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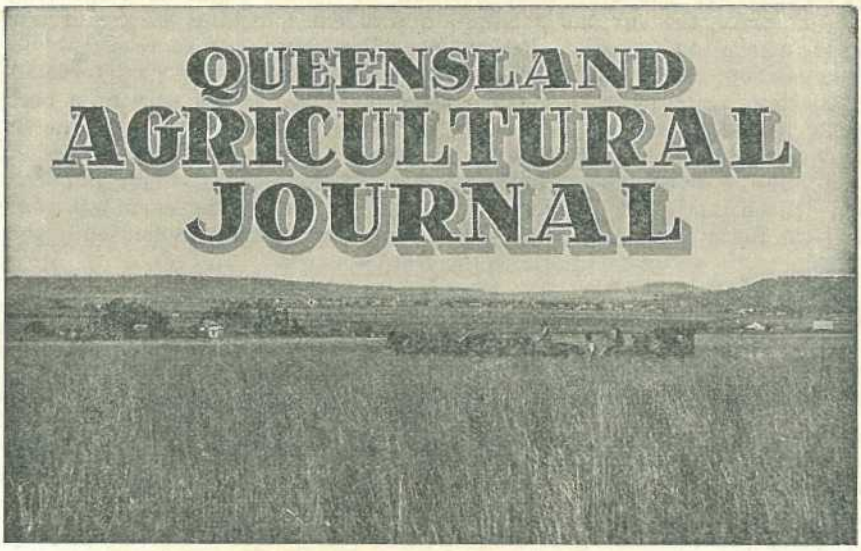


VOL. XLVII. 1 APRIL, 1937. PART 4

Event and Comment

Farming in the Far North.

IMPORTANT field problems were studied closely by the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) during a recent visit to North Queensland, an official tour which extended as far as the new dairy lands on the Daintree River. Soil erosion, grassland improvement, the incidence of the white grub pest in paspalum pastures, and the possibility of extending the fat lamb scheme were among the major subjects of investigation. On his return, Mr. Bulcock remarked that some of the agricultural and pastoral problems of the Atherton Tableland were intricate and perplexing and he proposed to make a special effort to devise means of solving them. The work of pasture renovation would involve much research work, he said, and he proposed a plan of co-ordination in which the district agricultural staff and the Bureau of Tropical Agriculture at South Johnstone would assist. In the course of his tour among the farms Mr. Bulcock saw some crossbred lambs slaughtered. Two crosses were represented in the yarding—Dorset Horn-Merino and Romney Marsh-Merino. The Romney cross was of fair to average quality, while the Dorset cross produced lambs of superfine quality. The progress of the scheme for fattening inland-bred beef cattle on the coastal country also claimed the Minister's attention. The

success of this scheme and that of lamb raising on the high tableland country would obviously become an important factor in the future development of the rich territory of the North.

The Case for Australia at the Sugar Conference.

ALTHOUGH the statistical position of world sugar is improving steadily, the surplus production problem continues as one of our major marketing anxieties. Present hopes are centred on increased world consumption, and the trend is certainly in that direction. Under recent legislation, agriculture in Britain is now assured apparently of a beet sugar industry that will, up to an agreed limit of output, continue to provide a profitable rotational crop, and that there will be no reversion to a state of dependence wholly by the Old Country on sugar imports. The Queensland cane farmer was, no doubt, relieved to learn last year that the limits fixed under the new law would not affect immediately the volume of their sugar exports to the British market. In fact, at the time it was claimed that the new measure was a material contribution to ordered control of the world sugar output. What will be the outcome of the international sugar conference now sitting in London is, however, within the realms of uncertainty. Cabled opinions have passed through the whole gamut of expression from gloomy pessimism to super-optimism.

So far as Australia is concerned, the existing preferential tariff on Empire sugar means to us about £2,500,000 a year—the annual value of our sugar shipments to Britain. The effects of its withdrawal—a distinct possibility—would be felt immediately. Reduced output and the consequent throwing of large numbers of people on to an already over-supplied labour market would be inevitable.

More than twenty countries are represented at the international conference now in session. The gathering is one of the most important in the history of the world sugar industry, and Australia is, therefore, very fortunate in its strong representation, which includes the Premier of Queensland, Mr. Forgan Smith.

Presenting the case for Australia, the Commonwealth Treasurer (Mr. R. G. Casey) emphasised that the world price of sugar had for an extended period remained uneconomic and disastrously low. Despite small preferences from the United Kingdom and Canada, the loss on Australian exports was particularly heavy, because Australia was the only country in the whole world producing cane sugar entirely by white labour, necessitating high wage-rates. Other countries in this matter had a tremendous advantage over Australia, which therefore would endeavour to support any fair and equitable plan to raise world prices to a reasonable level.

Continuing his exposition, Mr. Casey pointed out that directly and indirectly the sugar industry was responsible for 75 per cent. of Australia's present activities in the tropics. Therefore its maintenance and welfare were important. However, Australia's contribution to world stabilisation would require to be governed by the paramount necessity of avoiding any drastic curtailment in production by reduced exports. The Australian sugar industry had been gradually developed over seventy years in *bona fide* circumstances and in the face of many difficulties, and any drastic limitation in output would create graver problems in the parts of Australia concerned than in other countries enjoying a greater diversity of agriculture and more flexible social conditions and standards of living.

Mr. Casey urged the necessity of increasing consumption in the low consumption countries, which, if attained to even a limited extent, would solve the problem of over-production and produce a shortage in supplies. He pointed out that while New Zealand consumed 119 lb. per head, Australia 112·21 lb., and Britain 107·58 lb., Germany consumed only 52·23 lb., Czechoslovakia 55·10 lb., Hungary 23·80 lb., Poland 22.26 lb., Belgium 62·15 lb.

"Moreover, an arbitrary reduction in exports of sugar or of any other Australian commodity," continued Mr. Casey, "is a matter for serious consideration by a country with large external financial obligations, unless a higher price is received for the reduced exports and there is a possibility of alternative compensatory employment. It is essential that the conference should devise a plan to prevent any international agreement being thwarted by non-signatory Powers."

The British View.

MR. RAMSAY MACDONALD, in his inaugural speech, drew attention to the improvement in the statistical position, but pointed out that the world price was only remunerative to the cheapest producers. The fundamental object of the conference should be to assure stability. The United Kingdom, which was a large consumer, did not favour an increase in prices above a just economic level.

Mr. MacDonald suggested that countries not exporting on a free market should regulate production to maintain the free market at as high a figure as possible. Countries supplying a free market should regulate exports to keep supplies at a level appropriate to the possible demand. All countries should do what they could, if free market prices rose to an economic level, to adjust protective duties and subsidies to prevent internal prices from rising to a point that would check consumption and stimulating new production. A general agreement like that for tin and rubber was impossible. The conference must draw up rules applicable to each group of countries. The allocation of export quotas was not easy. He hoped that exporting countries would not seek quotas based on theoretical considerations, but would keep strictly within the limitations of the free market. Others might be asked to keep their internal production at an agreed maximum.

Mr. MacDonald suggested the appointment of a statistical committee and a small bureau to formulate proposals as the discussions proceeded.

The World Sugar Situation.

SUGAR circles are not without hope of a favourable outcome of the conference, to which the improved statistical position should contribute. World production for the year ending 31st August next is estimated at 30,770,000 tons, and consumption at 30,892,000 tons. It is expected that world stocks, normally 3,500,000 tons, will decline to around 75,000 tons.

The main problem of the conference will be the allocation of tonnage. A considerable difference of opinion exists in regard to the advisability of a restriction scheme based on output quotas. Some consider this would force up production costs to the disadvantage of British colonial producers, and would prefer a restriction of acreage with a view to fostering the most efficient producers.

The Grasshopper Outbreak in Queensland. 1934-35.

J. A. WEDDELL, Entomologist.

[*Continued from p. 259, Part III., Vol. XLVII.—March, 1937.*]

SECTION II.

LIFE HISTORY AND HABITS OF CHORTOICETES TERMINIFERA WALK. IN SOUTH-EASTERN QUEENSLAND.

Summary of Life-cycle Stages.

The species *C. terminifera* follows the developmental changes normal to members of the family Acridiidæ.

The eggs (Plate 126, figs. 1 and 2, and Plates 127 and 128) are laid in the earth in batches, each egg being approximately 5 millimetres long and 1 millimetre in diameter and light-brown in colour. The eggs normally fill the lower two-thirds of the egg hole. They are embedded in and covered by a frothy secretion from the parent insect, which hardens, giving a somewhat crystalline appearance when examined.

The stage immediately following the hatching of the egg has a very brief existence, and, because of its unusual structure, it is generally referred to as a pre-nymphal stage and termed the vermiform larva, and is not regarded as a true nymph (Plate 126, fif. 3). It is creamy white in colour, about $\frac{1}{4}$ inch in length, and it is quite helpless on emergence above ground. The emergence of this stage and its transformation to the active hopper is later outlined.

There are five nymphal or active hopper stages (Plate 126, figs. 4 and 5). The first is approximately $\frac{1}{4}$ inch in length, the measurements of the subsequent stages being largely determined by the availability of food. The general colour of the first hopper stage is grey to greyish-brown, but the later instars are brown with dark-brown markings; a percentage of individuals, however, develop gradually a general green colouration with brown or grey-brown markings. The wing-buds may be readily distinguished on instars III., IV., and V.

The adults (Plate 126, figs. 6 and 7) are of two main colour types with grading intermediate forms. The brown insects were usually by far the more numerous; a few green variants could, however, be easily distinguished, while in some swarms the green forms were almost in the majority. Swarms seen at Tara and Yarranlea in November, 1934, included a relatively high percentage of green individuals, while at Goondiwindi at the same time the swarms were predominantly brown.

Adults varied greatly in size, measurements from the front of the head to the tip of the folded wing varying from 0.95 inch to 1.65 inch—*i.e.*, from 24 millimetres to 40.5 millimetres.

Egg-beds.

Oviposition was observed in a variety of different situations and soil types during the course of the outbreak. In certain instances heavy laying had occurred in hard-beaten ground completely bare of all vegetation, an outstanding example being earth roads in the Inglewood township. Areas of claypan were also used for egg-beds. These claypans

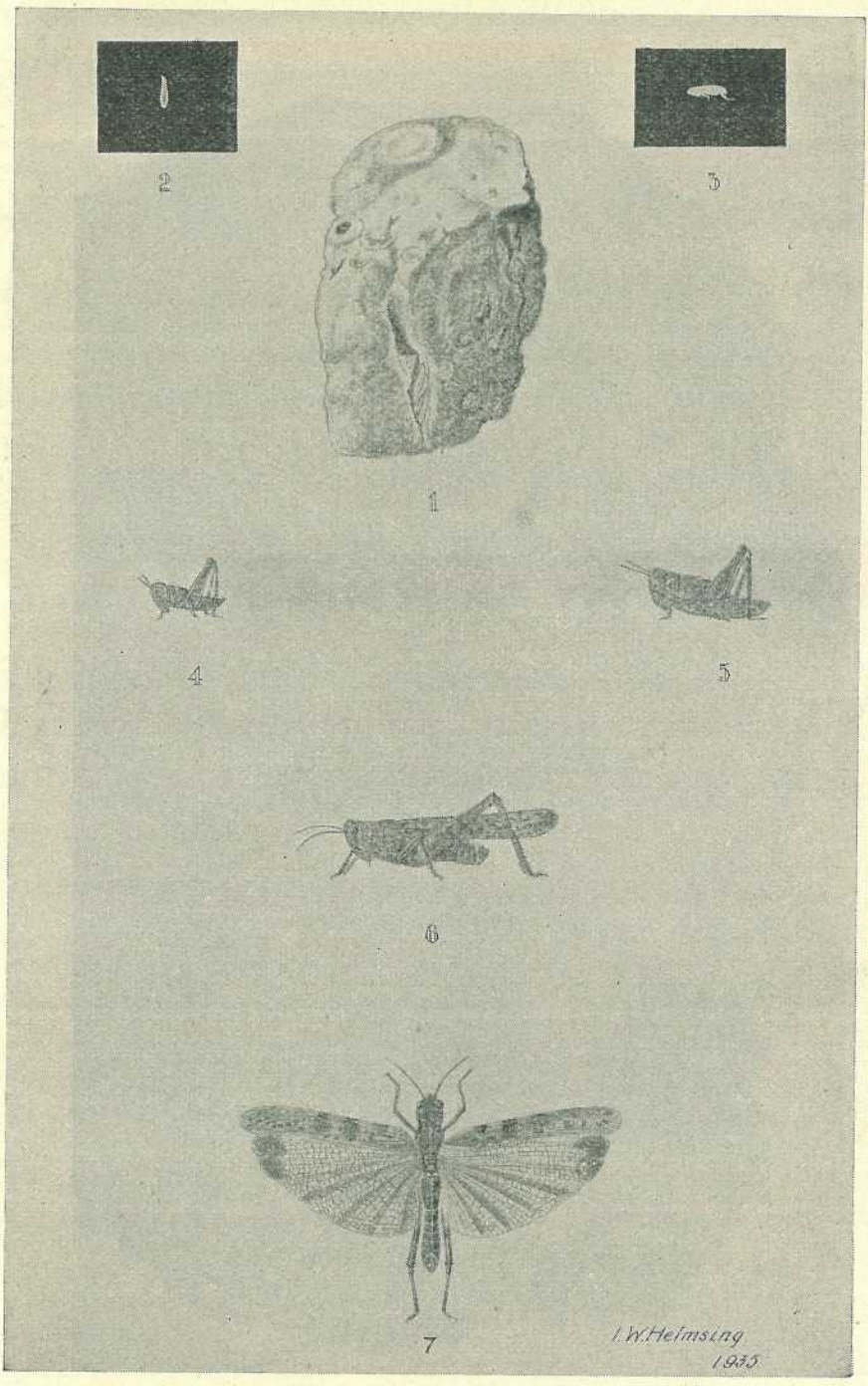


Plate 126.

Fig. 1.—Fragment of soil showing "egg pods" and eggs *in situ*. Fig. 2.—Egg. Fig. 3.—Newly emerged hopper. Fig. 4.—Later stage hopper. Fig. 5.—Pre-adult hopper. Fig. 6.—Adult male (lateral view). Fig. 7.—Adult male (dorsal view). All figures natural size.

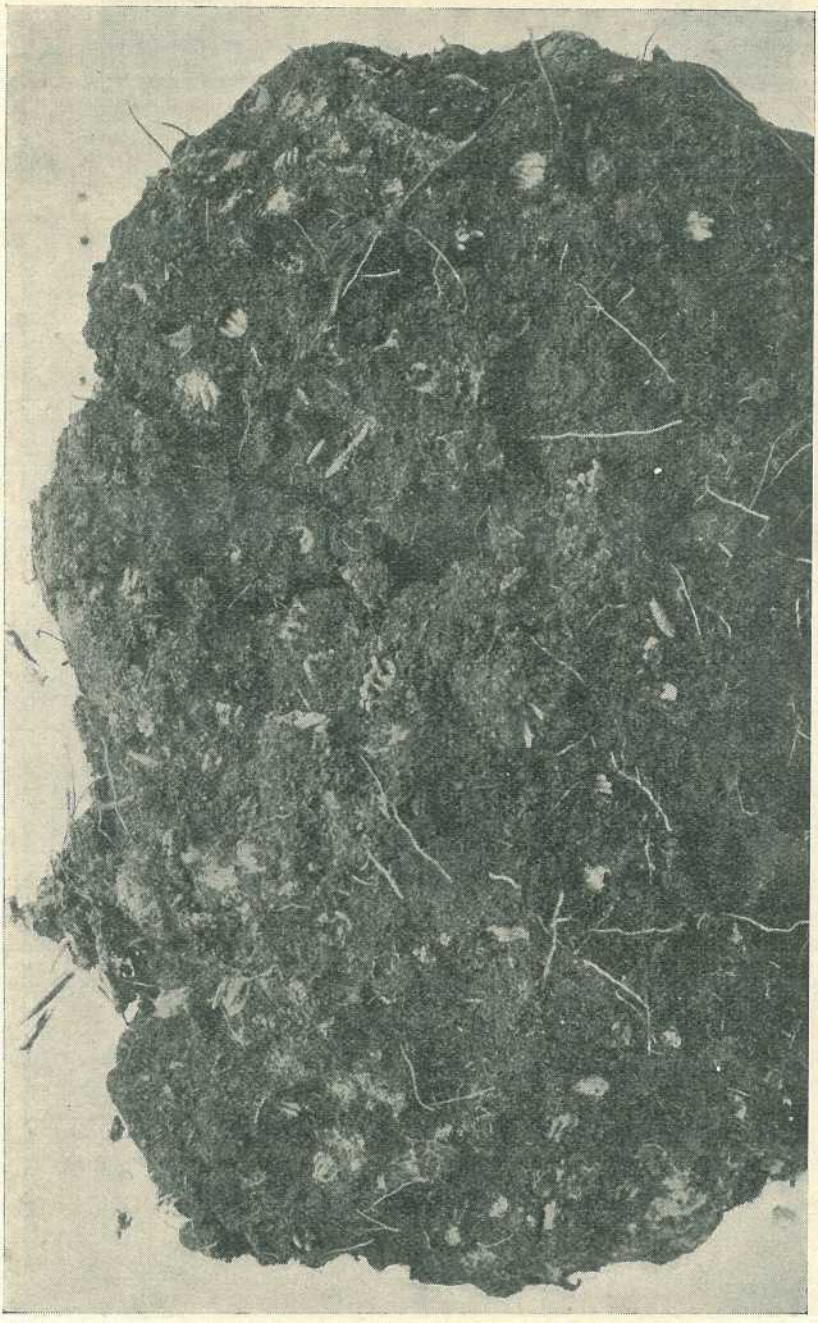


Plate 127.

The under side of a slab of earth removed from egg-bed; note the broken egg pods with eggs *in situ*.

were usually very hard and compact. The more usual sites, however, were those consisting of slightly rising ground, sparsely grassed, showing small areas of bare ground between the tufts of grass and herbage. Hard sandy ridges were also favoured.

A definite hardness of the ground was not by any means a necessary quality of an egg-bed. A surface crust such as that produced by the slight compacting that follows rain was amply sufficient to provide the necessary foothold for the gravid female. Heavy laying was observed in partially cultivated paddocks, between rows of maize, in the sandy loam of a tobacco farm, the ground being almost ready for planting, and in a sandy area carrying a very sparse grass cover. In all cases a slight crust had formed on the surface prior to egg-laying. An example of oviposition on a sandy loam is illustrated by Plate 129, which also shows the effect of heavy rain on the egg-bed. The rain washed the

Plate 128.
Vertical section of soil showing egg pod, natural size.

surface soil away and disclosed the egg holes. During oviposition egg-beds could be readily located owing to the swarming females. Further, a percentage of the insects usually became jammed in the soil, and their dead bodies then marked the site for a few days.

As a general rule, however, the actual egg holes were rather difficult to locate prior to hopper emergence, even though egg-laying had been observed. However, when the insects emerge, the small circular earthen cap is pushed from the hole and numbers of the tiny caps may readily be found.

Egg-beds of various dimensions were seen. Those in the Kooroongarra area were usually smaller—rarely exceeding an acre in extent—than those in the Goondiwindi and Inglewood districts, where egg-beds of several acres were not uncommon. Egg holes varied in density up to about 120 per square foot, while eggs in the egg pods ranged from 18 up to 57, the latter being found in an egg-bed in sandy soil. The general average ranged from 30 to 40 eggs per egg pod.

Exceptional behaviour on the part of the gravid female was observed in an egg-bed at Goondiwindi, where a large number of females laid their eggs on fence posts and rails and on the trunks and limbs of trees to a height of 15 feet from the ground. The eggs were all overlaid

by a mass of froth, as though they had been normally deposited. Needless to say, the eggs so laid quickly dried out and no hoppers emerged. (Plate 130.)

Emergence of Hoppers.

The emergence of the hoppers from an egg-bed is very interesting. Apparently the eggs in an egg pod hatch almost simultaneously, and the combined pressure of the young insects serves to dislodge the cap of the hole. The insects then commence to ooze (there is no better word) on to the surface. The first-stage or vermiform larva is white in colour, very weak, helpless, and fragile. It is only about one-quarter of an inch in length, but its slender, soft, white legs are quite incapable of supporting its weight. As a result, the insect lies helplessly on the surface.

Plate 129.
Egg holes disclosed in sandy soil, following heavy washing by rain.

Within periods varying from half an hour to five minutes the pale skin of this first stage splits dorsally and is shed, the moulted skin being finally pushed away from the hind tarsi. Almost simultaneously with the shedding of the skin the insect springs into activity. It stands alert with the jumping legs braced for use. The colouration of the chitin soon becomes evident, and within a few seconds the tiny insect is leaping away.

Habits of the Hoppers.

Hoppers were first observed at Kooroongarra in mid-September, 1934. The days then were just pleasantly warm, with cold nights. Newly hatched swarms were very compact, while further emergences daily increased the insect population. The young hopper swarms remained as compact masses and moved bodily, perhaps only a few feet per day, the movements being, for a period, at least, in no particular direction. The food requirements of these young hoppers appeared to be very slight, but they did feed, particularly on the succulent foliage of trefoils or burr clovers, two species—*Medicago denticulata* Willd. and *M. minima* Lam.—being very common on the Darling Downs. The

somewhat haphazard movements of the swarms usually brought them, in the course of a few days, to slight depressions such as creek banks, melon holes, and so on, where ample supplies of succulent clover were available.

About a fortnight after emergence the hoppers changed their habit and something in the nature of a mass migration commenced. The direction of the migration appeared to be influenced solely by chance. A definite movement in a particular direction began and a heavy massing of individuals on the leading "face" was evident, the main swarm following behind. In the absence of suitable quantities of food,

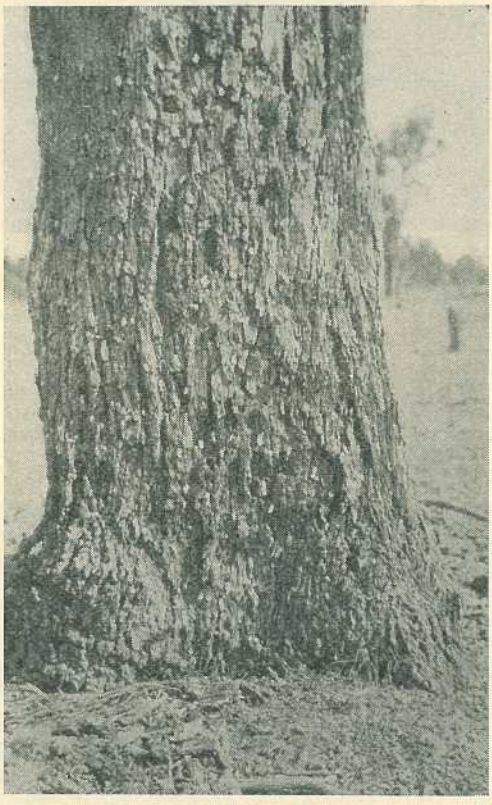


Plate 130.

An extraordinary oviposition site. Note the whitish egg masses on the tree trunk.

the insects moved forward fairly quickly, but when good pasturage was available the rate slackened noticeably and the front line became dense, sometimes over a width of 1 to 3 feet. Forward movement then continued day after day in the direction of the succulent feed. As a result, the appearance of a moving swarm attacking an area of young wheat was quite spectacular, resembling from a distance the daily advance of an irresistible tide.

On clover the young hoppers nibbled the leaves and older hoppers chewed also the young stalks. On tall pasture grasses and grain crops the flag was eaten, but where the grain crop was young and the swarms dense very little of the plant remained when the swarm leaders had passed on.

Plate 131.
Young hoppers clustered as a dark mass on the western side of a log at 5 p.m.

Plate 132.
Young hoppers clustered on a stone.

The reactions of hoppers to various stimuli are comparatively well known, but some points noticed seem worthy of mention. In the morning, up to about 8 a.m., the insects were quite sluggish and had not then abandoned their "sleeping" quarters. With the rising temperature, they became more active and were very easily disturbed. When walking through a swarm, the insects scattered from the line of advance, closing in again behind immediately afterwards. In bright sunlight they were exceedingly sensitive to any sudden movement. Thus, if one stood stationary for a short period, a sudden gesture was sufficient to stimulate the hoppers within a radius of several feet into intense activity, from which they gradually subsided.

As the shadows lengthened in the afternoon there was a general movement up the stalks of weeds, herbage, grass tufts, trunks of trees, logs, fencing, stones—in fact, anything that could be climbed, preferably, it seemed, to a height of about 18 inches above the ground. All such material within the area occupied by a swarm thus assumed a dark-brown to blackish appearance, due to the density of the hoppers (Plates 131 and 132).

The gregarious instinct was very evident, particularly among the young hoppers. The swarms of newly hatched hoppers were relatively small in the Kooroongarra district. The population density was, however, fairly high. One sampling yielded approximately fifteen insects per square inch throughout a swarm measuring approximately 33 yards by 17 yards—a total population of about 10,000,000 individuals. Needless to say, as the insects grew in size and became capable of a wider range of movement, these swarms spread and frequently occupied areas measurable in acres.

An avoidance of shade during the day was a noticeable characteristic of the spring generation (Plate 133). Practically all hopper movement in a swarm ceased during periods of cloud, and the margins of the swarm became noticeably blurred. Immediately the sun reappeared the line became distinct again and the insects moved forward. The next generation, bred under summer conditions, behaved rather differently. The hoppers became quiescent about midday and sought the shade, presumably owing to the higher temperatures.

As the feeding rate is apparently linked with general activity, it is not surprising that, whereas the spring generation fed during the middle of the day, the summer generation spent the midday hours in a state of comparative quiescence. Feeding started earlier in the morning and continued later in the afternoon. This had an important bearing on the selection of times for laying baits as a control measure.

Habits of Adults.

Adults migrated in fairly open or dispersed formation, each wave spreading over a wide area. Some travelled at heights up to 300 feet, but the majority of the population flew only 20 or 30 feet above the ground. Timber usually diverted or stopped the swarms, but sometimes the grasshoppers flew up and over lines of trees. Migration, however, usually took place over open or cleared country. Passing through townships, the adults mainly followed the roads. It was very noticeable that the main migration into the Inglewood district in November, 1934, was from south-west to north-east, following fairly well the improved

properties and the cleared channels represented by the McIntyre Brook, the railway, and the main road, which lay more or less parallel in that direction. Migration along cleared fence lines and firebreaks in timbered country was also observed.

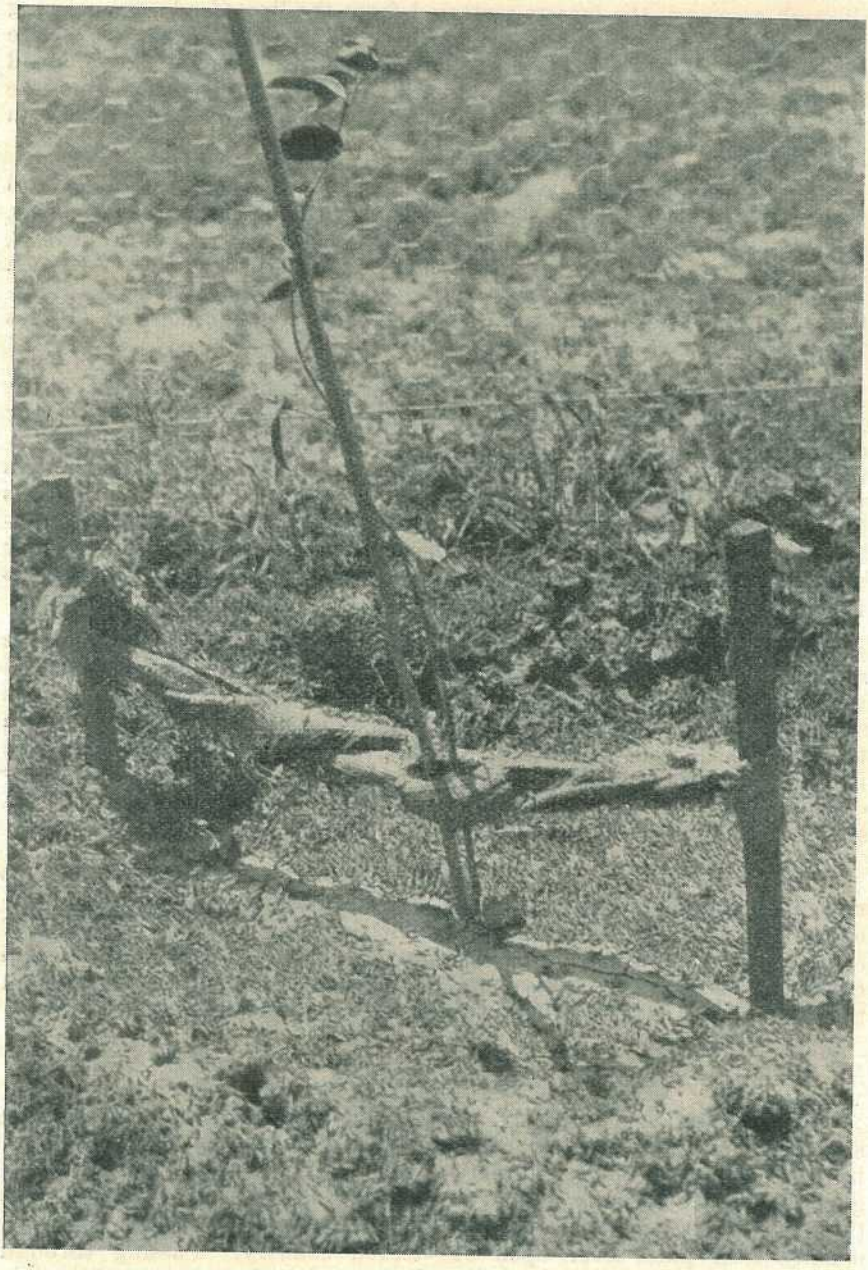


Plate 133.

