	6·45	5·5	7·27	9·6
29	6·35	5·3	6·45	5·5	8·23	10·4
30	6·35	5·2	6·45	5·5	9·19	11·1
31	6·36	5·2			10·15	

Phases of the Moon, Occultations, &c.

4th May.	☽	Last Quarter	4 36	a.m.
10th ,,	●	New Moon	11 17	p.m.
17th ,,	☾	First Quarter	4 49	p.m.
25th ,,	○	Full Moon	5 38	p.m.

Perigee, 11th May, at 4 a.m.
Apogee, 24th May, at 11 p.m.

On the 19th Mars will be in opposition to the Sun, rising as the Sun sets. Having moved with retrograde motion since 21st April it will again be seen near the head of the Scorpion as on that date.

On the 23rd Mercury will be stationary. Having apparently moved westward in Aries since the beginning of the month it will then resume its eastward course.

Neptune, in Leo, near the border of Virgo, will become stationary on the 28th. The remote planet, only visible in a telescope, might seem uninteresting to the ordinary observer were it not for the romantic story of its discovery by two young scientists simultaneously, and unknown to each other, Adams in England, and Leverrier in France, not by actual observation but by intricate calculation at their study table. That was in 1845, and then it was found that Adams' calculations differed by one degree only from those of Leverrier. Soon afterwards Dr. Galle in Berlin discovered the planet by observation only a few degrees from the position in Aquarius indicated by Leverrier—and Neptune had wandered into the empty space shown on the famous star maps of Berlin.

Mercury rises at 7.26 a.m., 1 hour 8 minutes after the Sun, and sets at 6.2 p.m., 42 minutes after it on the 1st; on the 15th it rises at 6.0 a.m., 26 minutes before the Sun, and sets at 4.54 p.m., 16 minutes before it.

Venus rises at 4.52 a.m., 1 hour 26 minutes before the Sun, and sets at 4.6 p.m., 1 hour 14 minutes before it on the 1st; on the 15th it rises at 3.52 a.m., 2 hours 34 minutes before the Sun, and sets at 3.20 p.m., 1 hour 50 minutes before it.

Mar rises at 6.31 p.m. and sets at 8.19 a.m. on the 1st; on the 15th it rises at 5.17 p.m. and sets at 7.11 a.m.

Jupiter rises at 10.19 p.m. and sets at 12.9 p.m. on the 1st; on the 15th it rises at 9.24 p.m. and sets at 11.18 a.m.

Saturn rises at 3.17 a.m. and sets at 3.31 p.m. on the 1st; on the 15th it rises at 2.27 a.m. and sets at 2.41 p.m.

The Southern Cross will be visible soon after sunset and until it fades in the approaching daylight.

2 June	☽	Last Quarter	3 24	a.m.
9 ,,	●	New Moon	6 43	a.m.
16 ,,	☾	First Quarter	5 3	a.m.
24 ,,	○	Full Moon	9 0	a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

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 somewhat 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.