Portion of swarm of young hoppers migrating past a newly-planted tree. Note the definite avoidance of the shadow cast on the ground by the roll of hessian.

Adults were seen flying through open timber, but they did not enter dense timber. One dense swarm was found margining a belt of trees, and only two or three paces into the timber there was complete freedom from grasshoppers. Egg-beds were frequently found adjacent to timber areas following migratory flights in that direction.

Swarms were relatively dense when mating occurred, while for oviposition the females congregated so closely together that sometimes the ground was almost obliterated from view.

Peculiar Feeding Habits.

One station-owner attempted to protect his vegetable patch from invading grasshoppers by covering the beds with hessian. Holes were subsequently eaten through this hessian cover.

A patterned linen cloth was washed and hung in the open to dry while a flight was in progress. A number of insects settled on the wet cloth and in a short time it was completely ruined. The cloth was of white linen patterned in blue and black, and in feeding on it the insects exhibited what almost amounted to a colour preference in that the darker portions were predominantly the worst affected.

Number of Generations in South-eastern Queensland.

Unfortunately, it was not possible to watch the insects breeding, in the districts affected, for a complete year. Nevertheless, there can be no doubt that not less than three complete generations are possible in South-eastern Queensland in a single year. The following records for 1934-35 can be explained only on this basis:—

TABLE 3.

Date.	Record.	Egg Period.	Larval Period.	Generation.
1934.				
April–May	Adults oviposited	Approx. 4 months	..	..
Early September ..	Nymphs emerged			
Early September ..	Nymphs emerged	..	Approx. 7–8 weeks	I.
Late October	Adults on the wing			
3rd November ..	Adults oviposited	19–21 days	..	..
22nd November ..	Nymphs emerged			
22nd November ..	Nymphs emerged	..	Approx. 6 weeks	II.
1935.				
4th January ..	Adults on the wing			

Assuming that adults on the wing in January laid eggs, their progeny—the third generation—would develop in nine to eleven weeks, yielding adults capable of oviposition early in April, thus returning to the period with which the table commenced.

Natural Enemies.

At intervals several species of birds, including ibis, starlings, plain turkeys, and crows, fed on the hoppers. The ibis appeared the most important, particularly in the Kooroongarra locality. Several large flocks visited the swarms day after day and fed actively. Quite often the presence of the birds facilitated the location of hopper swarms at a distance.

Birds are, no doubt, useful in destroying noxious insects, but in the face of an epidemic occurrence they are quite incapable of effectively reducing the pest population.

By far the most important insect enemies of the grasshoppers were the Scelionid egg parasites. Two species—*Scelio chortoicetes* Frogg. and *S. fulgidus* Crawf.—were collected. Occasional egg pods at Kooroongarra in September were parasitised to the extent of 60 per cent. to 80 per cent., but these were apparently exceptional, for the total parasitism in the egg-beds, as judged by the subsequent hopper emergence, could not have been considerable. At Goondiwindi up to thirty adult Scelionids per square yard were found on certain egg-beds during the spring. Again, in spite of this, very heavy hatchings of hoppers occurred.

These Scelios, however, accomplished outstanding work on the eggs laid in November. One example may be quoted. Female grasshoppers oviposited on the same site for the two successive generations. From eggs laid in the autumn the normal heavy hatch of hoppers occurred in the spring, and at the time of emergence a number of Scelionids were seen. Heavy oviposition recurred in November, and parasitism was so effective that only a few hoppers emerged. Scelionids were exceedingly active and numerous over the whole egg-bed of some acres. During November the Scelionid wasps were readily found wherever heavy oviposition occurred.

Two species of Tachinidæ were bred from the plague grasshopper—*Locustivora pachytyli* (Skuse) and *Helicobia australis* (J. and T.)—larvæ being found in both immature and adult grasshoppers from Goondiwindi. Among some swarms the percentage of parasitism appeared to be high. The degree to which this form of parasitism subsequently impaired reproduction was not investigated, but otherwise the effect of the parasitism was not particularly marked. Occasional parasitised individuals were certainly sluggish, but many apparently normal insects contained well-grown maggots.

A number of swarms of both adult grasshoppers and nymphs were infested by red mites, and in one instance the bulk of the population was attacked. The insects so infested were definitely sluggish.

[TO BE CONTINUED.]

CODLING MOTH CONTROL.

In the February issue of this journal a brief note on codling moth control was published, although the advice it contained was obviously out of season. The note was originally prepared for and published in another departmental publication—*The Weekly News Bulletin*—for use during the week ended 17th October last, when it had a seasonal value.

Although unseasonable at the time of publication in the *Queensland Agricultural Journal,* the advice the note conveyed might well be kept in mind as applicable next spring. A further reminder will, of course, be published before then.

Queensland Weeds.

JOHNSON GRASS AND WILD SORGHUM.

C. T. WHITE, Government Botanist.

Johnson Grass (*Sorghum halepense*).

DESCRIPTION.—A robust, perennial grass, mostly 3-5 feet high, with numerous well-developed white underground stems or runners; each runner with numerous short internodes and capable when cut into small pieces of developing into new plants. Leaf-blades 12 to 15 inches long, mostly under ½ inch wide; uppermost leaf-sheaths about 6 inches long, the lower ones successively shorter; ligule silky-hairy. Inflorescence (seed-head) 9-12 inches long and almost 8 inches across. Spikelets of two sorts, the smaller, narrower ones male or sterile, the others and larger, female or fertile. Fertile spikelets scarcely ¼ inch long, densely covered with silky hairs, awn brown, bent and twisted, over half an inch long, soon falling off.

Distribution.—A native of the Mediterranean region, now naturalised in most warm temperate and sub-tropical countries.

Botanical Name.—Sorghum, probably from Sorghi, an Indian name for *Sorghum vulgare; halepense,* Latin, meaning a native of Aleppo, Northern Syria.

Common Name.—The origin of the name Johnson Grass is explained in the following way by Ada E. Georgia in "A Manual of Weeds," New York, 1914:—"About 1830 there came to Governor Means, of South Carolina, a message from the Sultan of Turkey, requesting that an instructor in the art of raising cotton be sent to the Ottoman Empire. Two or three years later, when the instructor returned, he brought with him the seeds of a number of plants that seemed to him to be of economic value, and among them was this grass. An Alabama planter, Colonel William Johnson, while on a visit to South Carolina, became interested in the new plant, obtained a quantity of seed, and raised it extensively on his plantation in the fertile bottom lands of the Alabama River."

Properties.—Like most of the Sorghums, Johnson Grass contains a prussic acid-yielding glucoside. The glucoside is most developed in the young stages, particularly second growth, and its use as a fodder unless cut and allowed to wilt for a short time is always attended with a certain amount of risk.

Eradication.—As in all plants with an underground food storage system, all attempts at eradication should be aimed at keeping down the leaf growth by cutting or mowing, as the vigour of the underground runners depends on the leaves. Pigs are especially fond of the white, succulent, underground parts of Johnson Grass, and are useful in keeping the pest in check, but as the glucoside is present in these as well as the green leaves and stem there is always a certain amount of risk in allowing pigs to feed on them.

Botanical Reference.—Sorghum halepense (L.), Persoon Synopsis Plantarum I., 101 (1805).

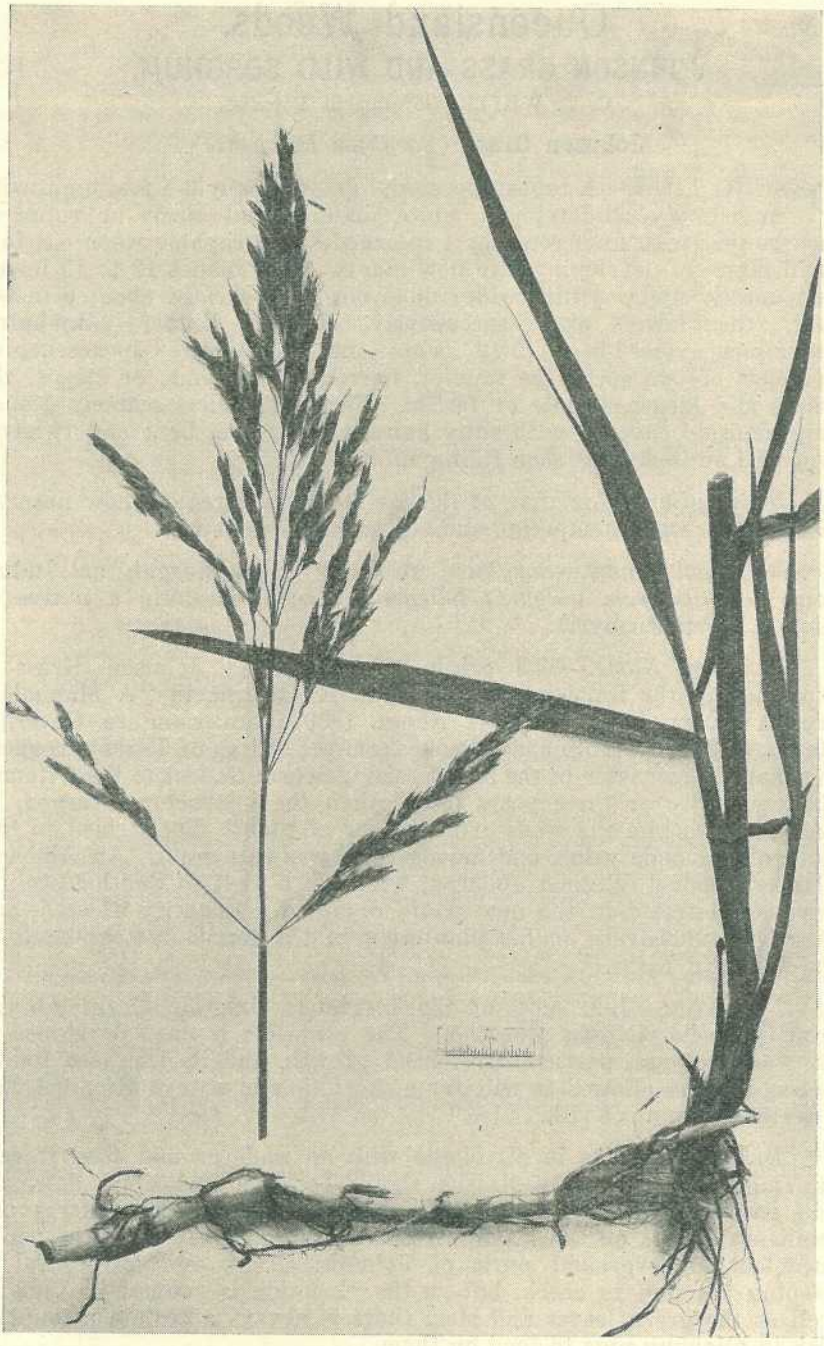


Plate 134.
Johnson Grass (*Sorghum halepense*).

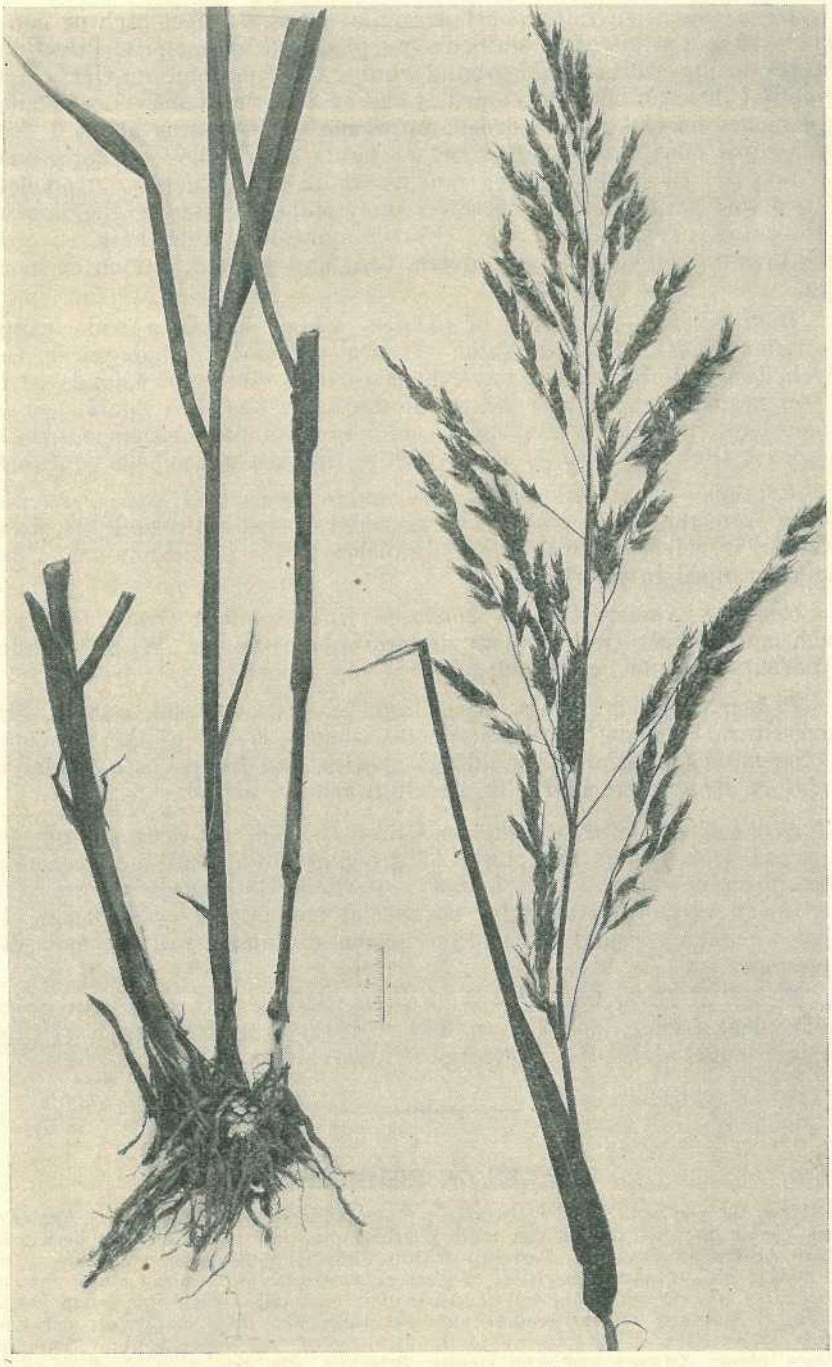


Plate 135.
Wild Sorghum (*Sorghum verticilliflorum*).

Wild Sorghum (*Sorghum verticilliflorum*).

Description.—A tall, robust perennial grass, 6-8 feet high or more, the leaves and stems often stained a purplish red by bacterial infection; not producing white, underground runners as in Johnson Grass, but perennial through buds developed at the base of the stems. Leaf-blades 9-18 inches long, ½-¾ inch broad, uppermost leaf-sheaths about 1 foot long, lower ones successively shorter; ligule silky-hairy. Inflorescence (seed-head), 12-18 inches long and about 12 inches across. Spikelets of two sorts, the smaller, narrower ones males or sterile, the larger, plumper ones female or fertile. Fertile spikelets ¼ inch long, covered with brown, silky hairs; awn brown, bent and twisted, ½ inch or more long.

Distribution.—A native of Africa, where it has a wide range through tropical Africa to Natal. It is also found in Madagascar, the Seychelles, and the Mascarenes (the Mauritius Group of Islands). It is now naturalised in many warm countries. It has been established in Queensland for many years, and is much more abundant than *Sorghum helepense* (Johnson Grass), with which in the past it has been confused.

Botanical Name.—*Sorghum* (see under Johnson Grass); *verticilliflorum* from the Latin *verticillus,* the whirl of a spindle, and *flos, floris* a flower, in reference to the lower branches of the panicle or seed head being arranged in whorls.

Common Name.—Usually confused with Johnson Grass, but is a much more robust grass without underground runners. Wild Sorghum is, perhaps, the most commonly applied vernacular.

Properties.—The grass, according to tests carried out at the Agricultural Chemist's Laboratory (Brisbane) is one of the strongest cyanogenetic (prussic acid yielding) species, and its use as a fodder is therefore always attended with a certain amount of risk.

Eradication.—Unlike Johnson Grass, this species does not possess rhizomes, which have the power of growing from small underground pieces into new plants. It is not a particularly aggressive grass in cultivation areas, and calls for no special methods of eradication. It is very common round cultivation headlands, along railway embankments, etc.

Botanical Reference.—*Sorghum verticilliflorum,* O. Stapf. in Flora of Tropical Africa, Vol. IX., p. 116. (1917.) *Andropogon verticilliflorus,* Steudel Synopsis Plantarum Glumacearium 1, 393. (1854.)

Review of Results from Fertility Trials in North Queensland.*

H. W. KERR.

Introduction.

IN 1929 the Bureau of Sugar Experiment Stations instituted the farm fertility trial project. To date, we have the results of seven years' effort, and it would appear opportune to review these results, for the purpose of extracting any general conclusions which appear warranted, and to indicate in which directions our future efforts should be concentrated.

It is recognised that the results obtained from an experimental area on one farm are specific for that area alone; but at the same time, when we have accumulated similar evidence from a series of such trials, on areas of similar soil type, we are justified in generalising our advice for the soil type as a whole. After all, our recommendations are based on but three classes of mixed fertilizer, which are, at the present time, adequate for our needs; as we cannot in the present state of our knowledge, draw finer distinctions between fertilizers of similar composition, or even designate to the nearest 50lbs. the quantity of fertilizer per acre which should be applied from year to year, no further refinement is demanded. We must remember, also, that the quantity of fertilizer which a farmer purchases is often governed not only by the needs of his land, but by the length of his purse.

Soil Types.

Our soil survey officer has provided us with maps of the Northern cane soils, and has classified them largely on the basis of their origin and mode of formation, into a number of major types, with minor variants. The major types are:—

(1) Granitic alluvials,
(2) Granitic residuals (usually sandy and gravelly loams),
(3) Schist alluvials,
(4) Red schist residuals,
(5) Red volcanic loam.

They occur in greater or less amounts, in all areas from Mossman to Tully: there are no schist alluvials in the Tully or Babinda areas, while red volcanic loams are absent from the Mossman and Tully districts.

These distinctive types have been kept in mind in the selection of sites for fertility trials, so that at the present time we are in possession of information regarding each major series, in addition to more specialised knowledge on minor variants.

(1) Granitic Alluvials.

This class embraces many of the river and creek flat soils of the Mossman, Mulgrave, Babinda and Innisfail districts. In their behaviour towards fertilizers, we find that they are frequently acid, and in need of

* Reprinted from the current "Cane Growers' Quarterly Bulletin" by courtesy of the Director, Bureau of Sugar Experiment Stations, and with acknowledgment to the Queensland Society of Sugar Cane Technologists.

liming. They also exhibit deficiencies in available phosphates and nitrogen, but are usually well supplied with available potash. An excellent example of this soil type is the Tropical Agricultural Station, South Johnstone, which was conducted for many years as a sugar experiment station. Our experiments showed consistently good and profitable results from the frequent use of lime, and the consistent applications of fertilizers rich in phosphates and nitrogen.

A number of our farm trials have been located on this type. A summary of the results gives the following average increase from modest application of nitrogen (as sulphate of ammonia), phosphoric acid (as superphosphate) and potash (as muriate) :—

TABLE I.
GRANITIC ALLUVIAL LOAMS.

Yield Increase Due to—	Plant Cane.	Ratoon Cane.
	Tons.	Tons.
Nitrogen (N)	2	5
Phosphoric acid (P)	5	6
Potash (K)	1	2
Total	8	13

The consistency over a range of trials confirms the general recommendations of the Bureau, for the use of Sugar Bureau No. 1 fertilizer mixtures, which are rich in phosphates and poor in potash. It will be observed that there is a marked increase for nitrogen on ratoons, whereas the plant cane response is relatively slight. Sulphate of ammonia should therefore be applied consistently to ratoons, even when green manuring has been practised prior to planting.

We have also the results of quantitative fertilizer trials on this soil type, which were designed to tell us the most profitable application per acre.

Though these are insufficient to allow of any fine conclusions, they indicate the need for the following:—

—	Plant Cane.	Ratoons.
Initial treatment.. ..	4 cwt. per acre, Sugar Bureau No. 1 Planting Mixture in drill	4 cwt. per acre, Sugar Bureau No. 1 Ratooning Mixture, when ratooning
Top dressings	2 cwt. per acre, sulphate of ammonia as top dressing (if farmer has not green manured)	3–4 cwt. per acre sulphate of ammonia, in two top dressings; the heavier application for old ratoons

(2) Granitic Residuals.

This class includes the characteristic gravelly loams of Babinda and Tully, as well as smaller areas of red granitic slopes at the foothills of certain districts. In spite of their low water-holding capacity, they are productive types in high rainfall areas, provided liberal fertilizer applications are made to maintain the available plantfood supply. In

their behaviour towards the individual nutrients, they are rather similar to the granitic alluvials, as is shown in Table II.: this summarises the results to date on the gravelly soils.

TABLE II.

Granitic Gravelly Loams.

Yield Increase Due to—	Plant Cane.	Ratoon Cane.
	Tons.	Tons.
Nitrogen (N)	4	6
Phosphoric acid (P)	2	2
Potash (K)	0·5	2
Total	6·5	10

It will be observed that these soils give generally a higher plant cane response to sulphate of ammonia than do the alluvials; this is to be expected, when it is remembered that these soils are very deficient in humus. The yield increase due to phosphate is relatively slight, and we have some indication of a slight potash deficiency in ratoons.

On the basis of quantitative trials carried out on this soil type, we offer the following general recommendation:—

—	Plant Cane.	Ratoons.
Initial treatment.. ..	3–4 cwt. per acre, Sugar Bureau No. 1 Planting Mixture in drill	3–4 cwt. per acre, Sugar Bureau No. 1 Ratooning Mixture, when ratooning
Top dressings	2–3 cwt. per acre sulphate of ammonia as top dressing (if farmer has not green manured)	3–4 cwt. per acre sulphate of ammonia, in two top dressings

(3) Schist Alluvials.

This soil type is generally not "pure" in character, as the silts from which it is built are usually of mixed granitic and schist origin; we therefore apply the name to soils which are purely *or* predominantly of schist origin. Soils of this class constitute some of the most highly productive lands of the North.

Due probably to the lack of uniformity in the parent material from which these soils are formed, they exhibit marked variations in their behaviour towards artificial manures. It is generally true that they display definite nitrogen deficiency, and some remarkable yield increases are obtained from applications of sulphate of ammonia. The remarks for residual schist soils should be consulted for further comment on schist loams in general.

(4) Red Schist Residuals.

This soil type is one of the major cane soils of North Queensland. The general colour is red, and for this reason they are often confused

with volcanic loams: indeed, the line of demarcation is particularly difficult to define where both types exist side by side. At times a moister variation of the major type exists, and this is brown in colour: where conditions of poor drainage occur, a characteristic white soil is obtained.

These soils as a class have been studied more extensively than any other type in North Queensland. This is the result of the lack of agreement obtained from areas even in close proximity. They are uniformly deficient in humus, and consequently, in available nitrogen: they therefore give good response to sulphate of ammonia. In certain cases an application of 4cwt. per acre has given increases ranging from 10 to 17 tons of cane per acre, with ratoons. As regards their reaction to phosphates and potash, we find sometimes one, sometimes the other is dominating, while on other occasions, both are in substantial demand.

The summarised results of Table III. illustrate this fact.

TABLE III.

SCHIST LOAMS.

Yield Increase Due to—	Plant Cane.	Ratoon Cane.
	Tons.	Tons.
Nitrogen (N)	3·4	8·4
Phosphoric acid (P)	2·5	2·0
Potash (K)	2·1	3·0
Total	8·0	13·4

These averages show clearly the need for sulphate of ammonia on this soil type, on both plant and ratoon crops: as regards phosphate and potash, the *average* increase is sensibly equal for both plantfoods: but if we should consider *extreme* cases, we have the following comparison, for trials located not more than one mile apart, on first ratoon crops:—

Increase Due to—	Farm "A."	Farm "B."
	Tons.	Tons.
Nitrogen (N)	3·8	12.8
Phosphoric acid (P)	4·8	2·8
Potash (K)	0·4	7·0

To quote another example, from a trial on red schist soil at South Johnstone, we found:—

Increase Due to—	Tons.
Nitrogen	2.2
Phosphoric acid	9.2
Potash	1.5

To generalise, then, we would offer the following advice; this will cover probably 75 per cent. of schist lands. It is best, however, for farmers on this class of soil to submit a sample for chemical analysis, as this can be relied upon to tell us the true state of the soil with reference to available phosphate, and to indicate the need or otherwise for potash; a specific recommendation then becomes possible.

——	Plant Cane.	Ratoons.
Initial treatment.. ..	3–5 cwt. per acre, Sugar Bureau No. 2 Planting Mixture, in drill	3–5 cwt. per acre, Sugar Bureau No. 2 Ratooning Mixture, when ratooning
Top dressings	3 cwt. per acre sulphate of ammonia, in two top dressings	3–4 cwt. per acre sulphate of ammonia, in two top dressings

(5) Red Volcanic Loam.

Substantial areas of this soil type are found in the far North, notably in the Innisfail and Babinda districts. The virtues of this soil from the point of view of its tillage qualities have frequently been extolled. It is also very interesting in its reactions to fertilizer, as it is the chief soil type which shows a definite and consistent potash deficiency: it is rarely if ever lacking in available phosphate, while yield-increases from sulphate of ammonia, even on ratoons, are not outstanding.

Applications of from 300-500lbs. of muriate of potash per acre have produced crop increases ranging from 6 to 14 tons of cane per acre, on plant cane. The highest increase was recorded on a field characterised by the presence of "sterile patches" which is so frequently strong evidence of potash deficiency on soils of this type.*

With ratoons, the crop increases for progressively heavier applications of potash are not so marked as for plant cane: and it would appear that the consistent application of 2cwt. of muriate of potash per acre is sufficient for customary yields. It is interesting to note, also, that the use of potash on this land influences the C.C.S. of the crop grown thereon, and farmers may expect permanent benefits from the practice. Our recommendations for red volcanic soils are as follows:—

——	Plant Cane.	Ratoons.
Initial treatment.. ..	4–5 cwt. per acre, Sugar Bureau No. 3 Planting Mixture, in drill	4–5 cwt. per acre, Sugar Bureau No. 3 Ratooning Mixture, when ratooning
Top dressings	2 cwt. per acre, sulphate of ammonia as top dressing (if farmer has not green manured)	2–3 cwt. per acre, sulphate of ammonia as top dressing

* This should not be confused with similar patches on alluvial country; they usually denote excessive acidity and phosphate deficiency.

Comfort for Cows.

WITH the dairy herd, a cold rainy spell always results in a falling off in production and—equally important but often overlooked—a falling off in condition. This may be regarded as an unavoidable evil, or, what is more likely, the dairyman blandly ignores it in the belief, probably, that the growth of feed after the rain will soon restore production to its original level or even raise it. But is such a temporary setback unavoidable? It is certainly not economical.

The remedy is not a matter of any great expense, or even of any great work. A corn-sack rug for each cow will mean the difference between a hungry herd, huddled into some inadequate shelter, and one out feeding even through the heaviest of showers, or on the coldest day. Two sacks sewn together lengthwise for the body of the rug and one across the withers and shoulders, short lengths of rope or cord for a breeching with ties under the belly and brisket are all that are necessary; about two shillings worth altogether, but a lot of comfort for a good cow. Although it won't be really waterproof, unless treated, until it has been in use some time, it is proof against the wind; and that is the real object, not to keep the cow dry but to keep her warm.

The usual objection is the labour of rugging and unrugging daily. Rugs are required on the cows day as well as night while the rain or cold weather lasts. When rugging in winter time the rugs should be removed on any fine day, but should be left on when the cold westerly winds are blowing. Any real herdmaster will rug throughout the winter, having once seen the comfort it provides for his cattle, in spite of the time taken in rugging and unrugging.—A. McDOWAL, Inspector of Dairies, Stock, and Slaughtering.

Cane Soils of North Queensland.*

N. J. KING.

THE canegrowing soils of North Queensland were discussed at the last Cairns Conference.† The maps submitted at that time were based on a preliminary soils survey carried out in 1930. During the latter half of 1936 the writer made a more detailed survey of these far northern areas supplying the Mossman, Hambledon, Mulgrave, Babinda, and Goondi Mills. The work will be continued as opportunity offers.

Several alterations and amendments were made in each mill district and the increasing volume of information being collected by the northern field officer, and per medium of fertility trials, makes possible a more detailed study of these soils. At the same time field experimental programmes are being vigorously pursued by several of the mill staffs, and the writer is particularly indebted to the staffs of Mulgrave and Goondi Mills, whose co-operation was of considerable value. The soil analytical survey initiated by the former mill should be of inestimable value to the suppliers in furtherance of an intelligent fertilizer programme.

Mossman.

Sugar cane agriculture in this area may be described as being carried out in a series of valleys and flood plains. Practically the entire area is alluvial, with only small agricultural development on the hillsides. On this account the cane area is not continuous. The more fertile land has been selected and assigned, leaving undisturbed poorer tracts of forest country between such fertile valleys. The flood plains of Whyanbeel and Saltwater Creeks, Mossman and Little Mossman Rivers, Cassowary Creek, and the Mowbray River and their tributaries cover the cane producing areas of this district.

Geologically, the alluvial soils are derived partly from schists and partly from granite. The influence of the latter is not noticeable except in the Whyanbeel Valley and on the Syndicate line. In these places the soils are usually gravelly—the small quartz particles from the granite having their influence in giving the soils an open structure of unmistakable granitic origin. In all other cases the Mossman alluvials are developed from schists, but during the processes of soil formation and flooding much mixing has undoubtedly taken place. It is probable that the large tracts of non-gravelly country are mixed schists and granitic alluvials, the gravel having separated out as the flood waters moved more slowly. The gravel is therefore found near stream banks or at the base of granite ranges.

The characteristics of these Mossman alluvial soils are (1) their general acidity, (2) fine particle size—they might be classified as a fine sandy clay-loam, (3) great depth of soil without change in structure, (4) uniform buff colour, (5) good moisture holding capacity, and (6) fair drainage. The soil surface is inclined to set somewhat after rain owing to the very fine sand present, but the crust is easily broken by light cultivation. The fertilizer requirements are firstly lime in most cases, and then applications of Sugar Bureau Mixture No. 1 with top dressings of sulphate of ammonia. In most fertility trials on this soil type excellent response has been obtained to phosphate and nitrogen,

* Reprinted from the current "Cane Growers' Quarterly Bulletin" by courtesy of the Director, Bureau of Sugar Experiment Stations, and with acknowledgment to the Queensland Society of Sugar Cane Technologists.

† Some notes on the Soils of the North Queensland Sugar areas, by G. Bates.

with very few instances of gains from potash. Much money is being wasted annually in this district by indiscriminate fertilizing. It should be borne in mind that potash is one of the most expensive ingredients of mixed fertilizers and that soils of the Mossman alluvial type do not require a mixture rich in potash.

Occasionally one finds in these alluvial areas patches of whitish soils which appear to have all the general characteristics of the buff type, except colour. These whitish patches are usually associated with bad drainage, and should be treated as a poorly-drained area. The influence of drainage will be noticed in the improvement of crops and the gradual disappearance of the white colour.

The other soil types of the area which appear in small sections are (1) red schist, (2) red granitic, (3) talc schist, (4) stony schist alluvial, and (5) chocolate sandy soils. Small areas of red schist soil occur on hillsides on the edge of Saltwater area, on Bonnie Doon Estate, along Cassowary Creek, and in the Mowbray Valley. The red granitic soil covers only a small area on the north-west corner of Mango Park Estate. The talc schist soils occur on the south bank of the Mowbray River and the stony schist alluvials along Spring Creek.

The chocolate sandy soils occur near Mossman Beach. The most important of these types is the red schist, and this is discussed as a major soil type in the Hambledon area.

Hambledon.

In this Mill area cane growing is confined to three major types (1) the Barron alluvial, (2) the red schist, and (3) the ancient buff alluvial which is in most respects similar to that at Mossman.

The Barron alluvial soils can be classified as among the richest in Queensland. Their origin is bound up in the red volcanics of the Tableland, and the granites and schists of the Barron gorge. Almost annual flooding keeps up the fertility, particularly in regard to potash, but fertility trials have shown responses to phosphates (as with all other alluvial soils) and a marked crop reaction to nitrogen. There are many textural variations within the type, from very sandy soils to very heavy clays, but the average is a sandy loam of excellent texture and considerable depth. Moisture holding capacity is good. At about 18″ the soil becomes heavier, but not so clayey as to impede good drainage.

The red schist soils form, by area, the most important type of this district. They extend through Redlynch and Jungara up to the Intake on each side of Freshwater Creek; also through Edgehill and down to Wright's Creek on the east slopes of the range. Similarly most of the soils in Sawmill Pocket fall within this type. These red soils are not volcanic though frequently misnamed as such. Their chief characteristics are (1) reddish colour, (2) considerable depth without a marked subsoil, (3) droughty nature, (4) peculiar reaction to fertilizers. Their red colour is due to iron oxide, which varies from 2 per cent. to 12 per cent., the higher figures being obtained in the Redlynch area (*cf.* red volcanic soils in which iron oxide is between 22 and 25 per cent.). The droughty nature is associated with low clay content giving a poor moisture holding capacity. Fertility trials on red schist soils from Hambledon to Tully have given puzzling results. Always a response to nitrogen is obtained, but similar soils on two adjoining farms will sometimes give response to potash in one case and to phosphate in the other. This is explained by

the northern field officer (Mr. Bates) as being due possibly to previous farm history. In the early days of cane farming the only fertilizers used were meatworks, bone, and offal—all rich in phosphates. The stage was eventually reached when potash deficiency developed and a response to potash would naturally result. On newer farms the normal phosphate deficiency of these soils and fair potash content manifests itself in giving phosphate responses to fertility trials. Advisory work on such lands is therefore intimately bound up with previous agricultural history. The chief defect of these soils is their low water holding capacity, and every effort should be made to improve this factor by a programme of green manuring and trash conservation.

The ancient buff alluvial soils are similar in most respects to those in the Mossman area, but are generally less acid; a similar fertilizer treatment is recommended.

Small areas of other soil types exist. The red volcanic soil occurs at Greenhill Estate and responds to a mixture rich in potash and nitrogen —as do other red volcanic soils. White soils occur on the flood plain of Skeleton Creek in the neighbourhood of Robert's Road, and in small areas at Sawmill Pocket. A mixed brown soil derived from admixture of red schist and alluvial occurs near the Carivonica School and just north of White Rock on the main road.

Mulgrave.

It is difficult to separate this from the previous mill area by any sharp line of demarcation. The soil types continue unbroken through each area. The red schist, ancient alluvial, red volcanic, and mixed schist-alluvial soils all occur in this area also. The recent alluvial soils along the flood plain of the Mulgrave can be closely correlated with those of the Barron. The only new soil type is the granite alluvial occurring from Aloomba to Fishery Creek.

The red volcanic soils in this area occur (1) just opposite the Experiment Station at Meringa, (2) a small development in Portion 65, parish Grafton, and a large tract on the south side of the Mulgrave in the upper part of the valley. Another small area also occurs in the Little Mulgrave. These soils are renowned for their excellent tilth, ease of cultivation, great productivity, and response to potash-containing fertilizers. They are also well known for the grub damage occurring thereon. They are well drained, but owing to their high clay content do not suffer from drought to the same extent as the red schist soils. Sugar Bureau Mixture No. 3, with sulphate of ammonia, is the recommended fertilizer treatment. The area opposite the Experiment Station is surrounded on all sides by red schist soil, and owing to the similarity in colour it is difficult to differentiate the two types. Three samples taken here show by analysis the gradation from the red volcanic to the red schist.

Soil Type.	pH (Water Suspension).	Avail. P_2O_5	Avail. K_2O per 100 gm.	Fe_2O_3
		p.p.m.	M.E.	%
Red volcanic	6·8	245	·40	18·6
Mixed volcanic and red schist ..	6·6	125	·30	15·9
Red schist	6·7	54	·37	6·5

The granitic alluvial soils first appear in the gorge south of the Pyramid and extend west and south through Charringa, Meerawa, to the southern boundary of the mill area at Fishery Creek. These soils contain much fine quartz gravel, but also have a good clay content and moisture holding capacity. Much of the land of this origin is even swampy and unsuitable for cane production. Such soils respond to nitrogen and phosphates, there being usually sufficient potash present from decomposition of felspars and mica in the granite. It is difficult to detect accurate soil boundaries in parts of this area. From the Pyramid working east one traverses red schist soil, mixed schist and old buff alluvial, buff alluvial, recent Mulgrave alluvium, and on the southern boundary of some of these types occurs the granitic alluvial soil. It is apparent that much soil mixing has developed at the various boundaries, but fortunately all alluvial soils—irrespective of their origin—appear to have similar fertilizer needs. The red schist development disappears at Aloomba, the ranges further south being principally granites and gneisses.

Babinda.

In this mill area the granite alluvials are the principal soil type, and conform in all respects to those encountered in the Mulgrave area. They are for the most part low-lying and rather poorly drained, much of the land being originally under palm swamps. They are of a more or less heavy nature, and, if worked too wet will form hard lumps. Hard-pan formation is common, and excellent results have often been obtained from subsoiling. The soils are almost exclusively acid (pH 3.8 to 5·4 in KCl suspension), indicating that liming should be a general practice. The excessive rainfall of this district is responsible for extensive leaching of the soils, and only systematic fertilizing can keep such lands in a state of high productivity.

On the hill slopes of the area a reddish soil demonstrates the younger granitic soil development *in situ*. These red soils are very gravelly and well drained. They are essentially a skeleton soil of quartz, felspar, and mica particles, the finer products of decomposition being washed away as quickly as formed. In an area of such heavy rainfall there would appear to be little future for such soils, the erosion factor having too great a bearing on their ultimate life.

Large tracts of rich alluvial country exist along the Russell River in the Bucklands Road area and west beyond Bartle Frere. Similar developments occur on the south bank of the Russell between these points. This soil differs from the recent Barron and Mulgrave alluvials in appearance—probably on account of difference in origin—but the fertilizer deficiencies are similar. The soil is brownish, free of gravel, rather heavy in texture, and contains much mica. It is usually acid. The soil is deep, but subject to hard-pan development at plough depth.

Red volcanic soils occur in Babinda area at Harvey's Creek, Happy Valley, Bartle Frere, and near Qunaba Estate on the south bank of the Russell. Of these the best development is at Bartle Frere where fertilizer trials have given consistent responses to potash and nitrogen, up to 500 lb. per acre of the former still showing a profitable return.

Goondi.

This mill area is remarkably compact and extends over only three soil types (1) the Johnstone alluvial, (2) the red volcanic, and (3) the extremely poor Mundoo soils.

The Johnstone alluvial differs in no way from the Russell alluvium except that the colour is somewhat lighter. Texture, origin, depth, and fertilizer responses appear to be similar, and the normal acidity of the North Queensland alluvials is again apparent in this district. Both sides of the Johnstone River contain extensive flats of this alluvial type, and the Goondi area also includes portion of the flats on the north bank of the South Johnstone River. The isolated Innisfail Estate is of similar type. Granite and schist contribute principally to the origin of these alluvials, and as in the case of the more northern river soils, phosphates and nitrogen give good responses. Lime is nearly always required.

The major portion of the Goondi district is covered by the red volcanic type—the largest development of basaltic soil yet encountered. This red volcanic is in no way dissimilar to those met further north either in origin, texture, depth, composition, or response to potash and nitrogen. The soil does not require lime.

The Mundoo red soil—with which must be included another small area at Todd's corner, north of Garradunga—has long been a problem in cane production in this area. Although red in colour, of good tilth, well drained, and subject to the same climatic influences as the rest of the district, this soil fails to produce crops of even average magnitude under the best conditions. Much of the Mundoo country has been allowed to go out of production altogether, and this fallow country cannot support even a poor growth of grass or lantana. Heavier than average dressings of complete fertilizers do not show anything like the response obtained on the adjoining red volcanic soil. A careful examination of this soil—and of the area at Todd's corner—showed the following deviations from the red volcanic:—

(1) Sand was present in the soil.
(2) The clay content was obviously low.
(3) Moisture holding capacity was very low.
(4) Veins of ironstone occurred at varying depths and pieces of quartz sometimes occurred associated with these veins.
(5) Grass and lantana growth on land now out of production was exceptionally poor.

These observations showed definitely that the soil was not a normal red volcanic. Analysis of typical soil samples from Mundoo area and Todd's corner are shown in Table I., and for purposes of comparison is included an analysis of a true red volcanic soil. The figures for phosphates and potash explain the extreme poverty of the soils; the high total iron content is important in its relation to origin. The extremely low phosphate content is also at variance with normal red volcanics, and the depressed moisture equivalent implies a lower clay content. All these factors, combined with field geological observations, led to the following theory for the genesis of this soil. During the flow of a basaltic lava there sometimes occurs the concentration at certain points of the flow of ore bodies associated with quartz veins. In such cases the quartz is usually very friable and can be reduced to sand by the fingers alone. It is thought, therefore, that the Mundoo and Todd's corner soils are developed from such concentration bodies. The presence of so much quartz sand in a basic lava, the abnormally high iron content, and the numerous ironstone veins are thus explained. At Todd's corner the

sand phase is entirely surrounded by the normal volcanic soil, the line of demarcation from poor to good soil being sharply defined. Table I. illustrates some of the analytical figures obtained.

TABLE I.

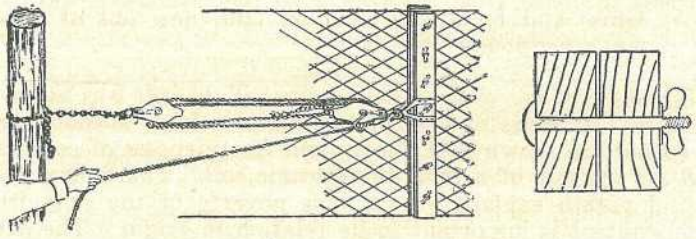
Soil.	Avail. P_2O_5	Avail. K_2O per 100 gm.	Replace CaO per 100 gm.	Coarse Sand.	Fe_2O_3 on Sand-free Soil.	Moisture Equivalent.
	p.p.m.	M.E.	M.E.	%	%	%
True red volcanic	116	0·30	9·7	3·4	20·3	32·0
Todd's Corner	11	0·13	0·5	25·1	34·9	24·0
Todd's Corner	19	0·09	0·4	18·2	36·7	28·5
Mundoo ...	3	0·07	0·4	11·0	30·0	29·4
Subsoil of above	4	0·07	0·1	26·4	34·8	25·6

A WIRE-NETTING STRETCHER.

Wire netting and woven wire fences can be set up perfectly taut with the help of a handy and simple outfit devised by an Argyllshire reader. This home-made stretcher is strong enough to stand any pull and powerful enough to stretch any length of fence required.

The clamp is made of two pieces of oak fixed together with seven ⅝-inch bolts. It is best to have bolts with thumb-screw nuts for the clamp can then be adjusted easily and moved about without being obliged to make use of a screw key.

The blocks used are of a small pattern with 2-inch sheaves, and the arrangement is such that the pull is away from the wire towards the post. The direction of the pull is clearly shown in the drawing given above.



Illustrating the wire-netting stretcher at work, with (right) a section through the clamp to show the arrangement of the bolt and thumb-screw nut.

With a double block as shown there is no slip, and a one pound pull on the rope is equal to four on the wire. The block next the clamp should have a hook on the end to go into the double eye of the clamp. The eye plate of the clamp is arranged by having a plate on each piece. These plates are set in to meet in the middle of the thickness of the wood so that when they are together there is no difficulty in connecting the block.

The arrangement, our reader states, is simple and works easily; every movement of the rope stretches the wire several inches when it is held in a vertical position.—"The Farmer and Stockbreeder (England)."

Maize and Pork Quality.

OWING to its relatively high fat content and the low melting point of its fat, maize can be responsible for the production of soft fat in pork and bacon.

A sweeping statement is sometimes made that "maize fed" pigs are soft as compared with pigs which have been fed on wheat or barley. The statement really needs some qualification so far as Queensland pigs are concerned. A large number could be classed as "maize fed," but they rarely receive sufficient maize to cause soft pork or bacon.

Maize is the most widely grown grain in Queensland, but the pig industry is not dependent on this crop. It is very closely associated with dairying, the pigs being used primarily to consume the milk by-products—separated milk, butter-milk, and whey. Pasture, forage crops, and root crops also form a large part of the diet of pigs on some Queensland farms, and the grains—maize, wheat, and barley—are really only used as supplementary foods.

These points should be borne in mind when reading the advice of some overseas authorities, who state that maize should not constitute more than about 35 per cent. of the grain allowance of pigs. This may be sound advice under English conditions where pigs frequently receive a diet which is about 90 per cent. grain and which usually does not contain milk products, but under Queensland conditions, where the feeding systems are as stated above, there appears to be little danger of pigs receiving sufficient maize to injure their carcass quality.

Most of the pigs produced in Queensland can be classed as "milk fed."—W. A. Downey, Instructor in Pig Raising.

Some Notes on Rat Control in the Mourilyan Area.*

E. H. FOX.

ALTHOUGH a good deal of rat control work had been attempted intermittently by the various Northern pest boards prior to 1934-35, the problem had only occasionally assumed serious proportions, and was usually considered a matter for local, even individual, attention, rather than one of major interest to the industry as a whole.

When it became necessary, therefore, to commence large-scale control operations, the necessary published data for their success were virtually non-existent, and most field investigators had to commence with the "trial and error" method, picking up such information as came their way during the more pressing business of practical attempts at control. It was assumed, at least among the majority of farmers, that a rat was simply a rat; a poison, poisonous; and any foodstuff a suitable medium for carrying the poison.

Undoubtedly there were a number of excellent formulæ in existence, giving lethal dose and recording details of tests, but many of these had been evolved for the destruction of house-rats, and few, if any, had been carefully checked under Queensland field conditions. However, they formed a basis on which to start work, and because of the urgency of the position, it was not long before new clues were being unearthed and exchanged and the classification and description of species under way.

Results at Mourilyan, as elsewhere, have often been confusing; success, for instance, under one set of conditions has often become failure under what appeared to be similar conditions; but certain broad conclusions or at least tendencies can be traced, and may be worth testing in other districts. It should be noted that our captures, alive and dead, suggest that over 90 per cent. of our field rats belong to the *Melomys littoralis* species, also that the destruction of harbourage has been actively pursued simultaneously with poisoning campaigns, and has undoubtedly brought results, and this, combined with the impossibility of evolving a check on field operations, renders more complicated the question of effectiveness of poison baits.

The evidence is overwhelming in favour of continuing poisoning operations, however, under our local conditions; thus the use of thallium-coated wheat has given 100 per cent. kill in dozens of cage tests, packets laid in fields showing extensive rat damage have been opened and the contents eaten, occasionally dead rats having been found, and in many cases damage to cane has ceased—temporarily. Certainly not in all cases, but whilst one such case noted could be passed over as an accident and the second as a coincidence, when it happens fairly regularly it seems logical to assume a measure of success for the method. It was admitted, of course, and still is, that there are probably factors operating which are neither controlled nor understood.

These activities soon pointed to another important question—what constitutes the adequate baiting of a paddock? Our most striking successes had been obtained under conditions of very lavish baiting (of the order of 2,000 baits per acre) and anyone who has attempted

* Reprinted from the current "Cane Growers' Quarterly Bulletin," and with acknowledgment to the Queensland Society of Sugar Cane Technologists.

the baiting of a badly infested paddock of lodged cane will realise the absurdity of putting down a few hundred baits around the headlands of a large paddock. Having once admitted the poisoning method as a handy and more or less effective one for the destruction of rats, it naturally followed that a more regular and complete baiting of paddocks was desirable if it could be accomplished economically.

A three-weekly issue of 1,000 baits for every farm in the area, whether rat infested or not, was aimed at as a minimum, with large reserves for those farmers who, because of extensive damage, either applied (themselves) for more or were advised that they required more. Obviously thallium wheat baits were too expensive to be used on such a scale, so other types were tested, and finally bread and phosphorus baits, as described below, were used for the regular campaigns in dry weather, with packeted wheat as an occasional change and for wet weather application.

The results of our cage tests showed:—

(*a*) One hundred per cent. kill in all cases within twelve hours of the rat taking even the smallest bite.

(*b*) The tinted, or poisoned, face of the bread cube was apparently the most palatable.

(*c*) Baits appeared to retain their palatability and potency after being kept one month in an airtight tin.

(*d*) Baits were still potent after twenty-four hours in the paddock.

The method of manufacture is still being improved, but consists at the moment in slicing large sandwich loaves into twenty-eight to thirty slices, laying them on a board which is constantly being smeared with phosphorus paste (made to Dr. Cilento's formula), dipping the sticky face in a mixture of flour and sugar, and finally cutting the slices into cubes by means of a cheap salad cutter. The cubes are then put into 4-lb. bags, labelled, and packed in air-tight tins for delivery.

It is possible to cut 4,000 baits from a double sandwich loaf, and the fresher the bread the more easily will it be found to cut. Instead of brushing the thick paste (previously warmed) directly on to the bread, it saves time to smear it on a heavy, shining surface, such as marble or a piece of thick glass, by means of a paint brush, and to press the slice down firmly on this. It is also found advisable to carry each process through quickly without any accumulation at each step, because of the rapid drying of the bread, with the consequent difficulty in cutting it.

The salad cutter, costing about 2s., is imply a series of thin sharpened metal discs, 3 inches in diameter, revolving on a common spindle and encased in a metal guard. It is capable of improvement for this work—a heavier and stouter one would handle the crusts better. Indeed, refinements are no doubt possible throughout all stages of manufacture, but the following figures of actual costs will serve to show how cheaply these baits are being prepared. Costs of supervision and delivery are not included. The cost of carriage on phosphorus paste is included, but, if carried freight free, it would reduce this charge from 1s. 8d. per lb. to 1s. 3d., reducing the total cost of baits to about 8d. per 1,000; whilst, if mixed on the premises, this charge of 1s. 8d. per lb. for phosphorus would be still further reduced to 8d. per lb. or less.

Cost of manufacturing 180,000 phosphorus rat baits:—

	£	s.	d.
45 double loaves at 10d.	1	17	6
45 lb. phosphorus paste at 1s. 8d. ..	3	15	0
Labour (youth, 2 days)	0	16	8
Flour and sugar	0	6	0
Bags	0	1	8
Labels	0	3	0
"Clag"	0	0	6
	£7	0	4

or a little over 9d. per 1,000 baits.

Their small cost has enabled us to lay a total of 1,386,000 baits over a comparatively small of approximately 8,000 acres net in nine months, and in the writer's opinion this is lower than the minimum needed for prevention of damage, and considerably lower than that required for clearing up harbourages already heavily infested. Damage throughout the area last year was so low (from whatever cause) that we feel justified in continuing our present methods even more extensively until such time as a better method of control is evolved, or unmistakable proof is forthcoming that we are drawing wrong inferences.

QUEENSLAND SHOW DATES FOR 1937.

May.

Longreach	3rd to 6th
Beaudesert—	
Show	5th and 6th
Bushmen's Carnival	7th and 8th
Wallumbilla	6th and 7th
Nanango	6th and 7th
Dirranbandi	6th to 8th
Ipswich	11th to 14th
Wowan—	
Show	11th and 12th
Rodeo	13th
Biggenden	20th and 21st
Gympie	20th to 22nd
Warrill View	22nd
Kilkivan	24th and 25th
Maryborough	25th to 27th
Charleville	25th to 27th
Maryborough	25th to 27th
Gin Gin	28th and 29th
Toogoolawah	28th and 29th
Kalbar	29th
Childers	31st May and 1st June

June.

Bundaberg	3rd to 5th
Lowood	4th and 5th
Boonah	9th and 10th
Gladstone	9th and 10th
Marburg	18th and 19th
Rockhampton	22nd to 26th
Mackay	28th June to 1st July

July.

Bowen	7th and 8th
Ayr	9th and 10th
Rosewood	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 and 21st
Laidley	21st and 22nd
Maleny	22nd and 23rd
Cairns	27th and 28th
Gatton	28th and 29th
Caboolture	30th and 31st

August.

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

September.

Imbil	3rd and 4th
Rocklea	11th
Innisfail	17th and 18th

November.

Murwillumbah	3rd and 4th

A Modified Irrigation Method.*

B. TAPIOLAS.

IN a paper on "Irrigation Principles" presented by Kerr at the 1933 Conference,† brief reference was made (Proceedings, p. 104) to a method of "one-side" irrigation, which was being tested in the Burdekin area. The writer has given further close study to the method since that time, and is now able to report that it has been developed into a very satisfactory scheme for both plant and ratoon cane irrigation.

The characteristics of the Burdekin alluvial soils were accurately described by Kerr and Cassidy,‡ and the difficulty in keeping these soils in a well-cultivated state between waterings is one of the biggest problems the farmer has to contend with. The ill-effects of the water on the soil also increases the difficulty of raising satisfactory crops, and this is particularly true of ratoons. The writer has therefore concentrated his attention on a method which would bring about the following improvements:—

(1) Reduction in the number of cultivation operations necessary.

(2) Water economy.

(3) Assistance in the retention of a favourable tilth in the surface soil, by minimising the ill-effects of water and implements.

Early efforts were confined exclusively to ratoons, and an implement was devised which would enable the cultivation of the land to be carried out in a few operations. At the present time, the standard ratooning practice is as follows:—Bumper discing, to create a surface mulch and level the land; ploughing away from both sides of the stools; subsoiling or grubbing; scarifying to level the interspace; preparing water furrows for irrigation; surface cultivation to restore tilth; hilling-up, in preparing water furrows; scarification, &c., after each watering, and the necessary repairing or re-shaping of water ditches before each subsequent irrigation. By the improved method, the number of operations is reduced to the following:—Bumper discing; ploughing away; sub-soiling to 15 inches, and preparing 10-inch furrow close to one side of the cane stools, all in one operation. As many as four light waterings may then be given, before cultivation for weed control becomes necessary, as the manner in which the water is applied keeps the surface soil of the interspaces dry, and the soil tilth is therefore not destroyed. When it becomes necessary to check weed growth, this is done by one operation with the combined implement. By this time the ratoons are well advanced in growth, and thereafter, watering only is necessary.

A brief description of the implement, assisted by the accompanying sketches and photographs, should make the essential features clear. It was built up by the writer from portions of old implements on the farm. To a standard tractor-grubber frame three mouldboard ploughs were attached in a special manner (*see* Plate 136). A pair of 7-inch ploughs placed at a distance of about 24 inches between share points, were so attached as to throw a light furrow *on* to the cane stools; they were set

* Reprinted from the "Cane Growers' Quarterly Bulletin" with acknowledgment to the Queensland Society of Sugar Cane Technologists.

† Annual Conference of the Queensland Society of Sugar Cane Technologists.

‡ "The Soils and Irrigation Waters of the Burdekin Delta"—Q'land Agric. Jour., 1932, p. 115.

so as to turn the surface 3 or 4 inches of soil, and effectively smother all weed-growth in the cane row. Following the right-hand plough, and set at a distance of about 4 inches nearer the cane stools, is a 10-inch mouldboard plough, which turns a furrow 10 inches deep *away* from the cane row. To the tip of the wing of this plough is attached a leveller, consisting of a horizontal iron bar braced to the grubber frame as shown in the illustration (Plate 136). To balance the implement, and to produce a sub-soiling effect, one grubber tyne with a chisel point is attached on the side opposite from the 10-inch plough, and operating towards the centre of the interspace. The effect of the implement on the soil is shown by the series of sketches (Plate 137). The implement is drawn by a tractor straddling the cane rows.

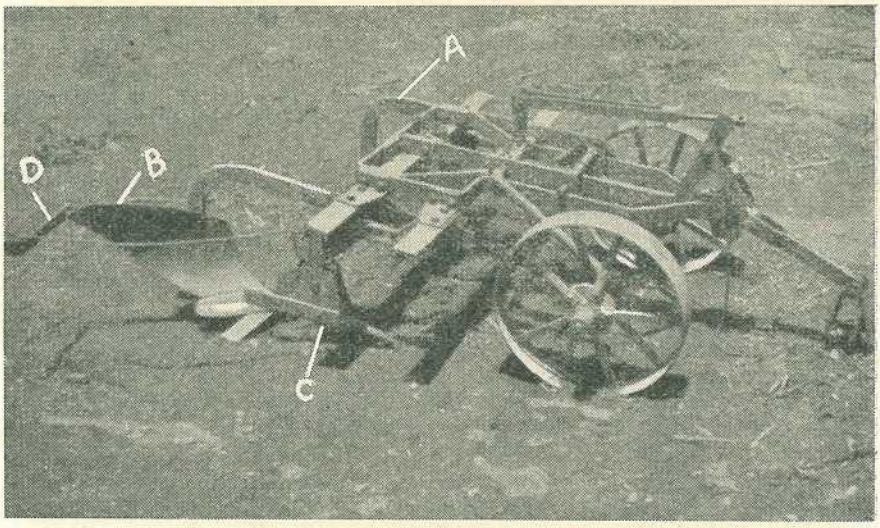


Plate 136.

Illustrating the essential features of the combined implement—A 7-inch plough, B 10-inch plough, C subsoiler, and D leveller, attached to plough wing. *Note.*—One of the 7-inch ploughs is absent from the machine, which was arranged for simplicity in photography.

As the implement is worked in "lands" of eighteen rows, it will be obvious that the central interspace of the land will carry no water furrow; in this interspace the tramline is laid.

It was found, also, that the implement worked very satisfactorily in plant cane. The depth of the 7-inch ploughs was in this case raised by means of the adjustable beam so as to turn only the surface 2 inches of soil from either side, and thus avoid hilling of the cane; the water-furrow was run at a 10-inch depth, as for the ratoons.

After the job is completed the field is free of weeds, and thereafter watering only is necessary. The deep water-furrow ensures deep penetration of the soil and subsoil, while the interspace surface remains quite dry unless rain should fall. Weed growth is therefore prevented, and the cane crop is encouraged to develop a deep rooting system, which means resistance to drought. On lands where rather saline waters are being used the upward rise of water and concentration of soluble salts in the surface soil is also prevented. The fact that cultivation is

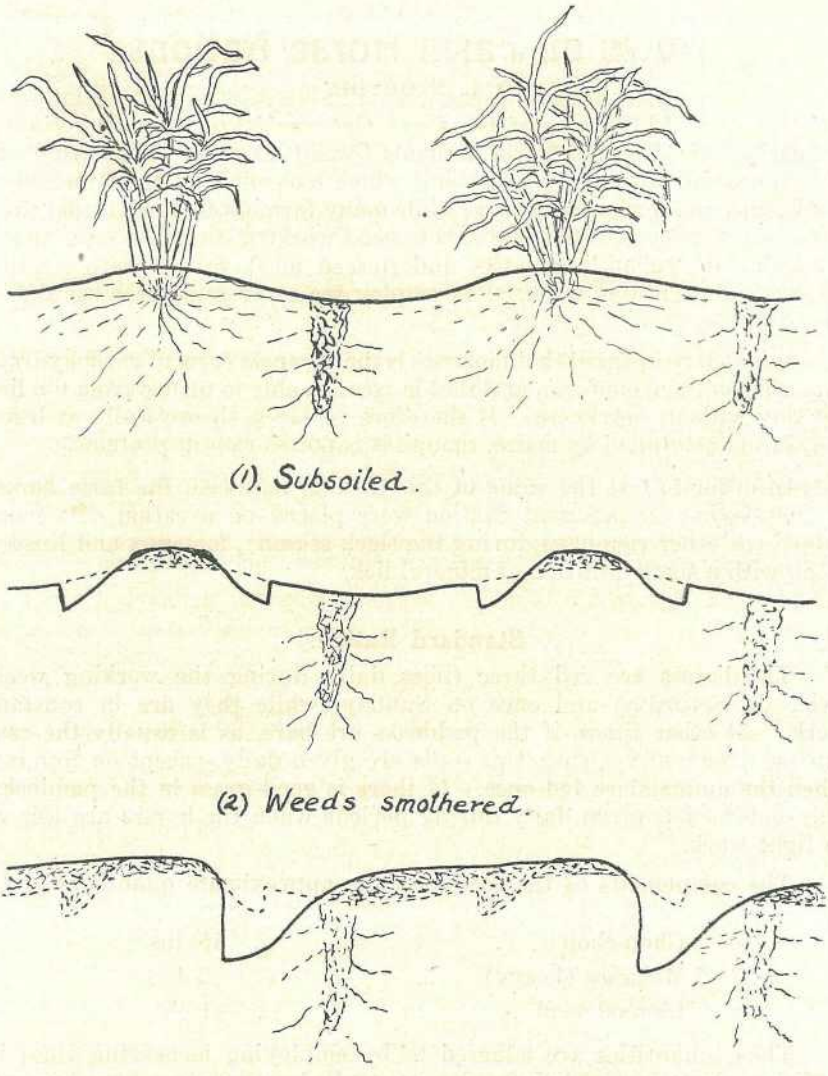


Plate 137.

Showing the successive operations performed by the combined implement.

reduced to a minimum also gives the soil a chance to recover its crumby structure, and makes for a permanent improvement in the tilth of the land. The method markedly increases the area which a man can irrigate daily, while bringing about an economy in water utilization amounting to probably 30 per cent.

The writer would state quite definitely that the modification in irrigation procedure as described above is the biggest forward step he has taken since he adopted the use of artificial manures as a standard practice.

Notes on Farm Horse Rations.*

D. L. McBRYDE.

IN the July, 1935, issue of the *Cane Growers' Quarterly Bulletin* an article on "Feeding Farm Animals" was presented. This arose out of a discussion on farm horse rations which took place at the Bundaberg Conference in April of that year; while many farmers contended that they were able to maintain their animals in good working condition on a ration consisting of "chop," molasses and linseed meal, others were equally emphatic that it was essential to employ maize or some other grain in the feed.

It is well recognised that molasses is the cheapest form of carbohydrate available on the cane farm, and that horses are able to utilize from 6-8 lbs. per day without detriment. It therefore replaces, theoretically at least, the starches supplied by maize, though it is not so rich in proteins.

In order to test the value of this feeding material, the farm horses at the Mackay Experiment Station were placed on a ration of "chop-chop" (or other roughage during the slack season), molasses and linseed meal, with a small addition of mineral lick.

Standard Ration.

The horses are fed three times daily during the working week, twice on Saturday, and once on Sunday, while they are in constant work. At other times, if the paddocks are bare, as is usually the case during winter and spring, two feeds are given daily, except on Sunday, when the animals are fed once. If there is good grass in the paddocks, only one feed is given daily during periods when the horses are idle or in light work.

The components of the feed, and the approximate quantities given are:—

Chop-chop	18 lbs.
Molasses (heavy)	2 lbs.
Linseed meal	1 lb.

These quantities are adhered to by employing measuring tins; in addition, about 1 oz. of lick per day is supplied, to make good any mineral deficiency.

When cane tops are not available, panicum or guinea grass, or both, are chaffed for the horses. This feed is usually cut in sufficient quantity to carry through for two or three days, and except for the needs of the first day, the grass is allowed to dry for a short period before it is taken to the barn.

It is of interest to study the true feeding value of the above-described ration, to determine whether it agrees with the generally accepted standards.

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* Reprinted from the current "Cane Growers' Quarterly Bulletin" by courtesy of the Director, Bureau of Sugar Experiment Stations, and with acknowledgment to the Queensland Society of Sugar Cane Technologists.

The analyses of the materials are as follows:—

Feedstuff.	Crude Protein.	Crude Fat.	Crude Fibre.	Crude Carbo-hydrate.
	%	%	%	%
Chop-chop	1·6	0·7	9·0	16·9
Molasses	5·9	—	—	50·0
Linseed Meal	31·4	6·4	10·2	36·8

Making due allowance for the quantity of each in the ration, and the digestibility of each nutrient contained therein, the following amounts of nutrients are given daily:—

Feedstuff.	Dry Matter.	Digestible Proteins.	Total Digestible Nutrients.	Nutritive Ratio.
	lb.	lb.	lb.	
Chop-chop—54 lb.	16·2	0·2	11·3	—
Molasses—6 lb.	4·5	0·1	4·7	—
Linseed Meal—3 lb.	2·7	1·0	2·4	—
Total	23·4	1·3	18·4	1 to 11
Minimum requirements	23·4	1·8	16·9	1 to 8

Discussion.

It will be observed that, without making any allowance for the value of grass obtained by grazing, the animals receive an abundance of dry matter, which is rather rich in total nutrients, but slightly deficient in digestible proteins. It would therefore be an advantage to increase the linseed meal, or substitute portion by a meal richer in proteins and lower in fat.

The accompanying photograph (Plate 138) shows the condition of the animals at the conclusion of the past harvesting season, when they had been fed this ration for eighteen months. It is found that the horses fatten between spells of steady work, but do not soften as their appearance might suggest. They come back into hard trim without any trouble, such as is the case, at times, when horses are given a heavier ration of molasses.

A noticeable improvement since adopting the above feeding systems was that of the condition of skin and coat, which lost all signs of scurf. This improvement was due, undoubtedly, to the linseed meal. Factors operating during the past eighteen months were decidedly against the

well-being of the animals, particularly from May, 1935, to February, 1936, when the horses were without shade or protection from the weather. It might be stated that the horses get little, if any more grooming than would the usual farm horse.

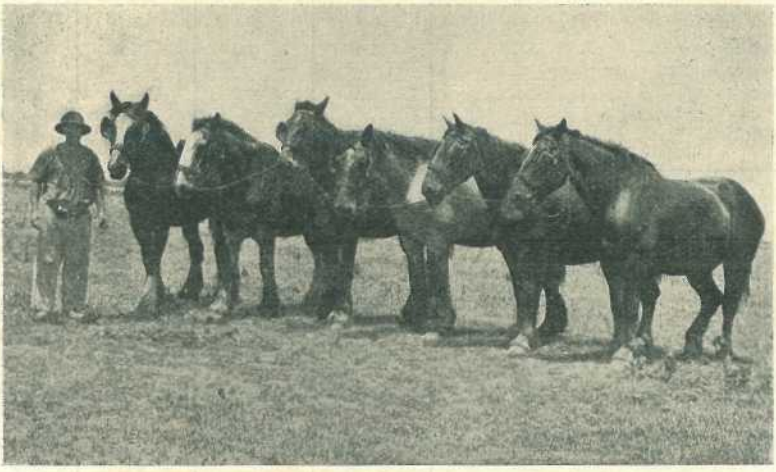


Plate 138.
Farm horses on Mackay Experiment Station, at the conclusion of the harvesting season.

THE USE OF UNSUITABLE FERTILIZER MIXTURES.

The correct fertilization of any crop lies in the ability to supply to the soil those particular foods required by the plant which the soil is unable to supply.

With a view to obtaining this information the Bureau of Sugar Experiment Stations has for the past eight years carried out numerous fertilizer trials on different farms covering a wide range of soils. This collection of a vast amount of data enables us to gauge with accuracy the particular type of fertilizer which will give the most payable return on any particular soil type. In view of this information special fertilizer mixtures have been compounded to suit these soil types, and are known as Sugar Bureau Mixtures Nos. 1, 2, and 3.

It is surprising, after the amount of publicity given these results and the recommendations made, to find that farmers are frequently using mixtures that are both more expensive and unsuitable. A good example is the use of a high-potash mixture on the acid alluvial lands, where a cheaper mixture containing more phosphate and less potash will give a larger tonnage. Another illustration is the use of high-phosphate mixtures on red volcanic soils, which require lots of potash. Such a mixture, while cheap per ton, is expensive in the long run.

If there is any doubt that the correct type of fertilizer is being used, an inquiry directed to the nearest officer of the Bureau of Sugar Experiment Stations will receive attention.

G.B. (in the "Cane Growers' Quarterly.")

Mule Breeding at Bundaberg.

N. J. KING.*

SOME eighteen months ago three jack donkeys were selected in the United States of America, for the purpose of attempting to breed good type mules for work in the Queensland canefields. Two of these animals were purchased by the Fairymead Sugar Co. Ltd., while the third animal was taken to the Burdekin area.

Through the courtesy of the Fairymead Sugar Company, we have pleasure in presenting the accompanying illustration (Plate 139) of a few mule colts which were dropped between early October and late December, 1936. We also reproduce the sire of these animals (Plate 140), a jack of 15.1 hands standard measurement, now eight years old. He was a well-tried animal in Kansas, and produced mules of excellent type in that country.

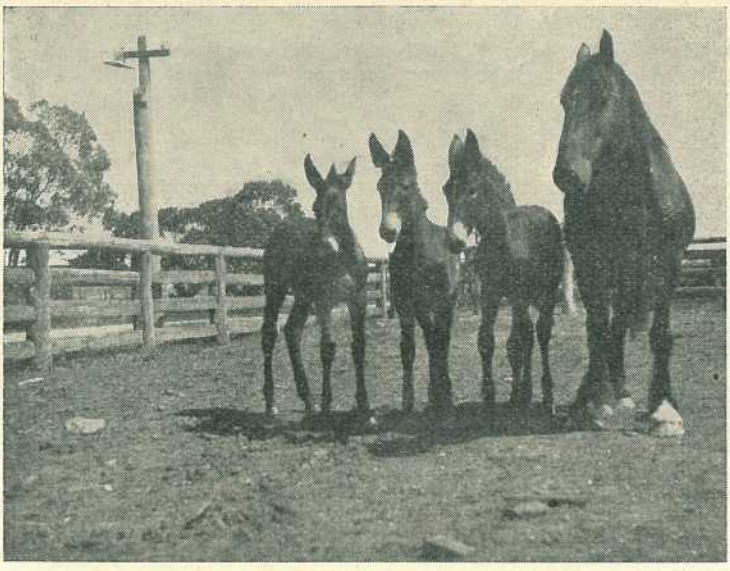


Plate 139.
A group of mule colts, 3-5 months old, sired by the jack pictured in Plate 140.

At Fairymead Plantation he was mated with 16-hand Clydesdale mares, and to date he has produced 11 foals. The height of the youngsters compares favourably with that of Clydesdale foals of the same age, while their weight is also practically identical. They have been fed uniformly with the usual foals on the plantation, and no variation in treatment has been introduced to date. The outstanding characteristics of the mule colts are their playfulness and inquisitiveness.

It is intended that they be handled and broken in to work as two-year-olds, and put to farm work at the age of three years.

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

Growers will doubtless be pleased to learn of the early success of this experiment, and will await further results with interest. As only one class of mare has been used for breeding—an attractive type of farm animal—it is not possible to suggest whether the mule type would vary with variation in the type of dam.

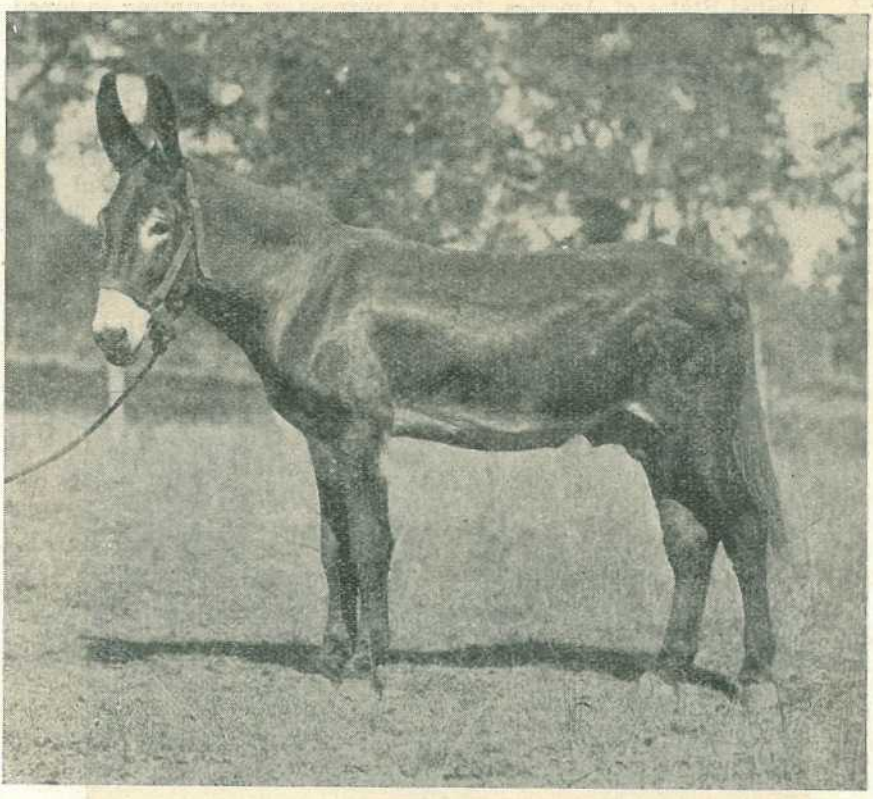


Plate 140.

The sire of the colts pictured in Plate 139. This jack is eight years old and stands 15.1 hands.

THE RISK OF FEEDING ENGLISH POTATO STALKS AND LEAVES.

It has recently been reported to the Department of Agriculture and Stock by one of the veterinary staff that seven dairy cows died suddenly on a farm in the Helidon district. The cows were given a corn bag full of English potato stalks and leaves. A post-mortem examination showed that the rumen was very full and that the potato tops constituted a considerable portion of the contents.

In this connection, it might be pointed out that English potato tops are extremely dangerous feed for stock. They are sometimes used in Europe, and numerous cases are on record there of horses and cattle being poisoned through eating them.

Two poisonous principles are present—both alkaloids—named solanine and solanidine, respectively. They occur to a more limited extent in the ordinary potato peel, and are also present in green potatoes. In the ordinary white, starchy part of the potato they are totally or almost totally absent. Cases are on record, also, in which pigs fed on uncooked sprouted potatoes were affected with slowly progressing paralysis which became complete after about twenty-four hours. Death may or may not result, but in any case the feeding of potato tops and leaves is always attended with risk.

COTTON.

The favourable progress of the cotton crops reported during February has not continued so satisfactorily during March, due to dry conditions and moderate attacks by various insects being experienced in the first half of the month. This is particularly true on the older cultivations, where the severe storms did not penetrate so deeply as on the more open newer cultivations or where cotton followed grassland. Excellent demonstrations of the value of growing cotton in rotation with grassland have been obtained in all districts this season, and undoubtedly a much greater factor of safety can be obtained where such a practice is followed.

The harvesting of the earlier-sown crops has started in all of the main cotton-growing districts, but has been appreciably delayed by the splendid rain group occurring at mid-month when 4 inches or more was received over the cotton areas. Such a soaking rain will promote the formation of a splendid top crop, however, and if frosts are moderately late reasonably good yields may be expected in many districts.

SUGAR.

All cane areas were favoured with excellent growing conditions during the month of March. Heavy tonnages are now practically assured in all areas from Mackay north. The heavy rains of mid-March came in time to give the southern areas a chance to produce a crop before growth is checked by wintry conditions. Even now the situation is critical, and a continuance of favourable conditions essential to ensure a moderate crop.

AUTUMN PLANTING OF ENGLISH POTATOES IN CENTRAL QUEENSLAND.

In Central Queensland, the winter crop of potatoes is normally planted between mid-February and March, and as the growing season is short, harvesting is usually in full swing by June. Climatic conditions are responsible for the comparatively short period between planting and maturity, and also the smaller yields in comparison with those obtained in more temperate regions.

Trials have disclosed that although the tubers attain normal size, the number per plant in this crop is comparatively low, which suggests that yields could be increased by closer planting. This opinion is confirmed by the successful crops obtained in areas where the seed tubers have been spaced 9 inches to 12 inches apart, instead of the wider 12 inches to 18 inches usually practised in the southern districts. As the yield per plant in the winter crop is apparently not reduced by the closer spacing, this method is valuable where small areas are under cultivation, particularly when irrigation facilities are available.

Fertilizer trials conducted on average soils have not shown any marked increase in yields, but further experimental work is necessary before a definite recommendation can be made. However, crops grown on the poorer soils, particularly of old cultivations, should benefit from substantial applications of phosphoric acid and potassic fertilizers.

As heavy rains are likely to be experienced at this period of the year, well-drained, free-working soils are to be preferred. Deep ploughing will be found to assist drainage, besides providing more favourable growing conditions.

If seed potatoes are purchased from outside sources, preplanting treatment with hot formalin or acid corrosive sublimate may be desirable.

Although cut tubers are permissible for spring planting, seed for the autumn crop should definitely comprise whole tubers only.

Attention is also directed to the control of Irish blight and other diseases by means of suitable sprays, full particulars of which may be obtained on application.—W. R. STRAUGHAN, Instructor in Agriculture.

Plate 141.
THE ROAD THROUGH THE RAIN FOREST.
A scene on the way from Mount Ossa to Kungurri, Queensland.

Silage.

A. E. GIBSON, Director of Agriculture.

SILAGE is the term given to green forage that has been preserved in such a way that it retains its succulence, palatability and, to a certain extent, its digestibility over an extended period.

Success in silage making depends chiefly on the exclusion of air from the material, which, in its processing, undergoes fermentation to a greater or lesser degree, during which the carbohydrates—such as sugars and starches—undergo certain changes and are reduced in value. Similarly, the proteins are reduced and acids—such as lactic and acetic—are formed; while, in the case of inferior silage, butyric acid is present. The exclusion of air from silage has the effect of reducing fermentation. In order to facilitate fermentation, weighting material is used, either by mechanical means or of stone, concrete blocks, heavy wood, or soil. The last mentioned is, however, the least satisfactory of all as a weighting material, for it becomes more or less mixed with the silage.

Although it is possible to utilise a variety of green materials for silage, naturally the best results are obtained by using the best class of fodders. Lucerne, which, without doubt, is the best class of material for hay making, does not lend itself to processing as silage; although it may be utilised to advantage, if combined with fodders such as maize or sorghum, when these two materials have reached a more mature stage than that considered necessary for the production of a good class of silage. Legumes, generally speaking, cannot be recommended for use for silage, unless mixed with some other material having a higher percentage of fibre in its composition.

The most suitable summer crops for silage purposes are in order of preference: Maize, sorghums, millets, setaria species (panicums). The winter cereals—preferably a combination of barley, oats, and wheat, with a mixture of peas or vetches, sown in equal quantities at the rate of 60 lb. per acre of the mixture—form a valuable silage material. In harvesting, however, they require to be handled with a reaper and binder in preference to a mower.

The stage of maturity at which a crop is harvested for ensiling has a distinct bearing also on the quality of silage produced. Maize harvested when the cobs have just reached the glazed stage, but, in which the grain still contains more or less milky substance, produces material having that pleasant acid smell which is associated with good silage and is light brown or yellow-brown in colour. Fermentation occurs usually when the temperature of the material is between 104 and 112 degrees Fahr. Sorghums, when harvested at the period at which the seed has been formed and is in the dough stage, produce good quality silage; but, owing to their high saccharine content, fermentation is more pronounced and a higher temperature is reached than in the case of those crops in which the sugar content is lower. Sorghum silage is dark brown to black in colour according to the temperature above 115 degrees Fahr. at which fermentation usually takes place.

Silage produced from crops having an excess of moisture, due to immaturity at harvesting, has an unpleasant odour on account of the presence of butyric acid and is not relished by live stock. Musty and

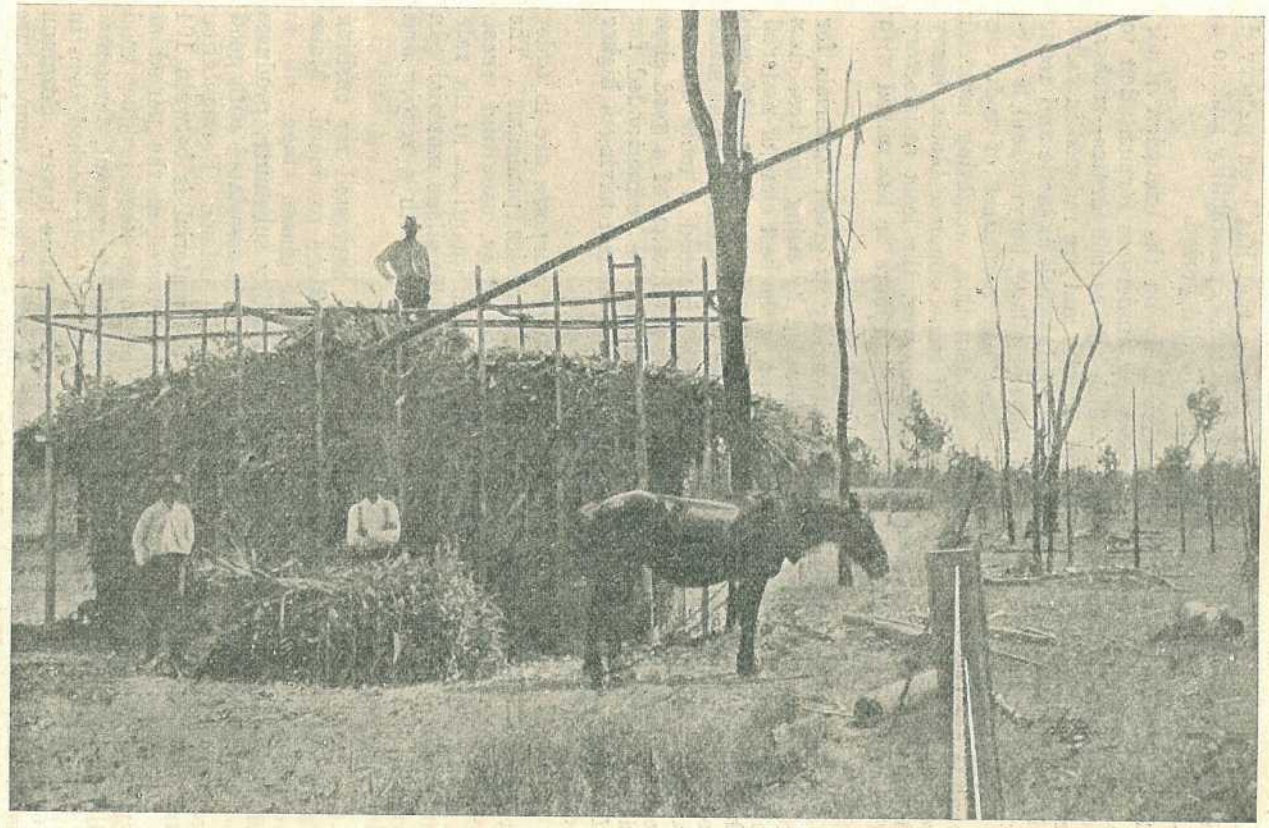


Plate 142.
Stack in course of construction, showing projecting "untrimmed ends," also "whip" hoist attached by means of a chain to a dead tree.

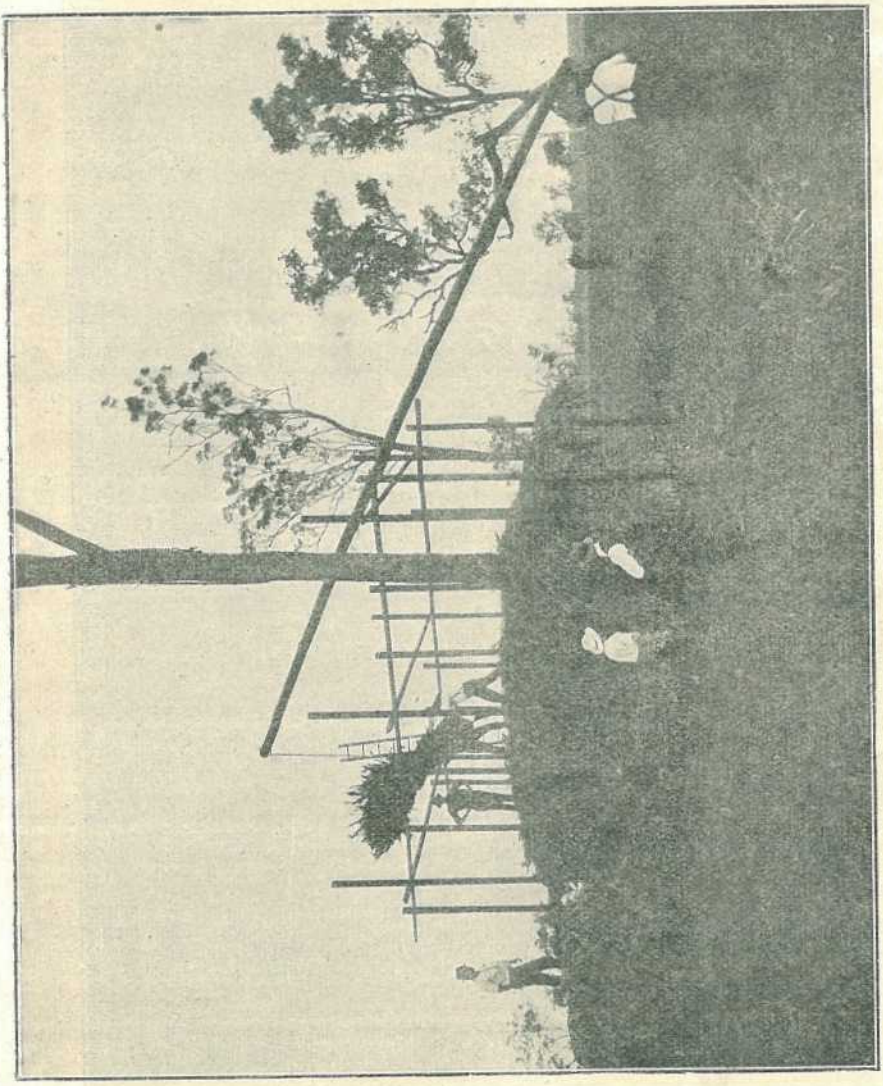


Plate 143.
Building a Silage Stack on a Lockyer Farm.

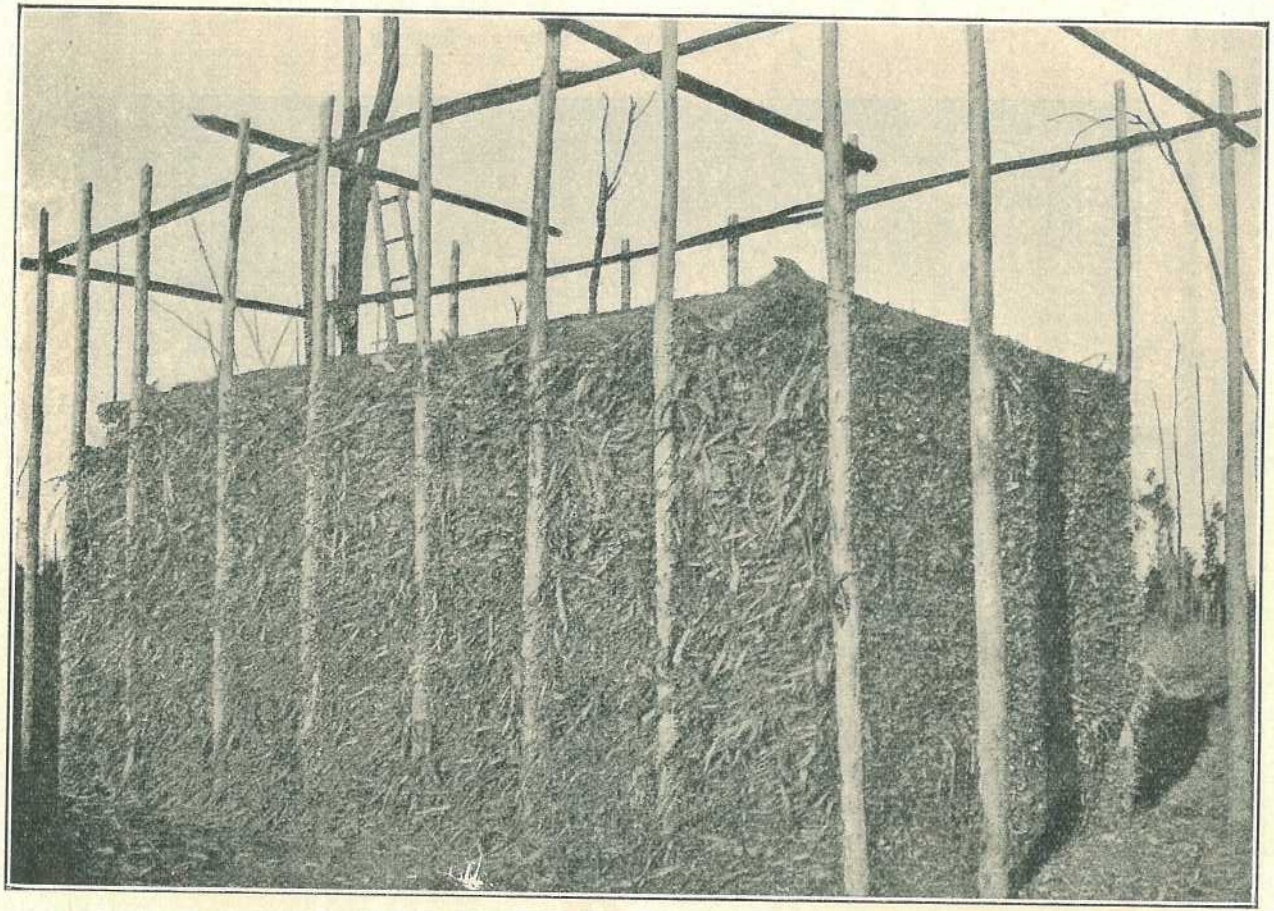


Plate 144.

Framework and "trimmed" stack, showing an extra pair of uprights at each end, to which a crosspiece is attached for supporting the ends of the fodder when stacking.

mouldy silage, on the other hand, is caused by the ensiling of material which is too dry for the purpose. It is sometimes noticeable in silos where neglect to remove dried-out material during a cessation in filling operations, or where air has had access to silage in the vicinity of doors which are not airtight.

During periods of drought the demand for information on silage in all its phases encourages the hope that an increased production of fodder crops for conservation in that form will follow the return to normal conditions. Unfortunately, however, a spirit of optimism based on a belief in a continuity of good seasons often persists, and, consequently the necessity for providing for lean years is relegated to the limbo of things forgotten.

Arguments in favour of hay in preference to silage are frequently advanced, but when farmers consider that hay loses at least 75 per cent. of its weight in the stack whilst silage loses no more than 15 per cent.

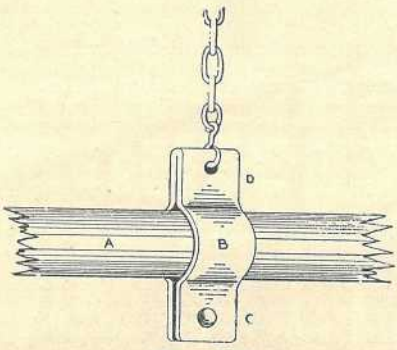


Plate 145.

Clamp for Suspending Whip.—(*a*) Whip spar. (*b*) Clamp made from an old tyre 4″ × §″. (*c*) Clamping bolt. (*d*) Clamp welded and bored for hook.

the case for hay is considerably weakened. Again, lucerne—the most popular fodder used for hay—is of much higher monetary value during periods of drought than wheat or oaten hay, due, of course, to its higher nutritional value. When used as fodder for dairy cattle during periods of drought, however, the economic value of lucerne compared with silage on a tonnage basis is distinctly in favour of silage, consequently the dairy farmer who can conserve fodder in the form of maize silage at a cost of 12s. a ton, with a loss of only 15 per cent., is in a much better position than the man who conserves lucerne at a value of, say, £5 a ton, and loses 75 per cent. of weight of green material in so doing.

That both summer and winter growing fodders can readily be conserved in the form of stack silage is generally conceded, and provided that care and attention is given in regard to stacking and covering sufficiently from weather influences, no reason exists why the resultant silage should not keep good for at least two or three years without any serious depreciation. The literature issued by the Department entitled "Some Notes on Silage," "Silos and Silage," is available to those who contemplate ensiling operations, and a careful perusal is advised.

Enquiries which reach the Department relative to type of silo deal invariably with the underground type in preference to the overhead type. It is somewhat difficult to understand why the ideas of

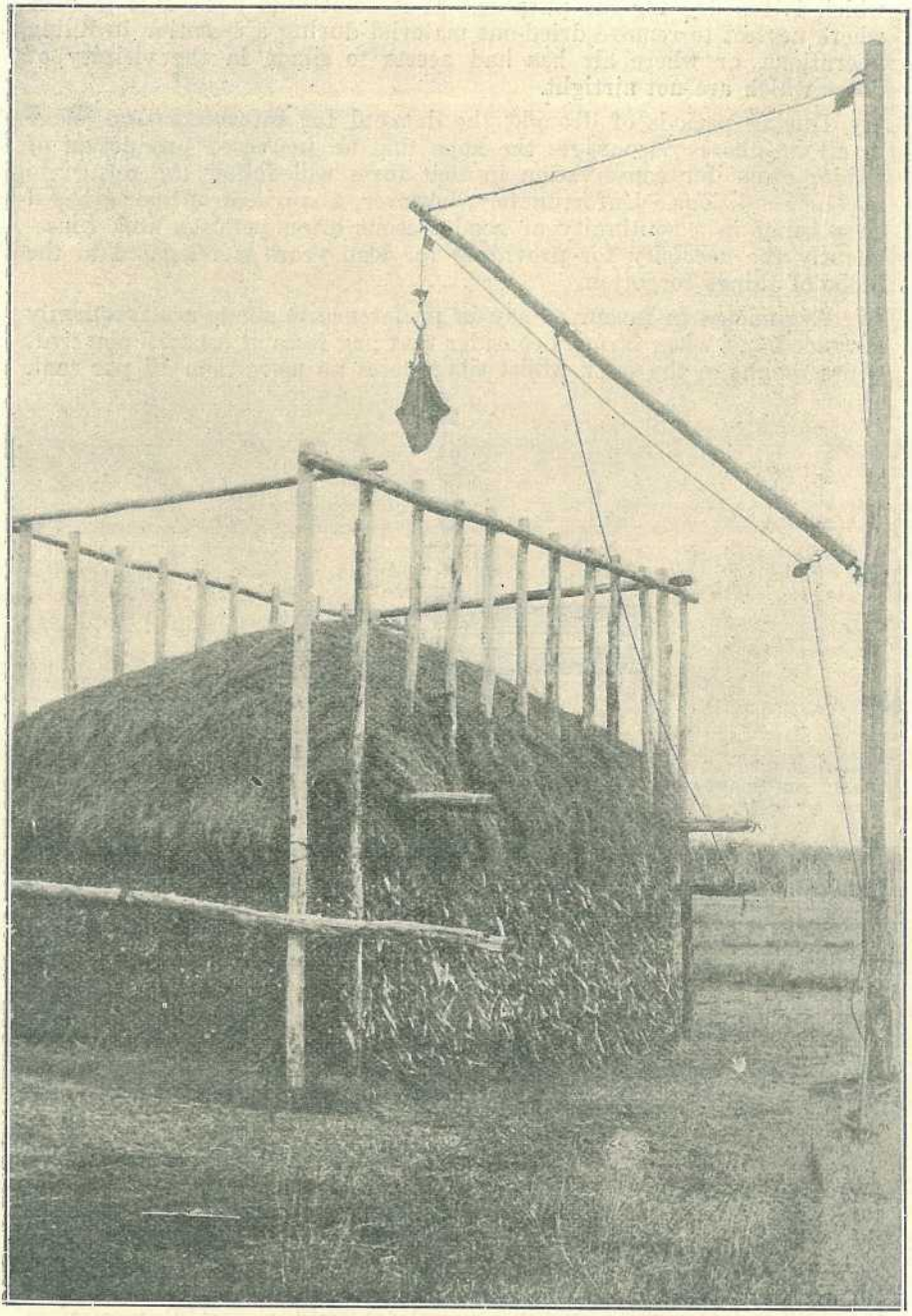


Plate 146.

A Silage Stack on a Central Burnett Farm.

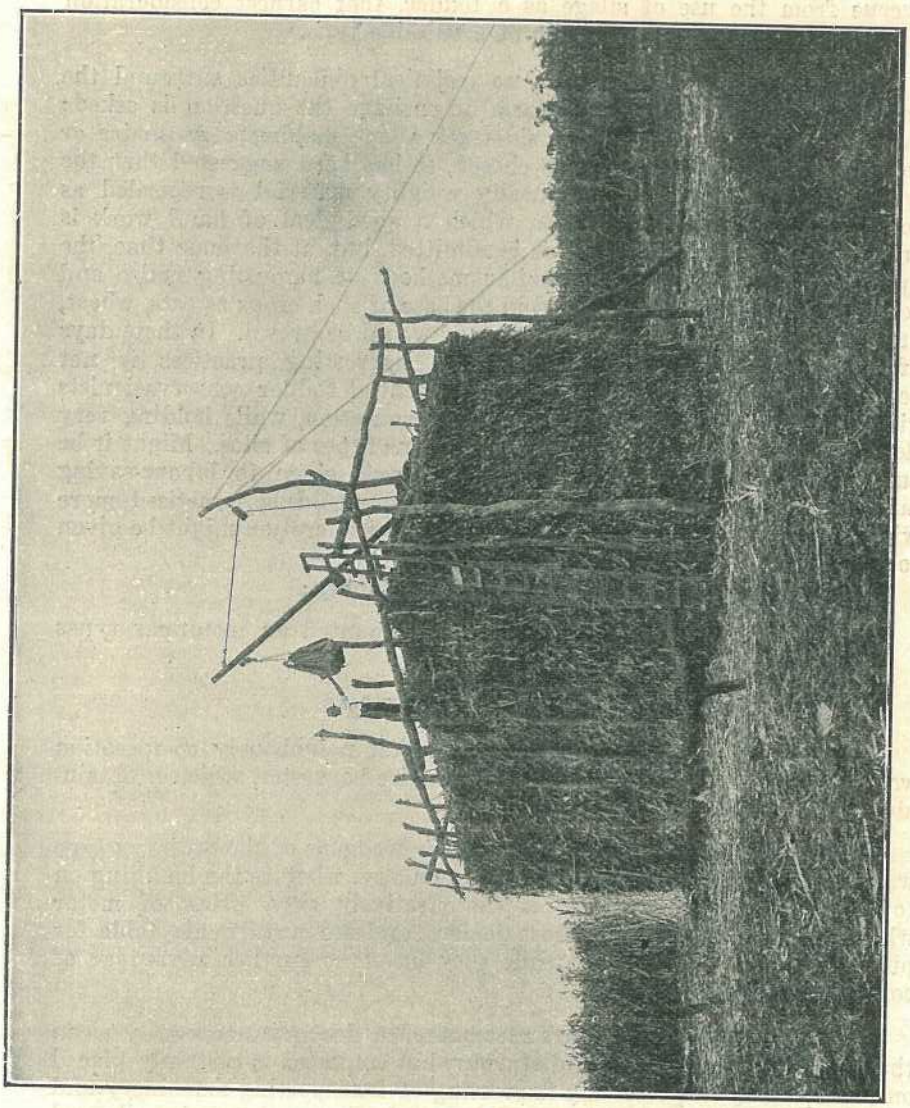


Plate 147.

Stack on the Darling Downs nearing completion. Weighting material (stones) being hoisted by a horse prior to the topping off of the stack with bush hay.

those who are inclined towards silage conservation should run in the direction of pits instead of overhead structures. It would appear that the ease with which the underground silo can be filled quite overshadows the difficulty of emptying it. To those who are lacking in silage experience, it is suggested that the stack method should be adopted and later on, when they have experienced the benefits that accrue from the use of silage as a fodder, that earnest consideration be given to the erection of a silo of a suitable type.

When it is considered that no technical difficulties surround the conservation of fodder in the form of ensilage the question is asked: Why do stockowners as a rule sidetrack silage making? As maize or sorghums are usually the crops chosen, it has been suggested that the work of handling what is naturally weighty material is regarded as somewhat laborious, apart from which a good deal of hand work is entailed. The correctness of this is admitted, but, at the same time, the opinion is expressed that if similar methods of harvesting maize and sorghums for silage were utilised in the case of such crops as oats, wheat, or barley, little if any of the latter crops would be grown. In these days of improved methods retrogression in harvesting practices is not economically sound, yet many of our potential fodder conservationists give no consideration to this aspect of the question, while holding very definite opinions on the merits of the various types of silos. Might it be suggested that if greater consideration were given to labour-saving methods and machinery silage conservation would be practised more widely than it is at present? For example, consideration might be given to:—

(*a*) The use of maize harvesting machinery;

(*b*) Utilisation of tabletop lorries, mounted on motor-car types of wheels;

(*c*) The building annually of silage stacks.

With regard to (*a*) it is suggested that neighbourly co-operation would reduce the individual cost of the maize harvester, which is obtainable in Queensland at £84.

(*b*). Loading green maize on drays or waggons of the ordinary type wastes a considerable amount of human energy, whereas the handling on to low table-topped waggons is comparatively easy. Sets of motor wheels are procurable from most dealers, and are readily adaptable for purposes of farm transport, while they have the further advantage of considerably reducing draft.

(*c*). That silage stacks are recommended does not necessarily mean that silos are looked on with disfavour, but emphasis is certainly placed on the necessity of possessing harvesting or transporting machinery and utilising the stack method in preference to having an expensive silo and only crude or laborious methods of filling it. The advantages (monetary and otherwise) that will accrue from the former will ultimately be a guide and of assistance when it is found necessary to adopt the silo in preference to the stack method—with the added possibility that it may not be necessary to go beyond one's current banking account in order to finance such a project.

Composition of Some Fruits and Fruit Waste.

E. H. GURNEY, A.A.C.I., Agricultural Chemist.

AS requests have frequently been forwarded to the Department for information concerning the composition of fruits and fruit waste, analysis of some fruits appearing on the market have been made, and these analyses are given in attached tables.

According to nature of season it is possible that some variation in composition of the different fruits may occur, and for this reason further analyses will be undertaken of fruits in season and also analyses of fruits not listed.

In connection with the attached tables of analyses, it must be understood that the first column refers only to the weight of sample submitted for analysis, and not to the average weight of fruit that may have been upon the market throughout the season.

The samples which were analysed were fruits already on the market, and hence all were available for public purchase. Some of the fruits had not reached the full stage of ripeness and, therefore, a rather higher acidity may be shown than would be the case with fully matured fruits.

It may be observed that the sucrose content (cane sugar) of some fruits is much lower than in others.

Fruits are valuable as an item in the diet on account of the presence of sugars which are easily digested. Fruit flavours are also stimulants to the appetite, while fruits contain some of the vitamins necessary for good health.

Analyses of the Edible Portion of Some Queensland-grown Fruits.

Fruit and Variety.	Average Weight in Grammes.	Edible Portion. (Per Cent.)	Skins. (Per Cent.)	Seeds. (Per Cent.)	Moisture. (Per Cent.)	Ash. (Per Cent.)	Protein. (Per Cent.) (N x 6·25.)	Per Cent. Sugars.		Refractive Index of Juice at 28° C.	Total Solids in Juice by Refractive Index. (Per Cent.)	*Fibre by Sugar-cane Method. (Per Cent.)	Acidity, 100 Grammes of Fruit contain the Equivalent of Grammes H_2SO_4.	pH.	Remarks.
								Reducing Sugars as Glucose. (Per Cent.)	Sucrose. (Per Cent.)						
Plums, var. Wilson ..	17·9	91·5	..	8·5	86·4	0·44	0·36	3·61	3·96	1·3500	11·93	0·70	0·92	3·65	Not quite ripe. Flesh hard. Fairly sweet. Slightly tart at seed.
Pawpaw	868·0	74·3	12·0	13·7	89·7	0·50	0·53	7·26	Nil	1·3460	9·38	0·91	0·07	5·63	One large and one small fruit. Both about half coloured.
Cherries (Black), var. ..	7·58	93·07	..	6·93	73·4	0·71	2·09	13·23	0·13	1·3619	19·50	4·3	0·45	4·03	..
Cherries (White) var. ..	4·94	91·08	..	8·92	83·5	0·61	0·96	10·45	0·48	1·3530	14·00	3·2	0·74	3·77	..
Peaches	110·6	91·4	..	8·6	87·6	0·55	0·84	1·91	5·78	1·3478	10·58	1·74	0·61	3·73	..
Apricots	48·8	91·8	..	8·2	87·2	0·66	0·83	1·56	5·73	1·3489	11·33	1·38	0·84	4·60	..
Plums, var. Burbank ..	67·2	95·53	..	4·47	89·4	0·42	0·56	2·22	6·32	1·3496	11·75	1·37	1·11	3·41	Some soft, with a sweet insipid taste. Some firm. Tart taste.
Plums, var. Black Diamond	55·7	92·57	..	7·43	87·0	0·47	0·45	4·08	4·76	1·3526	13·70	1·91	0·94	3·04	A few soft, with a slightly tart taste. Others firm; very tart taste.
Bananas, var. Sugar ..	60·5	73·2	26·8	..	69·4	1·10	1·43	18·45	2·99	..	..	4·45	0·47	4·57	..
Bananas, var. Cavendish	142·5	66·2	33·8	..	72·8	0·99	1·16	10·46	8·17	..	..	2·30	0·20	4·71	..
Bananas, var. Ladies' Finger	96·3	70·0	30·0	..	64·3	0·87	0·98	19·10	2·26	..	..	8·90	0·34	4·54	..
Passion Fruit	29·2	54·8	45·2	10·5	71·1	0·70	2·39	5·14	4·18	1·3567	16·30	14·16	2·13	3·26	Edible portion includes seeds.
Figs	27·1	85·4	14·6	..	82·3	0·37	0·71	13·92	0·35	1·3570	16·50	1·33	0·15	4·80	Edible portion includes seeds.
Persimmons	142·0	100·0	..	..	83·7	0·34	0·29	10·98	..	1·3530	14·02	..	0·07	6·80	Analysis of whole fruit; seedless.
Mango	259·8	63·7	20·1	16·2	87·39	0·35	0·36	4·93	4·22	1·3491	11·46	1·04	0·09	4·53	..
Pears, var. Parker's Triumph	156·8	96·12	Skins & Seeds = 3·88		83·4	0·31	0·30	8·57	0·35	..	..	3·09	0·06	4·78	On the market, but immature.
Pears, var. Rome Beauty	164·7	92·60	Skins & Seeds = 7·40		83·7	0·35	0·36	7·62	3·38	..	..	3·19	0·42	3·32	On the market, but immature.
Pears, var. William ..	112·7	94·7	Skins & Seeds = 5·3		81·9	0·28	0·32	8·38	0·70	..	..	3·67	0·06	4·95	On the market, but immature.
Apples, var. Delicious ..	122·0	92·9	Skins & Seeds = 7·1		81·2	0·28	0·19	10·68	2·06	..	..	3·09	0·13	4·05	On the market, but immature.
Egg Fruit	532	92·3	7·7	Trace	93·7	0·40	0·71	2·68	0·09	1·3379	3·98	2·5	0·06	4·90	..
Jack Fruit	8 lb.	53·9	29·8	5·1	67·1	3·40	2·0	17·38	2·27	..	..	4·05	0·46	5·0	Inedible centre 11·2 per cent.

* The method of determining fibre is the standard method adopted in Queensland sugar mills.

Analyses of Seeds, Skins, &c., of Some Queensland-grown Fruits.

Sample.	Whole Fruit. (Per Cent.)	Whole Seed. (Per Cent.)	Moisture. (Per Cent.)	Ash. (Per Cent.)	Protein.* (Per Cent.)	Fat. (Per Cent.)	Fibre by Acid-alkali Method. (Per Cent.)	Carbo-hydrates. (Per Cent.)	Sugars.		Lime CaO. (Per Cent.)	Phosphoric Acid. P_2O_5. (Per Cent.)	Potash. (Per cent.)	Hydrocyanic Acid.	Remarks.
									Reducing Sugars as Glucose. (Per Cent.)	Sucrose. (Per Cent.)					
Wilson Plum Seed Shells	7·0	82·4	17·7	0·94	..	..	57·4	..	..	..	0·07	0·02	0·05	..	..
Wilson Plum Seed Kernels	1·5	17·6	20·0	1·71	19·49	28·76	10·2	19·84	..	..	0·256	0·67	0·31	+	..
Cherry Seed Shells ..	7·17	90·0	10·7	2·0	2·1	..	59·3	..	..	..	0·56	0·216	..	..	..
Cherry Seed Kernels ..	0·80	10·0	13·1	4·5	28·6	22·5	..	..	..	..	0·064	1·306	..	..	..
Peach Seed Shells ..	8·6	..	10·4	1·6	1·2	..	62·5	..	..	..	0·28	0·161	..	..	..
Peach Seed Kernels ..		..	11·0	5·5	24·1	42·4	..	..	..	..	0·18	1·074	..	+	..
Apricot Seed Shells ..	6·15	75·0	11·4	1·68	1·1	..	49·0	..	..	..	0·49	0·183	..	..	..
Apricot Seed Kernels ..	2·05	25·0	7·6	3·6	25·6	75·8	..	..	..	..	0·14	1·410	..	+	..
Sugar Banana Skins ..	26·8	..	85·4	2·6	2·6	0·7	1·9	6·8	6·14	Nil	0·017	0·158	..	..	..
Ladies' Finger Banana Skins	30·0	..	87·7	2·0	0·9	0·9	1·9	6·6	5·51	0·26	0·082	0·111	..	..	..
Cavendish Banana Skins	33·8	..	90·0	2·6	1·1	0·4	1·5	4·4	3·33	0·66	0·027	0·072	..	..	..
Passion Fruit Skins ..	45·2	..	81·7	1·9	1·9	0·2	7·3	7·0	..	..	0·060	0·032	..	..	..
Passion Fruit Seeds ..	10·5	..	..	..	8·49	..	..	..	Nil	..	..	..	..	..	..
Fig Skins	14·6	..	76·3	0·7	1·5	0·5	2·3	18·7	..	..	0·162	0·055	0·233	..	..
Mango Skins	20·1	..	79·3	0·60	0·90	0·3	3·1	15·8	..	..	0·085	0·044	0·393	..	..
Mango Seeds Outside Husk	8·12	50·1	6·46	2·1	0·3	0·5	50·3	38·3	..	..	0·246	0·111	0·724	..	..
Mango Seeds, Parchment-like Covering of Kernel	0·32	2·0	6·73	1·8	20·2	..	50·25	..	..	..	0·337	0·123	0·402	..	..
Mango Seed Kernel ..	7·76	47·9	8·0	3·1	6·0	7·8	5·6	69·5	..	..	0·224	0·421	..	..	..
Jack Fruit Skin	29·8	..	60·1	2·83	2·79	1·87	7·58	24·86	..	..	0·17	0·13	..	..	..
Jack Fruit, Centre ..	11·2	..	80·8	3·27	1·75	0·58	3·33	10·29	..	..	0·090	0·105	..	..	..
Jack Fruit, Seeds.. ..	5·1	..	48·8	1·59	6·04	0·05	4·40	39·12	..	..	0·085	0·275	..	..	..

Granadilla Packing.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE granadilla, like most tropical fruits, is of a soft nature when ripe, and it is therefore necessary to exercise great care in the harvesting and packing of this fruit. Owing to the large size of the fruits, the loss of even one in a packed case would be considerable. Maturity and size have to be taken into account to ensure successful marketing.

Maturity.

It can be safely said that the greatest fault found on the inspection of granadillas at the markets is that of immaturity. Most growers appear to be afraid to permit the fruit to mature on the vines, yet the writer procured fully matured, coloured, but firm, specimens of the fruit in Cairns during a warm period in the month of May and carried them in a handbag to Townsville, where they ripened perfectly, and were consumed ten days later. Experimental consignments packed on the lines indicated in this booklet travelled from Cairns to Brisbane, and kept in sound condition for fourteen to twenty days, and then ripened satisfactorily.

When matured the fruit loses its white, and with some varieties its green, appearance, taking on a golden green colour at the end, and this is the correct stage at which to remove the fruit from the vine for long-distance transport. For local marketing the golden colour should be allowed to cover the whole of the fruit before it is removed from the vine. Where there is danger of fruit fly attacks, the fruits can be protected until fully mature by placing paper bags over them.

Harvesting.

All fruit should be clipped to remove it from the vine, and should be gently placed in baskets or picking-boxes for removal to the packing-shed. Only a short length of stalk should be left attached to each fruit.

Packing-shed Equipment.

It is advisable to provide a flat-topped table on which to spread out the fruit to cool; the table should have a raised edge to prevent any fruits from rolling off. Covering the top of the table with a thin padding of bagging or similar material is advantageous in obviating many skin abrasions.

Whilst handling the fruit on to the table it can be sized into various sizes suitable for the different packs.

Containers.

The tropical fruit case, 24¾ inches long by 12 inches wide, by 12 inches deep is a suitable container. Of the bushel cases tried, the standard case, 18 inches long by 11½ inches wide, by 10½ inches deep, has been found to be by far the most suitable type of this size of container, and is strongly recommended for general use.

Packing Materials.

Woodwool is recommended as the most suitable material for padding purposes. Grass is unsatisfactory owing to its tendency to develop damp and heat in transit. This causes premature ripening of fruit. White or coloured plain paper for wrapping the fruits, and corrugated cardboard for lining the boxes and giving added protection to the fruit, are also necessary.

Packing.

Protection is the keynote of successful granadilla packing. The cases are first prepared by placing corrugated cardboard sheets on the bottom and sides, with the corrugated side to the wood, and a layer of woodwool is placed on the bottom. Each fruit is then rolled in plain paper and placed upon the woodwool until a complete layer is formed. The layer of fruit is then covered with woodwool, which is also placed in the crevices between the fruits. Another layer of wrapped fruit is then placed in the case, and alternate layers of woodwool and fruit until the case is filled. A study of the packing table will give the number of layers required to fill the case.

When packing the fruit care should be taken to always place the stalk end of the fruit to the wood of the box in order to give maximum protection to the flower end of the fruit, which softens first.

It will be noticed that there are two different types of packs, across the case, and from end to end. See Plate 149 and compare with other packs.

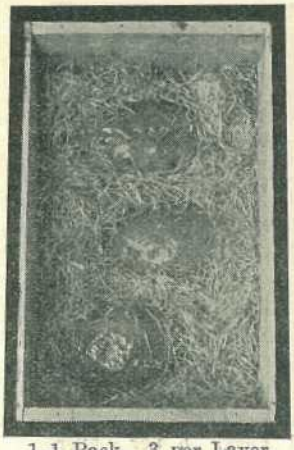
STANDARD BUSHEL CASE.

18 inches long x 11½ inches wide x 10½ inches deep.

First Layers.

Packed Across.

1—1 Pack. 4 per Layer.
3 Layers. 12 Count.



1–1 Pack. 3 per Layer.
3 Layers. 9 Count.
Note spacing of fruit.

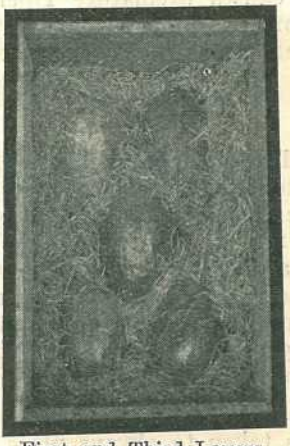
Note how to space fruit slightly apart to permit the layers to fit into each other and come to the correct height in the case. Pad well between each fruit.

Plate 148.

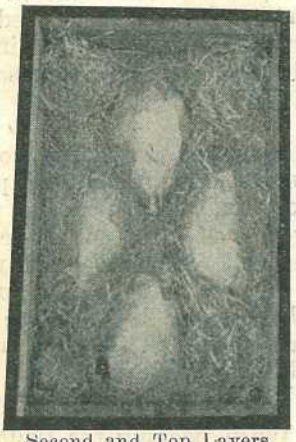
STANDARD BUSHEL CASE.

18 inches long x 11½ inches wide x 10½ inches deep.

Packed endways.



First and Third Layers. Fruit Unwrapped to show method of placing.

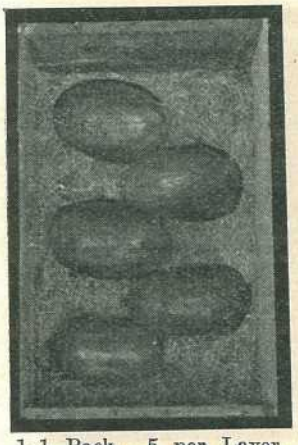


Second and Top Layers. Fruit Wrapped for Market.

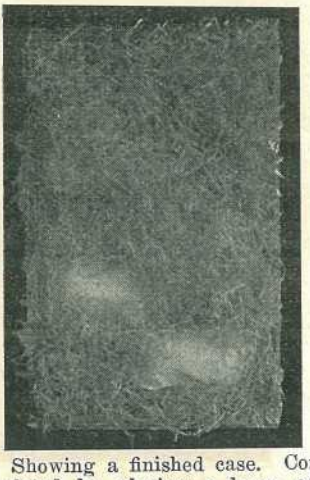
4 Layers to Case. 2 Layers of 5. 2 Layers of 4. 18 Count.

Plate 149.

Finishing Packing the Standard Case.



1–1 Pack. 5 per Layer. 3 Layers. 15 Count.



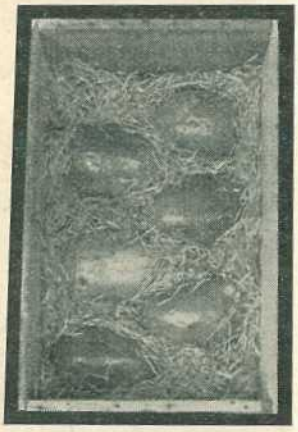
Showing a finished case. Completed by placing a layer of woodwool on the top. In this case the woodwool is removed to show method of wrapping fruit.

Plate 150.

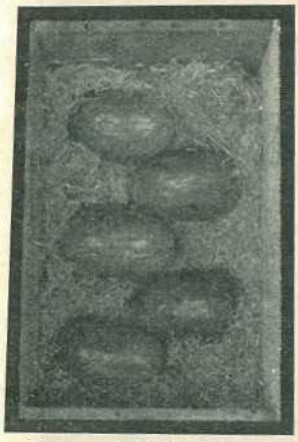
STANDARD BUSHEL CASE.

18 in. long by 11½ in. wide x 10½ in. deep.

First Layer Packed Across.



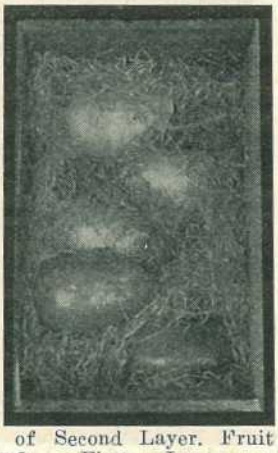
6 per Layer. 4 Layers. 24 Count.



First and Third Layers. 5 per Layer. 4 Layers. 20 Count.

Plate 151.

Packed Across the Case.



Start of Second Layer. Fruit Unwrapped. First Layer. Fruit Wrapped.

Finished Case. The second layer is placed the same way as the top layer.

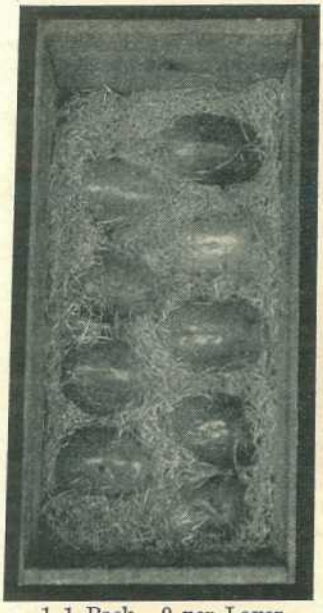
1–1 Pack. 5 per Layer. 4 Layers. 20 Count.

Plate 152.

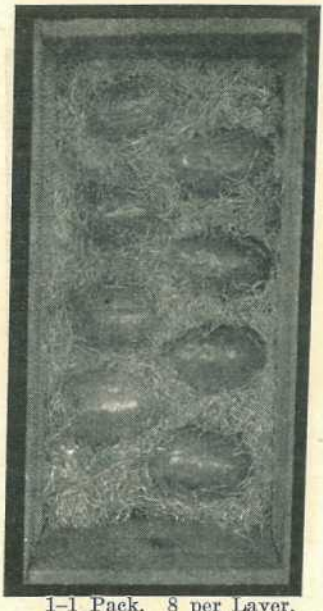
THE TROPICAL FRUIT CASE.

24¾ inches long x 12 inches wide x 12 inches deep.

1–1 Pack Across.



1–1 Pack. 9 per Layer.
4 Layers. 36 Count.



1–1 Pack. 8 per Layer.
4 Layers. 32 Count.

Plate 153.

1–1 Pack. 7 per Layer.
4 Layers. 28 Count.

1–1 Pack. 6 per Layer.
4 Layers. 24 Count.
The first row of the 21 pack is placed the same as this, but the fruit is larger.

NOTE.—In counts 28 and 24 the fruit is spaced to permit the other layers to fit down better and so prevent the fruit coming too high in the case.

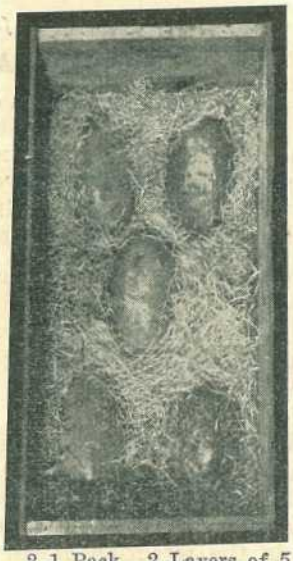
Plate 154.

THE TROPICAL FRUIT CASE.

24¾ inches long x 12 inches wide x 12 inches deep.

2—1 Pack. Endways.

2–1 Pack. 6 per Layer.
3 Layers. 18 Count.



2–1 Pack. 2 Layers of 5.
1 Layer of 4. 14 Count.

Plate 155.

GRANADILLA PACKS.

Tropical Case—24¾ in. long x 12 in. wide x 12 in. deep.

Approximate Average Size (Diameter).	Pack.	No. in each Layer.	No. of Layers.	Total.	Remarks.
3⅞ inches ..	1—1	9	4	36	Pack Across
4 „ ..	1—1	8	4	32	Pack Across
4¼ „ ..	1—1	7	4	28	Pack Across
4½ „ ..	1—1	6	4	24	Pack Across
5 „ ..	1—1	7	3	21	Pack Across
5¼ „ ..	2—1	6	3	18	Pack Endways
5½ „ ..	2—1	2 layers of 5 1 layer of 4	3	14	Pack Endways

Standard Case—18 in. long x 11½ in. wide x 10½ in. deep.

Approximate Average Size (Diameter).	Pack.	No. in each Layer.	No. of Layers.	Total.	Remarks.
3⅞ inches ..	1—1	6	4	24	Pack Across
4 „ ..	1—1	5	4	20	Pack Across
4¼ „ ..	2—1	2 layers of 5 2 layers of 4	4	18	Pack Endways
4½ „ ..	1—1	5	3	15	Pack Across
	1—1	4	3	12	Pack Across
	1—1	3	3	9	Pack Across

Acknowledgment.—Thanks are due to all growers and fellow officers who assisted in making available fruit and facilities for packing and photographing.

Passion Fruit Growing on the South Coast.

J. McG. WILLS, Fruit Branch.

[*Continued from page 332, March, 1937.*]

PREPARATION OF THE LAND.

THE thorough preparation of the land in which passion fruit vines are to be planted is essential in order that the young plants may establish themselves rapidly and develop a root system that can traverse a greater area from which to draw available plant food. No after cultivation will produce equal results. Wherever ploughing is possible the land should be ploughed deeply and worked into a fine tilth.

On land where ploughing is not possible the soil should be broken up by hand, mattocks or steel pronged forks being used for this purpose. On forest land, where hardwood stumps do not rot quickly and cost of stumping is very high—also on slopes too steep for the use of horse-drawn implements—the preparation and subsequent cultivation must all be done by hand.

Unburnt logs placed across the slope of the land will to some extent prevent surface soil erosion. Where the surface is stony time expended in placing the stones in lines at regular intervals across the slope will be regained many times in subsequent chippings. The preparation should help in the retention of surface soil and be completed by the end of August, as the land will then be in a condition to absorb any rain that falls. Planting out the young seedlings can be commenced in spring time with every prospect of them becoming quickly established in their new location.

As our coastal soils are acknowledged to be deficient in lime an application of lime at the rate of from ½ ton to 1 ton per acre would be an advantage. The lime will assist in correcting any acidity in the soil, hasten the decay of organic matter, render plant food more readily available, and improve the general physical condition of the soil.

Trellising and Planting Distance.

Growers' opinions differ on the question of the most suitable distance at which the vines should be planted. On the South Coast the most favoured distance is 10 feet between rows and 16 feet between each plant, giving roughly 270 plants to the acre. These distances permit the natural vigorous expansion of the vines along the trellis, while there is sufficient room between the rows to work horse-drawn implements without damaging the trellises, even when wide spreaders are used on the horizontal type of trellis. At the same time a better coverage is obtained, leaving little, if any, land exposed to the harmful effect of the sun's direct rays.

Planting too close in the rows is of little or no advantage, for, after the first year, the foliage of the vines will become too dense, thus necessitating the cutting out of possibly half the number of vines planted. This action is necessary to keep the foliage sufficiently open to admit light and allow for the free circulation of air throughout the vine, and also to permit dead fungus affected leaves to fall clear to the ground, carrying with them the spores which would otherwise infest other growing portions of the plant.

For the proper development and ripening of the fruit sunshine and air should penetrate to all aerial parts of the vine, hence the necessity, wherever possible, for running the trellises in a north-south direction. The vines will then have an even distribution of sunlight over the whole of the growth on the trellis.

If the vineyard is established on a steep hillside it may be inconvenient to plant north and south. However, where possible, this direction should be the rule.

If the vineyard be laid out across a slope then added provision can be made to conserve the surface soil by laying logs or stones also across the slope. The construction of contour drains to carry off excess surface water during heavy rainfall would be a decided advantage.

Plate 156.

A 10-months' old passion fruit vineyard on red-oak soil at Mudgeeraba.

The cost of wire, posts, and strainers and their erection are initial items of expenditure which influence to a great extent the choice of trellis to be erected. In commercial vineyards the trellises are mainly one of two types—either the vertical or the horizontal trellis. Both types have advantages and disadvantages, hence the main deciding factor is usually one of cost. A vertical trellis is less costly than a horizontal trellis, therefore, if posts and strainers have to be purchased growers mostly erect a vertical trellis at first; any extension of the area can be trained on a horizontal trellis if so desired when capital is available. Wherever the grower is capable of splitting and erecting the posts and strainers from suitable timber in the vicinity of the vineyard a considerable saving will be made. Usually there is plenty of suitable timber growing handy. Most of the natural hardwoods will last longer than the passion vines, which are comparatively short lived.

If selection is possible, then posts split from bloodwood, ironbark, grey gum, or yellow stringy will prove to be satisfactory in every way, for the varieties of timber named will last in the ground for many years and will serve as posts for successive sets of trellis.

The trellis should be inexpensive, although substantial enough to support a heavy growth of vines and fruit. The type of trellis erected, together with pruning and training of the vine, have an important influence in the control of fungus diseases. The idea to keep in mind should be the production of a sufficiency of surface foliage to carry a heavy crop while maintaining an open habit of growth.

The grower, therefore, may choose (1) a vertical trellis or (2) a horizontal trellis, and the height of the top wire in each case should not be less than 6 feet clear above the ground.

In a horizontal trellis the two wires are run side by side while in a vertical trellis the wires are run one above the other as in an ordinary fence. The posts for the trellis should be 7 feet 6 inches long, 7 inches

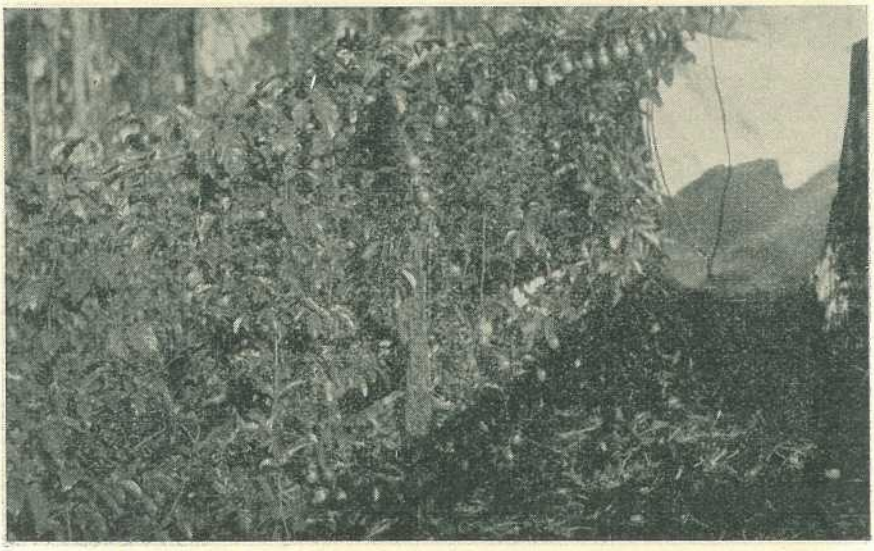


Plate 157.
Vine 10 months old. Note sturdy growth of twin leaders, dense vigorous laterals, and advanced fruit.

wide, and not less than 4 inches thick, set 16 feet apart and 18 inches in the ground, with 10 feet between rows. The strainers should be of much heavier material, and may be either round or split. They should be set 2 feet 6 inches in the ground, and must be well strutted or stayed so as to take the strain of the wires, the portion in the ground to be free of sapwood. One strainer to every 80 yards will prove sufficient in most locations. The posts should be erected with their width across the row.

For a vertical trellis holes are bored in the posts, through which the wire is run. One wire is run as close to the top of the post as practicable, and the second wire is run usually between 12 and 18 inches below, 15 inches being the average spacing between these wires.

The horizontal type of trellis is mostly favoured on the South Coast, and the distance between the wires has been recently increased to 24 inches, and this apparently has a decided advantage over the closer trellis in that it permits the entry of sunlight and air between the two sets of laterals, thus promoting the flowering and setting of fruit on the inner

growth of the vine. At the same time this practice should assist materially in maintaining a more open growth, allowing dead and diseased leaves to fall clear to the ground, carrying with them any fungus spores adhering to their surfaces.

In order to keep the wires apart in a horizontal trellis a T-piece not less than 2 inches by 2 inches, cut to the length desired, is fastened to to top of the post and the wires run through holes bored in the ends of the T-pieces and strained on the strainer posts.

It is an advantage to make some provision whereby the wires can be kept strained and so prevent heavily laden laterals from sagging to the ground. Small cast-iron rollers can be procured cheaply and are excellent for this purpose, being easily operated and always in position.

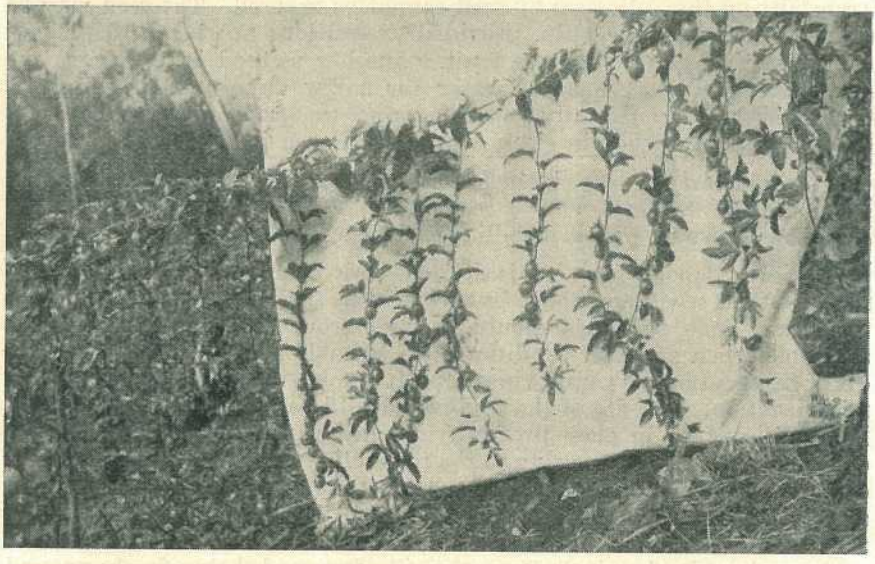


Plate 158.
Laterals on young vine 10 months old, showing open spacing, vigorous growth and cropping habit.

Various gauges of wire are used. Some growers prefer No. 8 galvanised iron wire, while on some of the more recently erected trellises 10 x 12 gauge high tension steel wire has been used. This wire, although rather thin, is very strong and carries the weight satisfactorily; also there is less stretching and sagging between the posts than is the case with iron wire.

Black iron wire, although cheaper to buy, should not be used in the South Coast district as it soon rusts, stretches, and sags, necessitating propping up between the posts in order to keep the laterals and fruit clear of the ground.

Should the wires sag between the posts stakes may be placed temporarily in position to support the wire until the crop has been harvested, then, after pruning, when the weight on the trellis has been reduced, the wires may be restrained with little possibility of the wire snapping.

Beginners would be well advised to experiment with a few rows of each type of trellis, and by keeping a careful check on production, &c.,

the most satisfactory type in any particular locality can be readily ascertained; any extension of area can be laid down accordingly, while original trellises can be converted as occasion requires.

Propagation.

Passion fruit plants may be propagated either from seeds or cuttings, although the latter practice is rare.

Growers are recommended to raise their own plants, and for this purpose only fruits fully matured and selected from healthy vigorous heavy-cropping vines should be used.

Growers cannot be too careful in the selection of seed material, as the passion fruit is subject to several diseases, and the possibility of transmitting these diseases by seed cannot be ignored. The seed may be allowed to dry in the pulp, provided precautions are taken to prevent the growth of moulds on the fruit. Another method is to remove the pulp, place it in a vessel of water for a few days until it ferments, when the seeds will easily separate from the fruit pulp. The seeds should then be washed in clean water and placed in the shade to dry.

Should early spring-ripened fruits be selected and the seeds planted immediately, seedlings will be ready to plant out in early summer. A later sowing would provide seedlings suitable for autumn transplanting.

If early spring planting is desired—this being the season most preferred—then seedlings should be raised from fruits maturing in the late summer. Such seedlings should be well grown before winter and be available when seasonal conditions are suitable for transplanting with every prospect of the young vines rapidly establishing themselves in their new situation. The site of the seed-bed should be very carefully selected. It should not be in close proximity to any other passion vines, either cultivated or otherwise, owing to the possibility of introducing woodiness or other diseases into the nursery. The soil should be friable and contain an abundance of plant food. After the soil has been well worked into a fine state of tilth the seeds should be planted just below the ground surface, about half an inch down, the soil afterwards being firmly pressed and covered with half an inch of fine horse manure as a mulch. The seedlings should appear in from four to six weeks, and as they develop they may be thinned out to about 4 inches apart—those remaining will then develop into sturdy plants with good root development. Lanky, weak plants will result from any crowding in the seed-bed.

Some growers first erect the trellis and then plant several seeds at the required planting distance under the trellis, afterwards selecting the most vigorous of their young plants and removing the others. This practice is not recommended as germination is often poor, the young plants are exposed to infection from any diseased vines which may be in the vineyard, and, generally, they require extra attention until they become well established.

Transplanting.

When the seedlings have attained a growth of from 6 to 9 inches they are suitable for transplanting. Larger plants have a greater tendency to wilt, and do not become established as quickly as smaller plants. Transplanting may be done at any time of the year, but from September to February is considered to be the most suitable time. Transplanting during the months from March to August is not recommended,

except in very favourable locations, as the plants rarely establish themselves satisfactorily, and being more or less stunted do not respond rapidly to the following spring conditions.

Seedlings planted out between September and January should return a profitable crop in the following twelve to sixteen months, provided the seasonal conditions have been normal.

Select dull, cool, or moist weather for transplanting, as hot, sunny, or windy days injure the plants by increasing transpiration. Plant the vines under the trellis in holes which have been dug ready to receive the young plants. These holes should be large enough to allow for the natural spreading of the roots. Surface soil should be filled in around the roots and pressed down firmly. A good watering should be given each vine before the holes are filled in. If weather conditions are dry subsequent waterings and partial shading may be necessary until the plants have become well established.

Care should be taken to see that the vine is not planted deeper in the hole than it occupied in the nursery, otherwise if the crown of the plant is below the surface it may become attacked by a fungous base rot which may kill the vine.

Two or three weeks before transplanting cut back any excessive top growth the seedlings may have made, and sever the larger roots by pushing a spade down full depth along and between the rows of plants which may then be easily removed when required with a minimum of root disturbance. The seedlings will rapidly recover from the shock of transplanting. Dig only as many plants as can be transplanted within a short space of time. After removal from the nursery keep the plants covered with a piece of wet sacking to prevent the young seedlings from drying out.

About twenty-four hours before the plants are dug give the nursery bed a good watering. The roots of the young seedlings are thus less likely to be damaged by being dragged through the soil, and the plant will have absorbed also sufficient moisture to assist it to recover from the shock of transplanting.

Training the Vine.

From the beginning the grower should have a definite system in mind, and train the vine systematically, so that a good solid foundation is modelled on the trellis.

Light stakes or poles should be driven into the ground alongside the young seedlings and fastened firmly at the top to the wires on the trellis. The stakes act as supports for the vine until they have become firmly established on the wires.

Within a few weeks after transplanting the young seedlings will have become established and vigorous growth will develop.

The training of the vine should commence from the outset. With the production of vigorous growth numerous shoots will appear from the crown of the plant, also as side growths from the original stem. In most cases these latter growths are the more vigorous, and rapidly overtake the original growth of the vine. When they have attained a growth of from 12 to 18 inches in height the required number of the most vigorous growths should be selected to form the main stems of the vine. All other growth should then be carefully cut away. With the growth of the stems it is necessary to keep them tied at intervals of 9 to

12 inches to the stakes provided for that purpose, in order to prevent the young tender growth from being broken or damaged through being blown about by wind.

When tying up the stems tie first firmly to the support and then tie up young growth, leaving sufficient space for the expansion of the vine.

All side growths arising from the stems should be suppressed until the wires are reached, thus forcing all the vigour of the vine into the terminal growth.

The leaves on the main stems between the ground and the wires should be permitted to remain, as these shade the stem and assist in the natural development of the young plant. On reaching the wires, if

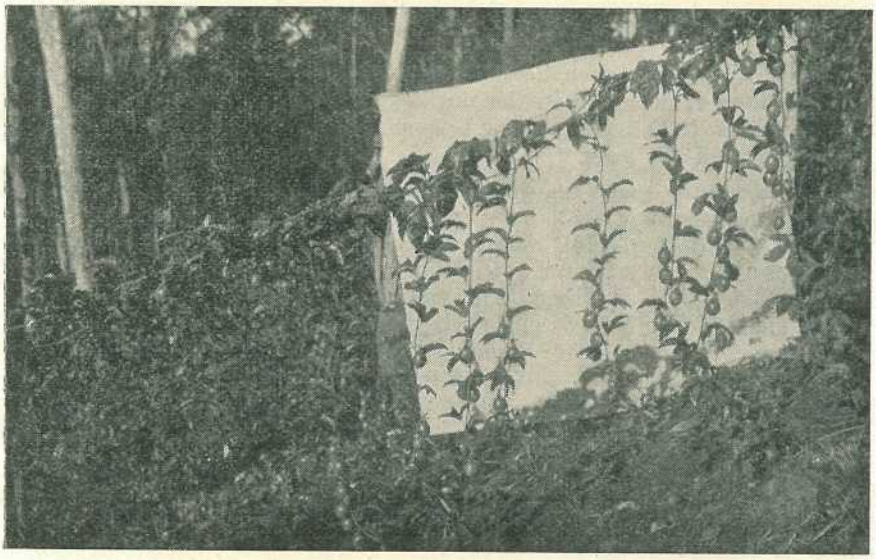


Plate 159.
Well spaced fruiting laterals on 10 months old vine.

only a single stem has been developed the terminal growth is pinched out. The vine will then put forth lateral growths from which the required number is selected to form the main leaders of the vine.

Where two or more stems have been selected there is no necessity to stop the terminal growth, for on reaching the wires the growth is directed along the trellis and forms the main leaders. The leaders should not be permitted to ramble along the trellis at will with only the tendrils to support them, but should be kept turned over the wires and tied in position at regular intervals, care being taken to maintain the turning in the same direction, thus preventing the formation of sagging loops in the leaders.

On the leaders becoming established on the trellis cut away all unnecessary tie bands, thus preventing the cincturing of the growth as it expands. As the leaders proceed along the wires lateral growth will develop, and this will be accelerated if leader terminals are cut back on reaching the approaching growth of the neighbouring vine.

Laterals should be permitted to develop at intervals of from 9 to 12 inches, and kept hanging straight down from the leader towards the ground, thereby preventing tangling while admitting light and air, which promotes the setting of the fruit, at the same time greatly lessening the labour of harvesting, spraying, and pruning.

All laterals should be kept shortened to within 6 inches clear of the ground.

The grower should give consideration to the system of growth to be developed by the young vines, and to whether a single or multiple stem system will be more suitable.

In the single stem system one stem only is allowed to grow until it reaches the height of the wires on the trellis, when the top is pinched out and leaders are developed from the subsequent growths at the head of the vine; while in the multiple stem system two or more stems as desired are developed to form the leaders on the trellis.

The development of two main stems is most popular on the South Coast, because more growth is produced in a short period, while the vines cover the trellis rapidly. A good crop is usually set within twelve to fifteen months, provided the vines have been planted at the right time and have been given the required amount of attention.

An added advantage of the multiple leader system over the single leader is that if one stem is lost or damaged the vine does not require complete reconstruction before another crop is produced, as sufficient growth from the undamaged leader will remain on the trellis to produce a crop until an additional stem is developed to replace the lost one. All main stems should be as nearly as possible of an even size, otherwise the more vigorous stem will rob the weaker, resulting in an unbalanced growth of the vine.

Vines trained on a single main stem take longer to establish a complete cover on the trellis, but during early life are much easier to keep in control, as the growth is not nearly so dense as that developed by the multiple stem system. Under this system the terminal growth is pinched out when the stem reaches the top wire, and the required number of leaders developed from the lateral growth promoted on the main stem.

In twelve to eighteen months the vines will have become well established on the trellis, carrying sufficient growth to produce a satisfactory crop in subsequent years. On flat land or land having only a gentle slope the leaders can be trained to grow in each direction on the trellis, but on steep slopes the vines naturally grow better towards the uphill direction. The vines should be trained to assist this natural tendency.

On sloping land two main leaders trained in the uphill direction will prove satisfactory, while on gentle slopes or on flat land four main leaders may be developed and trained, one to each wire in both directions.

[TO BE CONTINUED.]

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE heavy general rains experienced throughout the State have acted as a tonic on the fruit industry. Certainly fruit in season, like grapes, must suffer loss through excessive moisture causing splitting and loosening on the stems, but against this is the future development of crops now in the bud development stage.

Pineapples have lost in quality through excessive moisture. While too late to increase the coming season's crop—except, of course, where irrigation has been practised—the rain has given citrus trees a new lease of life. The rain in most cases possibly accounts for the slight easing in values experienced towards the end of March. Market values of fruit are as follows:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Bunches, 2d. to 7½d. per doz. Cases—Sixes, 6s. to 12s. 9d.; sevens, 8s. to 13s. 9d.; eights, 8s. to 14s. 9d.

Melbourne.—Sixes, 17s. to 18s.; sevens, 19s. to 20s.; eights and nines, 21s. to 22s. Owing to the shortage through floods 30s. was obained at one market.

Sydney.—Sixes, 13s. to 16s.; sevens, 15s. to 17s.; eights and nines, 16s. to 20s.

It is expected that the market will ease slightly during April, but values should again be high from May onward. Attention of growers is called to the introduction of the Cluster Pack as from this month, also the new one-bushel case, which should facilitate handling. Particulars of both improvements are obtainable in a free booklet issued by the Department of Agriculture. Growers are asked to co-operate in the application of these improvements, which will make work easier and the risk of disease less.

Pineapples.

Pineapple values in Brisbane eased considerably. Prices:—

Brisbane.—Cases, 2s. to 4s. Loose, 2s. to 4s. per dozen. Roughs were approximately the same value.

Melbourne.—10s. to 14s. per case.

Sydney.—8s. to 10s. per case.

Practically all lines sent to Southern markets have been affected with water blister.

Tests have shown that the new banana bushel case, 18 inches long by 13 inches wide by 9½ inches deep, inside dimensions, is quite a good box; all sized fruit packs head and tail giving the following counts—8, 10, 12, 15, and 18. Altogether it is a very suitable case, particularly for the country order trade in which buyers want small cases.

Custard Apples.

Early consignments of this luscious fruit are now on the market. Up to 8s. for special quality fruit was obtained. Growers are warned against sending immature lines. A creamy colour in the interstices of the fruit is a good indication of maturity.

Papaws.

Prices are high for good quality fruit, 8s. to 11s. per tropical fruit case being obtained in Brisbane. Growers contemplating sending to Southern markets must exercise care in packing fruit that is not too advanced in ripeness.

Avocados.

Small consignments sent to Melbourne have realised up to 16s. per half-bushel case. Remember, this is a specialised fruit; do not spoil its future consumption development by sending to market immature fruit, which, if it does ripen, is flavourless. Present indications show that it will be a long time before the supply will overtake the demand.

Monsteras.

Melbourne.—4s. to 6s. per half-bushel case. Quite a trade is being worked up in this fruit in Melbourne.

CITRUS FRUITS.

New season grape fruit is now on the market. It is certainly remarkable the way one season's citrus production runs into another. A few early oranges have been sold at satisfactory prices. Growers must remember that a citrus acidity test is used, and oranges before going on the market should pass this test. Following are particulars of the test:—

In the case of oranges, grape fruit, and mandarins, fruit in which the weight of the hand-pressed juice is not less than 30 per centum of the total weight of the fruit, and—

(*a*) As regards navel oranges and mandarins, 10 cubic centimetres of which juice is neutralised by not more than 26 cubic centimetres of deci-normal (N/10) alkali; and

(*b*) As regards oranges (other than navel oranges and mandarins) 10 cubic centimetres of which juice is neutralised by not more than 30 cubic centimetres of deci-normal (N/10) alkali.

Lemons are still maintaining satisfactory values.

Oranges.

Prices in Brisbane for oranges:—Locals, 10s. to 12s. per bushel case; Gayndah, 12s. to 14s. per bushel case.

Sydney.—6s. to 12s.

Melbourne.—6s. to 16s.

Lemons.

Brisbane.—Gayndah, 8s. to 13s.; Benyenda, choice, 15s. to 16s.; standard, 12s. to 13s.

Sydney.—Locals, 6s. to 10s. per case; Queensland, 14s. to 17s. per case.

Melbourne.—Gayndah lemons, 14s. per case.

Grape Fruit.

Brisbane.—6s. to 8s. per bushel.

Sydney.—Queensland, 14s. to 17s. per bushel; Palestine, imported, 35s. per one and a-half bushel export case.

Melbourne.—16s. to 20s. per bushel; imported, Palestine, 45s. per export case.

Passion Fruit.

Brisbane.—7s. to 8s.; second grade, 1s. per case lower.

Sydney,—3s. to 8s.

Melbourne.—4s. to 9s. per half-bushel.

DECIDUOUS FRUITS.

Apples.

Early export prices have been of a payable nature, returning the equivalent of 6s. to 9s., f.o.r. Stanthorpe.

Local prices are not as satisfactory as they might be, but should improve as the maturity of Granny Smiths improves and the marketing of export culls lessens.

Brisbane prices for apples.—Granny Smith, 6s. to 8s. 6d.; Jonathan, 6s. to 7s.

Grapes.

Considerable waste is being experienced after the heavy rains. Generally this season the quality has been excellent. Prices:—

Brisbane.—Muscats, 4s. to 5s. 6d. per half-bushel; Waltham Cross, 3s. to 5s.; Purple Cornichon, 5s. to 6s. 6d.; Colemans, 3s. to 4s.

Stanthorpe Rock Melons.—2s. to 4s. per bushel case.

Tomatoes.

Brisbane.—Coloured, 2s. to 3s. 6d.; green, 1s. to 2s. 6d.; ripe, 1s. to 2s.

Melbourne,—2s. to 5s.

Cucumbers.

Brisbane.—2s. to 4s. per bushel case.

Sydney.—2s. to 5s. per bushel case.

Publications.

The Banana Packing booklet is now available for distribution. Copies may be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane. The publication, in addition to illustrating all the packs now in use, deals with the marketing of the bushel case. A leaflet on Rock Melon packing is ready for distribution. Lettuce packing is also obtainable.

A COMMON CAUSE OF LOW-GRADE CREAM.

Careless washing of utensils is a common cause of low-quality cream. Contamination may result from:—Failing to wash up twice daily. Washing up with cold water, either once or twice a day. Leaving the separator unwashed at night. Failing to use washing soda to remove grease from utensils. Using objectionable cloths or unclean brushes for washing up. Failing to scald thoroughly all utensils, brushes, &c., after washing. Failing to wash and scald cans on their return from the factory. Washing up utensils in polluted water—rainwater is always preferable.

The Tropics and Man

The Climates of Queensland.

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

No. 4.

I SPOKE last time of a technical device which allowed us to turn the three important and variable factors in climate into a single figure which meant something concrete, and which could be used to compare one climate with another in so far as it affects man. This single figure is called "effective temperature." You may ask what is wrong with the present method of comparing ordinary temperatures, as given by the Weather Bureau each day. If you have been following the theory of this business, you will remember that ordinary (dry-bulb) temperatures take no account of humidity and no account of air-movement. How often have you heard people discussing the weather—

Mrs. A.: Phew! Isn't it hot to-day?

Mrs. B.: Yes! The thermometer only says 82, but it's the humidity! or another day,

Mrs. A.: It's 110 in my kitchen to-day!

Mrs. B.: It's hot alright, but I don't mind the dry heat so much; it's the humidity that gets me down.

These two ladies are apparently agreed that a dry 110 degrees is no worse, or may even be better than a wet 82 degrees. Most people, again, as far as climate is concerned would prefer to be in Cloncurry with a temperature of 90 degrees than in Townsville with a temperature of 82 degrees.

Obviously, then, any system which takes no notice of humidity is fallacious, if we are going to compare weathers or climates as they affect man.

How the Climates are Compared.

For over fifty years the Weather Bureau has been keeping records all over Australia of temperatures, humidity, rainfall, &c. At all stations observations are made at 9 a.m. At many these are repeated at 3 p.m. At some stations further readings are made at 9 p.m., while at a very few stations continuous records are made. There have accumulated vast amounts of information of a most useful character. Unfortunately, these are for the most part unpublished. The Bureau, however, very kindly supplied us with the information we wanted—the average dry-bulb and wet-bulb temperatures for each month of the year at each of eighty-four stations throughout Queensland and the Northern Territory. Using the American figures we were able to work out the average "effective temperature" for each month of the year at each of these stations. We then had figures for the different places which could be compared without worrying unduly about other disturbing factors. Both temperature and humidity were accounted for. We then proceeded to study the figures, and the results proved to be well worth the trouble we had expended upon them.

Results of Enquiry.

The first point which struck us upon examining these "effective temperatures" was that the figures agreed very much more closely with one's own experiences. Instead of Cloncurry having a temperature of 90 degrees and Townsville one of 82 degrees, both now had the same figure of 79 degrees. This means that both Cloncurry and Townsville during this month have the same general effect *upon the human body*, and that this effect is the same as an atmosphere saturated with water vapour at a temperature of 79 degrees. That Cloncurry and Townsville, in spite of differences in ordinary temperature, do have the same general effect upon one's comfort and efficiency in summer is, I think, a common experience.

To look at the other side, if one trusted to ordinary temperatures alone one would be tempted to say that Charleville in the south-west had the same effect in summer as Cooktown on the north-east coast, both having an average temperature of 83·5 degrees. This is quite foreign to one's experience, and when the "effective temperatures" are worked out we find that Charleville is considerably milder than Cooktown (76 degrees as against 80 degrees).

When maps are made of the hot month temperatures, the usefulness of "effective temperatures" in comparing the effects of climate upon man is very well seen. During the hot months the ordinary temperature rises as one goes west, but changes surprisingly little as one goes north. Effective temperatures, on the other hand, rise as one goes north, and change very little except for the mountainous regions as one goes west. There is no doubt that the latter changes agree very much more with one's experiences.

The second result of the enquiry, and one of more real importance to Queensland, is that we can determine in the laboratory just what effects a certain "effective temperature" will have upon a man at rest, or upon a man at work, and determine also whether his efficiency is lowered by that temperature or what strain he is likely to suffer.

Determining the Effects of Climate.

To solve a large and complicated practical problem involving living beings nearly always means investigation along two lines. In the first place the problem must be studied in its natural surroundings and as many observations made about as many features as possible. This method alone, however, usually results in a jumble of disjointed bits of knowledge, whose relation to one another can only be guessed at. If efficiency is lower in a place with a higher temperature it does not follow that the higher temperature is the cause of inefficiency. The food may be poorer, the social life may be worse, the type of people there may not be so good, and so on. If one tries to sort out all these possible causes merely by enquiry one becomes hopelessly confused.

It is here that the second method comes in—that of experiment. To continue with the example, the *same* people, eating, the *same* food, working under exactly the *same* conditions, can be tried out at different temperatures and their efficiency measured. Such an experiment will show to what extent temperature is to blame. The importance of diet and even of social conditions can likewise be investigated.

Taken alone the experimental method has its drawbacks, too. An artificially made climate is not the same as a natural one; people do not behave in the same way when put into a hot room as they do when working in a hot climate. The ideal way is run natural observations and experimental work side by side and make each check the other.

This then is the method whereby we hope to set about investigating the effects of Queensland climates upon man. Extensive and continuous observations and tests will be made upon people following different occupations and leading different lives in different parts of the State. At the same time the effect of artificial climates will be determined in the laboratory upon unacclimatised and acclimatised people doing different kind of work, eating different kinds of food, and so on. Constant comparison of one set of results with the other will go on, and fresh avenues of investigation will be followed up as suggested by the earlier enquiries.

This means a long, continuous, and exhausting programme. Without it we can but continue with our blind guessing, and blind guessing will provide us with our just deserts—failure in the face of increasing competition.

Other Climatic Factors.

I have been concentrating upon three of the climatic factors—heat, humidity, and air movement. These are universal in operation and are undoubtedly the most important. Moreover, they can be conveniently measured and a method has been devised for dealing with all three at once. But there are other factors whose presence we must not forget. They are not always in the picture and about some of them we know very little. Nevertheless, they must not be ignored. The first and most important of these interfering factors is radiation. There are a whole group of radiations, of which heat is one. The effects of these I want to mention next time, since there is an immense amount of misconception abroad about them.

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 February, 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.				
Alfa Vale Model 2nd.*	W. H. Thompson, Nanango	1,5430·9	713·544	Reward of Fairfield
Princess 2nd of Trevor Hill	J. Phillips, Sunny View, Wondai	17,386·8	677·763	Prince of Braemar
Cameo of Braemar	A. H. E. Black, Kumbia	12,132·0	543·971	Victory of Balmoral
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Kyabram Marie 2nd	A. H. E. Black, Kumbia	10,329·0	422·655	Springlands Bridadier
College Stateley 5th	Queensland Agricultural High School and College, Gatton	6,016·83	285·47	Fussy's Kitchener of Hillview
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Newhaven Calm	E. O. Jeynes, Raceview	9,621·5	431·943	Fairy Bower Brilliant
College Rascal 5th	Queensland Agricultural High School and College, Gatton	7,316·51	309·978	Fussy's Kitchener of Hillview
JERSEY.				
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Bellgarth Pearl	D. R. Hutton, Bellgarth, Cunningham	7,829·25	433·045	Trecarne Renown II.
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Kingsford Dell	W. E. Meirs, Rosevale	4,922·0	297·972	Oxford Saturn
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Kathleen Royal Wren	J. Goostrey, Bald Knob	6,084·75	316·91	Retford Royal Atavist
Prim Lady of Hope View	H. T. C. Gibson, Kingaroy	5,421·0	282·421	
Wyreene Rosette	J. B. Keys, Gowrie Little Plain	4,933·75	257·551	Lyndhurst Majesty

Answers to Correspondents

BOTANY.

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

Grasses from Dawson Valley Identified.

J.M. (Wowan)—

(1) *Eragrostis poecoides.* A species of love grass most frequently occurring in Queensland as a weed of cultivation. We cannot say that we have seen stock take readily to it, but in the form of hay it would probably be eaten readily enough, and this seems to apply to a number of grasses.

(2) *Dichanthium* sp., a species of blue grass. All the blue grasses are generally regarded as excellent fodders. The genus Dichanthium is at present under review, and we cannot give you a specific name.

(3) *Paspalidium caespitosum,* brigalow grass.

(4) *Dactyloctenium radulans,* button grass. This is a very common grass on parts of the Downs and in the West. Like Flinders grass it is often eaten when quite dry. It produces an abundance of seed heads, and in this stage is said to be quite nutritious.

(5) *Sporobolus pallidus,* fairy grass. This is one of the grasses that come up very quickly after summer rains. We have little information about its food value, but it is generally recognised as of second-class value. However, like some other native grasses, it is a useful addition to the average native mixed pasture.

(6) *Chloris acicularis,* curly chloris or curly windmill grass. It makes good bottom feed, but does not spread by means of runners to the extent of some of the chloris grasses.

(7) *Panicum Buncei,* a native panic grass. Most of the native panic grasses are regarded as excellent grasses in the mixed native pasture.

Wild Millet. Warrego Summer Grass. Phalaris bulbosa.

T.G. (Nerang)—

(1) *Echinchloa crus-galli,* wild millet or swamp millet, an excellent grass for wet situations. It is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum.

(2) *Paspalidium flavidum,* sometimes called Warrego summer grass, fairly wildly spread in Australia and favouring flooded country. In such situations it is generally regarded as an excellent fodder.

Regarding *Phalaris bulbosa,* we do not know how this came to be mentioned as a legume. It was either a slip of the pen on our part or just one of those mistakes that will occur at times. As you surmise, it is not a legume but a true grass. All the legumes have pea flowers and seed pods.

Wild Mint.

W.H. (Dalby)—

Your specimen represents *Salvia reflexa,* the wild mint, or narrow-leafed sage. This plant has received a good deal of Press publicity due to its being such a serious pest on parts of the Darling Downs. Feeding tests prove it to be poisonous to stock, but most of the trouble experienced has been with travelling stock, ordinary paddock or resting stock seeming to browse among the plant with impunity.

If you have only a small patch the best means of eradication is, of course, to pull the plants out and carefully burn. I take it the plant is a new-comer to your district, and this would be practical at the present time and the most certain method of getting rid of the weed. The plant you forwarded did not bear many seeds, but as the seeds ripen very quickly, eradication should be carried out as soon as possible.

Barrier Salt Bush.

F.W.M. (Ducklo)—

The specimen represents *Enchylaena tomentosa*, the Barrier salt bush, a plant of the salt bush family, Chenopodiaceae. It is very common in cleared brigalow and belah country in Queensland. It is not known to possess any poisonous or harmful properties, but as far as we have observed stock do not seem to eat it, at least to any extent. We cannot say we have seen it become a serious pest on the Brigalow country.

"Coffee Bush" or Arsenic Bush.

H.C. (Mackay)—

The plant is *Cassia occidentalis*, a very common weed in North Queensland, sometimes known as "coffee senna" and at other times as "arsenic bush." The latter name is applied to several plants of the genus Cassia in North Queensland and is rather misleading. Feeding tests have been carried out with your particular plant, yielding negative results, except that the animals experimented with showed considerable purging. This is to be expected, as species of Cassia provide the senna of commerce, and practically all the members of the genus possess purgative properties.

Prickly Poppy.

J.F.D. (Mackinlay)—

Your specimen represents *Argemone mexicana*, the prickly poppy, a very common farm weed in parts of Queensland. In the North and Central-West it seems to be confined to level flats and apparently has not spread very much, for we remember seeing a few odd specimens growing about Julia Creek a good many years ago. The plant might become a serious pest on some of the alluvial country, however, for in such places on the Downs and in the neighbourhood of Brisbane it is sometimes very abundant.

So far as we have observed, we cannot say that we have ever seen it eaten by stock, but it is reputed to be poisonous. The only cases of poisoning by it have been where it has been cut, allowed to wilt, and the subsequently softened plants fed to poddy calves.

In addition to being spiny, the plant contains an intensely bitter sap which renders it unpalatable to stock.

Grasses from Central-West Identified.

L.R.B. (Blackall)—

(1) *Chrysopogon pallidus*, a very common grass throughout the whole of the Central-West and generally regarded as quite a good fodder.

(2) *Sporobolus actinocladus*, a small grass, moderately common in many places, and makes rather good bottom feed for sheep.

(3) *Enneapogon nigricans*, blackheads. A very common grass in parts of the West, generally regarded as of only secondary value as a fodder.

(4) *Brachyachne convergens*, sometimes called star grass. It is quite a lusciously-looking grass, but stock do not seem to take readily to it.

(5) *Enneapogon avenaceum*, white heads.

(6) *Paspalum dilatatum*, common paspalum. This grass is very extensively cultivated on the coastal areas, particularly after the burning of big scrub.

(7) *Digitaria divaricatissima*. This is one of the roly-poly or umbrella grasses, the seed head breaking off and rolling about.

NOTICE TO SUBSCRIBERS.

When renewing your subscription, write your full name plainly, preferably in block letters.

Address your renewal to the Under Secretary, Department of Agriculture and Stock, Brisbane.

General Notes

Staff Changes and Appointments.

Mr. C. E. Ellis, Inspector of Stock, Killarney, has been appointed District Inspector of Stock, Department of Agriculture and Stock, and the Stock District of Warwick has been assigned to him.

Mr. E. W. B. Da Costa (Sandgate) has been appointed Assistant to Plant Physiologist, and Mr. H. M. Groszmann (Woongoolba) Assistant to Horticultural Research Officer, Department of Agriculture and Stock.

Mr. W. J. Park, Cadet (Pig Branch), has been appointed Inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock.

Mr. A. C. P. Nurcombe, Assistant Grader (Senior), Cotton Section, Department of Agriculture and Stock, has been transferred to the Glenmore Ginnery, Rockhampton.

Mr. A. R. Nott, Government Veterinary Surgeon, Blackall, has been transferred to the Animal Health Station, Yeerongpilly.

Mr. R. Small, Fairymead, Bundaberg, has been appointed an honorary ranger under the Animals and Birds Acts.

Mr. N. A. Anderson, loader for the Committee of Direction of Fruit Marketing at Burrum, has been appointed also an inspector under the Diseases in Plants Acts.

Mr. A. V. Thorp, Moreton Mill, Nambour, has been appointed millowners' representative on the Moreton Local Sugar Cane Prices Board.

Citrus Levy Regulation.

Approval has been given to the extension of the Citrus Levy Regulation, passed in April, 1936, for a further twelve months, as from the 1st March, 1937.

The Regulation empowers the Committee of Direction of Fruit Marketing to make the levy at the following rates:—

(*a*) On all citrus sold, consigned, or delivered whether by rail, road, or boat to factories, at the rate of 5s. per ton.

(*b*) On all citrus sold, consigned, or delivered by rail to any agent, person, or firm other than a factory, at the rate of 3s. 2d. per ton, with a minimum of 2d., but no levy is collected on single case consignments.

(*c*) On all citrus sold or delivered other than by rail to any railway station to any agent or person other than a factory, at the rate of 1d. per case.

Slight amendments of the Regulation include the reduction, in paragraph (*b*), of the minimum levy to 1d. instead of 2d., and in paragraph (*c*), an alteration to the effect that the levy shall be 1d. per bushel case, or ½d. per half-bushel case, with a minimum of 1d.

Open Season for Duck and Quail.

An Order in Council issued under the Animals and Birds Acts declares the periods of close season for duck and quail throughout the State. In effect, this will mean that the open season for duck and quail in the three divisions of Queensland will be:—

(*a*) *In Southern Queensland*—
For wild duck.—From 1st April to 31st August.
For quail.—From 1st May to 30th September.

(*b*) *In Central Queensland*—
For duck and quail.—From 1st July to 30th November.

(*c*) *In North Queensland*—
For duck and quail.—From 1st June to 31st October.

Packing and Grade Standards for Cavendish Bananas.

Amendments of the Fruit and Vegetable Grading and Packing Regulations issued under the Fruit and Vegetables Acts have been approved. These describe the measurements and capacity of a one-bushel banana case, and prescribe grade standards for Cavendish bananas.

The banana case shall be 18 inches long by 13 inches wide by 9½ inches deep, and its capacity shall be not less than 2,223 cubit inches.

The grade standards provide for cased bananas being divided into two grades—"Standard" and "Large." "Standard" shall mean sound fruit from 6½ to 7½ inches in length, with a minimum circumference of 4 inches. "Large" grade shall mean sound fruit over 7½ inches in length, with a minimum girth of 4½ inches, with a variation of not more than 1½ inches in length of fruit in any one case.

Sugar Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Queensland Cane Growers' Council to make a particular levy on all growers of sugar cane at the rate of one halfpenny per ton of sugar cane harvested during the coming season, the amounts raised by the levy to be expended on matters of an economic, legal, or compensatory nature, where such matters are of vital importance to the sugar industry generally.

One hundred growers of sugar cane may, on or before the 19th April next, make a request to the Minister for a poll on the question of whether or not the levy should be made.

Quarantine Area for Sugar-cane Plants.

A Proclamation issued on the 16th May, 1936, under the Diseases in Plants Acts, declared a quarantine area in portions of the parish of Sophia, Mulgrave district, on account of the prevalence of gumming disease of sugar cane, and prohibited the removal of sugar-cane plants from this quarantine area.

During the heavy wet season of last year the gumming disease outbreak in the Mulgrave area spread considerably, and it has become necessary to increase the size of the quarantine area in consequence. A Proclamation has been issued rescinding the one abovementioned, and extending the boundaries of the quarantine area in the Mulgrave area. The removal therefrom and planting therein of certain varieties of sugar cane is prohibited.

Veterinary Surgeons Board.

Executive Council approval has been given to the issue of a Proclamation bringing "*The Veterinary Surgeons Act of* 1936" into operation as from the 11th March. This Act makes provision for the registration of veterinary surgeons for which, and other purposes of administration, the Veterinary Surgeons Board has been constituted. This Board consists of Professor H. R. Seddon, D.V.Sc., Dean of the Faculty of Veterinary Science, University of Queensland; Colonel A. H. Cory, M.R.C.V.S. (L.), Chief Inspector of Stock; Messrs. E. F. Sunners, Chairman of the Queensland Meat Industry Board; J. W. Irving, M.R.C.V.S. (L.); and G. Mackay, Veterinary Surgeons. Mr. H. S. Iliff, Deputy Registrar of Brands, Department of Agriculture and stock, has been appointed Registrar of the Veterinary Surgeons Board.

A person is entitled to be registered as a Veterinary Surgeon under the Act who—

(*a*) is a holder of a degree or diploma in veterinary surgery of a university or is a member of a college of veterinary surgeons recognised by the Governor in Council;

(*b*) has undertaken a training course at, and has passed the examination prescribed by, a training institute within the Commonwealth of Australia, and approved by the Governor in Council as affording a training in veterinary science;

(*c*) has, previous to the commencement of this Act, been for a period of at least five years engaged *bonâ fide* in the practice of veterinary surgery in Queensland.

Provision is made for applications for registration as veterinary surgeons to be submitted to the Board. Regulations have also been approved which will give effect to the provisions of the Act. An Order in Council issued under the Act declares that certain operations done in connection with animal husbandry shall not constitute the practice of veterinary surgery.

Rural Topics

Standover Cotton—A Menace to Adjacent Cotton Fields.

Many farmers in the main cotton-growing areas are planting this season the whole or part of their acreage of cotton on newly broken grassland, and intend planting the old cotton fields with Rhodes grass, as the soundness of the grassland-cotton rotation has been amply borne out during the past season. It appears likely, however, that many old cotton fields will be left either as "standover" for some months, or in some cases, until the land is prepared for wheat or winter feed.

There is ample evidence to show that standover fields, through the prolific weed growth associated with them during the spring and summer months, are breeding centres for some of the major cotton pests, such as cutworm and corn ear worm, and are, therefore, a menace to adjacent fields of growing cotton. Over a series of years there have been recorded migrations of cutworms, and during the 1934-35 and 1935-36 seasons migrations of corn ear worm, from weedy standover fields to nearby seedling cotton which have caused substantial loss of stand. The weed growth is also responsible for a big increase in corn ear worm population during January and February, and heavy loss of squares and bolls in crops adjacent to a weedy standover field has occurred even in seasons of generally moderate corn ear worm attack. It is thus imperative that the grassing of standover fields be effected as soon as practicable, to eliminate completely the danger associated with weed growth adjacent to the new cotton.

Although fair stands of Rhodes grass have occasionally been obtained by sowing the seed between the rows of old cotton stalks of the "standover" field during February and March, this practice is not recommended, as more often a thin scattered stand results, and which is insufficient to smother weed growth. The growth made by Rhodes grass planted under such conditions is also usually slow, due to the surface soil being packed hard by the summer rains. It is, therefore, recommended that all standover fields be ploughed before any spring weed growth is apparent, further cultivation being given as is necessary to destroy any weed growth occurring afterwards and to establish a fine seedbed.

The preparation of a suitable seedbed for Rhodes grass is undoubtedly advisable, particularly on the old cotton cultivations of the forest soils, as this not only assists in the establishment of the seedlings but also ensures of a good supply of nitrate-nitrogen in the upper soil to promote a quick vigorous growth of grass.

As the idea of sowing the Rhodes grass on the old cotton cultivation is to check weed growth, improve the physical condition through the development of a large population of grass roots and reduce the nitrate content of the soil, it is advisable to sow the grass at a rate sufficient to give a thick even cover. In this respect it should be appreciated that Rhodes grass usually germinates only moderately well, so a good rate of sowing should be used—preferably 8 to 10 lb. per acre. Care should also be exercised to avoid sowing too deeply—dragging a brush harrow after broadcasting the seed usually gives ample cover in a normal season.—A. Nagle, Senior Instructor in Cotton Culture.

Giant Setaria (Giant Panicum).

In the past more or less confusion has arisen in connection with the sale for sowing of so-called panicum seed—*Setaria italica*. Botanically the seed in question is not a panicum, but belongs to the genus Setaria, a common collective name for which is "foxtail millet."

At the present time, *Setaria italica* (so-called panicum) may be divided into three main types, viz.,—giant, dwarf, and an admixture of both. The so-called giant panicum offered for sale in Queensland is frequently a mixture of the giant and dwarf varieties. In order to clarify the position, it has been decided that the giant and dwarf varieties shall be respectively called giant setaria and dwarf setaria. To ensure that these products will not lose their identity so far as farmers and others are concerned, they should be referred to in catalogues and other publications as follows:—

Giant Setaria (Giant Panicum), and
Dwarf Setaria (Hungarian Millet).

It may be mentioned that the identification of the giant or dwarf varieties is comparatively simple, and is carried out by the Seed Testing Station, Department of Agriculture and Stock, Brisbane, a period of about fourteen days being required for the purpose. It is intended at an early date to publish an illustrated article on this subject, and pamphlets will be made available to those interested.—F. B. Coleman, Pure Seeds Branch.

Dehorning Cattle.

The Royal National Association offered substantial prize money for pens of bullocks suitable for the export chilled beef trade, i.e., of approved breed, liveweight about 1,100 lb., age not to exceed four years. The number of entries was large, and the high standard reached by all exhibitors was very gratifying.

It is a great pity that all who saw the stock "on the hoof" did not see them "on the hooks."

The quiet, contented appearance of the animals shows they had been well handled, the full cods, steady, bulging eyes, and the sleek hides showed they had been well finished. Any observer would have classed them as prime killers. They were. The dressed weight, 650-700 lb., met the requirements of the English market. The conformation, covering of fat, depth, and evenness of flush left little or nothing to be desired. One animal aged twenty months dressed over 700 lb.

These animals must not be regarded as something extra special—something seen only at exhibitions. During the second quarter of the year thousands of such "fats" are trucked to the slaughter-houses. They leaves the homesteads in just the condition these "Exhibition" bullocks left, yet on slaughter many of the best carcases are so badly bruised that they must partly or wholly be condemned.

The loss is borne by every section of the trade, from the grower, whose stock are "marked down," to the treatment works, where loss of time in dressing such carcases means loss of money. Wherein lies the difference?

The terms of the Royal National Association's competition included " . . . . polled, dehorned, or tipped bullocks . . . ."

By far the greater number of fats trucked to the meatworks are Herefords or their crosses. Each animal carries a pair of bayonets in the form of horns. In old animals the spread of these horns is remarkable. Anyone with the slightest knowledge of cattle recollects that the normal position of the head is drooped, but when roused the animal throws its head quickly into a raised position. Each disturbance evokes such an action, and what happens among horned stock in the close confines of a railway carriage can easily be imagined. Struggles develop, beasts "get down," hooves score the fallen animal, horning takes place, and in the general fracas hips are broken, shoulders and ribs are contused. Losses which no one can afford occur.

It is often possible for cattle owners to walk large mobs to the meatworks. With careful management, the loss from bruising is small, but the loss in condition is appreciable.

Rail transport means such a saving in time that it is the recognised method of bringing stock from distant properties to the works.

Some bruising admittedly, and quite unavoidably, occurs in handling and working cattle, in the trucking yards and from the trucks themselves—particularly when stoppages are frequent—but most of the damage is wrought by horns. The obvious thing is to dehorn.

The ideal thing would be to breed hornless types. This practice is common in other beef cattle countries, but in Queensland it is not entirely practicable.

Dehorning at the calf stage is by far the easiest and most economical method. The operation can be done when calves are yarded for branding, castrating, or for any other purpose. Efficient instruments are available for "scooping out" the horn bud. Chemicals for suppressing horn development are also obtainable.

Failing an early dehorning, the animals should be dehorned, partly or wholly, at the beginning of the fattening period. Breaking off the horn with the aid of a hollow lever is cruel and dangerous; sawing off the unbleached, i.e., growing, portion of the horn is simple and painless. Complete dehorning of the adult animal should only be done with suitable veterinary instruments. These are obtainable in a variety of makes. They are strong, easy to use, and obtainable in Australia. Most agents are willing to demonstrate the operation. A suitable antiseptic, such as fat and Stockholm tar, should be smeared over the exposed base. As a last resort, the animals should be dehorned immediately prior to trucking.

Any notes on the advantages of dehorning would be incomplete without some reference to the animals themselves.

Dehorning largely eliminates the domineering type of animals. Horned stock should never be run with hornless. The rule should be "all or none," for even the most craven horned beast soon becomes a bully among the hornless. Hornless animals are more contented and quieter. They make more rapid gains in weight. They "handle" better, and settle down to new conditions quicker. Moreover, you can put more of them in a truck.—Dr. M. WHITE.

Sulphuring of Pineapple Soils.

Within the past few seasons the application of sulphur to pineapple soils has been widely practised, and its effect has been of great value in the control of pineapple "wilt disease." The function of sulphur is not that of a fertilizer; its value lies in the fact that it will increase the acidity or pH of the soil. It is now generally recognised that, under certain conditions, an acid soil is required for pineapple cultivation, and this is particularly the case with regard to the sandy forest areas.

The chief reason for this is that with the increased acidity the iron in the soil becomes more readily available to the plant. The presence of iron is necessary for the functioning of the chlorophyll, which is the green colouring matter of the plant leaf.

The amount of iron in the sandy forest soils is very low, and, as usually only a small part of the iron is available to the plant, it so happens that, after being cropped for a few years, this iron is all used up. This condition may be remedied by the application of sulphur, for, with the resulting increase in acidity, a sufficient quantity of iron will again become available. The response to this treatment can be detected by observing that there is a general improvement in the colour of the plant, and the new growth will be green and vigorous, in marked contrast to the pale, lifeless appearance of the previous condition.

With the heavier types of loams, and in particular the red volcanic loams, the application of sulphur is not always necessary, due to the sufficiency of available iron naturally present in the soil. However, it is a fact that in many of these heavy soils, which contain normally ten to twenty times the amount of total iron of the sandy soils, there is only a very small amount of this available, and consequently there will be a definite response to sulphuring.

In sandy soils, the pH test may be regarded as an index of the availability of the iron, and, except in the case of some virgin areas, if the pH is much above five, the application of sulphur can be confidently recommended. The amount of sulphur varies with the soil, but generally 2½ to 3 cwt. per acre should suffice for the light-coloured very sandy types. For those which are of the nature of a sandy loam, a heavier dressing of 4 to 5 cwt. per acre is necessary. With loams, and the red volcanic soils, dressings of less than 6 to 7 cwt. per acre are of little use, and, moreover, before these heavy dressings are made, advice should be obtained as to whether they are necessary, and will warrant the expenditure.

As the period in which the effect of sulphur becomes noticeable is about one to two months in the summer and at least three to six months in winter, it is advisable to apply it as soon as possible, i.e., a month or so before planting. The land should be brought to a fine tilth, and the sulphur broadcast by hand. Powdered sulphur is on the market; it is of the required degree of fineness, and is cheaper than the very fine flowers of sulphur. If at all lumpy, it should be rubbed through a sieve before distributing, in order to ensure an intimate admixture of the sulphur particles with the soil. The best time to apply is early in the morning, or on a still day, and it is very advisable to wear some form of protecting goggles, as the fine particles of sulphur cause considerable irritation to the eyes. The sulphur is then scarified in to a depth of about 4 inches; this is preferable to turning it in deeper by ploughing.

Sulphur may be applied with benefit to plants showing iron deficiency, up to twelve months old; the response, however, is not as marked as when it is applied before planting. In this case, it should be applied to the soil fairly close to the base of the plant, and then chipped in. It must be clearly understood that the sulphur should be applied to the soil itself, and that any portion lodging in the base of the leaves will be wasted. Note that this is different from fertilizer practice, for sulphur, unlike a fertilizer mixture, must be applied directly to, and thoroughly incorporated with, the soil for any reaction to take place.

Finally, it must be pointed out that the health and growth of the young plant is all important, and therefore the great value of sulphur lies in its use as a preventive and not as a cure.—L. G. VALLANCE, Analyst.

Orchard Notes

MAY.

THE COASTAL DISTRICTS.

IN these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first indication of changing colour or is large enough to cure down to about from 2¼ to 2½ inches in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or speckling. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of blue-mould infected or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one-sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month, and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELAND.

CLEAN up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place, as, if delayed till the pruning has been finished, the land is apt to dry out.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not vines*, as the later vines are pruned in the season the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manures—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland, and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

POINTS IN TOMATO CULTURE.

For the best results with tomatoes it is important that only seedlings that are strong and vigorous should be planted out. Careful experiments have demonstrated the marked influence of the early life of the plant on its subsequent behaviour. In view of this, and of the fact that most plant diseases are due to parasatic fungi, the following rules should be observed:—

Choose healthy seedlings. Practise crop rotation. Raise seedlings under a waterproof cover open to the north-east. Avoid over-watering of seedlings. Spray with Bordeaux mixture. Burn the crop residue at the end of the season. Plants grown on stakes and pruned are less liable to damage by diseases and pests.

Farm Notes

MAY.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late-maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland. Prairie grass seed should be treated with formalin or a reliable mercury dust before sowing.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

A PROLIFIC SOW.

The following record of a litter of fourteen pigs from the Large White Sow, Strathmore Perfection, and sired by the Large White boar, Staghorn Bradbury 14th, owned by Mr. A. G. Stewart, Strathmore Stud Piggery, Cedar Pocket, Gympie, is considered a particularly good performance and possibly an Australian record for a litter at eight weeks old.

The litter consisted of fourteen pigs at birth and all were reared, but one pig (Tattoo No. 219) was so small at birth that it was taken from the sow when a day old and hand-reared.

The sow was fed on separated milk and meal during the suckling period, and the pigs, in addition to feeding at the trough with the sow, had access to a self-feeder containing a meal mixture in a creep away from the sow.

The birth weights and the weights at fifty-six days old were taken by officers of the Department of Agriculture and Stock. The intermediate weekly weighings were taken by Mr. Stewart.

Owner: A. G. Stewart, Strathmore Stud, Cedar Pocket, Gympie.

Dam of Litter: Strathmore Perfection (Large White).

Sire of Litter: Staghorn Bradbury 14th (Large White).

Litter Born on: 11th December, 1936.

Tattoos or Earmarks.	209	210	211	212	213	214	215	216	217	218	219	220	221	222	Total.	Average.
Sexes	B	B	B	B	B	B	S	S	S	S	S	S	S	S	..	..
Weight at Birth–lb.	3	2½	3	3	2½	2½	2	3	3	3½	1½	2	3	3	37·5	2·6
Weight at 1 week	5	3½	5	5	4	4½	3	5	5	6	3	3½	5	4	61·5	4·3
Weight at 2 weeks	8	4	7½	6½	6	6	5½	8	7½	9	7	5	7	6	93·0	6·6
Weight at 3 weeks	13	7	11	9	10	10	8	11	11	13	12	7	11	10	143·0	10·2
Weight at 4 weeks	20	10	15	17	14	14	13	16	16	19	18	12	15	17	216·0	15·4
Weight at 5 weeks	26	15	22	20	19	20	18	22	22	25	25	17	27	24	302·0	21·5
Weight at 6 weeks	33	21	29	25	22	28	29	30	29	33	32	23	30	30	394·0	28·1
Weight at 7 weeks	42	26	39	33	30	32	32	36	33	41	39	29	36	35	483·0	34·5
Weight at 8 weeks	51	36	43	41	33	40	38	42	39	47	49	36	44	44	583·0	41·6

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.

WHY IS MY CHILD NAUGHTY?

THE following talk to mothers is taken from the "Mother and Child" journal.

"If your child is naughty, if he is selfish, if he 'shows off,' it may not be altogether his fault. Perhaps you have made him like this. All children are naughty at times, of course, but where naughtiness has become a habit instead of an occasional lapse there is reason to suspect that all may not be well in the parents' attitude to the child, and parents who honestly desire their child's well-being and contentment will ask themselves some heart-searching questions such as these:—Are you nicer to one child than to another? Do you laugh at your child sometimes when he is naughty and sometimes when he is good? No wonder he is puzzled! How can he possibly know what to do in order to please his parents? Is your attitude consistent, that is, can your child understand your attitude to right and wrong? Do you punish the children when you are angry? The story is told of a mother who was punishing her little boy very severely, when a friend asked her whether it did the child any good to be smacked so hard. The mother answered, "Perhaps it doesn't do him any good, but it does me lots of good." Children know when they are being punished unfairly, and unjust punishment will only make them more difficult than ever to manage. Do you punish your children too severely? If you do this they will tell lies to avoid being punished.

"Are you always truthful yourself, both in what you say and what you do?

"Supposing a friend telephones and asks you, for example, to go to the pictures with her, and your boy answers the telephone. Do you say to him, 'I don't want to go. Tell her I have a headache'? Can you wonder if the next morning your boy 'has a headache' when it is time for him to go to school?

"Are you letting your little child grow up and begin to be independent of you, or are you trying to keep him a baby? We cannot blame parents for being rather sad when they see their baby growing out of babyhood, but it is a very bad policy to try to hold back the child's growth, to try to force him to remain a baby by doing everything for him, and talking to him in 'baby talk.' Children want to do things for themselves, and if they are not allowed to try they very often become naughty. They love to 'help,' and though their efforts may be very clumsy at first they should be encouraged in spite of accidents. Some parents, when they see a broken cup or something spilled on the floor, scold the child and refuse to let him help. The child learns that it is safer for him not to help. Later on, when his parents want him to be useful and helpful, he will refuse, and he will be blamed for selfishness and laziness. But who taught him to be selfish and lazy?

"Do you talk about your child before him? Many parents do this. They think that the child is too young to understand, that he is not paying attention, or else they do not think at all. But very little children—even babies—do pay attention, and they do understand. They may not understand your words, perhaps, but they understand your voice and your face. They know when you are talking about them. If you allow your little child to hear you say to a friend, 'No, I can't go so early because Johnny cries if I don't sit with him until he goes to sleep,' you have taught him that he has only to cry and you will obey him. If you remark at breakfast, 'Father, can you make Johnny eat his porridge? I can't,' Johnny understands that he has only to say, 'I won't,' and you are helpless. If you allow a child to hear you say again and again, in his presence, that you cannot make him obey it is hardly a wonder if he becomes disobedient.

"Another point—when he is within hearing do you describe to your friends your little child's amusing and clever sayings and doings? That is the way to turn him into a 'show off,' wanting attention all the time. It is natural, of course, for parents to talk about their child's ways and laugh together over the funny little remarks he makes, but they should keep this pleasure until the child is out of earshot.

"Disagreement between the parents on some point of management, in the child's presence, is another frequent cause of disobedience. If mother forbids him to go out to play and father, more easy going, says, 'Oh, let him go! Why shouldn't he?' the child naturally feels that he need not obey his mother. Parents who are eager to be good parents will never let each other down in this way. If one thinks the other has made a mistake they will talk it over when the child cannot hear them."

IN THE FARM KITCHEN.

POULTRY DISHES.

Chicken Loaf.

Take 2 cupfuls chopped cooked chicken, 1 cupful breadcrumbs, 1½ tablespoonfuls butter, ½ cupful milk, ½ cupful pea puree, 2 eggs, 1 onion, salt, pepper, paprika.

Slice and fry the onion. Place crumbs in a basin and pour over the heated milk. Rub enough cooked or tinned peas through a sieve to give you the quantity of puree required, then mix all ingredients together, and season to taste. Place in a baking dish which has been well greased. Bake in a moderate oven till firm and brown. Serve hot or cold. If cold, garnish with sliced tomato and serve with potato salad.

Chicken Mousse.

Take 1 cupful white chicken meat, 3 egg-yolks, 1 cupful whipped cream, ½ cupful heated chicken jelly, 1½ cupfuls milk, 1 dessertspoonful gelatine, lettuce-leaves, tomatoes.

Beat the egg-yolks. Add the milk. Cook mixture in the top of a double boiler until like custard. Cool and add chopped white chicken meat. Soak gelatine in the hot chicken jelly and dissolve, season custard to taste with salt, pepper, and paprika, and add chicken jelly and gelatine. Whip cream until thick, measure, then gradually fold into mixture, when beginning to set. Turn into a round mould rinsed out with cold water. When set turn out into a glass dish lined with lettuce leaves. Garnish with quarters of tomatoes.

Chicken Canapes.

Take 1 large cucumber, chicken, capers, tomatoes, mayonnaise, mustard, and cress, or parsley.

Peel cucumber. Cut into thick slices, scoop out centre with a cutter which is large enough to remove all but the rim. Place each cucumber ring on a thick slice of tomato, then fill rings with cold chopped breast of chicken, moistened with mayonnaise. Decorate each with minced capers, parsley, or mustard and cress.

Chicken Croquettes.

Take 2 cupfuls chopped cooked chicken, 1 cupful white sauce, ¼ teasponful onion juice, ½ teaspoonful salt, cayenne, 1 teaspoonful lemon juice, 1 egg, 1 teaspoonful chopped parsley, breadcrumbs.

Chop the chicken finely. Season to taste with cayenne and salt, lemon juice, onion juice, and parsley. Add white sauce, mix well together, shape into croquettes. Roll in crumbs, then in beaten egg and crumbs again. Fry in deep, smoking fat till crisp and brown.

Giblet Pie.

Take 2 sets poultry giblets, 1 small onion, 6 peppercorns, 1 egg, 1 lb. rump steak, sprig parsley, 1 lb. flaky pastry, cold water.

Prepare, clean, and wash giblets, and place them in a saucepan. Add peeled onion, six peppercorns, and a sprig of parsley. Cover with cold water. Bring to the boil. Add a pinch of salt, then skim. Cover and simmer gently for two hours. Then remove and allow to cool. Line the bottom of a buttered pie-dish with steak cut into small pieces, and dipped in seasoned flour. Cover with chopped giblets, and then another layer of seasoned steak. Add the giblet stock, and season highly. Cover pie-dish with pastry in the usual way. Decorate with pastry leaves and brush top with beaten egg. Bake in a quick oven for one and a-half hours.

Chicken Roly Poly.

Take 2 cupfuls minced chicken, 2 onions, 2 teaspoonfuls salt (scant), ½ cupful chopped fried bacon, 4 tablespoonfuls minced parsley, ½ teaspoonful pepper, 4 cupfuls sifted flour, 4 teaspoonfuls baking powder, 4 oz. butter, stock, about 1 cupful water.

Sift the flour with baking powder and one teaspoonful of the salt. Rub in the butter with the tips of fingers. Mix to a dough with the water. Turn on to a floured board. Divide into two portions. Roll each out to ¼ inch thick. Meanwhile, place chicken in a basin with the onions grated, finely-chopped parsley, diced bacon, and remainder of salt and pepper. Mix well. Moisten with stock or giblet gravy. Spread on pastry. Roll and press ends of pastry firmly together. Place on a well-greased baking-tin and bake for thirty-five minutes in a moderate oven.

Blanquette of Chicken.

Take 1 lb. cold chicken, ¼ lb. tongue, 1 pint white sauce, juice ½ lemon, 1 gill stock, salt, and pepper.

Place white stock in a saucepan. Stir in sauce and mix well. Add chopped chicken and the tongue cut into dice. Season to taste with salt and pepper, and add strained lemon juice. Place pan over the gas and stir until mixture is thoroughly hot. Turn on to a hot dish and serve at once with mashed potatoes.

Chicken Cream Moulds.

Take 1 tablespoonful gelatine, ¼ cupful cold chicken stock, ¾ cupful hot chicken stock, 1 cupful cold cooked chicken, 1 cupful thick cream, salt and pepper to taste, lettuce.

Soak the gelatine in the cold stock, then dissolve in the hot stock, well seasoned and strained. When mixture begins to thicken beat until it is frothy. Then add whipped cream and chicken cut into dice. Season with salt and pepper, and pour into individual moulds. Serve on a bed of lettuce leaves, and garnish with slices of hard-boiled egg.

Chicken Salad.

Take ½ pint diced cooked chicken, 1 tablespoonful lemon juice, ½ cupful diced celery, ½ cupful mayonnaise, chopped stuffed olives, lettuce, capers, salt and pepper.

Dice the chicken and mix with lemon juice, celery, and seasoning to taste. Toss in mayonnaise and serve in a bed of lettuce, and leave arranged on a pretty dish. Garnish with chopped stuffed olives and capers.

Timbale of Spaghetti and Chicken Livers.

Take 4 oz. spaghetti, 2 chicken livers, 2 tablespoonfuls grated cheese, 2 tomatoes, pepper, salt, margarine for frying.

Boil the spaghetti in salted water for twenty minutes. Fry the chicken livers and cut into small pieces. Fry the tomatoes until soft, and press them through a sieve. Mix all together, and add grated cheese, pepper and saft to taste. Stir the mixture thoroughly, and place in a timbale or ordinary casserole. Cook in a moderate oven from twenty-five to thirty minutes. Serve very hot.

Rissotto of Chicken.

Take 1 cupful cooked chicken (chopped), 1 onion, ¾ cupful rice, 1 quart chicken broth, 2 tablespoonfuls butter, grated cheese.

Melt the butter in a saucepan. Fry onion without browning it. Add chicken broth. Bring to boil, then wash and add rice. Cover saucepan. Simmer for about twenty-five minutes, shaking the pan occasionally to prevent rice sticking. Don't stir unless absolutely necessary. When ready the rice should have absorbed nearly all the broth, and the grains should be swollen and separate. Add chicken, stir for a moment or two, then turn on to a hot dish. Sprinkle thickly with grated cheese and serve at once.

DEFECTS IN DAIRY UTENSILS.

No farmer has to use tinware of various descriptions to the same extent as the dairyman, and an elementary knowledge of the use of the soldering iron is of particular value in his case. In fact, it might almost be considered a necessary part of a dairy farmer's training. The mending of leaks, the retinning of rust spots, the refixing of milk-can hoops, &c., are all jobs that are possible to a man determined to master a few essentials of the process.

It is the continuous neglect of the rough places in tinware that has such a serious effect on milk and cream quality, by affording lodging places for decaying milk and cream. The exposed metal is also attacked by the acid in the cream, and this is responsible for some of the flavour defects in butter. A few drops of solder will quickly rectify these tinware faults.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY 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.	
	Feb. 1936.	No. of Years' Records.	Feb. 1937.	Feb. 1936.		Feb. 1936.	No. of Years' Records.	Feb. 1937.	Feb. 1936.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	10·65	36	12·17	15·18	Clermont	4·19	66	3·58	2·42
Cairns	15·95	55	4·90	29·57	Gindie	2·70	38	4·60	0·38
Cardwell	17·16	65	6·63	51·31	Springsure	3·83	62	4·33	0·93
Cooktown	13·79	61	9·24	22·61					
Herberton	7·95	51	9·64	10·43					
Ingham	16·43	45	6·32	41·74					
Innisfail	22·92	56	7·30	53·89					
Mossman Mill ..	18·38	24	20·64	29·15	*Darling Downs.*				
Townsville	11·26	66	4·70	28·70					
Central Coast.					Dalby	2·83	67	1·04	0·61
					Emu Vale	2·53	41	2·32	0·28
Ayr	9·20	50	..	28·61	Hermitage	2·42	31	..	0·56
Bowen	8·78	56	5·76	16·67	Jimbour	2·63	49	1·33	0·45
Charters Towers ..	..	..	3·82	7·66	Miles	2·69	52	3·08	1·64
Mackay	11·72	66	15·38	8·78	Stanthorpe	3·16	64	2·36	..
Proserpine	12·69	34	6·08	29·98	Toowoomba ..	4·53	65	2·96	1·47
St. Lawrence ..	7·74	66	9·55	5·30	Warwick	3·05	72	0·89	0·91
South Coast.									
					Maranoa.				
Biggenden	4·40	38	3·17	1·59					
Bundaberg	6·54	54	6·06	1·27	Roma	2·89	63	3·75	1·72
Brisbane	6·41	85	5·25	1·27					
Caboolture	7·79	50	6·53	1·61					
Childers	6·74	42	4·72	1·92					
Crohamhurst	12·89	44	9·37	2·09					
Esk	5·48	50	2·15	2·05					
Gayndah	4·24	66	1·77	0·87					
Gympie	6·80	67	6·49	2·00	*State Farms, &c.*				
Kilkivan	4·93	58	4·09	1·67					
Maryborough ..	6·81	66	6·59	2·46	Bungeworgoral ..	..	..	..	2·99
Nambour	9·74	41	7·82	3·30	Gatton College ..	3·56	38	..	2·03
Nanango	4·09	55	1·72	1·64	Kairi	9 99	21	..	18·84
Rockhampton ..	7·71	56	10·63	4·69	Mackay Sugar Experiment Station	10·91	40	22·77	27·21
Woodford	8·45	50	7·48	0·85					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure at 9 a.m. Means	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29.77	90	75	95	13, 17, 18, 19	72	2, 3	924	16
Herberton	..	83	64	86	21, 22, 23	59	2, 13	964	15
Rockhampton	29·84	87	72	98	23	68	18, 19, 27	1063	12
Brisbane	29·97	84	68	92	22	63	1, 20, 27	127	15
Darling Downs.									
Dalby	29·91	87	63	98	21, 22	55	20	104	8
Stanthorpe	..	77	57	89	9	44	23	236	15
Toowoomba	..	..	60	93	21, 22	52	17	296	11
Mid-Interior.									
Georgetown	29·80	92	71	99	12	63	13	473	9
Longreach	29·80	97	71	109	2	64	12	431	8
Mitchell	29·88	86	65	98	1	55	24	453	6
Western									
Burketown	29·77	95	77	103	12	69	6	180	8
Boulia	29·77	101	75	108	1, 2, 3, 4	69	7	77	1
Thargomindah	29·81	94	72	105	1, 2	65	11, 12, 13, 23, 24	87	4

ASTRONOMICAL DATA FOR QUEENSLAND.

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

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April. 1937.		May. 1937.		MOONRISE. April. 1937.	MOONRISE. May. 1937.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·2	5·50	6.18	5·20	9·2	9.39
2	6·3	5·49	6·18	5·19	9·52	10·29
3	6·3	5·48	6·19	5·18	10·44	11·24
4	6·4	5·46	6·20	5·17	11·41	..
					a.m.	a.m.
5	6·4	5·45	6·20	5·17	..	12·22
6	6·5	5·44	6·21	5·16	12·37	1.20
7	6·5	5·43	6·21	5·15	1·35	2·20
8	6·6	5·42	6·22	5·14	2·36	3·23
9	6·6	5·41	6·23	5·14	3·38	4·31
10	6·7	5·40	6·23	5·13	4·40	5·39
11	6·7	5·39	6·24	5·12	5·49	6·50
12	6·8	5·38	6·24	5·11	6·56	7·59
13	6·8	5·37	6·25	5·11	8·6	9·3
14	6·9	5·36	6·26	5·10	9·14	10·3
15	6·9	5·35	6·26	5·10	10·19	10·47
16	6·10	5·34	6·27	5·9	11·17	11·31
					p.m.	p.m.
17	6·10	5·34	6·27	5·9	12·10	12·10
18	6·11	5·33	6·28	5·8	12·53	12·45
19	6·11	5·32	6·29	5·8	1·33	1·18
20	6·12	5·31	6·29	5·7	2·9	1·50
21	6·12	5·30	6 30	5·7	2·43	2·23
22	6·13	5·29	9·31	5·6	3·16	2·58
23	6·13	5·28	6·31	5·6	3·50	3·36
24	6·14	5·26	6·32	5·5	4·21	4·14
25	6·14	5·25	6·32	5·5	4·54	4·56
26	6·15	5·24	6·33	5·4	5·34	5·44
27	6·15	5·24	6·34	5·4	6·14	6·34
28	6·16	5·23	6.34	5·3	6.59	7·27
29	6·16	5·22	6·35	5·3	7·46	8·23
30	6·17	5·21	6·35	5·2	8·38	9·19
31			6·36	5·2		10·15

Phases of the Moon, Occultations, &c.

4 Apr.	☽ Last Quarter	1	53 p.m.
11 ,,	● New Moon	3	10 p.m.
18 ,,	☾ First Quarter	6	34 a.m.
26 ,,	○ Full Moon	1	23 a.m.

Perigee, 12th April, at 6 p.m.
Apogee, 27th April, at 8 p.m.

Mercury rises at 6.33 a.m., 31 minutes after the Sun, and sets at 6.11 p.m., 21 minutes after it on the 1st; on the 15th it rises at 7.37 a.m., 1 hour 28 minutes after the Sun, and sets at 6.27 p.m., 52 minutes after it.

Venus rises at 7.59 a.m., 1 hour 57 minutes after the Sun, and sets at 6.37 p.m., 1 hour 37 minutes after it on the 1st; on the 15th it rises at 6.35 a.m., 26 minutes before the Sun, and sets at 5.27 p.m., 8 minutes before it.

Mars rises at 8.39 p.m. and sets at 10.15 a.m. on the 1st; on the 15th it rises at 7.47 p.m. and sets at 9.25 a.m.

Jupiter rises at 12.10 a.m. and sets at 1.52 p.m. on the 1st; on the 15th it rises at 11.23 p.m. and sets at 1.3 a.m.

Saturn rises at 5.0 a.m. and sets at 5.17 p.m. on the 1st; on the 15th it rises at 4.22 a.m. and sets at 4.18 p.m.

In the months of March and April of every recurring year our evening sky is resplendent with the most brilliant of both the northern and southern constellations. When about 7 o'clock in the beginning of March Orion had reached its greatest altitude one could trace from this, the finest of all constellations, as in a great round, to the eastward, Canis Major with the wonderful Sirius, lower down Canis Minor with the deep orange-coloured Procyon, and lower still the conspicuous white stars Castor and Pollux in Gemini, and below Orion, nearest the horizon, the fine first magnitude star Capella in the great five-cornered constellation Auriga; then, upward to the north-west, the Pleiades and, nearest Orion, the Hyades—all these, though not quite so favourably placed as in February.

In April, when the enormous length of the good ship Argo with its one bright light Canopus lies westward of the Southern Cross, the whole of the Centaur, eastward of it, has arisen—of which only the Pointers were visible in March—with its great disk of beautifully grouped stars of nearly the same magnitude. And now, when Orion is nearing the horizon in the west, the Scorpion arises in the east, a rival in grace and beauty if not in brilliancy.

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.

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.